Operating Manual

OPTIMOD

8585

Surround Audio Processor

Version 1.0 Software

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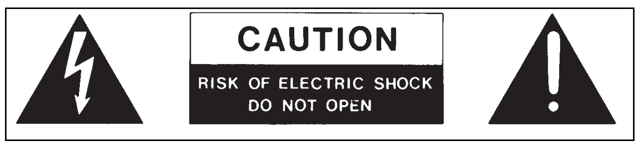
IMPORTANT NOTE: Refer to the unit's rear panel for your Model Number.

Model Number:	Description:
8585	OPTIMOD 8585 audio processor for digital surround transmission channels. Digital I/O, Two-Band Structure with CBS Loudness Controller, Five-Band Structure with CBS Loudness Controller. 85-250V operation at 50-60 Hz.

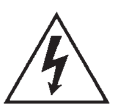
MANUAL:

Part Number:	Description:
	8585 Operating Manual



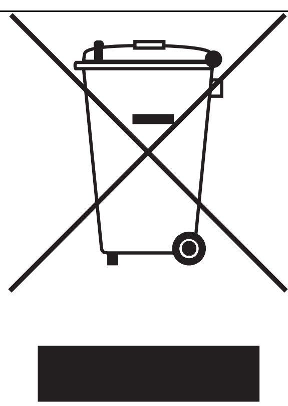
CAUTION: TO REDUCE THE RISK OF ELECTRICAL SHOCK, DO NOT REMOVE COVER (OR BACK). NO USER SERVICEABLE PARTS INSIDE. REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.

WARNING: TO REDUCE THE RISK OF FIRE OR ELECTRICAL SHOCK, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE.



This symbol, wherever it appears, alerts you to the presence of uninsulated dangerous voltage inside the enclosure — voltage that may be sufficient to constitute a risk of shock.

This symbol, wherever it appears, alerts you to important operating and maintenance instructions in the accompanying literature. Read the manual.



In accordance to the WEEE (waste electrical and electronic equipment) directive of the European Parliament, this product must not be discarded into the municipal waste stream in any of the Member States. This product may be sent back to your Orban dealer at end of life where it will be reused or recycled at no cost to you.

If this product is discarded into an approved municipal WEEE collection site or turned over to an approved WEEE recycler at end of life, your Orban dealer must be notified and supplied with model, serial number and the name and location of site/facility.

Please contact your Orban dealer for further assistance.

www.orban.com

IMPORTANT SAFETY INSTRUCTIONS

All the safety and operating instructions should be read before the appliance is operated.

Retain Instructions: The safety and operation instructions should be retained for future reference.

Heed Warnings: All warnings on the appliance and in the operating instructions should be adhered to.

Follow Instructions: All operation and user instructions should be followed.

Water and Moisture: The appliance should not be used near water (e.g., near a bathtub, washbowl, kitchen sink, laundry tub, in a wet basement, or near a swimming pool, etc.).

Ventilation: The appliance should be situated so that its location or position does not interfere with its proper ventilation. For example, the appliance should not be situated on a bed, sofa, rug, or similar surface that may block the ventilation openings; or, placed in a built-in installation, such as a bookcase or cabinet that may impede the flow of air through the ventilation openings.

Heat: The appliance should be situated away from heat sources such as radiators, heat registers, stoves, or other appliances (including amplifiers) that produce heat.

Power Sources: The appliance should be connected to a power supply only of the type described in the operating instructions or as marked on the appliance.

Grounding or Polarization: Precautions should be taken so that the grounding or polarization means of an appliance is not defeated.

Power-Cord Protection: Power-supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plugs, convenience receptacles, and the point where they exit from the appliance.

Cleaning: The appliance should be cleaned only as recommended by the manufacturer.

Non-Use Periods: The power cord of the appliance should be unplugged from the outlet when left unused for a long period of time.

Object and Liquid Entry: Care should be taken so that objects do not fall and liquids are not spilled into the enclosure through openings.

Damage Requiring Service: The appliance should be serviced by qualified service personnel when: The power supply cord or the plug has been damaged; or Objects have fallen, or liquid has been spilled into the appliance; or The appliance has been exposed to rain; or The appliance does not appear to operate normally or exhibits a marked change in performance; or The appliance has been dropped, or the enclosure damaged.

Servicing: The user should not attempt to service the appliance beyond that described in the operating instructions. All other servicing should be referred to qualified service personnel.

The Appliance should be used only with a cart or stand that is recommended by the manufacturer.

Safety Instructions (European)

Notice For U.K. Customers If Your Unit Is Equipped With A Power Cord.

WARNING: THIS APPLIANCE MUST BE EARTHED.

The cores in the mains lead are coloured in accordance with the following code:

GREEN and YELLOW - Earth   BLUE - Neutral   BROWN - Live

As colours of the cores in the mains lead of this appliance may not correspond with the coloured markings identifying the terminals in your plug, proceed as follows:

The core which is coloured green and yellow must be connected to the terminal in the plug marked with the letter E, or with the earth symbol, or coloured green, or green and yellow.

The core which is coloured blue must be connected to the terminal marked N or coloured black.

The core which is coloured brown must be connected to the terminal marked L or coloured red.

The power cord is terminated in a CEE7/7 plug (Continental Europe). The green/yellow wire is connected directly to the unit's chassis. If you need to change the plug and if you are qualified to do so, refer to the table below.

WARNING: If the ground is defeated, certain fault conditions in the unit or in the system to which it is connected can result in full line voltage between chassis and earth ground. Severe injury or death can then result if the chassis and earth ground are touched simultaneously.

Conductor		WIRE COLOR	
		Normal	Alt
L	LIVE	BROWN	BLACK
N	NEUTRAL	BLUE	WHITE
E	EARTH GND	GREEN-YELLOW	GREEN

AC Power Cord Color Coding

Safety Instructions (German)

Gerät nur an der am Leistungsschild vermerkten Spannung und Stromart betreiben.
Sicherungen nur durch solche, gleicher Stromstärke und gleichen Abschaltverhaltens ersetzen. Sicherungen nie überbrücken.
Jedwede Beschädigung des Netzkabels vermeiden. Netzkabel nicht knicken oder quetschen. Beim Abziehen des Netzkabels den Stecker und nicht das Kabel enfassen. Beschädigte Netzkabel sofort auswechseln.
Gerät und Netzkabel keinen übertriebenen mechanischen Beaspruchungen aussetzen.
Um Berührung gefährlicher elektrischer Spannungen zu vermeiden, darf das Gerät nicht geöffnet werden. Im Fall von Betriebsstörungen darf das Gerät nur Von befugten Servicestellen instandgesetzt werden. Im Gerät befinden sich keine, durch den Benutzer reparierbare Teile.
Zur Vermeidung von elektrischen Schlägen und Feuer ist das Gerät vor Nässe zu schützen. Eindringen von Feuchtigkeit und Flüssigkeiten in das Gerät vermeiden.
Bei Betriebsstörungen bzw. nach Eindringen von Flüssigkeiten oder anderen Gegenständen, das Gerät sofort vom Netz trennen und eine qualifizierte Servicestelle kontaktieren.

Safety Instructions (French)

On s'assurera toujours que la tension et la nature du courant utilisé correspondent bien à ceux indiqués sur la plaque de l'appareil.
N'utiliser que des fusibles de même intensité et du même principe de mise hors circuit que les fusibles d'origine. Ne jamais shunter les fusibles.
Eviter tout ce qui risque d'endommager le câble seceur. On ne devra ni le plier, ni l'aplatir. Lorsqu'on débranche l'appareil, tirer la fiche et non le câble. Si un câble est endommagé, le remplacer immédiatement.
Ne jamais exposer l'appareil ou le câble ä une contrainte mécanique excessive.
Pour éviter tout contact averc une tension électrique dangereuse, on n'oouvrira jamais l'appareil. En cas de dysfonctionnement, l'appareil ne peut être réparé que dans un atelier autorisé. Aucun élément de cet appareil ne peut être réparé par l'utilisateur.
Pour éviter les risques de décharge électrique et d'incendie, protéger l'appareil de l'humidité. Eviter toute pénétration d'humidité ou fr liquide dans l'appareil.
En cas de dysfonctionnement ou si un liquide ou tout autre objet a pénétré dans l'appareil couper aussitôt l'appareil de son alimentation et s'adresser à un point de service aprésvente autorisé.

Safety Instructions (Spanish)

Hacer funcionar el aparato sólo con la tensión y clase de corriente señaladas en la placa indicadora de características.
Reemplazar los fusibles sólo por otros de la misma intensidad de corriente y sistema de desconexión. No poner nunca los fusibles en puente.
Proteger el cable de alimentación contra toda clase de daños. No doblar o apretar el cable. Al desenchufar, asir el enchufe y no el cable. Sustituir inmediatamente cables dañados.
No someter el aparato y el cable de alimentación a esfuerzo mecánico excesivo.
Para evitar el contacto con tensiones eléctricas peligrosas, el aparato no debe abrirse. En caso de producirse fallos de funcionamiento, debe ser reparado sólo por talleres de servicio autorizados. En el aparato no se encuentra ninguna pieza que pudiera ser reparada por el usuario.
Para evitar descargas eléctricas e incendios, el aparato debe protegerse contra la humedad, impidiendo que penetren ésta o líquidos en el mismo.
En caso de producirse fallas de funcionamiento como consecuencia de la penetración de líquidos u otros objetos en el aparato, hay que desconectarlo inmediatamente de la red y ponerse en contacto con un taller de servicio autorizado.

Safety Instructions (Italian)

Far funzionare l'apparecchio solo con la tensione e il tipo di corrente indicati sulla targa riportante i dati sulle prestazioni.
Sostituire i dispositivi di protezione (valvole, fusibili ecc.) solo con dispositivi aventi lo stesso amperaggio e lo stesso comportamento di interruzione. Non cavallottare mai i dispositivi di protezione.
Evitare qualsiasi danno al cavo di collegamento alla rete. Non piegare o schiacciare il cavo. Per staccare il cavo, tirare la presa e mai il cavo. Sostituire subito i cavi danneggiati.
Non esporre l'apparecchio e il cavo ad esagerate sollecitazioni meccaniche.
Per evitare il contatto con le tensioni elettriche pericolose, l'apparecchio non deve venir aperto. In caso di anomalie di funzionamento l'apparecchio deve venir riparato solo da centri di servizio autorizzati. Nell'apparecchio non si trovano parti che possano essere riparate dall'utente.
Per evitare scosse elettriche o incendi, l'apparecchio va protetto dall'umidità. Evitare che umidità o liquidi entrino nell'apparecchio.
In caso di anomalie di funzionamento rispettivamente dopo la penetrazione di liquidi o oggetti nell'apparecchio, staccare immediatamente l'apparecchio dalla rete e contattare un centro di servizio qualificato.

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PLEASE READ BEFORE PROCEEDING!

Manual

The Operating Manual contains instructions to verify the proper operation of this unit and initialization of certain options. You will find these operations are most conveniently performed on the bench before you install the unit in the rack.

Please review the Manual, especially the installation section, before unpacking the unit.

Trial Period Precautions

If your unit has been provided on a trial basis:

You should observe the following precautions to avoid reconditioning charges in case you later wish to return the unit to your dealer.

(1) Note the packing technique and save all packing materials. It is not wise to ship in other than the factory carton. (Replacements cost $35.00).

(2) Avoid scratching the paint or plating. Set the unit on soft, clean surfaces.

(3) Do not cut the grounding pin from the line cord.

(4) Use care and proper tools in removing and tightening screws to avoid burring the heads.

(5) Use the nylon-washered rack screws supplied, if possible, to avoid damaging the panel. Support the unit when tightening the screws so that the threads do not scrape the paint inside the slotted holes.

Packing

When you pack the unit for shipping:

(1) Tighten all screws on any barrier strip(s) so the screws do not fall out from vibration.
(2) Wrap the unit in its original plastic bag to avoid abrading the paint.
(3) Seal the inner and outer cartons with tape.

If you are returning the unit permanently (for credit), be sure to enclose:

- The Manual(s)
- The Registration/Warranty Card
- The Line Cord
- All Miscellaneous Hardware (including the Rack Screws and Keys)
- The Extender Card (if applicable)
- The Monitor Rolloff Filter(s) (OPTIMOD-AM only)
- The COAX Connecting Cable (OPTIMOD 8585 and OPTIMOD 8585 only)

Your dealer may charge you for any missing items.

If you are returning a unit for repair, do not enclose any of the above items.

Further advice on proper packing and shipping is included in the Manual (see Table of Contents).

Trouble

If you have problems with installation or operation:

(1) Check everything you have done so far against the instructions in the Manual. The information contained therein is based on our years of experience with OPTIMOD and broadcast stations.

(2) Check the other sections of the Manual (consult the Table of Contents and Index) to see if there might be some suggestions regarding your problem.

(3) After reading the section on Factory Assistance, you may call Orban Customer Service for advice during normal California business hours. The number is (1) 510/351-3500.

WARNING

This equipment generates, uses, and can radiate radio-frequency energy. If it is not installed and used as directed by this manual, it may cause interference to radio communication. This equipment complies with the limits for a Class A computing device, as specified by FCC Rules, Part 15, subject J, which are designed to provide reasonable protection against such interference when this type of equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference. If it does, the user will be required to eliminate the interference at the user's expense.

WARNING

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the radio Interference Regulations of the Canadian Department of Communications. (Le present appareil numerique n'emet pas de bruits radioelectriques depassant les limites applicables aux appareils numeriques [de las class A] prescrites dans le Reglement sur le brouillage radioelectrique edicte par le ministere des Communications du Canada.)

IMPORTANT

Perform the installation under static control conditions. Simply walking across a rug can generate a static charge of 20,000 volts. This is the spark or shock you may have felt when touching a doorknob or some other conductive surface. A much smaller static discharge is likely to destroy one or more of the CMOS semiconductors employed in OPTIMOD 8585. Static damage will not be covered under warranty.

There are many common sources of static. Most involve some type of friction between two dissimilar materials. Some examples are combing your hair, sliding across a seat cover or rolling a cart across the floor. Since the threshold of human perception for a static discharge is 3000 volts, you will not even notice many damaging discharges.

Basic damage prevention consists of minimizing generation, discharging any accumulated static charge on your body or workstation, and preventing that discharge from being sent to or through an electronic component. You should use a static grounding strap (grounded through a protective resistor) and a static safe workbench with a conductive surface. This will prevent any buildup or damaging static.

U.S. patent 5,737,434 protects OPTIMOD 8585.

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8350 East Evans Suite C4, Scottsdale, AZ 85260 USA

Phone: (1) (480) 403-8300; Fax: (1) (480) 403-8301; E-Mail: custserv@orban.com; Site: www.orban.com

Operating Manual

OPTIMOD
8585

Surround Audio Processor

Version 1.0 Software

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Section 1
Introduction

Crucial Information—Please Read!

To make automatic loudness control as straightforward and dependable as possible, the 8585 operates somewhat differently from other Optimods.

- **Dialnorm:** The 8585 works very easily with Dolby Digital® transmission systems if you do one crucial thing: You must tell the 8585 what value of Dolby Digital Dialnorm metadata you are transmitting to your audience. This will prevent your transmission from being too loud or quiet compared to other correctly set up Dolby Digital transmissions.
- The 8585's *Quick Setup* wizard (page 2- 8) leads you through the process of setting Dialnorm on the 8585. Step 9 on page 2-13 explains how the 8585 uses its knowledge of transmitted Dialnorm to control loudness.
- Your Dolby Digital transmission's loudness will automatically be correct if:
  - you use a "TV" factory preset (Table 3-1 on page 3-26),
  - you have adjusted the 8585's input reference level so that the processing operates with normal amounts of gain reduction (step 6 on page 2-10 or step 6 on page 2-20), and
  - you have adjusted the 8585's Dialnorm to match the Dialnorm you are transmitting (step 9 on page 2-13 or step 12 on page 2-28).

    The 8585's DIALNORM value can be set in two places: There is a global setting in the active Setup, which can be overridden by a setting in the active processing preset. Except for the 2.0 parameters in the analog TV presets, all factory processing presets are configured to use the global Dialnorm setting specified in the active Setup.

    You can use the 8585's RS-485 serial ports (serial ports #2 and #3 on the back panel) to convey DIALNORM to the Dolby encoder automatically. See *Conveying Metadata via RS-485 serial connections* on page 2-14.
- **Setting Output Loudness:** To set the 8585's output loudness, adjust its DIALNORM value or adjust the MB LIMITER DRIVE control in the active processing preset. Both methods cause 8585's OUTPUT LEVEL meter indication to change.

- Adjusting DIALNORM changes output loudness without changing the indication on the 8585's CBS Loudness Level meter or the amount of gain reduction in the loudness controller. The peak limiter's gain reduction will change. This is the preferred method if the 8585's loudness controller is active because it has the smallest effect on the sonic texture of the 8585's audio processing.
- Adjusting MB LIMITER DRIVE changes the Loudness Level meter's indication and the amount of gain reduction in the loudness controller and peak limiter.

The 8585's output level controls (called SURROUND OUTPUT 100% and 2.0 OUTPUT 100% for the surround and 2.0 processing chains respectively) do not change output loudness. Their only purpose is to set the 8585's maximum peak output level with respect to 0 dBfs, which allows you to compensate for transmission channels that introduce peak overshoots. For example, if you lower an OUTPUT 100% control from 0 dBfs to –2 dBfs, the 8585 automatically reduces the gain following its peak limiter by 2 dB and simultaneously increases the drive into the peak limiter by 2 dB. Hence, the average output level does not change but the maximum peak output level is constrained to –2 dBfs. This unconventional arrangement results from the 8585's handling of Dialnorm—if you have set DIALNORM correctly on the 8585, you can change the 8585's output level control freely without causing your on-air loudness to be incorrect with respect to other transmissions.

If you are processing for a Dolby Digital distribution channel and wish to customize a factory preset, see *Setting Preset Loudness Correctly for Dolby Digital Transmission* on page 3-18.

Using This Manual

The Adobe pdf eBook form of this manual contains numerous hyperlinks and bookmarks. A reference to a numbered step or a page number (except in the Index) is a live hyperlink; click on it to go immediately to that reference.

If the bookmarks are not visible, click the "Bookmarks" tab on the left side of the Acrobat Reader window.

This manual has a table of contents and index. To search for a specific word or phrase, you can also use the Adobe Acrobat Reader's text search function.

The OPTIMOD 8585 Digital Audio Processor

Orban's all-digital Optimod-Surround 8585 Audio Processor can help you achieve the highest possible quality digital audio broadcast, digital television, and netcast audio processing using up to 7.1 audio channels. Thanks to versatile compression ratio controls and a mastering-quality look-ahead peak limiter, the 8585 is also ideal for mastering chores.

OPTIMOD 8585 is descended from the industry-standard OPTIMOD audio processors for radio and television. Thousands of these broadcast-specific processors are attracting and holding audiences all over the world. They have proven that the "OPTIMOD sound" can attract and keep an audience even in the most competitive commercial environment.

Take a little time now to familiarize yourself with OPTIMOD 8585. A small investment of your time now will yield large dividends in audio quality.

The rest of Chapter 1 explains how OPTIMOD 8585 fits into the DAB and DTV broadcast facilities and how to use it for netcasting. Chapter 2 explains how to install it. Chapter 3 explains how to operate OPTIMOD 8585. Chapters 4 through 6 provide reference information.

OPTIMOD 8585 was designed to deliver a high quality sound while simultaneously increasing the average modulation of the channel substantially beyond that achievable by "recording studio"-style compressors and limiters. Because such processing can exaggerate flaws in the source material, it is very important that the **source audio be as clean as possible.**

For best results, **feed OPTIMOD 8585 unprocessed audio.** No other audio processing is necessary or desirable.

User-Friendly Interface

- A large (quarter-VGA) **color liquid crystal display** (LCD) makes setup, adjustment and programming of the 8585 easy. Navigation is by a miniature joystick, two dedicated buttons, and a large rotary knob. The LCD shows all metering functions of the processing structure in use.

- Use the *LOCATE* **joystick** to navigate through a menu that lets you recall a preset, modify processing (at three levels of expertise), or to access the system's setup controls.

Absolute Control of Peak Modulation

- Using a set of low-IM, mastering-quality look-ahead limiters, the 8585 **precisely controls peak levels** to prevent digital clipping. The maximum level of the digital samples is controlled to better than 0.5 dB.

- The look-ahead limiters in the 2.0 processing chain can be preemphasized at 50 μs or 75μs. This allows the 8585 to process for analog television.

Flexible Configuration

- **Two processors in one**: A gain-coupled surround processor for **up to 7.1 channels**, plus an additional, **independent 2.0 channel processor** (whose performance is equivalent to an OPTIMOD 6300) that can be used for many tasks like processing the audio for a second language or up to two ATSC subchannels.

Because its output can be mixed into the LF and RF outputs of the surround processing, the 2.0 channel processor can also be used to **process an independent feed** (like the output of a sports truck, news truck, or newsroom) before it is mixed with the station's main surround audio path.

- The surround and 2.0 processors can operate **with separate audio processing parameters** like release times. For example, the 2.0 processing could be set up for relatively heavy processing to make a newsroom feed or a weather subchannel more consistent, while the main processing was set up more conservatively to correct network material and commercials unobtrusively.

- The 8585 includes **five AESid digital** inputs and **six AES3id outputs**, all **transformer-coupled**. These inputs and outputs appear on BNC connectors and have 75Ω impedance. The digital inputs and digital outputs have sample-rate converters and can operate at 32 kHz, 44.1 kHz, 48, 88.2, and 96 kHz sample rates.

- OPTIMOD 8585's AES3id inputs and outputs are **highly configurable via remote-controllable routing switchers**. Additionally, the outputs of the surround and 2.0 processing chains can be independently configured to emit the output of the **AGC** or the output of the **multiband compressor/limiter**, all configurable to use or bypass look-ahead limiting.

- When used to drive a transmission channel using the Dolby Digital® codec, the 8585's built-in **CBS Loudness Level meters** (for the surround processing and 2.0 processing) can be **aligned to the Dialnorm metadata** value in the Dolby Digital bitstream conveying the 8585's output signal to the consumer's receiver. When this is done, the **loudness level at the receiver will be correct** when the 8585's processing is adjusted to make dialog peak at "0 dB" on the 8585's Loudness Level meter.

- Two **RS-485 serial ports** allow the 8585 to **accept and emit Dolby Digital metadata**.

- Via the routing switcher, a given output signal can be applied to more than one hardware output. This allows using the 8585 as an **AES splitter**.

- A stereo **analog monitor output** appears on XLR connectors on the rear panel. It can be configured to emit any 8585 output signal, including a downmix of the surround audio.

- A stereo **headphone jack** is available on the front panel. It can be configured to emit any 8585 output signal and is independent of the stereo analog monitor output.

- OPTIMOD 8585 **controls the audio bandwidth** as necessary to accommodate the transmitted sample frequency. OPTIMOD 8585's high frequency bandwidth can be switched instantly (typically in 1 kHz increments) between 10 kHz and 20 kHz.

- The 8585's 2.0 processing offers a **dual-mono** mode that allows two entirely separate mono programs to be processed, facilitating multiple-language operation.

  In this mode, both processing channels operate using the same processing parameters (like release time); you cannot adjust the two channels to provide different processing textures.

- A **sync input** is configurable to accept **AES11id** or **word clock** sync. You can synchronize the output sample rate of all AES3id outputs to this input. You can also **synchronize the outputs to the AES3 digital input #1 or to the 8585's internal clock**. The sync source of each AES3 output is independently selectable.

- The 8585 is designed and certified to **meet all applicable international safety, emissions, and susceptibility standards**.

Adaptability through Multiple Audio Processing Structures

- A **processing structure** is a program that operates as a complete audio processing system. Only one processing structure can be on-air at a time. OPTIMOD 8585 realizes its processing structures as a series of high-speed mathematical computations made by Digital Signal Processing (DSP) chips.

- The 8585 features **three processing structures: Five-Band** for a spectrally consistent sound with good loudness control, **Two-Band** for a transparent sound that preserves the frequency balance of the original program material while also effectively controlling subjective loudness, and **Pass-Through**, which allows you to switch the processing on and off smoothly on-air.

- A special Two-Band preset creates a no-compromise "Protect" function that is functionally similar to the "**Protect**" structures in earlier Orban digital processors.

- The 8585's AGC **rides gain** over an adjustable range of up to 25dB, compressing dynamic range and compensating for both operator gain-riding errors and gain inconsistencies in automated systems. The AGC output is available to drive STLs, so the 8585 can be used as a studio AGC.

- The 8585's processing structures are all **phase-linear** to maximize audible transparency.

- The 8585's equalizers and crossovers use 48-bit fixed-point arithmetic to ensure **mastering-quality noise and distortion performance**.

- The 8585 includes third-generation **CBS Loudness Controllers™** for DTV applications. **Separate loudness controllers are available in the surround and 2.0 processing chains**. The CBS algorithm has **proven its effectiveness** by processing millions of hours of on-air programming since the early 1980s. It smoothly limits subjectively perceived loudness to a broadcaster-set threshold, **preventing audience irritation**. The controller measures subjective loudness (as perceived by an average listener) and then closes a feedback loop to limit loudness to a preset level. It effectively controls loud commercials, which are the primary irritant in sound-for-picture applications. Third generation improvements **reduce annoyance more than simple loudness control alone**, doing so without audible gain pumping. **Attack time is adjustable** to trade off short-term loudness control against transient punch.
- Orban's **PreCode**™ technology manipulates several aspects of the audio to minimize artifacts caused by low bitrate codecs, ensuring consistent loudness and texture from one source to the next. It is particularly useful when processing for netcasts or mastering for any low bit rate channel.
- PreCode includes special audio band detection algorithms that are energy and spectrum aware. This can improve codec performance on some codecs by reducing audio processing induced codec artifacts, even with program material that has been preprocessed or mastered by other processing than Optimod. There are several factory presets tuned specifically for low bitrate codecs. These presets have "LBR" in their names.

Controllable

- The 8585 **can be remote-controlled** by 5-12V pulses applied to eight programmable, optically isolated "general-purpose interface" (GPI) ports.
- **8585 PC Remote software** is a smooth, responsive graphical application that runs under Windows XP and Vista. It communicates with a given 8585 **via TCP/IP** over **modem, direct serial,** and **Ethernet** connections. You can configure PC Remote to switch between many 8585s via a convenient organizer that supports giving any 8585 an alias and supports grouping multiple 8585s into folders. Clicking an 8585's icon causes PC Remote to connect to that 8585 through an Ethernet network or initiates a Windows Dial-Up or Direct Cable Connection if appropriate. The PC Remote software allows the user to access all 8585 features and allows the user to archive and restore presets, automation lists, and system setups (containing I/O levels, digital word lengths, GPI functional assignments, etc.).
- An API provides **remote administration over TCP/IP via the RS-232 serial or Ethernet ports**. The 8585 hosts a TCP/IP terminal server to allow external control of the 8585 from either a Telnet/SSH client or a custom third party application. All commands are **simple text strings**. You can recall presets, operate the input and output routing switchers and more. Password security is provided.

- The 8585 contains a versatile **real-time clock**, which allows automation of various events (including recalling presets) at pre-programmed times. To ensure accuracy, the clock can be synchronized to an Internet timeserver.
- **Silence alarm** and **digital audio fault tally outputs** are available.
- A **Bypass Test Mode** can be invoked locally, by remote control (from either the 8585's GPI port or the 8585 PC Remote application), and by automation to permit broadcast system **test and alignment** or "proof of performance" tests.
- The 8585 contains a built-in **line-up tone generator**, facilitating quick and accurate level setting in any system. It can also be used to **test the 8585 itself**, eliminating the need for a separate digital oscillator.
- The 8585's **software can be upgraded** by running Orban-supplied downloadable upgrade software on a PC. The upgrade can occur remotely through the 8585's Ethernet port or serial port (connected to an external modem), or locally (by connecting a Windows® computer to the 8585's serial port through the supplied null modem cable or to the 8585's Ethernet port through a crossover cable).

Presets in OPTIMOD 8585

There are two distinct kinds of presets in OPTIMOD 8585: **processing presets**, which contain the settings of the 8585's audio processing controls (like compression thresholds), and **setups**, which contain technical setup settings (like input reference settings and channel routing). You can modify both presets and setups and save them as "user presets" and "user setups." You can recall these by several means, including the 8585's GPI inputs, serial and Ethernet API, PC Remote, clock-based automation, and front panel.

To recall a preset from the front panel, start from the main screen that shows meters. If the screen is not displaying meters, press the *ESCAPE* button until you see the meters. Then press the *ESCAPE* button and *LOCATE* to RECALL/IMPORT. Press the *ENTER* button to see the preset list. *LOCATE* to the desired preset and hit *ENTER* to activate it.

Factory Processing Presets

The Factory Presets are our "factory recommended settings" for various program formats or types. There are multiple Factory Presets for both radio-oriented and video oriented programming. Each Factory Preset on the Preset list is really a library of more than 20 separate presets, selected by navigating to MODIFY PROCESSING > LESS-MORE and using the LESS-MORE control to adjust OPTIMOD 8585 for less or more processing. The factory presets are listed and described starting on page 3-23. The description indicates the processing structure and the type of processing.

Factory Presets are stored in OPTIMOD 8585's non-volatile memory and cannot be erased. You can change the settings of a Factory Preset, but you must then store those settings as a User Preset, which you are free to name as you wish. The Factory Preset remains unchanged.

The surround and 2.0 processing do not have to use the same Factory Preset. To use different presets, start by recalling your preferred Factory Preset for the surround processing. Then "import" a different factory preset for the 2.0 processing and save the result as a User Preset. This procedure is described in more detail below.

User Processing Presets

User Presets permit you to change a Factory Preset to suit your requirements and then store those changes.

You can store more than 40 User Presets, limited only by available memory in your 8585 (which will vary depending on the version of your 8585's software). You can give your preset a name up to 18 characters long.

User Presets cannot be created from scratch. You must always start by recalling a Factory Preset. Make the changes and then store your modified preset as a User Preset. You can also recall a previously created user preset, modify it, and save it again, either overwriting the old version or saving under a new name. In all cases, the original Factory Preset remains for you to return to if you wish.

User Presets inherit the structure of their parent Factory Presets (Five-Band or Two-Band). The *only* way you can choose the structure of a factory preset is to edit it from a Factory preset having that structure (or to edit it from an older User Preset having the desired structure). You cannot change an existing User Preset's structure.

Presets contain parameters for both the surround and 2.0 processing. A preset, whether Factory or User, can be edited in several ways to create a new User Preset. You can adjust any individual parameter in the surround and 2.0 sections of the preset. You can also bulk-import all of the 2.0 parameters contained in any User Preset or Factory Preset.

User Presets are stored in non-volatile memory that does not require battery backup. *To Create or Save a Preset* on page 3-20 has more about User Presets. Instructions for importing and editing a 2.0 preset are on page 3-25.

Input/Output Configuration

OPTIMOD 8585 simultaneously accommodates:

- Digital AES3id inputs (5) and outputs (6).
- Two analog monitor outputs.
- A headphone output.

The surround processing can be operated in 5.1, 5.1+2.0, 7.1, or 7.1+2.0 modes, selected with the CHANNEL MODE control. The CHANNEL MODE control only mutes the inputs of unused channels; all processing channels continue to operate in DSP. For example, in 5.1 mode, the signal path between the LB, RB, stereo left, and stereo right input signals (as assigned in the input routing switcher) and the DSP is broken. This allows the CHANNEL MODE to be smoothly changed on-air.

The 2.0 processing in OPTIMOD 8585 can be operated in either stereo or dual-mono mode via the 2.0 PROC MODE control. In dual-mono mode, the channels operate independently (and have separate Loudness Controllers and Loudness Level Meters), but the processing parameters that determine the "sound" of the processor are the same on both channels.

Dual-mono or stereo mode is a global system parameter. You can change modes manually, via the 8585's GPI inputs, via 8585 PC Remote software, or via the 8585's built-in time-of-day automation. Further, the 8585 can be programmed to recognize the "stereo" and "dual-mono" flags in the AES input bitstream and to switch modes accordingly. It will also set these flags appropriately in its output AES bitstream.

Digital AES3id Inputs/Outputs

The digital input and outputs conform to the professional AES3id standard, which calls for 75Ω coaxial cable terminated with BNC connectors.

> The 8585's AES3id connections are all internally terminated with transformers, which expect to see 75Ω. To interface AES3id to AES3 (110Ω balanced) connections, we recommend using 75Ω/110Ω matching transformers when cable runs are long. For short runs, transformers are usually unnecessary.

There are five inputs (which carry 10 channels) and six outputs (which carry 12 channels). All inputs and outputs have sample rate converters that allow operation at 32, 44.1, 48, 88.2, and 96 kHz sample frequency.

> To ensure best control of peak modulation, operate the output at 48 kHz or higher.

Level control of the AES3id inputs are accomplished via software control through System Setup (see step 7 on page 2-22) or through PC Remote. Level control is one of the many parameters contained in a Setup.

The output sample rate of each AES3id output can be locked independently to the 8585's internal crystal clock, the sample rate present at its AES3id input, the sample rate present at the 8585's AES11id sync input, or 1x word clock.

The 8585 can apply J.17 deemphasis to signals applied to the digital input assigned to the 2.0 processing. J.17 is a 6 dB/octave shelving preemphasis/deemphasis standard with break points at 400 Hz and 4 kHz. It is used mainly in older studio/transmitter links that use NICAM technology.

Analog Outputs

The two analog outputs appear on XLR-type male connectors on the rear panel. These are intended primarily for monitoring. However, their frequency response is wide enough to limit overshoot to 1% or less, allowing these outputs to be used feed processed audio to a transmitter or STL.

These outputs can emit many different signals as determined by the 8585's output routing switcher. Output impedance is 50Ω; balanced and floating. The outputs can drive 600Ω or higher impedances, balanced or unbalanced. The peak output level is adjustable from –6dBu to +24dBu.

Level control of the analog outputs is accomplished via software control through System Setup (see step 4 on page 2-19 and step 9 on page 2-24) or through PC Remote.

Remote Control Interface

The Remote Control Interface is a set of eight optically isolated GPI inputs on a DB-25 connector, which can be activated by 5-12V DC. They can control various functions of the 8585:

- Recall any processing Preset, Setup, Test Mode state (Bypass or Tone), or exit from a Test Mode to the previous processing preset.
- Reset the 8585's internal clock to the nearest hour or to midnight.

You can reconfigure the functions of the GPI inputs via System Setup. For example, if you are not switching between stereo and mono, the inputs ordinarily dedicated to controlling the stereo/mono status can instead be re-configured to call additional presets.

See *Remote Control Interface Programming* on page 2-48 for information on programming the GPI and step 5 on page 2-3 for wiring information.

Computer Interface

On the rear panel of the 8585 are an RS-232 serial port and an Ethernet port for interfacing to IBM-compatible PCs either locally or through a TCP/IP network. The Ethernet port supports remote control and metering, and allows downloading software upgrades. The RS-232 port supports ASCII commands through a terminal connection.

Each 8585 package ships with 8585 PC Remote software, an application for any PC running Microsoft Windows XP (SP2 or higher) or Vista. 8585 PC Remote permits you to adjust any 8585 preset by remote control or to do virtually anything else that you can do from the 8585's front panel controls. The program displays all of the 8585's meters on the computer screen to aid remote adjustment. Because of the large numbers of meters and controls in the 8585, we expect that most users will prefer to operate it via PC Remote.

RS-485 Serial Ports

There are two RS-485 serial ports on the rear panel (serial ports #2 and #3). These can operate up 115 kbps. These can accept and emit Dolby® AC3 metadata.

RS-232 Serial Port

8585 PC Remote can communicate at up to 115 kbps direct connection between the computer and the 8585 through their RS-232 serial ports.

RJ45 Ethernet Connector

The 8585 can be connected to any Ethernet network that supports the TCP/IP protocol.

See page 2-39 for instructions on how to control the 8585 via the RS-232 and Ethernet ports via a terminal emulator and page 2-64 for instructions on how to connect to the 8585 via its PC Remote application for Windows.

Routing Audio to and from the 8585

Audio links are used in different ways. Performance requirements differ depending on the application:

- A link that passes unprocessed audio to drive the OPTIMOD 8585 should have very low noise and low non-linear distortion, but its transient response is not important.
- A link that passes OPTIMOD 8585's peak-controlled output does not need as low a noise floor as a link passing unprocessed audio. However, if the application calls for high average modulation, the link's transient response is critical.
- A link that passes OPTIMOD 8585's peak-controlled output after it has been coded by the transmission codec requires bit-accurate transmission of the transmission codec's output. In DTV applications, the 8585 will typically drive a Dolby Digital encoder at the studio. The link will pass the Dolby Digital encoder's output to the transmitter, either directly or multiplexed onto a transport stream.

Using Lossy Data Reduction before the 8585's Input

Many broadcasters are now using lossy data reduction algorithms like MPEG-1 Layer 2, Layer 3, or AAC to increase the storage time of digital playback media and to transmit audio. Sometimes, several encode/decode cycles will be cascaded before the material is finally delivered to OPTIMOD 8585's input.

All such algorithms operate by increasing the quantization noise in discrete frequency bands. If not psychoacoustically masked by the program material, this noise may be perceived as distortion, "gurgling," swishing, or other interference. Psychoacoustic calculations are used to ensure that the added noise is masked by the desired program material and not heard. Cascading several stages of such processing can raise the added quantization noise above the threshold of masking, making it audible.

In addition, at least one other mechanism can cause the noise to become audible at the radio. OPTIMOD 8585's multiband limiter performs an "automatic re-equalization" function that can significantly change the frequency balance of the program (sometimes by more than 10 dB). This can cause noise that would otherwise have been masked to become unmasked because the psychoacoustic masking conditions under which the masking thresholds were originally computed have changed. Accordingly, if you use lossy data reduction before the 8585, you should use the highest data rate possible. This maximizes the headroom between the added noise and the threshold where it will be heard. In addition, you should minimize the number of encode and decode cycles because each cycle moves the added noise closer to the threshold where the added noise is heard.

For MPEG Layer 2 encoding, we recommend 384kb/second or higher.

Links from the 8585's Output to a Transmission Encoder or Transmitter

When used as a transmission processor, the 8585's output should be connected to the encoder or transmitter (like Dolby's DP569 Dolby Digital encoder) so that the link introduces no change in OPTIMOD 8585's output bitstream. A simple AES3id connection is ideal. Alternatively, an uncompressed digital link will pass the 8585's output with little or no degradation if the link does not truncate word length (from 20 to 16 bits, for example) and does not require downward sample rate conversion.

The 8585's look-ahead limiters tightly control peak levels at the 8585's outputs. Lossy compression following the 8585's output can decrease system performance because the compression adds peak level overshoots. Such links must therefore be carefully qualified before you use them to carry the peak-controlled output of OPTIMOD 8585 to the transmitter. For example, the MPEG Layer 2 algorithm can increase peak levels up to 4dB at 160kb/sec by adding large amounts of quantization noise to the signal. While the desired program material may psychoacoustically mask this noise, it is nevertheless large enough to affect peak levels severely. For any lossy compression system, overshoot decreases as bit rate increases, so use the highest bit rate practical in your system. In addition, there will be an unavoidable amount of overshoot caused by asynchronous re-sampling (see page 1-13).

When using lossy digital compression, it is particularly important to minimize the amount of peak limiting in the 8585. Heavy peak limiting may introduce audible artifacts as a side effect of precisely controlling peak levels. It is pointless to introduce such artifacts if the lossy compression compromises the benefits of the limiting by adding overshoots. Instead, allow a generous amount of headroom when setting the drive level into the STL. Most lossy digital STLs have a noise floor that is low enough to make this practical.

The Dolby Digital transmission encoder is lossy and introduces overshoot. Hence, it is usually unwise to use substantial amounts of peak limiting when the 8585 is used as a final transmission processor to drive a Dolby Digital encoder. If a reasonable value of Dialnorm is used, little or no peak limiting should be required in the 8585 because the Dolby Digital signal path will have a generous amount of headroom.

Peak control in OPTIMOD 8585 occurs at a 48 kHz sample frequency. This is sufficient to prevent any samples from exceeding the threshold of limiting. However, after reconstruction, the analog output may overshoot the nominal 100% level because these overshoots "fall between the samples," so the processing cannot be aware of them. If you pass the 8585's output through a digital>analog>digital conversion, the new samples will not be synchronous with the samples inside OPTIMOD 8585. Therefore, they may well fall on the overshoots, causing loss of peak modulation control. Typically, this introduces less than 1 dB of overshoot, so allowing 1 dB of headroom in the transmission chain should be adequate to prevent audible problems.

The 8585's outputs are equipped with sample rate converters that can output at 32 kHz, 44.1 kHz, 48, 88.2, or 96 kHz. Setting the output sample rate below 48 kHz can cause overshoot due to spectral truncation and asynchronous re-sampling of the 48 kHz peak-controlled samples, just as in the D>A>D case described above. Spectral truncation can cause overshoots substantially larger than 1 dB. To prevent this, set the 8585's bandwidth control (in the active Setup) to so it is lower than the bandwidth of the downstream link. For example, a 32 kHz sample rate link requires setting the 8585's bandwidth to 15 kHz or lower.

Sample Frequency Synchronization

Virtually all digital broadcasting systems require audio to be synchronized to a master clock. The 8585 provides a BNC connector that accepts "house sync" in AES11id (75Ω unbalanced) or 1 x word clock (squarewave at the sample frequency) format. The 8585 automatically detects which of these signals is present, if any. Setup menu selections (one for the 2.0 processing and one for the surround processing) determine whether the 8585's output is synchronized to its sync input, its internal clock, or the signal applied to its AES3 audio input. Because the 8585's digital input has a sample rate converter, an asynchronous digital input can be applied to the 8585 while its output is synchronized to a master clock.

Using the 8585 to Control Studio Output Levels

The 8585 can be used to process a live production like a sports remote or news studio for consistency. In this case, the 8585 is usually not the final peak control device in the audio chain before the station's on-air encoder or transmitter. In these applications, it is wise to minimize the amount of peak limiting by turning down the FINAL LIMIT DRIVE control in the 8585's active preset until the 8585's limiting meters show little or no gain reduction.

If the 8585 is outside the studio, it is common for the audio to be linked to the studio via a lossy digital STL. See the comments about minimizing peak limiting in the section *Using Lossy Data Reduction before the 8585's Input* on page 1-11 .

Lip-sync Delay

OPTIMOD 8585 provides an adjustable time delay of up to 96 milliseconds. This allows the installer to force the total delay through the processing to equal exact multiples of one frame (in sound-for-picture applications). The definition of "frame" depends on the system in which OPTIMOD 8585 is installed.

The selections are MINIMUM (approximately 24 ms delay), 30 fps (NTSC monochrome video), 29.97 fps (NTSC color video), 25 fps (most PAL video), and 24 fps (film). You can also adjust the delay in one-millisecond increments from 25 to 60 ms.

Using OPTIMOD 8585 as a Studio Level Controller

See page 6-67 for a block diagram of the 8585's signal processing and routing.

OPTIMOD 8585 can be used as a studio AGC, digital radio/netcast processor, or low-delay talent headphone processor. The surround and 2.0 outputs can be configured independently to emit one of the following signals:

- Stereo enhancement, equalization, and AGC without look-ahead peak limiting
- Stereo enhancement, equalization, and AGC with peak limiting
- Stereo enhancement, equalization, and multiband processing (two-band or 5-band, including AGC) without peak limiting
- Stereo enhancement, equalization, and multiband processing (two-band or 5-band, including AGC) with peak limiting

About Transmission Levels and Metering

Meters

Studio engineers and transmission engineers consider audio levels and their measurements differently, so they typically use different methods of metering to monitor these levels. The VU meter is an average-responding meter (measuring the approximate RMS level) with a 300ms rise time and decay time; the VU indication usually under-indicates the true peak level by 8 to 14dB. The Peak Program Meter (PPM) in-

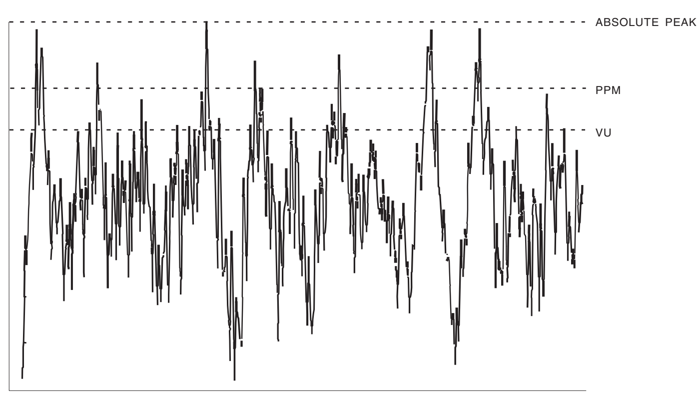

Figure 1-1: Absolute Peak Level, VU and PPM Reading

dicates a level between RMS and the actual peak. The PPM has an attack time of 5 or 10ms, slow enough to cause the meter to ignore narrow peaks and under-indicate the true peak level by 5 dB or more. The absolute peak-sensing meter or LED indicator shows the true peak level. It has an instantaneous attack time, and a release time slow enough to allow the engineer to read the peak level easily. Figure 1-1 shows the relative difference between the absolute peak level, and the indications of a VU meter and a PPM for a few seconds of music program.

Studio Line-up Levels and Headroom

The studio engineer is primarily concerned with calibrating the equipment to provide the required input level for proper operation of each device, and so that all devices operate with the same input and output levels. This facilitates patching devices in and out without recalibration.

For line-up, the studio engineer uses a calibration tone at a studio standard level, commonly called line-up level, reference level, or operating level. Metering at the studio is by a VU meter or PPM (Peak Program Meter). As discussed above, the VU or PPM indication under-indicates the true peak level. Most modern studio audio devices have an analog clipping level of no less than +21dBu, and often +24dBu or more. So the studio standardizes on a maximum program indication on the meter that is lower than the clipping level, so those peaks that the meter does not indicate will not be clipped. Line-up level is usually at this same maximum meter indication. In facilities that use VU meters, this level is usually at 0VU, which corresponds to the studio standard level, typically +4 or +8dBu. If the link is PCM digital, there are two common standards for line-up level: –18 dBfs (EBU) and –20 dBfs (SMPTE).

For facilities using +4dBu standard level, instantaneous peaks can reach +18dBu or higher (particularly if the operator overdrives the console or desk). Older facilities with +8dBu standard level and equipment that clips at +18 or +21dBu will experience noticeable clipping on some program material.

In facilities that use the BBC-standard PPM, maximum program level is usually PPM4 for music, PPM6 for speech. Line-up level is usually PPM4, which corresponds to +4dBu. Instantaneous peaks will reach +17dBu or more on voice.

In facilities that use PPMs that indicate level directly in dBu, maximum program and line-up level is often +6dBu. Instantaneous peaks will reach +11dBu or more.

Transmission Levels

The transmission engineer is primarily concerned with the peak level of a program to prevent overloading or over-modulation of the transmission system. This peak overload level is defined differently, system to system.

In FM modulation (FM/VHF radio and television broadcast, microwave or analog satellite links), it is the maximum-permitted RF carrier frequency deviation. In AM modulation, it is negative carrier pinch-off. In analog telephone/post/PTT transmission, it is the level above which serious crosstalk into other channels occurs, or the level at which the amplifiers in the channel overload. In digital channels, it is the largest possible digital word.

For metering, the transmission engineer uses an oscilloscope, absolute peak-sensing meter, calibrated peak-sensing LED indicator, or a modulation meter. A modulation meter usually has two components—a semi-peak reading meter (like a PPM), and a peak-indicating light, which is calibrated to turn on whenever the instantaneous peak modulation exceeds the overmodulation threshold.

Line-Up Facilities

Metering of Levels and Subjective Loudness

The meters on the 8585 show peak input levels, the peak output modulation, and subjective loudness.

- Input levels are displayed using a VU-type scale (0 to –40dB), but the metering indicates *absolute instantaneous peak* (much faster than a standard PPM or VU meter). The maximum digital word at the input corresponds to the 0 dB point on the 8585's input meter.
- The output meter indicates the values of the digital samples at the output of the 8585's audio processing, not at its digital outputs. 0 dB on the output meter corresponds to the setting of the digital output level control in the active Setup (SURROUND OUT 100% for the surround processing and 2.0 OUT 100% for the 2.0 processing). For example, if this control is set to –3 dBfs and the meter indicates 0 dB, the peak level at the 8585's digital output is –3 dBfs.
- 0 dB on the meter also corresponds to the threshold of limiting of the 8585's look-ahead peak limiters, which prevent the processed audio's level from increasing beyond 0 dB.

  If the output's sample rate is set to a rate other than 48 kHz and or passed through a D/A converter, the peak level of the output may increase because of asynchronous resampling. (See page 1-13).
- The subjective loudness meter, labeled LOUDNESS LEVEL in the 8585's GUI, uses the CBS Technology Center algorithm developed by Jones and Torick[1]. The meter is scaled so that the loudness level at the consumer's receiver is correct when the 8585's processing is adjusted to make dialog peak at "0 dB" on the 8585's Loudness Level meter and the Dialnorm value (which you must enter manually) in the active 8585 Setup is the same as the Dialnorm value being transmitted to the consumer's receiver. Because loudness perception combines the contributions of

[1] Bronwyn L. Jones and Emil L. Torick, "A New Loudness Indicator for Use in Broadcasting," J. SMPTE September 1981, pp. 772-777.

all acoustic sources, there is only one Loudness Level meter indication regardless of the number of audio channels.

The CBS meter is a "short-term" Loudness Level meter that displays the details of moment-to-moment loudness with dynamics similar to a VU meter. Created using Orban-developed modeling software, the DSP implementation typically matches the original CBS analog meter within 0.5 dB on sinewaves, tone bursts and noise.

The Jones & Torick algorithm improves upon the original loudness measurement algorithm developed by CBS researchers in 1967. Its foundation is psychoacoustic studies done at CBS Laboratories over a two year period by Torick and the late Benjamin Bauer, who built on S. S. Stevens' '50s-era work at Harvard University.

After surveying existing equal-loudness contour curves (like the famous Fletcher-Munson set) and finding them inapplicable to measuring the loudness of broadcasts, Bauer and Torick organized listening tests that resulted in a new set of equal-loudness curves based on octave-wide noise reproduced by calibrated loudspeakers in a semireverberant 16 x 14 x 8 room, which is representative of a room in which broadcasts are normally heard. They published this work[2] along with results from other tests whose goal was to model the loudness integration time constants of human hearing. These studies concentrated on the moderate sound levels typically preferred by people listening to broadcasts (60 to 80 phons[3]) and did not attempt to characterize loudness perception at very low and high levels.

According to this research and its predecessors, the four most important factors that correlate to the subjective loudness of broadcasts are these:

1. The power of the sound.

2. The spectral distribution of the power. The ear's sensitivity depends strongly on frequency. It is most sensitive to frequencies between 2 and 8 kHz. Sensitivity falls off fastest below 200 Hz.

3. Whether the power is concentrated in a wide or narrow bandwidth. For a given total sound power, the sound becomes louder as the power is spread over a larger number of *critical bands* (about 1/3 octave). This is called *loudness summation*.

4. Temporal integration: As its duration increases, a sound at a given level appears progressively louder until its duration exceeds about 200 milliseconds, at which point no further loudness increase occurs.

Bauer and Torick used the results of this research to create a loudness level meter with eight octave-wide filters, each of which covers three critical bands. (B & T did not use one filter per critical band because this

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[2] Benjamin B. Bauer and Emil L. Torick, "Researches in Loudness Measurement," IEEE Transactions on Audio and Electroacoustics, Volume AU-14, Number 3, September 1966, pp. 141-151

[3] The phon is a unit of perceived loudness, equal in number to the intensity in decibels of a 1 kHz tone judged to be as loud as the sound being measured.

would have made the meter, which was realized using analog circuitry, prohibitively expensive.) Each filter feeds a full-wave rectifier and each rectifier feeds a nonlinear lowpass filter that has a 10 ms attack time and a 200 ms release time, somewhat like the sidechain filter in an AGC. This models the "instantaneous loudness" perception mechanism in the ear. Instantaneous loudness is not perceived directly but is an essential part of the total loudness model.

To map the instantaneous loudness to perceived short-term loudness, the outputs of each of the nonlinear lowpass filters are arithmetically summed with gains chosen to follow the 70 phon equal-loudness curves of the ear as determined by Bauer and Torick's research. The sum is applied to a second, slower nonlinear lowpass filter. This has an attack time of 120 ms and a release time of 730 ms. Along with the eight nonlinear lowpass filters following the individual filters, this filter models temporal integration and maps it to the visual display. Meanwhile, the arithmetic addition models loudness summation.

The internationally accepted unit of subjective loudness is the *sone.* With a sinewave, 40 phons = 1 sone. A doubling of sones corresponds to a doubling of loudness. However, because broadcasters were accustomed to working in decibel units, Jones and Torick chose to map loudness on a LED ladder display encompassing –20 to +5 dB in 0.5 dB increments, with the understanding that the perceived loudness doubles every 10 dB at loudness levels typically heard by broadcast audiences.

The J & T meter is monophonic. Psychoacoustic studies indicate that when multiple acoustic sources are present in a room, loudness is most accurately expressed by summing the power in the sources. For example, driving two loudspeakers with identical program produces 3 dB higher loudness than a single speaker produces. Therefore, to extend the J & T algorithm to surround reproduction, we implement one eight-filter filterbank for each channel and compute RMS sums of the outputs of corresponding filters in each channel before these sums are applied to the eight nonlinear lowpass filters. As in the monophonic J & T algorithm, the sum of these lowpass filters drives a second nonlinear filter, which drives the display.

Test Modes

Calibrated Bypass Test Mode

A BYPASS Test Mode is available to transparently pass line-up tones generated earlier in the system. It will also pass program material, with no gain reduction or protection against overmodulation. It can transparently pass any line-up tone applied to its input up to about 130% output modulation, at which point clipping may occur.

BYPASS is not appropriate for normal on-air use because switching to and from it will usually cause clicks or other program disruptions and because it does not protect against inadvertent output clipping. To defeat the dynamics processing on-air (which might be desired when switching from a local to a network program, for example), use the PASS-THROUGH factory preset or a user preset derived from the PASS-THROUGH factory preset.

Calibrated Line-up Tones

To facilitate matching the output level of the 8585 to the transmission system that it is driving, the 8585 contains a test tone oscillator that produces sine waves at 8585's outputs. You can adjust the frequency and modulation level of the built-in line-up tone via the front panel or PC Remote software, and you can specify which outputs emit the tone. Outputs that do not emit the tone are automatically set to BYPASS, which facilitates using the tone oscillator as a sinewave source to test the 8585—use a cable to connect an output that is emitting the tone to an input that is in BYPASS mode. (See step 4 on page 4-10 for an example.) You can use the front panel, the PC Remote software, or the opto-isolated remote control interface ports to activate the Test Tone.

Setting Output/Modulation Levels

In a perfect world, one could set the peak level at OPTIMOD 8585's output to 0 dBfs. However, there are several potential problems that may make it desirable to set the modulation level slightly lower.

- First is asynchronous re-sampling, which we have discussed earlier in this chapter. (See page 1-13.) If any digital processing that causes its output samples to be asynchronous to its input samples is used after OPTIMOD 8585's output, this can cause the peak levels of individual samples to increase above the nominal threshold of limiting. This increase is typically less than 0.5dB.
- Second is additional processing, like equalization. Equalization that applies boosts at certain frequencies is very likely to add peak level and thus cause clipping. However, equalization that attenuates certain frequencies can also cause overshoots because of added phase shifts. So be wary of any equalization and allow headroom to accommodate it.
- Third is headroom in lossy data compression systems. A well-designed perceptual encoder will accept samples up to 0dBfs and will have enough internal headroom to avoid clipping. However, there is no guarantee that *receiver* manufacturers or *decoder* providers will implement perceptual decoders with sufficient headroom to avoid clipping overshoots. Such overshoots are the inevitable side effect of increasing the quantization noise in the channel, and can be as large as 3-4dB. Most perceptual encoder algorithms are designed to have unity gain from input to output. So if peak levels at the input frequently come up to 0dBfs, peak levels at the output will frequently exceed 0dBfs (and will be clipped) unless the decoder algorithm is adjusted to have less than unity gain.

Canny engineers familiarize themselves with the performance of real-world receivers and reduce the peak modulation of the transmissions if it turns out that most receivers are clipping due to perceptual encoding overshoots. Our experience to date suggests that allowing 3dB headroom will prevent audible overshoot-induced clipping in low bite-rate systems (e.g., 32 kbps streams), while 1.5 dB is adequate for 128kbps and above. While some clipping may still occur, it will have a very low duty cycle and will almost certainly be inaudible.

Streaming and Netcasting Applications

This section was written in mid 2008. As the state of the art in netcasting is changing with ferocious rapidity, we expect it to become outdated quickly. Please check Orban's web site, www.orban.com, for newer information.

Using OPTIMOD 8585 in Streaming Applications

You need an audio source connection (either AES3id digital or SPDIF digital). The 8585 AES3id inputs can accept any sample rate from 20 to 96 kHz. You can also use any stream available within the computer's internal WAVE audio system, like a digital playout system. If you use the computer's WAVE audio system, you will need a sound card with full duplex capability along with digital inputs and outputs. Connect the digital output of the sound card to the 8585's digital input and connect the 8585's digital output to the input of the sound card.

You will ordinarily connect the signal that the sound card receives to the input of an encoder application, like Orban's Opticodec-PC. You then apply the encoded output of the encoder to a netcast server application, which may operate on the same machine as the encoder, or on a different machine on your network. In the latter case, you will route the encoded audio to the netcast server application through your network.

See *Processing for Low Bit Rate Codecs* on page 3-5.

Loudness

You can expect a significant increase in loudness from OPTIMOD 8585 processing by comparison to most unprocessed audio.

> An exception is recently mastered CDs, which may have already been aggressively processed for loudness when they were mastered.

In radio broadcasting, it is generally believed that loudness relative to other stations attracts an audience that perceives the station as being more powerful than its competition. We expect that the same subliminal psychology will also hold true in netcasting.

Choosing your Encoder

The state of the art in encoder technology is rapidly changing. At this writing, the most efficient audio encoder technology available is MPEG4 HE-AACv2, which also has the advantage of being standards-based. Orban is the first provider of this technology for streaming audio applications with Opticodec-PC 1010.

Be aware that different encoders are optimized for different bit rates, so you should match your encoder to your potential audience. An encoder appropriate for a dial-up rate of 20kb/sec may not be optimum for ISDN, DSL, or E-1/T-1 rates. This makes it necessary to use more than one algorithm to optimally serve audiences with these disparate connection speeds.

MPEG-1 Layer 3 has become a de-facto standard for distribution of non-streaming, high fidelity audio on the Internet, although HE-AACv2, as used in Opticodec-PC, is far more efficient. Thanks to the Apple iPod®, AAC/MP4/M4A is rapidly becoming the de-facto standard for downloadable music.

OPTIMOD 8585 is well matched to AAC, HE-AAC, and MP3. It can effectively pre-process audio intended for playback from either format. If you decide to use MP3, choose your MP3 encoder wisely, as not all MP3 encoders are created equal — they provide different levels of quality for a given bitrate.

EAS Transmission

In normal operation, 8585 audio processing may not provide the minimum modulation level required by EAS Emergency Alert System (EAS) standards. It may therefore be necessary to defeat the 8585's dynamics processing during the broadcast of EAS tones and data.

The LOOK-AHEAD LIMITER preset provides an easy way to do this. (You could also use the PASS-THROUGH preset.) If you set the level of your EAS message generator appropriately, simply recall the LOOK-AHEAD LIMITER preset, run the test, and then recall the previous processing preset. (Presets can be recalled via the front panel, PC Remote, the 8585's Ethernet terminal server, clock-based automation, and GPI.)

If it is impractical to set the level of the EAS message generator to work correctly with the fixed throughput gain provided in factory LOOK-AHEAD LIMITER preset, you can instead edit the LOOK-AHEAD LIMITER preset's throughput gain to set the correct modulation level. To set the gain, adjust the preset's GAIN control, which is available in Intermediate Modify and Advanced Modify. When you are satisfied, save the result as a User Preset. See *Customizing the 8585's Sound* on page 3-16

PC Control and Security Passcode

PC software control provides access to OPTIMOD 8585 via network, modem or direct (null modem cable) connection, with computers running Windows 2000, XP, or Vista. PC access is permitted only with a valid user-defined passcode.

PC remote control can be ended from the 8585's front panel; this feature effectively prevents simultaneous remote and local control.

See *Security and Passcode Programming* (starting on page 2-34) for more detail.

Warranty, User Feedback

User Feedback

We are very interested in your comments about this product. We will carefully review your suggestions for improvements to either the product or the manual. Please email us at custserv@orban.com.

LIMITED WARRANTY

[Valid only for products purchased and used in the United States]

Orban warrants Orban products against defects in material or workmanship for a period of two years from the date of original purchase for use, and agrees to repair or, at our option, replace any defective item without charge for either parts or labor.

IMPORTANT: This warranty does not cover damage resulting from accident, misuse or abuse, lack of reasonable care, the affixing of any attachment not provided with the product, loss of parts, or connecting the product to any but the specified receptacles. This warranty is void unless service or repairs are performed by an authorized service center. No responsibility is assumed for any special, incidental, or consequential damages. However, the limitation of any right or remedy shall not be effective where such is prohibited or restricted by law.

Simply take or ship your Orban products prepaid to our service department. Be sure to include a copy of your sales slip as proof of purchase date. We will not repair transit damage under the no-charge terms of this warranty. Orban will pay return shipping. (See *Technical Support* on page 5-13.)

No other warranty, written or oral, is authorized for Orban Products.

This warranty gives you specific legal rights and you may have other rights that vary from state to state. Some states do not allow the exclusion of limitations of incidental or consequential damages or limitations on how long an implied warranty lasts, so the above exclusions and limitations may not apply to you.

INTERNATIONAL WARRANTY

Orban warrants Orban products against evident defects in material and workmanship for a period of two years from the date of original purchase for use. This warranty does not cover damage resulting from misuse or abuse, or lack of reasonable care, or inadequate repairs performed by unauthorized service centers. Performance of repairs or replacements under this warranty is subject to submission of this Warranty/Registration Card, completed and signed by the dealer on the day of purchase, and the sales slip. Shipment of the defective item is for repair under this warranty will be at the customer's own risk and expense. This warranty is valid for the original purchaser only.

EXTENDED WARRANTY

Any time during the initial two-year Warranty period (but not thereafter), you may purchase a three-year extension to the Warranty (yielding a total Warranty period of five years) by remitting to Orban ten percent of the gross purchase price of your Orban product. This offer applies only to new Orban products purchased from an authorized Orban Dealer. To accept the extended five-year warranty, please sign and date below, and fax this copy along with a copy of your original invoice (showing date of purchase) to Orban Warranty Extension at +1 480.403.8314.

I ACCEPT THE EXTENDED FIVE-YEAR WARRANTY

____

DATE____

MODEL NUMBER: 8585

SERIAL NUMBER____________________________________

Section 2
Installation

Installing the 8585

Allow about 2 hours for installation.

Installation consists of: (1) unpacking and inspecting the 8585, (2) checking the line voltage setting, fuse, and power cord, (3) mounting the 8585 in a rack, (4) connecting inputs, outputs and power, (5) optional connecting of remote control leads and (6) optional connecting of computer interface control leads.

When you have finished installing the 8585, proceed to "Quick Setup," on page 2-8.

1. Unpack and inspect.

A) If you note obvious physical damage, contact the carrier immediately to make a damage claim. Packed with the 8585 are:

Quantity	Item
1	Operating Manual
2	Line Cords (domestic, European)
2	Fuses (½ A-250V Slow-Blow for 115V; 250 mA-250V for 230V)
2	Fuse holders (gray for 115V fuses and black for 230V fuses)
4	Rack-mounting screws, 10-32 x ¾—with washers, #10
1	Ethernet crossover cable
1	PC Remote Software CD

B) Save all packing materials! If you should ever have to ship the 8585 (e.g., for servicing), it is best to ship it in the original carton with its packing materials because both the carton and packing material have been carefully designed to protect the unit.

C) Complete the Registration Card and return it to Orban. (please)

The Registration Card enables us to inform you of new applications, performance improvements, software updates, and service aids that may be developed, and it helps us respond promptly to claims under warranty without our having to request a copy of your bill of sale or other proof of purchase. Please fill in the Registration Card and send it to us today. (The Registration Card is located after the cover page).

Customer names and information are confidential and are not sold to anyone.

2. Check the line voltage, fuse and power cord.

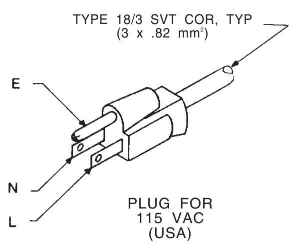
DO NOT connect power to the unit yet!

A) Check the Voltage Select switch. This is on the rear panel.

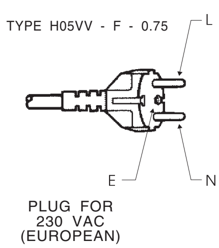
The 8585 is shipped from the factory with the Voltage Select switch set to the 230V position. Check and set the Voltage Select switch to your local voltage requirements. To change the operating voltage, set the Voltage Select to 115V (for 90-130V) or 230V (for 200-250V) as appropriate.

B) Install the proper fuse and fuse holder, per your country's standards.

The 8585 is shipped from the factory with the fuse and fuse holder removed. Select the appropriate fuse holder and fuse from the supplied parts in the accessory kit. Use the gray fuse holder for domestic/115V operation, or the black fuse holder for European/230V operation. For safety, use ½ A-250 V Slow-Blow for 115V and 250mA-250V for 230V for 230V.



CONDUCTOR		WIRE COLOR	
		NORMAL	ALT
L	LINE	BROWN	BLACK
N	NEUTRAL	BLUE	WHITE
E	EARTH GND	GREEN-YELLOW	GREEN



CONDUCTOR		WIRE COLOR
L	LINE	BROWN
N	NEUTRAL	BLUE
E	EARTH GND	GREEN-YELLOW

Figure 2-1: AC Line Cord Wire Standard)

C) Check the power cord.

AC power passes through an IEC-standard mains connector and an RF filter designed to meet the standards of all international safety authorities.

The power cord is terminated in a "U-ground" plug (USA standard), or CEE7/7 plug (Continental Europe), as appropriate to your 8585's Model Number. The green/yellow wire is connected directly to the 8585 chassis.

If you need to change the plug to meet your country's standard and you are qualified to do so, see *Figure 2-1*. Otherwise, purchase a new mains cord with the correct line plug attached.

3. Mount the 8585 in a rack.

The 8585 requires three standard rack units (5 inches/12.7 cm).

There should be a good ground connection between the rack and the 8585 chassis—check this with an ohmmeter to verify that the resistance is less than 0.5Ω.

It is wise to allow one rack unit of free space for ventilation above and below the unit. Mounting the unit over large heat-producing devices (like a vacuum-tube power amplifier) may shorten component life and is not recommended. Ambient temperature should not exceed 45°C (113°F) when equipment is powered.

Equipment life will be extended if the unit is mounted away from sources of vibration, like large blowers and is operated as cool as possible.

4. Connect inputs and outputs.

See the hookup and grounding information on the following pages.

5. Connect remote control interface. (optional)

For a full listing of 8585's extensive GPI remote control provisions, refer to *Remote Control Interface Programming* on page 2-48.

Optically isolated remote control connections are terminated in a type DB-25 male connector located on the rear panel. It is wired according to *Figure 2-2*. To select the desired function, apply a 5-12V AC or DC pulse between the appropriate REMOTE INTERFACE terminals. The (–) terminals can be connected together and then connected to ground at pin 1 to create a Remote Common. A current-limited +12VDC source is available on pin 25. If you use 48V, connect a 2kΩ ±10%, 2-watt carbon composition resistor in series with the Remote Common or the (+) terminal to provide current limiting.

In a high-RF environment, these wires should be short and should be run through foil-shielded cable, with the shield connected to CHASSIS GROUND at both ends.

6. Connect tally outputs (optional)

See the schematic on page 6-32.

The 8585 supports two hardware tally outputs, which are NPN open-collector and operate with respect to pin 1 (common). Therefore, the voltage applied to the load (like a relay or opto-isolator) must be positive. You can use the 12 VDC source on pin 25 to drive the high side of the load, taking into account the fact that the voltage on pin 25 is current limited by a 310 Ω resistor.

PIN ASSIGNMENT

1.	COMMON	
2.	REMOTE	1+
3.	REMOTE	2+
4.	REMOTE	3+
5.	REMOTE	4+
6.	REMOTE	5+
7.	REMOTE	6+
8.	REMOTE	7+
9.	REMOTE	8+
10.	TALLY	1
11.	TALLY	2
12.	N/C	
13.	POWER COMMON	
14.	REMOTE	1-
15.	REMOTE	2-
16.	REMOTE	3-
17.	REMOTE	4-
18.	REMOTE	5-
19.	REMOTE	6-
20.	REMOTE	7-
21.	REMOTE	8-
22-24.	N/C	
25.	+12 VOLTS DC	

REMOTE INTERFACE

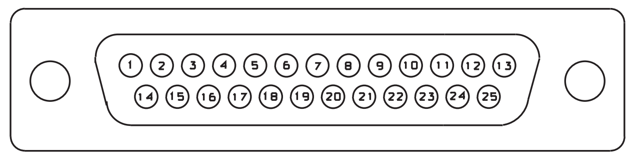


Figure 2-2: Wiring the 25-pin Remote Interface Connector

The tally outputs are protected against reverse polarity.

To avoid damaging the 8585, limit the current into a tally output to 30 mA. DO NOT connect a tally output directly to a low-impedance voltage source! The tally outputs are not protected against this abuse and the output transistors are likely to burn out. When driving a relay or other inductive load, connect a diode in reverse polarity across the relay coil to protect the driver transistors from reverse voltage caused by inductive kickback.

Note that the tally outputs have no special RFI protection. Therefore, it is wise to use shielded cable to make connections to them.

See step 20 on page 2-31 for instructions on programming the tally outputs.

7. Connect to a computer

You can connect to a computer via the 8585's serial connector or via an Ethernet network. See *Networking and Remote Control* on page 2-49 and *Installing 8585 PC Remote Control Software* on page 2-55 for more details.

8585 Rear Panel

[Note: The 8585's front panel is described starting on page 3-1.]

The **Power Cord** is detachable and is terminated in a "U-ground" plug (USA standard), or CEE7/7 plug (Continental Europe), as appropriate to your 8585's Model Number.

An **RS-232 (Terminal) Computer Interface,** labeled SERIAL PORT, is provided to connect the 8585 to IBM PC-compatible computers to support ASCII terminal commands, Orban's PC Remote software, or ppp connections. This port is labeled SERIAL 1.

Two **RS-485 Serial Ports** can accept and emit Dolby AC3 metadata that follows the SMPTE Rdd06-2008 standard.

These ports are labeled SERIAL 2 AND SERIAL 3. You can use these ports to convey DIALNORM to a Dolby Digital encoder (like Dolby's DP-569) automatically. See *Conveying Metadata via RS-485 serial connections* on page 2-14.

A **Remote Interface Connector** (GPI connector) allows you to connect the 8585 to your existing transmitter remote control or other simple contact-closure control devices. The 8585 remote control supports user-programmable selection of up to eight optically isolated inputs for any one of the following parameters: recalling any factory- or user presets, selecting tone or bypass modes, recalling Setups, and clock synchronization. (See *Remote Control Interface Programming* on page 2-48.) The 8585 remote control accepts a DB-25 connector.

The **Ethernet Port** accepts a 10 Mb/second or 100 Mb/second Ethernet connection terminated with an RJ45 connector. Because of its speed compared to the RS-232 port, Ethernet is the preferred method of connecting the 8585 to PC Remote.

Digital AES3id Inputs and **AES3id Outputs** support digital audio signals through BNC connectors. Hardware inputs and outputs each carry two audio channels.

CHASSIS LABEL	SERIAL 1	SERIAL 2	SERIAL 3
DB-9 GENDER	Male	Female	Female
FORMAT	RS-232	RS-485	RS-485
PINOUT			
1 →	DCD	Shield	Shield
2 →	S IN	TX A data out -	TX A data out -
3 →	S OUT	RX B data in +	RX B data in +
4 →	DTR	Ground	Ground
5 →	Ground	NC	NC
6 →	DSR	Ground	Ground
7 →	RTS	TX B data out +	TX B data out +
8 →	CTS	RX A data in -	RX A data in -
9 →	NC	Shield	Shield

Table 2-1: Serial Port Pin Identification

Analog Outputs are mainly provided for monitoring various audio signals through XLR-type connectors. However, because of low tilt and overshoot they can also drive transmitters while maintaining tight peak control.

Word clock/AES11id Sync Input is provided on a female BNC connector.

Input and Output Connections

AES3id Digital Inputs and Outputs

There five AES3id audio inputs and six AES3id audio outputs. The inputs and outputs are all equipped with sample rate converters and can operate at 32, 44.1, 48, 88.2, and 96 kHz. You can force the output sample rate to be genlocked to signal appearing at either the word clock/AES11id sync input or the audio input. The output can also synchronize to the 8585's internal clock.

Inputs and outputs follow the AES3id standard. This specifies 75Ω unbalanced coaxial cable, terminated in male BNC connectors. It is suitable for very long cable runs (up to 1000 meters).

If you wish to connect these inputs and outputs to an AES3 balanced connection, it is wise to insert a 110Ω/75Ω balun transformer between the AES3 and AES3id sides of the connection to ensure best signal integrity.

The digital input clip level is fixed at 0 dB relative to the maximum digital word. The maximum digital input will make the 8585 input meters display 0dB. The reference level is adjustable using the DI REF control.

The 8585's internal sample rate is 48 kHz. Because of "asynchronous resampling," any output sample rate other than 48 kHz/internal sync can introduce overshoots.

If you need to use an STL with 32 kHz sample rate (because that is all that is available), you will achieve lowest overshoot by setting the 8585's internal bandwidth to 15 kHz. That way, the 8585's peak limiter operates on a signal with 15 kHz bandwidth and subsequent sample rate conversion will not add overshoot caused by spectral truncation.

Word clock/AES11id Sync Input

The sync input accepts a standard 5V p-p squarewave 1 x word clock signal (a squarewave at the sampling frequency) or an AES11id signal, automatically detected. A menu item allows you to synchronize the output sample frequency to the frequency present at the sync. The connector is a female BNC with the shell grounded to chassis.

To permit daisy-chaining sync signals, the input impedance is greater than 1 KΩ. If the 8585 is the last device driven by the sync coaxial cable, you should terminate it by using a BNC Tee connector and a 75Ω BNC terminator. This will prevent performance-degrading reflections in the cable. This is required for both word clock and AES11id operation.

Analog Audio Output

- We recommend using two-conductor foil-shielded cable (like Belden 8451 or equivalent) for the analog output connections because signal current flows through the two conductors only. The shield does not carry signal and is used only for shielding.

- Analog output connectors are XLR-type connectors. There are two connectors. These are intended for monitoring and troubleshooting. You can specify which signals (LF, RF, C, LS, RS, LFE, LB, RB, STEREO L, STEREO R, DOWNMIX L, DOWNMIX R, LF/RF, C, LS/RS, LB/RB, STEREO, or DOWNMIX) drive these outputs.

  In the XLR-type connectors, pin 1 is CHASSIS GROUND, while pin 2 and pin 3 are a balanced, floating pair. This wiring scheme is compatible with any studio-wiring standard: If pin 2 or 3 is considered LOW, the other pin is automatically HIGH.

- Electronically balanced and floating outputs simulate a true transformer output. The source impedance is 50Ω. The output is capable of driving loads of 600Ω or higher; the 100% modulation level is adjustable with the AO 100% control over a –6dBu to +24dBu range. The outputs are EMI suppressed.

- If an unbalanced output is required (to drive unbalanced inputs of other equipment), it should be taken between pin 2 and pin 3 of the XLR-type connector. Connect the LOW pin of the XLR-type connector (#3 or #2, depending on your organization's standards) to ground; take the HIGH output from the remaining pin. No special precautions are required even though one side of the output is grounded.

- At the 8585's output (and at the output of other equipment in the system), do not connect the cable's shield to the CHASSIS GROUND terminal (pin 1) on the XLR-type connector. Instead, connect the shield to the chassis ground at the input destination. Connect the red (or white) wire to the pin on the XLR-type connector (#2 or #3) that is considered HIGH by the standards of your organization. Connect the black wire to the pin on the XLR-type connector (#3 or #2) that is considered LOW by the standards of your organization.

Power Ground

- Ground the 8585 chassis through the third wire in the power cord. Proper grounding techniques never leave equipment chassis unconnected to power/earth ground. A proper power ground is essential for safe operation. Lifting a chassis from power ground creates a potential safety hazard.

Quick Setup

The 8585's Quick Setup feature provides a guided, systematic procedure for setting up the 8585. It should be adequate for most users without special or esoteric requirements. Following this section, you can find more detailed information regarding setup outside the Quick Setup screens. Mostly, you will not need this extra information.

For the following adjustments, use *LOCATE* (the green joystick, between *ESCAPE* and *ENTER*) to select parameters. After you have highlighted the desired parameter on the screen, use the front panel control knob to adjust the parameter settings as desired.

- Quick Setup sets the 8585's Channel Mode to 5.1/2.0, which is the most common scenario in broadcast. This means that the surround processing is in 5.1-channel mode and the 2.0 processing is active and available.
- The 8585 has input and output routing switchers that connect the 8585's physical inputs and output to the logical inputs and outputs of the 8585's surround and 2.0 audio processors. Quick Setup allows you to retain a custom routing setup or to use the factory default: AES3id input #1=Lf/Rf, #2=C/LFE, #3= Ls/Rs, #4=Lb/Rb (applies to 7.1 processing only), and #5=Stereo (2.0). (This arrangement is consistent with the Dolby DP-569 Dolby Digital Encoder's default I/O routing setting.)

  With the 8585's factory default Setup, the 2.0 processor operates in STEREO mode and its output is not mixed into the surround processor's output. We recommend using the default routing for Quick Setup and customizing it after you run Quick Setup.

1. **From the pop-up Menu display, Locate to System Setup, then press the Enter button.**

   If the pop-up Menu isn't onscreen, press the control knob in.

2. **From the System Setup screen, Locate to the Quick Setup icon, then press the Enter button.**

   Quick Setup presents a guided sequence of screens into which you must insert information about your particular requirements.

   Each Quick Setup page is titled in the top right corner (e.g., page 1 is QUICK SETUP 1).

3. **Set time and date.**

   A) *LOCATE* to the Time & Date screen (SYSTEM SETUP > QUICK SETUP 2).

   B) Choose Time Format as desired (either 24-hour time or 12-hour AM / PM-style time).

C) Set hours, minutes, and seconds, in that order, using a 24-hour format for entering hours even if you have set the time format to 12-hour.

Seconds will stop advancing when you set hours and minutes. So set seconds last.

D) Choose the desired date format.

E) Set today's date.

F) If you want the clock to reset itself automatically to conform to Daylight Saving Time (Summer Time), use the DAYLIGHT SAVING > MONTH/WEEK and STANDARD TIME MONTH/WEEK. to match the daylight saving and standard times in your area. If you do not wish to use this feature, leave the DAYLIGHT SAVINGS and STANDARD TIME fields set to OFF.

> Note that the clock will set itself automatically if you have set the 8585 to synchronize to an Internet timeserver. See *Synchronizing Optimod to a Network Timeserver* in page 2-52.

4. Set the surround and 2.0 maximum low pass filter frequency as appropriate to your application.

The audio bandwidth of the 8585's surround and 2.0 processing (10.0 to 20.0 kHz in 1.0 kHz steps) can be set in three places: (1) in the active Setup, (2) in the EQ page of the Modify screen, and (3) by remote control. The 8585's bandwidth is always the *lowest* of these three settings. The frequency in Setup is a technical parameter that determines the *highest* bandwidth available. The installing engineer should set it to be congruent with the sample rate of the digital system being driven by the 8585.

For ATSC digital television transmission (which uses 48 kHz sample rate), set the 2.0 MAX LOW PASS FILTER to 20 KHZ.

> If the 8585 is driving a system with a 32kHz sample rate, set the 2.0 MAX LOW PASS FILTER to 15.0 KHZ. That way, a setting of 20 kHz elsewhere will not cause excessive bandwidth and aliasing because the 8585 will automatically override it with the MAX LPF setting.
>
> The 2.0 MAX LOW PASS FILTER for the surround and 2.0 channel processing are independent.

A) *LOCATE* to the Lowpass Filter screen (SYSTEM SETUP > QUICK SETUP 3).

B) Set the 2.0 MAX LOW PASS FILTER control as required.

5. Set surround and 2.0 external AGC mode.

Most of the processing structures in the 8585 control level with a preliminary AGC (Automatic Gain Control). In typical 8585 installations, there is no AGC upstream from the 8585. However, if you are using a suitable Automatic Gain Control ahead of the 8585 (to protect an STL, for instance), the AGC in the 8585 should be defeated. This is so that the two AGCs do not "fight" each other and so they do not simultaneously increase gain, resulting in increased noise.

A) *LOCATE* to Studio Configuration screen (SYSTEM SETUP > QUICK SETUP 4).

B) Set the Surround External AGC mode.

- Set the field to YES if you have an external AGC installed at your studio feeding the studio-to-transmitter link. This setting appropriately defeats the 8585's AGC for all presets.
- If you do not have an external AGC installed, set the field to NO; this setting allows the selected preset to determine the 8585 AGC status.

C) Set the 2.0 External AGC mode (see above for choices).

6. Set surround and 2.0 operating levels.

The Reference Level screen allows you to match the 8585's processing to the normal operating level expected at the 8585's input so the 8585's AGC can operate in the range for which it was designed. If you know the reference VU or PPM level that will be presented to the 8585, set the SURROUND REFERENCE LEVEL to this level.

It is wise to verify your setting with the steps below, which also allow you to set the reference level controls when you do not know the reference VU or PPM level that will be presented to the 8585.

A) Feed normal program material to the 8585.

Play program material from your studio, peaking at normal program levels (typically 0VU if your console uses VU meters).

B) *LOCATE* to the Reference Levels screen (SYSTEM SETUP > QUICK SETUP 5).

C) Adjust the SURROUND REFERENCE LEVEL so that the surround AGC meter reads an average of 10 dB gain reduction.

[–40 to –10 dBFS (VU), or –33 to –3 dBFS (PPM)] in 0.5 dB steps.]

The DIGITAL REFERENCE LEVEL VU and PPM settings track each other with an offset of 8 dB. This compensates for the typical indications with program material of a VU meter versus the higher indications on a PPM.

If you are using the TV 2B DRAMA or TV 5B DRAMA presets, adjust the operating level so that the AGC meter indicates an average of 5 dB of gain reduction. This is because the AGC compression ratio in these presets is 2:1 in order to retain some of the dynamic range of the original programming.

D) If you will be using the 2.0 processing, adjust the 2.0 REFERENCE LEVEL so that the 2.0 AGC meter reads an average of 10 dB gain reduction.

7. Set the surround and 2.0 output feeds and sample rates.

A) *LOCATE* to the Output Configuration screen (SYSTEM SETUP > QUICK SETUP 6).

B) Choose one of the following to feed the hardware outputs assigned to the surround audio processing:

- MB+LIMIT (stereo enhancement, equalization, AGC, two-band or 5-Band compression, loudness control, and look-ahead peak limiting). This setting is correct for most applications, including driving a digital television transmitter. It fully supports Dialnorm.

The three settings below do not support Dialnorm automatically:

- MULTIBAND (stereo enhancement, equalization, AGC, and two-band or 5-Band compression, and loudness control without peak limiting).
- AGC+LIMIT (stereo enhancement, equalization, AGC, and look-ahead peak limiting).
- AGC (stereo enhancement, equalization, and AGC without peak limiting).

If you set EXT AGC to YES in System Setup, this defeats the AGC. In this case, choosing:

- MB+LIMIT results in stereo enhancement, equalization, two-band or 5-Band compression, and loudness control with look-ahead limiting but without AGC.
- MULTIBAND results in stereo enhancement, equalization, two-band or 5-Band compression, and loudness control without AGC.
- AGC+LIM results in stereo enhancement, equalization, and look-ahead limiting.
- AGC causes the input signal to be passed to the analog output with no dynamics processing (just stereo enhancement and equalization).

The only reason to use an output without peak limiting is if low delay is needed, as the 8585's sophisticated, low-IM peak limiter adds about 12 milliseconds of delay. Note that this is only true if a given output's DELAY parameter in System Setup is set to MINIMUM. If DELAY is set to any other value, the 8585 will automatically add delay to ensure that the input/output delay corresponds to your DELAY control setting. In digital television applications, DELAY will usually be set to exactly one frame to make it easy to retain lip sync.

In digital radio and netcast applications, you might want to use a low-delay output to drive your studio monitor speakers as well as talent headphones.

CAUTION: If an output is configured for no peak limiting, it can clip and distort. If this happens, correct it by turning down the 8585's MB LIMITER DRIVE control (if you are using MULTIBAND mode) or AGC LIMITER DRIVE control (if you are using AGC mode). Then save the result as a user preset. Note that these control settings apply only to the active processing preset. If you use more than one processing preset, you must adjust the appropriate LIMITER DRIVE control for each and save each as a user preset.

C) Choose the source to feed the hardware outputs assigned to the 2.0 channel audio processing (see above for the choices).

D) Set the surround output sample rate to 32, 44.1, 48, 88.2, or 96 kHz. 48 kHz is correct for digital television transmission.

The internal sample rate converter sets the rate at the 8585's digital output. This adjustment allows you to set the output sample rate to ensure compatibility with equipment requiring a fixed sample rate. In all cases, the 8585's internal processing sample rate is 48 kHz.

E) Set the 2.0 output sample rate to 32, 44.1, 48, 88.2, or 96 kHz.

8. Set surround and 2.0 output levels.

A) *LOCATE* to the Set Output Levels screen (SYSTEM SETUP > QUICK SETUP 7).

B) Set the SURROUND OUTPUT LEVEL control to the desired peak level in units of dB with reference to digital full-scale. (Note: This control is labeled SURROUND OUTPUT 100% IN PC Remote.)

–2.0 dBfs is an appropriate value. It provides some headroom for any overshoots introduced by equipment (like codecs) following the 8585.

Note that if a given output is fed with a non-limited signal (AGC or LIMIT), the peak level will not be controlled tightly.

- IMPORTANT: In MB LIMIT mode, the 8585's SURROUND OUTPUT LEVEL and SURROUND OUTPUT LEVEL controls do not adjust loudness; they only set the maximum peak level at the 8585's output. This is to reduce the likelihood of setup errors when the 8585 is driving a Dolby Digital channel. The active DIALNORM value and the MB LIMITER DRIVE controls set output loudness.
- Regardless of the output mode, do not try to adjust loudness at the receiver by using the 8585's OUTPUT LEVEL controls. Use these controls only to set output headroom. In MB+LIMIT mode, use the DIALNORM control to set loudness. In MB mode, use the MB LIMITER DRIVE control in the active preset. In AGC and AGC+LIMIT modes, use the AGC LIMITER DRIVE control in the active preset.
- If you have readjusted either LIMITER DRIVE control (located in the MULTIBAND MODIFY screens), you must save the result as a user preset in order to avoid the possibility of losing your settings, which will otherwise happen if you recall a different preset.

This will allow you to use the full amount of headroom available in the transmission channel following the 8585 and, in digital television service, will minimize or eliminate the need to apply peak limiting to the signal. This is because the Dolby Digital system allows you to use the DIALNORM metadata parameter to ensure that there is enough peak headroom through the transmission system. For most digital television transmissions, setting DIALNORM to –24 dB or below (i.e., closer to –31 dB) will ensure that no peak limiting ever occurs, assuming that you set loudness with the 8585's LIMITER DRIVE control to make the 8585's Loudness Level meter peak at 0 dB with typical dialog and set the 8585's OUTPUT control to –2.0 dBfs, which allows 2 dB of peak headroom for overshoots in the AC3 codec.

C) Set the 2.0 OUTPUT control to the desired peak level in units of dB with reference to digital full-scale.

D) Set the ANALOG OUTPUT control to the desired peak level in units of dBu, where 0 dBu = 0.775 v r.m.s.

> The 8585's two analog output channels are most commonly used for monitoring. Nevertheless, they produce low overshoot and can be used to drive a transmission system with an analog input.

9. Set surround and 2.0 global Dialnorm values. (Do not skip this step!)

If you skip this step, your audio may be objectionably louder or quieter than other stations' audio.

The 8585 is designed to work smoothly with Dolby Digital. In essence, the Dolby Digital Dialnorm metadata sets an invisible volume control that is cascaded with the volume control in the consumer's receiver. To produce the same loudness as other properly set up transmission channels, the 8585 needs to be aware of the Dialnorm value you are transmitting to the consumer. The 8585 uses this value in two ways:

- It adjusts the sensitivity of the 8585's Loudness Level meter so that when the Loudness Level meter is peaking at 0 dB on speech material, loudness is correct at the receiver. This means that you can use the 8585's Loudness Level meter as a reference if you are modifying a factory preset and want to ensure correct loudness at the consumer's receiver.

- It scales the output level of the 8585's presets so that the level will be correct for the Dialnorm value you are transmitting to the consumer. To do this, it sets the gain of a hidden level control cascaded with the 8585's LIMITER DRIVE control. This gain adjustment is before the 8585's look-ahead limiters and OUTPUT 100% controls. This arrangement allows you to use the full headroom of the Dolby Digital transmission channel regardless of the Dialnorm setting. In addition, changing Dialnorm adds a hidden offset to the LOUDNESS THRESHOLD control's displayed setting, which ensures that the loudness controller's gain reduction does not change when DIALNORM is changed.

> These scale factors adjust themselves automatically so that the loudness of the consumer's receiver is the same regardless of the settings of the 8585's SURROUND OUTPUT 100% and 2.0 OUTPUT 100% controls, whose only purpose is to set the 8585's maximum peak output level with respect to 0 dBfs. This allows you to compensate for transmission channels that introduce peak overshoots.
>
> For example, if you change the SURROUND OUTPUT 100% control from 0 dBfs to –6 dBfs, the drive level into the look-ahead limiters automatically increases by 6 dB. Meanwhile, the threshold of the loudness controller and the sensitivity of the 8585's Loudness Level meter decrease by 6 dB. Hence, the r.m.s. drive level into the Dolby Digital encoder stays the same, the loudness controller produces the same amount of gain reduction, and the Loudness Level meter continues to peak at 0 dB.
>
> To change the 8585's output loudness, adjust its DIALNORM value or adjust the MB LIMITER DRIVE control in the active processing preset. Adjusting DIALNORM changes loudness without changing the indication on the 8585's Loudness Level meter and without changing the amount of gain

reduction in the loudness controller. Adjusting MB LIMITER DRIVE changes both the Loudness Level meter's indication and the amount of gain reduction in the loudness controller.

Each processing preset has a Dialnorm value that can override the global Dialnorm values that you set in this step. To use the global Dialnorm value, be sure that the active processing preset's Dialnorm value is set to USE GLOBAL, which is true of all Factory Presets except for the analog TV presets. *In all cases, you must ensure that the 8585's active Dialnorm value matches the Dialnorm value you are sending to consumers.*

Setting the 8585's active Dialnorm value:

A) *LOCATE* to the Set Dialnorm screen (SYSTEM SETUP > QUICK SETUP 8).

B) Set the SURROUND DIALNORM value so that it is the same as the Dialnorm value you are transmitting to the consumer's receiver.

Many broadcasting organizations have standardized on –24 dBfs. This is the correct value if your transmission plant has been set up to comply with ATSC a_85-2009, which is a guide to standardizing loudness. You can download this recommendation from the ATSC website. At the time of this writing, the standard was here:

http://atsc.org/cms/index.php/standards/recommended-practices/185-a85-techniques-for-establishing-and-maintaining-audio-loudness-for-digital-television

If you are not driving a Dolby Digital system (in a netcasting application, for example), you must choose an arbitrary value of Dialnorm. The 8585's processing was tuned for a nominal Dialnorm value of –19 dBfs and other values of the 8585's DIALNORM control produce hidden offsets in the MB LIMITER DRIVE and LOUDNESS THRESHOLD controls, as described above.

If you are not using the 8585 to process a Dolby Digital transmission, –19 dBfs is a reasonable choice for the 8585's DIALNORM. This splits the difference between the SMPTE standard line-up level (–20 dBfs) and the EBU standard line-up level (–18 dBfs). It offers a good tradeoff between headroom and noise, particularly in 16-bit transmission channels.

As you set Dialnorm closer to –11 dB, loudness increases. Eventually, you will start to see significant limiter gain reduction as the 8585's mastering-quality look-ahead limiters work harder and harder prevent peak overload. Above a certain Dialnorm value, the limiters will start to create audible side effects as they create more and more gain reduction. Allowing up to 6 dB of limiter gain reduction is usually safe, but the best sounding limiter gain reduction is no gain reduction at all, so we advise taking advantage of any available headroom in your transmission channel to minimize the amount of look-ahead limiter gain reduction.

C) [Optional] Set the 2.0 DIALNORM value so that it is the same as the Dialnorm value you are transmitting on your 2.0 channel stream, if any.

Conveying Metadata via RS-485 serial connections: In version 1.0 software, the 8585 can, via an SMPTE Rdd06-2008-compliant RS-485 serial connection, automatically convey its active surround metadata value to a downstream Dolby Digital encoder like the Dolby DP-569, which must be set up according to its operating instructions to receive and act upon this input. This greatly reduces the possibility that operator error will cause the wrong value of surround metadata to be transmitted to consumers.

To emit an Rdd06-2008-compliant signal, the 8585 must be receiving a valid input RS-485 serial stream that is compliant with Rdd06-2008—this is necessary to synchronize the output metadata to video frame boundaries per the Dolby specification. When a valid input stream in present, the 8585 passes this stream unchanged to its output except for the following modifications:

- The `ac3_dialnorm` word in the output metadata stream is reauthored so it is the same as the 8585's active DIALNORM value.
- The `ac3_dynrnge` word in the output stream is set to 0, indicating that the downstream AC3 encoder must reauthor the line-mode DRC metadata, following the level compression profile found in the `ac3_dynrng1` word in the input metadata.
- The `ac3_compre` word in the output stream is set to 0, indicating that the downstream AC3 encoder must reauthor the RF-mode DRC metadata, following the level compression profile found in the `ac3_compr1` word in the input metadata.

To maintain sync when using metadata, it is important to set the 8585's delay to one frame of the video associated with the metadata. See step 13 on page 2-17.

10. Choose a processing preset.

A) *LOCATE* to the Set Preset screen (SYSTEM SETUP > QUICK SETUP 9).

B) Turn the knob until your desired preset is highlighted at the top of the screen.

C) Press the *ENTER* button to put your desired preset on-air.

This step selects the processing to complement various program formats. There are presets for radio-style and television-style applications. The latter begin with “TV.”

After this step, you can always select a different processing preset, program the 8585 to automatically change presets on a time/date schedule, use a GPI input to trigger preset changes, modify presets to customize your sound, and store these presets as User Presets.

Preset names are *just suggestions*. Feel free to audition different presets and to choose those whose sound you prefer.

You can easily modify a preset later with the 8585’s one-knob LESS-MORE feature. Refer to Section 3.

If you want the 8585’s surround and 2.0 processing to operate with different presets, import a 2.0 preset into the active preset and save the combination as a User Preset. Instructions for importing and editing a 2.0 preset are on page 3-25.

Congratulations! You are now transmitting with your initial sound. Feel free to read the material in Section 3 of this manual, which describes the various presets and how you can customize them to achieve your desired signature sound.

Presets and Loudness: All 8585 TVxxxx presets are designed to produce very similar loudness with speech and to do so regardless of the setting of their LESS-MORE controls. Our goal was to allow these presets to be used on-air without need for loudness adjustment, assuming that you have told the 8585 what DIALNORM value you are transmitting to the consumer. We set loudness partly by making appropriate compression threshold and limiter drive adjustments, and partly by using the 8585's Loudness Controller.

We tuned the "Radio" presets to produce loudness that is approximately the same as the TVxxxx presets. Unlike other Optimods, LESS-MORE adjustments have minimal effect on loudness and mainly set the amount of compression. Because the 8585's loudness controller is defeated in the "Radio" presets, loudness will not be as consistent from source to source as it is with the TVxxxx presets.

You can use the loudness controller to improve the loudness consistency of a "Radio" preset. First, adjust the preset with LESS-MORE to achieve the desired processing texture. Then activate the loudness controller by setting the preset's LOUDNESS THRESHOLD control to –10 dB, which matches the loudness controller's threshold to the active DIALNORM value. For the best tradeoff between consistent loudness and potential artifacts, adjust the MB LIMITER DRIVE control so that the loudness controller's gain reduction meter typically indicates 3 dB. You should see the Loudness Level meter peaking around at 0 dB. When you have finished your adjustments, save the result as a User Preset.

See also *Setting Preset Loudness Correctly for Dolby Digital Transmission* on page 3-18.

This concludes the guided Quick Setup procedure. However, you may wish to set up some other 8585 features. These are described in the following optional steps.

11. Complete Station ID (optional).

The Station ID is an optional setting that you can provide to name a given 8585. The name can be up to eight characters long. It is used to identify your 8585 to Orban's 8585 PC Remote application and appears on the Main Screen when PC Remote is controlling the 8585. It is also displayed on the Meters screen of the 8585 unit.

A) *LOCATE* to SETUP > NEXT > TIME DATE AND ID > STATION ID.

B) Use *LOCATE* to select each character in the ID and *ENTER* to confirm the selection.

C) When finished entering your name, *LOCATE* to SAVE. Then press *ENTER.*

D) When you select SAVE, you will return to the Setup main menu. If you press *ESCAPE*, you can see the station name on the main screen.

12. Set up the 2.0 processing's response to and transmission of AES3id status bits (optional).

The default behavior of the 8585 is to ignore AES status bits because many pieces of external equipment handle these incorrectly. However, the 8585 allows the

AES3 "channel mode" determine its 2.0 channel processing operating mode (stereo or dual-mono). The AES3 channel mode specification provides for "two-channel mode" (corresponding to 8585 dual-mono mode) with bits 1-4 in byte 1 in the pattern "0001," and "stereophonic mode" (corresponding to 8585 stereo mode) with these bits in the pattern "0100."

The 8585 can also emit these status bits at its digital output to control downstream equipment.

A) *LOCATE* to INPUT/OUTPUT > SURROUND OUT > 2.0 OUT and set the 2.0 OUTPUT FORMAT to AES.

> SPDIF cannot be used to handle status bit because the specification does not allow it.

B) To enable the 8585 to change its operating mode in response to AES status bits received at its AES input:

a) *LOCATE* to SYSTEM SETUP > NETWORK/REMOTE > AES STAT BITS.

b) Set IN>MODE to ON.

> Unless you are sure that upstream equipment will correctly format these bits, set IN>MODE to OFF.

c) Make sure that the equipment driving the 8585 is formatting its output as AES3. SPDIF will not work.

C) To send "two-channel mode" and "stereophonic mode" bits indicating the 8585's current operating mode, set MODE>OUT to ON.

> If this parameter is set to OFF, then the 8585 will output "0000" ("mode not indicated'). This is the safest setting if you are uncertain whether downstream equipment can respond appropriately to these bits.

13. Set the Processing Delay for a given signal path (optional).

[minimum], [30 fps], [29.97 fps], [25 fps], [24 fps], [33-50 ms in 1 ms increments]

You can set the delay through the surround and 2.0 processing paths independently. This feature is usually used in sound-for-picture applications to add time delay so that the input/output delay through a given processing path is exactly one frame, using a variety of different standards. The selections are MINIMUM (depends on processing structure in use; typically between 20 and 23 ms), 30 fps, 29.97 fps (NTSC color video), 25 fps (most PAL video), and 24 fps (film). You can also set the delay in 1 millisecond increments.

LOCATE to I/O CALIB > SURROUND/2.0 OUTPUT and set the delay as required using the SURROUND and 2.0 fields.

> This control does not affect the delay to a given output if that output is in AGC or MULTIBAND mode.

IMPORTANT: If the 8585 is processing Dolby metadata (via its serial or SDI connections), you must set the 8585's processing delay to match the frame rate of the associated video. This is because the 8585 delays the metadata by exactly one frame to comply with Dolby's requirements for synchronization of the metadata and video frames, so the audio must also be delayed by one frame to keep the audio and metadata in sync.

To maintain A/V sync if you are not using the 8585's HD-SDI option, you must delay the video by one frame elsewhere in your facility. The 8585's HD-SDI option will automatically delay the video by one frame, hence keeping audio, video, and metadata in sync.

I/O Setup

The following material provides detailed instructions on how to set up the 8585. If QUICK SETUP does not fully address your setup needs or if you wish to customize your system beyond those provided with QUICK SETUP, then you may need the additional information in the sections below. However, for most users, this material is only for reference because QUICK SETUP has enabled them to set up the 8585 correctly.

For the following adjustments, use the *LOCATE* button to choose the parameter to be adjusted and the knob to change its value.

Follow steps in order. Some later settings depend on earlier settings being correct.

1. **Set the 2.0 maximum lowpass filter frequency as appropriate to your application.**

   [10.0 kHz] to [20.0 kHz]; 1 kHz steps

   The 2.0 processing's lowpass filter is located before any dynamics processing and affects all outputs equally. It is a phase-linear FIR filter.

   > The surround processing does not offer a lowpass filter because it is unlikely to be used in applications that need bandwidth limiting below 20 kHz.

   The 2.0 processing's audio bandwidth can be set in the active Setup and in the EQ pages of the Basic, Intermediate, and Advanced Modify screens. (The latter allows the active preset to determine the bandwidth so you can change the bandwidth by recalling a User Preset.)

   The 2.0 processing's bandwidth is always the *lowest* of these settings. The frequency in I/O SETUP is a technical parameter that determines the *highest* bandwidth available. The installing engineer should set it to be congruent with the sample rate of the digital system that the 8585 is driving. For example, if the 8585 is driving a system with a 32 kHz sample rate, set the MAX LPF to 15.0 KHZ. That way, a setting of 20 kHz elsewhere will not cause excessive bandwidth and aliasing because the 8585 will automatically override it with the MAX LPF setting.

   For ATSC digital television transmission, 20 kHz is the correct setting.

   A) *LOCATE* to INPUT/OUTPUT > UTILITIES.

   B) Using the 2.0 MAX LOW PASS FILTER control, set the maximum bandwidth for the 2.0 processing.

C) *(optional)* Using the SAVE/SAVE AS > SETUP screen, save the resulting Setup.

This will allow you to recall it later. Even if you do not save the setup explicitly, the 8585 will retain your settings (even after the unit is powered off) until another Setup is recalled. However, it is wise to save Setups formally so they are not later overwritten accidentally.

2. Temporarily set the external AGC mode to "No."

A) *LOCATE* to INPUT/OUTPUT > UTILITIES.

If you performed the previous step, you should be there already.

B) Set the SURROUND EXTERNAL AGC control to NO.

If you are using an external AGC before the 8585's surround processing, you should restore this setting to YES after the setup procedure is complete.

C) Set the 2.0 EXTERNAL AGC control to NO.

If you are using an external AGC before the 8585's 2.0 processing, you should restore this setting to YES after the setup procedure is complete.

3. Set the routing between hardware inputs and processing inputs.

LOCATE to INPUT/OUTPUT > INP. ROUTING. This screen allows you to choose which hardware inputs feed which processing inputs.

Because each AES3id hardware input receives two audio channels, you can only route pairs of audio channels.

It is OK to use one hardware input to drive more than one processing input. For example, hardware input 1/2 can drive both the 2.0 processing and the Lf/Rf inputs to the surround processing.

For an explanation of the FALLBACK input, see step 19 on page 2-30.

4. Set the routing between processing outputs and hardware outputs.

LOCATE to INPUT/OUTPUT > OUT ROUTING and assign processing outputs to the six hardware AES3id outputs as desired. The choices are:

- Lf/Rf (left front/right front)
- C/LFE (center/low frequency effects)
- Ls/Rs (left surround/right surround —the surround channels in 5.1 and 7.1)
- Lb/Rb (left back/right back —the rear channels in 7.1)
- Lst/Rst (left stereo/right stereo — the outputs of the 2.0 processing chain)
- Ldm/Rdm (left downmix/right downmix — the outputs of the surround processing, downmixed to stereo according to the settings in the INPUT/OUTPUT > CHANNEL MODE page). See step 14 on page 2-29.

- Various monophonic variations of the above, which are convenient for doing things like assigning the left and right outputs of the 2.0 processing to separate hardware outputs when the 2.0 processing is in dual-mono (1/0/1.0) mode and carrying independent monophonic programs on the two channels.

You can assign a given processor output signal to more than one hardware output. This allows using the 8585 as an AES splitter.

If you wish to use the 8585's automatic fallback functionality, you must use the 8585's default input routing: 1/2>Lf/Rf, 3/4>C/LFE, 5/6>Ls/Rs, and 9/10>Ls/Rs. See step 19 on page 2-30.

5. Set the 2.0 input preemphasis.

[Flat, J.17]

You can configure the 8585 to apply J.17 deemphasis to input signals assigned to the 2.0 processing. J.17 is first-order shelving preemphasis/deemphasis with breakpoints at 400 Hz and 4 kHz. It is rarely used now; in broadcasting, it was mostly used in NICAM links.

A) *LOCATE* to INPUT/OUTPUT > INPUT.

B) Set the 2.0 INPUT PREEMPHASIS control to FLAT or J.17. If in doubt, choose FLAT, which is correct for almost all installations.

C) Set the 2.0 INPUT PREEMPHASIS control to FLAT or J.17.

6. Adjust the surround input reference Level.

[–40 dBfs to –10 dBfs (VU), or [–33 dBfs to –3 dBfs (PPM)] in 0.5 dB steps

This step matches the 8585's average AGC gain reduction to the level to which program material is normally peaked on the studio meters. It makes the 8585's processing presets operate in their preferred range. Correctly setting the input reference level ensures that processing presets will produce their intended sound, controlling loudness effectively and subtly.

- If your organization uses a standardized line-up level, you can simply set the 8585's SURROUND INPUT REFERENCE VU control to this level and skip to step (H). However, we strongly suggest checking the result of your setting by using the procedure starting with step (A) and choosing to calibrate using program (step (G)).

  There are two commonly used line-up levels: SMPTE (–20 dBfs) and EBU (–18 dBfs).

- Note that you are calibrating to the normal indication of the studio meters; this is quite different from the actual peak level.

- The reference level VU (average) and PPM (quasi-peak) settings are not independent—they track each other with an offset of 7 dB. This compensates for the typical indications with program material on a VU meter versus the higher indications on a PPM.

A) *LOCATE* to RECALL/IMPORT.

B) Turn the knob until ROCK MEDIUM appears in the lower line of the display.

C) Press the *ENTER* button to recall the preset.

D) Verify that the 8585's SURROUND EXTERNAL AGC control is set to NO.

Refer to step 2 on page 2-19.

E) *LOCATE* to INPUT/OUTPUT > INPUT > SURROUND INPUT REFERENCE (VU or PPM, depending on which metering system you use).

F) Calibrate using tone.

If your facility does not use a formal reference level and/or if the link to the 8585's input uses J.17 preemphasis (which is only available for the 2.0 input; see step 5 on page 2-20):

- To calibrate using tone, perform steps (a) and (b) below.
- To calibrate using program material, skip to step (G) on page 2-21.

a) If you are not using a studio level controller, feed a 400 Hz tone into the Lf and Rf channels of the 8585 through your console at your normal program line-up level (typically 0 VU if your console uses VU meters). Do not drive any other channels.

b) If you are using a studio level controller that performs an AGC function, feed a 400 Hz tone at your normal program level into its Lf and Rf channels and adjust the studio level controller for normal operation.

c) Adjust the 8585's SURROUND INPUT REFERENCE (VU or PPM) control to make the 8585's AGC meter indicate 10 dB gain reduction.

d) Skip to step (H).

G) Calibrate using program.

[Skip this step if you are using Tone to calibrate the 8585 to your standard studio level—see step (F) above.]

a) Feed normal program material to the 8585

Play program material from your studio, peaking at the level to which you normally peak program material (typically 0VU if your console uses VU meters).

b) Adjust the SURROUND INPUT REFERENCE (VU or PPM) control to make the 8585's AGC meters indicate an average of 10 dB gain reduction when the console's VU meter or PPM is peaking at its normal level.

If the AGC gain reduction meter averages less than 10 dB gain reduction (higher on the meter), re-adjust the SURROUND INPUT REFERENCE (VU or PPM) to a lower level.

If the AGC gain reduction meter averages more gain reduction (lower on the meter), re-adjust the SURROUND INPUT REFERENCE (VU or PPM) to a higher level.

H) When finished, reset the 8585's SURROUND EXTERNAL AGC control to YES, if required (e.g., if that was its setting prior to setting SURROUND INPUT REFERENCE (VU or PPM) level).

Refer to step 2 on page 2-19.

7. Adjust the 2.0 input reference Level.

[Skip this step if you will not be using the 2.0 processing input.]

Repeat step 4 on page 2-19, but use the 2.0 INPUT REFERENCE (VU OR PPM) control. If you choose to calibrate using tone or program material, drive the 2.0 processing's inputs.

8. Set the 2.0 output configuration.

[Skip this step if you will not be using the 2.0 processing.]

A) *LOCATE* to INPUT/OUTPUT > 2.0 OUTPUT

B) Set the 2.0 OUTPUT SYNC to INTERNAL, SYNC IN, or any of the 8585's AES3id inputs.

- INTERNAL synchronizes sample rate of the 2.0-connected hardware output that carries the 2.0 processing to the 8585 internal crystal time base.
- SYNC IN synchronizes the sample rate to AES3id, AES11id, or word clock applied to the 8585's SYNC INPUT. It will overwrite the setting of the 8585's 2.0 OUTPUT RATE control.
- Choosing any 8585 hardware input locks the sample rate to the sample rate appearing at that input.

If there is no valid signal present on the chosen reference input, the 8585 uses internal sync until a valid signal appears.

C) Set the 2.0 OUTPUT RATE to 32, 44.1, 48, 88.2, or 96 kHz.

- If you are using INTERNAL sync [step (B) above], 48 kHz or 96 kHz are preferred because their samples are synchronous with the peak-controlled samples in the processing. If you are using external sync, this special relationship no longer holds.
- Selecting a 32 kHz output sample rate will automatically set the highest available audio bandwidth to 15 kHz.
- 2.0 OUTPUT RATE affects the usable range of test tone frequencies. When 2.0 OUTPUT RATE is set to 32 kHz, the highest usable tone frequency is 15 kHz. When 2.0 OUTPUT RATE is set to 44.1 or above, all tone frequencies are usable.

D) Set the 2.0 OUTPUT WORD LENGTH.

[14], [16], [18], [20], or [24], in bits

The largest valid word length in the 8585 is 24 bits

The 8585 can truncate its output word length to 20, 18, 16 or 14 bits and can add appropriate dither before the truncation to linearize it (see the next step).

E) Set the 2.0 OUTPUT DITHER to IN or OUT, as desired.

[In] or [Out]

When this control is set to IN, the 8585 adds "high-pass" dither before any truncation of the output word. The amount of dither automatically tracks the setting of the WORD LEN control. This first-order noise shaped dither considerably reduces added noise in the midrange by comparison to white PDF dither. However, unlike extreme noise shaping, it adds a maximum of 3 dB of excess total noise power when compared to white PDF dither. Thus, it is a good compromise between white PDF dither and extreme noise shaping.

To ensure maximum system linearity, it is wise to set this control to IN.

F) Set 2.0 OUTPUT FORMAT to AES or SPDIF

G) Set 2.0 OUTPUT SOURCE control. The choices are:

- MB+LIMIT (stereo enhancement, equalization, AGC, two-band or 5-Band compression, and look-ahead peak limiting).
- MULTIBAND (stereo enhancement, equalization, AGC, and two-band or 5-Band compression without peak limiting)
- AGC+LIMIT (stereo enhancement, equalization, AGC, and look-ahead peak limiting)
- AGC (stereo enhancement, equalization, and AGC without peak limiting)

See step 7 on page 2-10 for more about these choices.

H) Set the 2.0 OUTPUT PREEMPHASIS control. The choices are FLAT, 50μs or 75μs.

- Use FLAT if you are driving a channel that does not use preemphasis. (Very few digital channels use preemphasis.) Set the control FLAT for DAB, DRM, HD Radio, digital television, netcasts, and any other channel that uses a lossy codec. When in doubt, set this control FLAT.
- Use 50μs if you are driving a channel that is preemphasized at 50μs, such as an analog TV aural transmitter in European countries.
- Use 75μs if you are driving a channel that is preemphasized at 75μs, such as an aural transmitter in the Americas (Region 2).

When the control is set to 50μs or 75μs, the signal feeding the 2.0 look-ahead limiter has this preemphasis applied to it before it feeds the limiter and complementary deemphasis is applied after the limiter. The frequency response through the limiter therefore remains flat below the threshold of limiting but high frequencies cause the limiter to produce more wideband gain reduction than do low frequencies. Because deemphasis is applied after the limiter, the transmitter that follows the 8585's output must apply the final transmission preemphasis.

With 5-Band presets, the OUTPUT PREEMPHASIS control determines if the 5-band compressor's sidechain is preemphasized at 50µs or 75µs. This makes the 5-band compressor "preemphasis-aware," allowing bands 4 and 5 to be used as a high-frequency limiter to prevent the look-ahead limiter (which creates wideband gain reduction) from creating audible "pumping" or "gulping" artifacts on program material that is rich in high frequencies, like "esses" in speech.

The 2.0 processing in the "TVA" presets is tuned to complement 50µs and 75µs preemphasis. See Table 3-1 on page 3-26.

I) Set the 2.0 OUTPUT DELAY control.

This sets the time delay between the 8585's input and output in units of milliseconds or frames. All common frame rates are supported without the need to convert them into milliseconds.

MINIMUM delays the signal as little as possible. When MINIMUM is chosen, the delay will depend on which output feed is in use (step (G) above) and the setting of the active preset's AGC CROSSOVER control. However, if the delay is not set to MINIMUM, the delay through the 8585 will be the same as the setting of the 2.0 OUTPUT DELAY control regardless of the settings of other controls.

9. Set the 2.0 processing's output level if OUTPUT PREEMPHASIS control is set Flat.

[Skip this step if the OUTPUT PREEMPHASIS control is set to 50µs or 75µs.]

LOCATE to INPUT/OUTPUT > 2.0 OUT > 2.0 OUTPUT LEVEL (100%) and set the 2.0 OUTPUT LEVEL (100%) control to desired peak level in units of dBfs (dB with respect to digital full scale). The setting of the 2.0 OUTPUT 100% control is the maximum peak level that the 8585 can produce at its output. This level corresponds to a reading of 0 dB on the 8585'S 2.0 OUTPUT METER.

> Typical settings are –0.5 dBfs to –3.0 dBfs, depending on whether sample rate conversion and/or lossy encoding is occurring downstream from the 8585. Refer to *Setting Output/Modulation Levels* on page 1-19.

- If the 2.0 OUTPUT SOURCE is AGC+LIMIT or MB+LIMIT (step (8.G) on page 2-23), the 8585's look-ahead limiter will automatically constrain the peak output level to the setting of the 2.0 OUTPUT 100% control without clipping.

- If and only if the 2.0 OUTPUT SOURCE is MB+LIMIT, the average level and loudness do not change when you adjust the 2.0 OUTPUT Level (100%) control. The control only sets the maximum peak level at the 8585's output. For every dB that the 2.0 OUTPUT SOURCE is turned down, the 8585 automatically increases the limiter drive by 1 dB to compensate. This is to ensure that the output loudness is always consistent with the 8585's active DIALNORM setting.

- If the 2.0 OUTPUT SOURCE is AGC or MB, the 8585's output level is not peak limited. However, its average value is usually well controlled by the 8585's multiband compressor and loudness controller. The 8585's peak output level will depend on the peak-to-average ratio of the program material, so clipping is possible if the 2.0 LIMITER DRIVE control in the active preset is set too high.

It is normal for the 2.0 OUTPUT LEVEL meter to indicate 0 dB on peaks when the 2.0 OUTPUT SOURCE is AGC+LIMIT or MB+LIMIT. This does not indicate clipping; the look-ahead limiter is constraining peaks to this level.

The only reason to choose the AGC or MB output sources is to minimize input/output delay, which is important if you are driving talent headphones from the 8585's output. Otherwise, AGC+LIMIT and MB+LIMIT are preferred because the 8585's look-ahead limiter prevents clipping in normal operation.

To prevent objectionable clipping distortion when the 2.0 OUTPUT SOURCE is AGC or MB, set the 2.0 LIMITER DRIVE control as follows:

a) Make sure that the program material is loud enough to produce normal amounts of gain reduction in the AGC (if activated), the multiband compressor/limiter, and the loudness controller (if activated).

b) If the 8585's 2.0 OUTPUT LEVEL meter is frequently hitting the top of its scale (0 dB) and the 8585's look-ahead limiter is defeated (as it is when the 2.0 OUTPUT SOURCE is AGC or MB), then excessive clipping is occurring. Turn down 2.0 LIMITER DRIVE control until you no longer see clipping on the meter.

Occasional light clipping is usually inaudible. It is sometimes preferable to allow occasional clipping in order to use the headroom available in the downstream channel most efficiently. This depends on the headroom available—for example, in a 24-bit channel, there is no excuse for clipping at any time.

If the 2.0 OUTPUT LEVEL meter is indicating very low levels, you may wish to turn up the 2.0 LIMITER DRIVE control to better use the downstream headroom.

c) Once you have determined a good setting for this control, save the preset as User preset.

10. Set the 2.0 processing's output level if OUTPUT PREEMPHASIS control is set to 50µs or 75µs.

[Skip this step if the OUTPUT PREEMPHASIS control is set FLAT.]

We recommend using 5-Band "TVA" presets (or User Presets derived from them) when the 2.0 OUTPUT PREEMPHASIS control [step (8.H) on page 2-23] is set to 50µs or 75µs. The 2.0 processing in the "TVA" presets is designed to feed an analog TV aural channel using 50us or 75us preemphasis. The surround processing in these presets is identical to the surround processing in the corresponding "TV" presets, whose 2.0 processing is optimized to drive channels with no preemphasis. The main purpose of the "TVA" presets is to allow the 8585 to process analog and digital transmission channels simultaneously, which is useful for stations in countries that have not completed the transition to all-digital broadcasting.

To simplify setup, the "TVA" presets have local values of 2.0 DIALNORM (–17 dB), 2.0 LOWPASS FILTER CUTOFF (15 kHz), and 2.0 HIGHPASS FILTER CUTOFF (20 Hz).

These values override the corresponding global values in the active Transmission Preset.

The filter settings complement analog aural carriers, while the value of DIALNORM matches the loudness of the 8585's 2.0 processing to the loudness of an Optimod-TV designed for analog television (like Optimod-TV 8282 and 8382) when the peak output levels of the two processors are the same and when the 2.0 OUTPUT 100% control is set to 0.0 dBfs.

A) Set the 2.0 Output Source to MB+LIMIT (step (8.G) on page 2-23).

> The 8585's look-ahead limiter will automatically control the peak modulation of a transmitter that applies 50μs or 75μs to its input. Moreover, the average level and loudness do not change when you adjust the 2.0 OUTPUT LEVEL (100%) control. The control only sets the maximum peak level at the 8585's output. For every dB that the 2.0 Output Source is turned down, the 8585 automatically increases the limiter drive by 1 dB to compensate. This is to ensure that the output loudness is always consistent with the 8585's active Dialnorm setting.

B) Make sure that preemphasis is set according to the standard used in your country. See step (8.H) on page 2-23.

C) Make sure that your transmitter is configured to apply preemphasis to the audio it receives from the 8585.

D) *LOCATE* to INPUT/OUTPUT > 2.0 OUT > 2.0 OUTPUT LEVEL (100%) and set the 2.0 OUTPUT LEVEL (100%) control to 0.0 dBfs.

E) Set your transmitter's modulation with tone.

   a) *LOCATE* to SYSTEM SETUP > TEST MODES.

   b) Choose TONE. Set FREQUENCY to 100 HZ and LEVEL to 100%.

   c) Click the TONE button.

   d) *LOCATE* to the TONE MAP page (to the right of the TEST MODES page) and set the L 2.0 TONE AND R 2.0 TONE fields to TONE.

   e) *If you are driving your transmitter with the 8585's analog outputs: LOCATE* to INPUT/OUTPUT > UTILITIES and adjust the ANALOG OUTPUT LEVEL control to produce 100% modulation of your transmitter as measured by the peak modulation instrument specified by your country's regulatory authority.

   > This assumes you have routed the 2.0 processing's left and right outputs to the analog outputs. The routing matrix is located in the OUTPUT ROUTING tab in I/O SETUP.

   f) *If you are driving your transmitter with an 8585 digital output:* Use a gain control following the 8585 output (typically, your analog transmitter's sensitvity control) to produce 100% modulation of your transmitter.

   > Achieving correct on-air loudness and proper operation of the 8585's loudness meter requires you to align the transmission system following the 8585 so that 0.0 dBfs at the 8585's output corresponds to 100% peak modulation of the transmitter. Using the 8585's 2.0 OUTPUT LEVEL control to set the gain between the 8585 and the transmitter will not produce

correct loudness meter calibration and on-air loudness because this control only sets the maximum peak level while attempting to maintain the average modulation constant when adjusted. It does this by driving the look-ahead limiter 1 dB harder for every 1 dB that the 2.0 OUTPUT LEVEL is turned down.

F) Test modulation with program material to determine the overshoot in your transmission system.

a) *LOCATE* to SYSTEM SETUP > TEST MODES and choose OPERATE

b) Recall the TVA 5B GEN PURPOSE preset.

c) Apply typical program material to the 8585's input. Verify that the 2.0 LIMITER GR meters are indicating gain reduction on peaks, which ensures that the 8585 is producing 100% peak modulation on program material.

d) Measure your transmitter's peak modulation. If this exceeds 100%, turn down the 8585's 2.0 OUTPUT LEVEL control until the modulation of peaks of frequent recurrence is constrained to 100% deviation.

Turning down the 2.0 OUTPUT 100% control reduces the peak modulation without significantly affecting the average modulation. Hence, using this technique keeps the 8585's LOUDNESS LEVEL meter correctly calibrated and provides correct on-air loudness.

G) Check loudness with respect to other stations in your market and correct your average modulation if necessary.

Because there is no standard value for the average modulation in analog TV transmission, the loudness of your analog transmission might be different from other stations in your market. If this is so, match the 8585's loudness to the other stations by adjusting the 2.0 DIALNORM control in the on-air preset. In PC Remote, this control is located in the 2.0 LESS-MORE TAB; on the 8585's front panel, the control is located in ADVANCED MODIFY > DISTORTION. For example, changing DIALNORM from –17 dB to –15 dB makes the transmission 2 dB louder. Adjusting DIALNORM is the *only* correct way to adjust on-air loudness after the system has been calibrated according to steps (E) and (F) above; this technique will retain correct calibration of the 8585's loudness level meter and loudness controller.

Note that increasing the loudness in this way will increase the likelihood that the 8585's look-ahead limiter will create audible "pumping" or "gulping" artifacts on program material that is rich in high frequencies because the look-ahead limiter is operating on a preemphasized signal and turning up DIALNORM drives the look-ahead limiter harder. If you hear such artifacts, we recommend that you use a 5-Band TVA preset if you are not doing so already. This allows you to use the Band 5 compressor/limiter as a high-frequency limiter. If you hear audible pumping on material rich in high frequencies, turn down the B5 THRESHOLD control until you find the most subjectively pleasing trade-off between high frequency loss and look-ahead limiter pumping. You can also try speeding up the B5 ATTACK control by setting it to a lower number, or adjusting the both controls to taste.

When you use a 2-Band "TVA" preset, some material rich in high frequencies may cause subtle pumping even with DIALNORM set to its nominal –17 dB value. This is because the 2-band compressor cannot produce high frequency limiting, so preemphasis control must be performed by the loudness controller and look-ahead limiter. We have tuned the 5-Band factory "TVA" presets to produce appropriate amounts of high-frequency limiting. We therefore recommend that if you need to use a "TVA" preset, use a 5-Band preset unless you have a very good reason not to.

11. Set the surround output configuration and level.

A) *LOCATE* to INPUT/OUTPUT > SURROUND OUTPUT.

B) Follow the procedure in step 8 on page 2-22, replacing "2.0" by "surround."

C) Follow the procedure in step 9 on page 2-24, replacing "2.0" by "surround."

12. Set surround and 2.0 global Dialnorm values. (Very important!)

See step 9 on page 2-13.

The global Dialnorm settings are in INPUT/OUTPUT > UTILITIES.

You can use the 8585's RS-485 serial ports to convey surround DIALNORM to the Dolby encoder automatically. See *Conveying Metadata via RS-485 serial connections* on page 2-14.

13. Set the processing's channel mode controls.

A) *LOCATE* to INPUT/OUTPUT > CHANNEL MODE.

B) Set the CHANNEL MODE to 5.1, 5.1+2.0, 7.1, or 7.1+2.0 as appropriate.

C) Set the 2.0 PROC MODE to STEREO or DUAL MONO.

DUAL MONO mode allows the 2.0 processing to handle two independent mono (1.0) signals. It removes all stereo coupling and activates a separate, independent CBS Loudness Controller and CBS Loudness Level meter for each channel. However, you cannot set the processing parameters independently for each mono channel. Moreover, the active 2.0 DIALNORM value is applied to both mono channels equally.

STEREO mode allows you to couple or uncouple the channels in the AGC and multiband compressor/limiter to any extent you wish via the MAX DELTA GR controls in Advanced Control. However, in STEREO mode there is only one loudness controller and Loudness Level meter. These work on the r.m.s. sum of the two channels.

You can also set the 2.0 processing mode by first saving a Setup with the 2.0 PROC MODE control set as desired. Then recall the Setup from a GPI input, the 8585's clock-based automation, the 8585's front panel, or PC Remote. You can also change the 2.0 processing mode by reading channel status data in the AES3id input feeding the 2.0 processing (see step (B) on page 2-17.) A command from any of these sources overwrites the current stereo/mono status.

D) Set the 2.0 TO SURROUND INPUT MIX control to LF/RF IN, LF/RF LIM or NO MIX.

- LF/RF IN mixes the unprocessed 2.0 left and right inputs (as set in the Input Routing Matrix) into Lf and Rf channels feeding the surround processor.
- LF/RF LIM mixes the processed "Multiband" signal from the 2.0 processor into the surround channel's Lf and Rf channels. This mixing occurs just before the surround loudness controller and look-ahead limiter so that these elements can control the loudness and peak level of the mix.

  The setting of 2.0 DIALNORM does not affect this 2.0 feed. The SURROUND DIALNORM setting determines the loudness of the surround processing, including the 2.0 material that has been mixed in.

  This mode can be used to process a 2.0 source (for example, a newsroom feed) before it is mixed with the main surround audio (for example, a network feed or commercials).
- NO MIX makes the 2.0 processing completely independent of the surround processing.
- The 2.0 TO SURROUND INPUT LEVEL control sets the amount of 2.0 material mixed into the surround processing.

14. Set the surround-to-2.0 downmix values (optional).

The 8585 creates two separate 2.0 downmixes from the surround channels:

(1) A downmix of the inputs to the surround processing (as determined by the Input Routing Matrix). This downmix is only used as one possible source to drive the input of the 2.0 processing.

(2) A downmix of the surround processing's output channels. This downmix appears as an available source in the output routing matrix and is never applied to a processor's input.

Note that even if the surround output is configured as AGC+LIMIT or MB+LIMIT, the output downmix is not consistently peak limited because peak limiting is applied to the individual channels before the downmix. Hence, the output downmix's maximum permitted peak level becomes higher when more channels are active. For example, when a given signal appears in one channel (like Center), the downmix's maximum peak level will be 6 dB lower than it is when the same signal is appears equally in two channels (such as Lf and Rf).

Moreover, the output downmix will not have fully controlled loudness because the 8585's loudness controller and Loudness Level meter use RMS summation of the channels, whereas the output downmix is an arithmetic sum. If you need a downmix whose loudness is perfectly controlled and whose maximum peak level is fixed, use the 2.0 processing chain to control loudness and peak levels by assigning its input to the input downmix. In this case, the loudness at the 2.0 processing chain's output will correctly track the 8585's active 2.0 DIALNORM value.

LOCATE to INPUT/OUTPUT > CHANNEL MODE. You will see controls that determine the contribution of the various surround channels to the two downmixes, normalized so that the left front and right front are mixed at 0 dB.

- The default is –3dB for all inputs.
- The center is mixed equally into the left and right 2.0 downmix channels. All other channels are assigned only to left or right.
- The mixer settings apply identically to downmixes (1) and (2).
- To make different sets of mix parameters available, save each mix in a Setup and recall the Setup when required.

15. Set the 2.0 processing's response to AES3 status bits.

See step (B) on page 2-17.

16. Choose whether the 8585 2.0 output will emit status bits depending on whether the 8585's 2.0 processing is in stereo or dual mono mode.

See step (C) on page 2-17.

17. End Analog and Digital I/O setup.

If you are using a external AGC and you temporarily set the EXT AGC to NO in step 2 on page 2-19, set the EXT AGC to YES.

18. Select a processing preset.

See step (9.C)) on page 2-14.

19. Program Silence Sense (optional)

You can program each processing chain (surround and 2.0) in the 8585 to switch automatically from its primary digital input to a backup input if the signal at the primary digital input falls silent.

There are silence detectors for each physical input channel. The silence sense parameters apply to all silence detectors. All detectors are available to drive the 8585's tally outputs. (See step (20.B) on page 2-31.)

In the surround processing chain, silence sense will be triggered only if all hardware channels assigned to the surround processing fall silent.

In the 2.0 chain, silence sense will be triggered if either logical input channel assigned to the 2.0 processing falls silent, thereby protecting against "loss-of-one-stereo-channel" faults. (Each hardware AES3id input carries two "logical input channels.")

A) *LOCATE* to INPUT/OUTPUT > SILENCE.

B) Set the SILENCE THRESHOLD to the level below which the 8585 will interpret the input as being silent.

C) Set the SILENCE DELAY to the amount of time that the input must be below the SILENCE THRESHOLD before the 8585 automatically switches to the backup input.

D) Set MULTICHANNEL INPUT FALLBACK to YES if you wish the 8585 to automatically switch the surround processing's Lf/ Rf input from its assigned hardware input to a fallback input when silence on all surround channels is detected or an AES receiver unlock error on the input assigned to Lf/Rf is detected. (Channels LFE, Lb, Rb, Ls, and Rs will be muted.) Set the control to NO to defeat automatic switching.

> If audio is restored at the input assigned to Lf/Rf, the 8585 will automatically reconnect the Lf and Rf channels to this input and unmute the remaining channels.

E) Set MULTICHANNEL FB SOURCE to the hardware input that will drive the Lf and Rf channels if silence or an AES receiver unlock error on the normal Rf/Lf input is detected and SURROUND INPUT FALLBACK = YES . The choices are inputs 7/8 and 9/10.

F) Set the 2.0 FALLBACK to YES if you wish the 8585 to automatically switch the 2.0 processing from the hardware input normally assigned to the 2.0 processing to a fallback input when silence on either channel or an AES receiver unlock error is detected on the normal input channel. Set the control to NO to defeat automatic switching.

G) Set 2.0 FB SOURCE to the hardware input that will drive the 2.0 processing if silence or an AES receiver unlock error is detected and 2.0 FALLBACK = YES. The choices are inputs 1/2 and 7/8.

20. Program Tally Outputs.

[Skip this step if you do not wish to use the tally outputs.]

See step 6 on page 2-3 for wiring instructions.

You can program the two tally outputs independently to indicate a number of different operational and fault conditions.

A) *LOCATE* to SETUP > NETWORK REMOTE > TALLY OUTPUT > TALLY 1.

B) Program tally output #1.

To program a given tally output, *LOCATE* to TALLY 1 or TALLY 2. As you turn the control knob, the functions listed below will appear in the highlighted field.

- **Channel xx Silent**: Indicates that the level of the specified hardware input channel has been below the SILENCE THRESHOLD for longer than the SILENCE DELAY. See step (19.B) on page 2-30.

  > This function can detect if the center channel is silent.

- **Surround Silent**: Indicates that the levels at all hardware input channels assigned to surround processing have been below the SILENCE THRESHOLD for longer than the SILENCE DELAY.

- **2.0 Silent**: Indicates that the level at either logical input channel assigned to the 2.0 processing has been below the SILENCE THRESHOLD for longer than the SILENCE DELAY.
- **AES xx In Error**: Indicates that the AES input receiver chip on hardware input xx has detected an unlock error, which can occur if there is no input carrier or if the carrier is corrupted.
- **Input Normal**: Indicates that the silence sense function has not automatically switched an input to its assigned fallback input.
- **Input Fallback**: Indicates that the silence sense function has automatically switched an input to its assigned backup because it detected silence. See step 19 on page 2-30.
- **No Function**: Tally output is disabled.

C) Program tally output #2 if you wish, following the procedure in step (B) above with the TALLY 2 field.

Using Clock-Based Automation

1. If you have not already done so, set the system clock.

If you can connect your 8585 to the Internet through the 8585's Ethernet port, you can specify an Internet timeserver to set your 8585's clock automatically. In addition, Optimod PC Remote software can automatically set your Optimod's local time, OFFSET, and TIME SERVER to reflect the Windows settings in the machine running PC Remote software. See *Synchronizing Optimod to a Network Timeserver* on page 2-52. If you are planning to set your Optimod's time via PC Remote and/or the Internet, skip to step (C).

A) *LOCATE* to SYSTEM SETUP > PLACE > DATE > TIME.

B) *LOCATE* to the TIME AND DATE screen.

a) Choose TIME FORMAT as desired (either 24-hour time or AM/PM-style time).

b) Set hours, minutes, and seconds, in that order.

Seconds will stop advancing when you set hours and minutes. So set seconds last.

c) Choose the desired date format.

d) Set today's date.

e) If you want the clock to automatically reset itself to conform to Daylight Saving Time (Summer Time), use the DAYLIGHT SAVING MONTH/WEEK and the STANDARD TIME MONTH/WEEK fields to specify when Daylight Saving Time begins and ends in your area. If you do not wish to use this feature, leave these controls set OFF.

C) (Optional) > *LOCATE* to the STATION IDENTIFIER screen to specify your station's identifier (call sign or call letters).

2. Locate to System Setup > Automation.

3. If the far left button reads "Disabled," choose it and press Enter to enable automation.

This button lets you enable or disable all automation events easily without having to edit individual automation events.

4. To add an automation event:

A) Select ADD.

B) You can program an event that occurs only once or an event that occurs in a weekly preset pattern. Highlight either SET BY WEEK or SET BY DATE and press the *ENTER* button.

C) For SET BY WEEK:

a) *LOCATE* to the each day of the week in turn; then use the knob to turn the day on or off.

You can program the event to occur on as many days as you wish.

b) *LOCATE* to the Event Time field and set the hour, minute, and second when the automation event is to occur.

Automation events have a "start" time but no "stop" time. The 8585 will stay in the state specified by an existing automation event indefinitely, until its state is changed by another automation event or by another action (like a user's interacting with the front panel or with the PC Remote application).

c) *LOCATE* to the Event Type field and set the desired event. You can recall any factory processing preset, user processing preset, and Setup. You can activate BYPASS mode (for scheduled transmission network testing), TONE, and EXIT TEST, which returns you to the processing preset that was active before you invoked TONE or BYPASS.

Although two Setups might only differ by one parameter (for example, different values of SURROUND DIALNORM), recalling Setups also provides an easy way to automate complicated changes involving many parameters like input/output routing.

D) For SET BY DATE, set the desired date and time for the event and specify the Event Type.

E) Choose DONE and press *ENTER*.

You will return to the automation event list. *You may have to scroll the list (using the knob) to see the event that you just added*.

5. To edit an existing event:

A) Using the knob, highlight the event you wish to edit.

B) Select the EDIT button and press *ENTER*. The edit screen appears.

C) Edit the event as desired.

D) When you have finished making edits, choose DONE and press *ENTER*.

6. To delete an event:

A) Highlight the event to delete with the knob.

B) Choose DELETE and press *ENTER*.

7. Choose DONE and press Enter to leave the Automation screen.

Security and Passcode Programming

You can use multi-level passcodes to control access to the 8585 via the front panel and via PC Remote. You can configure a given passcode to allow one of the following levels of access:

1. All Access (i.e., administrator level)
2. All Access except Security
3. All screens except Modify and Security
4. Recall, Modify, and Automation
5. Recall Presets and program Automation
6. Recall Presets

Only passcodes with ALL ACCESS let you do software updates and set passcode permissions.

Each Passcode is unique; the software will not let you create duplicate Passcodes. Further, to prevent accidental lockout, the software requires you to have at least one passcode with ALL ACCESS (administrator) privileges.

Your Optimod secures User Presets by encrypting them (using the Advanced Encryption Standard algorithm with the session passcode as its key) when PC Remote fetches them. Hence, a packet sniffer cannot intercept User Presets in plaintext form. PC Remote then writes the fetched User Presets in encrypted form on your hard drive, where they remain for the duration of your PC Remote session.

If PC Remote exits normally, it will erase these temporary User Preset files from your computer's hard disk. If it does not exit normally, these files will remain in encrypted form. However, the next time that PC Remote starts up, it will automatically clean up any orphaned files.

1. **From the main menu, locate to SYSTEM SETUP and then to SECURITY.**

   The Security screen lets you set front-panel lockout time, choose if you want the meters to be viewable when the 8585 is in lockout mode, create new passcodes, review and/or assign authorization levels for existing passcodes, and delete passcodes.

   If the 8585 is already under security control, you must enter an ALL ACCESS-level passcode to enter the Security screen.

2. **Set the Security Screen "Lockout" parameter.**

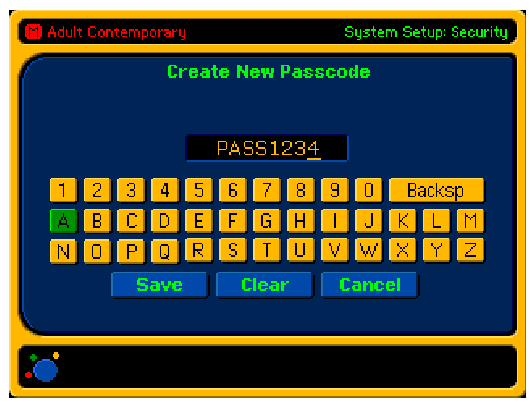
   The choices are 1, 5, 15, or 30 minutes, 1, 2, 4, or 8 hours, or OFF.

   Front Panel lockout only occurs when the lockout value is not OFF.

   The Lockout field sets the time delay between the last user interaction with the front panel and automatic front-panel lockout. Once the front panel is locked out, you can only regain access by entering a valid passcode.

   The Lockout field does not affect PC Remote connections. Once connected, the PC Remote application does not time out automatically; it remains connected until explicitly disconnected by its user.

   The lockout timer begins at the top of the next minute. For example, if you set Lockout to be 1 minute at 9:10:33 AM and do not touch the front panel again, the front panel will lock out at 9:12:00 AM.



3. **Set the Security Screen "View Meters" parameter.**

   Select YES to display meters and NO to hide meters when lockout is active.

4. **Create a new passcode (optional).**

   A) Select the "New" button from the Security screen.

      The "Create New Passcode Screen" appears.

   B) Use the "virtual keyboard" to create a passcode.

      Use the *LOCATE* button to locate to each character. Then press *ENTER* to accept that character.

      The letters on the virtual keyboard are all uppercase. When you use the passcode later, you must enter it using capital letters because the passcode is case sensitive. For example, if you set up your passcode as OOPS25, you must enter it as OOPS25, not as oops25 or Oops25.

   C) When you have finished creating

your passcode, write it down so you do not forget it.

D) Choose SAVE. The Security screen reappears.

E) Initially, your new passcode has ALL ACCESS (administrator) privileges. To change its privileges, *LOCATE* to the PASSCODE AUTHORIZES ACCESS TO field. Then turn the knob to choose the desired privilege level.

F) Choose DONE or press *ESCAPE* when you are finished. The System Setup screen appears.

5. Edit or delete an existing passcode (optional).

A) *LOCATE* to SYSTEM SETUP and then to SECURITY

If the 8585 is already under security control, you must enter an ALL ACCESS-level passcode to enter the Security screen.

B) *LOCATE* to the CURRENT PASSCODE field. Use the blue knob to scroll through the passcodes until you see the one you wish to edit or delete.

C) To delete the passcode, choose the DELETE button.

At least one passcode must have "All Access" privileges. If you try to delete the last "All Access" passcode, the following dialog box will appear:

> You cannot delete this Passcode because you must have at least one Passcode with All Access privileges. Press OK to continue.

D) To edit the passcode, *LOCATE* to the PASSCODE AUTHORIZES ACCESS TO field. Then turn the knob to choose the desired privilege level.

E) Choose DONE when you are finished. The System Setup screen appears.

You may edit or delete more than one passcode before choosing DONE.

Choosing DONE on the Security Screen automatically saves all of your Passcode settings.

To Unlock the Front Panel

A) On the 8585 front panel, operate any button or the knob.

The ENTER PASSCODE screen appears.

B) Enter your passcode using the virtual keyboard.

If you enter a Passcode that does not exist, you are returned to the ENTER PASSCODE screen.

C) Press *ENTER* to unlock.

You will be able to access 8585 functions allowed by the privilege level of your passcode.

After you have finished working, the panel will automatically re-lock after the time delay set in step 2 on page 2-35. If you have ALL ACCESS privileges, you can set the delay as desired by following the instructions in that step.

8585 User Interface Behavior during Lockout

If security is set so that the meters are hidden during lockout, a Lockout screen replaces the Meters screen. It displays Input Status, Time, Date, Studio Name, and Help Text.

If you set security to hide meters when the 8585 is locked out, the On-Air Preset and Meters do not appear. This prevents your competitors from seeing them if your 8585 is installed in a shared facility.

The diagnostic screens are unavailable during lockout unless you enter a passcode of any privilege level.

Default ADMIN Passcode

When you first open to the Security screen on the 8585, there is one default passcode: ADMIN (all capitals), which has ALL ACCESS privileges. This passcode permits an initial connection to the 8585 via PC remote; you must enter ADMIN when PC Remote asks you for a passcode.

The front panel lockout feature's default setting is OFF, so your 8585 will not have the lockout feature functioning until a lockout time is set.

Any passcode you have programmed into the 8585 (via step 3 on page 2-35) allows PC Remote connections with the same privileges. For example, if you connect to the PC Remote and use a Passcode with ALL ACCESS access, this Passcode will allow full access to the 8585 from that PC. Conversely, if you connect to the 8585 with a Passcode that only allows access to the "Presets" on the 8585, you will only be able to recall presets from the PC Remote.

To ensure good security, you should first create a new ALL ACCESS passcode and then delete the ADMIN passcode (in that order) to prevent others from accessing your 8585 with the ADMIN passcode. The longer a passcode is, the more secure it is. Moreover, the most secure passcodes use a random combination of letters and numbers.

Security and Orban's PC Remote Application

Any passcodes set on the 8585 will allow the PC Remote application to connect via direct, modem and Ethernet connections at the level authorized by the passcode.

- *If no Passcodes are assigned to 8585 except the ADMIN default passcode;*

  When you attempt a connection to the 8585 via Direct, Modem, and Ethernet connections, the "Enter Passcode Screen" will prompt you to enter a Passcode. Type in ADMIN from your keyboard. This will allow you full access to the 8585 via the PC Remote.

  To ensure that your 8585 is fully protected, create a new passcode that has ALL ACCESS access. Then delete the ADMIN passcode.

See step 3 on page 2-35 for instructions on how to create a new passcode and step (5.C) on page 2-36 for instructions on how to delete a passcode.

- *Using passcodes to end PC Remote connections from the 8585 front panel:*

  If you try to access an 8585 from its front panel while a remote connection exists, a message will appear asking you whether you want to disconnect the remote connection. If you choose to disconnect the connection, the "Enter Passcode Screen" will appear if the unit is locked out.

Passcodes and Software Updates

PC Remote allows a software update to occur regardless of passcode level of the 8585 ↔ PC Remote connection. However, PC Remote will *only* offer to perform a software update if the version of PC Remote higher than the version of the software installed in your 8585. Hence, this does not create a significant security issue; the 8585 is silent for only a few seconds when it reboots following a software update.

If you have forgotten your "All Access" passcode…

You can access the 8585 even if you have forgotten your ALL ACCESS passcode.

A) Press the *ENTER* button within two seconds after the 8585 displays its "Please wait while Optimod initializes" screen upon boot-up.

B) Choose whether you want the 8585 to delete all passcodes while retaining other customizations (like I/O levels and user presets) or if want the 8585 to reset itself to its factory defaults. In either case, all existing passcodes will be erased.

- If you choose to reset the unit to factory defaults, the 8585 will subsequently ask whether it should erase all user presets or retain them.
- If you choose to only delete passcodes, the front panel will not unlock automatically. After you have deleted the passcodes, there will be only one passcode, ADMIN, which has All Access privileges. Use this passcode to unlock the front panel normally.
- If you reset the unit to its factory defaults, the panel will unlock automatically. Please note that resetting the unit to its factory defaults:
  - Resets all global parameters to factory default settings
  - Deletes all Automation Events
  - Restores Remote Interface inputs 1-8 to "no function".

Administering the 8585 through its RS-232 Serial Port or Ethernet

You can connect a PC to the 8585's RS-232 serial port or to its Ethernet port by using a terminal program like HyperTerminal to administer security and to recall presets using simple ASCII commands.

You must configure the 8585 so that it loads the correct serial port driver when booting up. You do this by setting the serial interface type in the NETWORK screen and then rebooting the 8585. There are two available drivers: One driver supports simple ASCII commands; the other driver supports communication via TCP/IP and PPP.

Using the RS-232 port to connect to 8585 PC Remote software via a direct cable connection or modem requires configuring the port as PPP. However, in most cases you will use Ethernet to connect to PC Remote.

The 8585's two RS-485 ports (Serial Ports 2 and 3) are dedicated to sending and receiving Dolby Digital metadata; they cannot be used to control the 8585.

- Valid commands are in either upper or lower case, not a combination.
- Only one valid command is permitted per line.
- The 8585 will not respond to unrecognized commands.
- The character code supported is ASCII.

Connecting via the RS-232 Port Using a Terminal Program on a PC

- The RS-232 port must be configured as "ASCII."
- The 8585's RS-232 port can be used with any computer or terminal that is compatible with the RS-232 standard interface.
- Automation systems capable of sending ASCII via an RS-232 port can control the 8585.
- Users will connect their computer or terminal to the 8585 with a null modem cable. Only direct connections are supported; there is no provision for communications via modem.
- Communications configuration is 9600, N, 8, 1, no handshaking (flow control = none).
- To facilitate maintaining security at sites shared with others, the 8585 monitors the RS-232 port for 30 minutes after power-up or after the last valid command is received, after which all commands are ignored except for recalling a Preset or Setup.

To allow the 8585 to be controlled through its RS-232 terminal via a PC running a terminal program like HyperTerminal:

A) From the main menu, *LOCATE* to SYSTEM SETUP > NETWORK REMOTE > NETWORK. The current setting of the RS-232 Serial Port will appear. If it is not already set to ASCII, set it there.

B) If you have changed the configuration of the RS-232 port to ASCII from DIRECT or MODEM, you must power-cycle the 8585. It will reboot and load the new serial driver.

C) Connect an available RS-232 serial port (COM port) on your computer to the RS-232 port on the 8585 via a null modem cable.

> You do not need to remove power from either your computer or the 8585 when you do this.

D) Start HyperTerminal. (You can usually access it from Start > Programs > Accessories > Communication.)

The NEW CONNECTION dialog box appears.

E) Give your new connection a name and choose OK.

The CONNECT TO dialog box appears.

F) Set the CONNECT USING field to “Direct to COMx,” where “x” is the COM port you are using on your PC.

G) Choose OK.

The PORT SETTINGS dialog box appears.

H) Set the port properties as follows:

Bits per second 9600
Data Bits.....................8
Parity ....none
Stop bits.....................1
Flow control ....none

I) Choose OK.

J) *LOCATE* to File > Properties > Settings > ASCII Setup. Set the ASCII Setup properties as follows:

Check:
- Send line ends with line feeds
- Echo typed characters locally
- Wrap lines that exceed terminal width

Uncheck:
- Append line feeds to incoming line ends
- Force incoming data to 7 bit ASCII

Leave “Line delay” and “Character delay” at their default values.

K) Activate the CAPS LOCK on your computer to ensure that you type in uppercase.

You can now type in commands described in the specification in *Administrative Operations* below.

Administrative Operations

In the following tables of commands and responses:

- Text that the user enters appears in **`MONOSPACED BOLD`**.
- Responses that the 8585 transmits appear in `monospaced normal`.
- The symbol "↵" means CR (for received commands) and CR+LF (for transmitted responses from 8585).

1. To recall a preset:

Command	Response

`RP XXXXXXX[PASSCODE]↵`	(valid passcode and preset name)
	`ON AIR: XXXXXXX`
	(invalid passcode)
	`[no error message is issued]`

In the above table: **XXXXXXX** = the preset name;
PASSCODE = any valid passcode.

- If a non-existent preset name, control value, and/or an invalid passcode is entered, the 8585 will ignore the command.
- You can apply this command anytime after the 8585 boots up. The 30-minute timeout does not apply.
- This command is useful in interfacing automation systems to the 8585.

2. To recall a Setup:

Command	Response

`RS XXXXXXX[PASSCODE]↵`	(valid passcode and Setup name)
	`ON AIR: XXXXXXX`
	(invalid passcode)
	`[no error message is issued]`

In the above table: **XXXXXXX** = the Setup name;
PASSCODE = any valid passcode.

- If a non-existent Setup name, control value, and/or an invalid passcode is entered, the 8585 will ignore the command.

- You can apply this command anytime after the 8585 boots up. The 30-minute timeout does not apply.
- This command is useful in interfacing automation systems to the 8585.

3. To restore factory defaults:

Command	Response
`RESTORE FACTORY DEFAULTS↵`	`Are you sure (yes/no)?↵`
YES↵	(factory defaults restored) `Restored↵`
NO↵ (or any response other than **YES↵**")	(abort) `Defaults not restored↵`

To protect against accidental loss of settings, you must enter the entire command string and a "YES" response in uppercase.

Restoring factory defaults does the following:

- Deletes all User Presets
- Resets all global parameters to factory default settings
- Deletes all Automation Events
- Restores Remote Interface inputs 1-8 to "no function"

4. To unlock an 8585:

The following command assigns an ALL ACCESS passcode. This passcode is then available from the front panel or when you connect normally via the 8585PC application (through the 8585's Serial Port #1 or optional Ethernet connections).

Command	Response	
`PW ########↵`	(valid passcode entry) (invalid passcode entry)	`Accepted↵` `Denied↵`

Valid arguments follow the same rules for passcode entries made from the front panel and via 8585PC:

- Passcode length must be 1 to 8 characters.
- Only alphanumeric characters are allowed (0…9 and A…Z). No punctuation or extended characters are allowed.
- Lower case letters included in the argument will automatically be converted to upper case.

5. To change the IP Address:

Command	Response

IP XXX.XXX.XXX.XXX↵	(valid IP address)
	`IP: xxx.xxx.xxx.xxx entered↵`
	(invalid IP address)
	`ERROR. Using IP: yyy.yyy.yyy.yyy↵`

IP?↵	`Using IP: yyy.yyy.yyy.yyy↵`

In the above table: **XXX.XXX.XXX.XXX** = the specified IP address; yyy.yyy.yyy.yyy = the present (or default) IP address in use.

192.168.254.254 is the factory default.

Any out-of-range or invalid characters render invalid the whole IP address that you entered.

6. **To change the Subnet Mask:**

Command	Response

SN XXX.XXX.XXX.XXX↵	(valid subnet)
	`SN: xxx.xxx.xxx.xxx entered↵`
	(invalid subnet)
	`ERROR. Using SN: yyy.yyy.yyy.yyy↵`

SN?↵	`Using SN: yyy.yyy.yyy.yyy↵`

In the above table: **XXX.XXX.XXX.XXX** = the specified subnet mask; yyy.yyy.yyy.yyy = the present subnet mask in use.

255.255.255.0 is the factory default.

Valid subnet masks are defined according to existing standards. Any out-of-range or invalid characters render the whole argument invalid.

7. **To change the Gateway:**

Command	Response

GW XXX.XXX.XXX.XXX↵	(valid gateway)
	`GW: xxx.xxx.xxx.xxx entered↵`
	(invalid gateway)
	`ERROR. Using gw: yyy.yyy.yyy.yyy↵`

GW?↵	`Using GW: yyy.yyy.yyy.yyy↵`

In the above table: **XXX.XXX.XXX.XXX** = the specified gateway; yyy.yyy.yyy.yyy = the present gateway in use.

Valid gateways are defined according to existing standards. Any out-of-range or invalid characters render the whole argument invalid.

8. To change the Port:

Command	Response

PO XXXXX ↩	(valid port)
	`PO: xxxxx entered↩`
	(invalid port)
	`ERROR. Using PO: yyyyy↩`

PO?↩	`Using PO: yyyyy↩`

In the above table: **XXX.XXX.XXX.XXX** = the specified port;
yyy.yyy.yyy.yyy = the present port in use.

Port 6201 is the factory default.

Valid ports are defined according to existing standards. Any out-of-range or invalid characters render the whole argument invalid.

9. To change the Terminal Port:

Command	Response

TP XXXXX ↩	(valid terminal port)
	`TP: xxxxx entered↩`
	(invalid terminal port)
	`ERROR. Using TP: yyyyy↩`

TP?↩	`Using TP: yyyyy↩`

In the above table: **XXX.XXX.XXX.XXX** =s the specified terminal port;
yyy.yyy.yyy.yyy = the present terminal port in use.

Port 23 is the factory default.

Valid ports are defined according to existing standards. Any out-of-range or invalid characters render the whole argument invalid.

10. To change the Modem Init string:

Applies only for modem connections (via 8585's Serial 1 port)

Command	Response
MO ATF0S0=4↩	`MO[ATF0S0=4] entered↩`
MO?	`Using MO[ATF0S0=4]↩`

The 8585 appends CR+LF to the modem init string as transmitted to a modem (physically connected to Serial 1). The 8585 will not perform any case conversion to the argument (i.e., lower case arguments will be transmitted to the modem as lower case).

11.To change the RS-232 serial port Interface Type:

Command	Response

TY M|D|A↵	(valid argument)
	`Ty: Modem|Direct|ASCII entered↵`
	(invalid argument)
	`ERROR. Using Ty: M|D|A↵`

TY?↵	`Using Ty: Modem|Direct|ASCII↵`

12.To fetch diagnostic information from the 8585:

This provides a status report indicating essential information:

Command	Response

ST↵	`8585 V 1.0.x.xx`
	`Station Name: undefined`
	`Access Level: 0: all access`
	`Bootup: Sat Jan 01 02:26:37 2000`
	`Ethernet Adapter's MAC Address: xx-xx-xx-xx-xx-xx`
	`Memory Total: 16121856`
	`Memory Available: 6598384`
	`Available Space: 8504 Kbytes`
	`Dialnorm value=00`
	`485 loopback ok`

Connecting to the 8585's Ethernet Port or RS-232 Port Using TCP/IP

You can connect a terminal emulation application that supports the TCP/IP protocol to the 8585 via its RS-232 or Ethernet ports. This is mainly useful when interfacing the 8585 to third-party automation systems that support TCP/IP. If such an automation system only supports ASCII serial commands, you must configure the 8585's serial port as described in *Connecting via the RS-232 Port Using a Terminal Program on a PC* on page2-39.

- If you wish to use the RS-232 port for this application or for connecting to 8585 PC Remote software running on a PC, the port must be configured as DIRECT or MODEM, either of which will load the port's PPP driver following a reboot.

  If you will be using Ethernet, the RS-232 configuration does not matter.

  A) From the main menu, *LOCATE* to SYSTEM SETUP > NETWORK REMOTE > NETWORK. The current setting of the RS-232 Serial Port will appear. Set it to DIRECT. (MODEM will also work.)

  If you plan to connect the 8585 PC Remote Application to the 8585's RS-232 serial port, you must choose DIRECT or MODEM as appropriate for the kind of connection you are planning to make — DIRECT for a null modem cable connection to a PC's RS-232 serial port and MODEM for a modem connection. Either choice will cause the 8585's PPP serial port driver to be loaded the next time the 8585 is booted up.

B) If you have changed the configuration of the RS-232 from ASCII, you must power-cycle the 8585. It will reboot and load the new serial driver.

- You can connect a terminal emulation application to the 8585's Ethernet or RS-232 Serial ports via TCP/IP, port 23 (which is the standard Telnet port and the 8585 factory default). When connected like this, you can:
  - recall Presets (which contain the settings that determine the "sound" of the processing); see step 1 on page 2-41
  - recall Setups (which contain technical settings for input levels, output levels, routing, etc.); see step 2 on page 2-41

  However, you cannot perform other administrative functions. These require operating the 8585 from its front panel (which is the most straightforward way), using 8585 PC Remote software, or connecting a terminal program to the RS-232 port in ASCII mode. (See *Installing 8585 PC Remote Control Software* on page 2-55.)

- To set a different port number:

  A) From the main menu, *LOCATE* to SYSTEM SETUP > NETWORK REMOTE > NETWORK. The current setting of the Terminal Port will appear.

  B) If you wish to change the Terminal Port, *LOCATE* to TERMINAL PORT. Press the *ENTER* button to access the SET TERMINAL PORT screen.

  C) *LOCATE* to CLEAR, then press the *ENTER* button.

  This will allow you to enter the Terminal Port number.

  D) *LOCATE* to the first number and press the *ENTER* button; repeat until you have selected all the numbers in the Terminal Port. When the Terminal Port entry is complete, *LOCATE* to SAVE and press the *ENTER* button.

- The IP address for this Ethernet connection is the same as the IP address set in step (1.A) on page 2-49 and is visible in the SYSTEM SETUP > NETWORK REMOTE > NETWORK screen.

- A serial connection uses a fixed IP address: 192.168.168.101.

To control the 8585 externally via TCP/IP, establish a Telnet/SSH connection and issue commands and parameters, either by typing them directly into a Telnet/SSH client or by placing them within batch files. Then process them with a scriptable Telnet/SSH client that supports this operation, such as PuTTY, along with its companion command-line interpreter, Plink. Both of these applications are available for free download from the following web site:

http://www.chiark.greenend.org.uk/~sgtatham/putty/

The following description is based on PuTTY Release 0.55:

A) Start PuTTY.

The SESSION window appears.

B) Click the TELNET button, which is hard-wired for Port 23.

C) In the TERMINAL category, check "Implicit CR in every LF."

You should not have to change any other PuTTY Terminal, Window, or Connection defaults

D) Specify the host name or IP address:

- If you are connecting through the 8585's RS-232 port, type 192.168.168.101 into the "Host Name (or IP address)" field.
- If you are connecting through the 8585's Ethernet interface, type the 8585's IP address into the "Host Name (or IP address)" field.

The IP address for this connection is the same as the IP address set in step (1.A) on page 2-49 and is visible in the SYSTEM SETUP > NETWORK REMOTE > NETWORK screen.

E) Name and save the Session if you wish.

F) Click OPEN.

G) Activate the CAPS LOCK on your computer to ensure that you type in upper-case.

You can now recall presets and Setups. Refer to step 1 on page 2-41 and step 2 on page 2-41.

Using the API: Example

These examples show how PuTTY and Plink can be used to control the Optimod using scripting and batch files on a computer connected to the same Ethernet subnet as the Optimod being controlled. Plink and all associated scripting text, PuTTY, and batch files should be located together in the same user-defined directory unless the path is specified in the .bat files.

In the example, replace "192.168.1.1" with the addressed Optimod's IP address and "23" with the Optimod's port number. 23 is the default; see step (B) on page 2-46. Replace "passcode" with a passcode having any access level (because all levels allow you to recall presets). See *Security and Passcode Programming* on page 2-34.

Each control session requires two ASCII files:

- a .bat file that calls Plink to establish a Telnet connection to the Optimod
- a reference.txt file that contains the actual control script.

Recalling a Processing Preset

This function will recall the TV 5B DRAMA factory preset and put it on-air. (See step 1 on page 2-41.)

The file “recall_tv_5b_drama.bat” contains:

```
plink -telnet -P 23 192.168.1.1 < recall_tv_5b_drama.txt
```

The file “recall_tv_5b_drama.txt” contains:

```
RP TV 5B DRAMA[password]
disconnect
```

Remote Control Interface Programming

This section describes how to program the opto-isolated GPI remote control interface. See step 5 on page 2-3 for wiring instructions.

1. Locate to the System Setup > Network Remote > Remote Interface screen.

2. Program one or more remote control interfaces.

To program a given remote input, use *LOCATE* to highlight the input. As you turn the control knob, the functions listed below will appear in the highlighted field. A momentary pulse of current will switch most functions, except as noted.

- **Preset Name**: activates that processing preset.

  Any factory or user preset can be recalled via the control interface.

  Presets programmed into the Remote Interface can be recalled more quickly than they can via the 8585’s front panel or PC Remote. If you need to recall a preset within one video frame, we advise using the Remote Interface to do so. This advice also applies to the PASS-THROUGH preset and user presets based on it.

  Application example: By saving your active preset as two User Presets, identical except that one has the 8585’s Loudness Controller turned on and one has it turned off, you can use the GPI inputs to smoothly activate and defeat the Loudness Controller by recalling the appropriate User Preset.

- **Setup Name**: activates that Setup.

  You can save multiple setups that do things like changing the global DIALNORM value and reassigning inputs and outputs in the routing switcher.

- **Bypass**: switches the Bypass Test Mode on the air.

Note that this is a *test mode*; to smoothly defeat the audio processing except for peak limiting (to accommodate network program pass-through, for example), recall the factory PASS-THROUGH preset or, if you need a different bypass gain than the factory PASS-THROUGH preset provides, a user preset you have edited and saved based on the PASS-THROUGH preset.

- **Tone**: switches a Tone Test on the air.
- **Exit Test**: If a test mode (Tone or Bypass) is switched on the air, EXIT TEST reverts to the normal operating mode using the previous processing preset.
- **Reset Clock To Hour**

  Note that it is usually more convenient to synchronize your 8585 to a network timeserver than to use this function. See *Synchronizing Optimod to a Network Timeserver* on page 2-52.
- **Reset to Midnight** (See the note immediately above.)
- **No Function**: remote input is disabled.

End remote control interface programming.

When you are finished programming the remote control interface, press the *ESCAPE* button once to return to the System Setup screen.

Networking and Remote Control

This section describes how to connect a PC to your 8585 remotely for downloading software upgrades and for PC Remote Control.

The 8585 has a built-in Ethernet connector that can be used with 10 Mbps or 100 Mbps networks using the TCP/IP protocol. You can also connect a PC to the 8585 through the 8585's RS-232 serial port, either by modem or directly through a null modem cable.

1. Prepare the 8585 for a network connection.

[Skip this step if you will not be using an Ethernet connection.]

A) Set the IP address:

a) From the main menu, *LOCATE* to SYSTEM SETUP > NETWORK REMOTE > NETWORK.

b) If you wish to change the IP Address, *LOCATE* to SET ADDRESS. Press the *ENTER* button to access the SET IP ADDRESS screen.

192.168.254.254 is the 8585 default setting.

c) *LOCATE* to CLEAR, then press the *ENTER* button.

This will allow you to enter your IP address.

d) *LOCATE* to the first number and press the *ENTER* button; repeat until you have selected all the numbers in the IP address assigned by your network administrator. When the IP address entry is complete, *LOCATE* to SAVE and press the *ENTER* button.

B) If necessary, set the Subnet Mask assigned by your network administrator:

a) *LOCATE* to SET SUBNET.

Unless previously set away from the factory default, the Subnet Mask should indicate 255.255.255.0.

b) Press the *ENTER* button to access the SET SUBNET MASK screen.

c) *LOCATE* to the first number and press the *ENTER* button; repeat until you have selected all the numbers in the Subnet Mask. When the Subnet Mask entry is complete, toggle to SAVE and press the *ENTER* button.

The 8585 will not accept an invalid Subnet Mask (like 255.255.255.300).

C) If necessary, set the Gateway assigned by your network administrator.

To cross subnets, you must specify a gateway. If the PC and 8585 are on the same subnet, then it is unnecessary to specify a gateway.

If the gateway, port, and firewall (if used) are configured correctly, it is possible to connect 8585 PC Remote to an 8585 via a VPN.

a) *LOCATE* to SET GATEWAY.

Unless previously set away from the factory default, the Gateway should indicate 0.0.0.0.

b) Press the *ENTER* button to access the Set Gateway Address screen.

c) *LOCATE* to the first number and press the *ENTER* button; repeat until you have selected all the numbers in the Gateway. When the Gateway entry is complete, toggle to SAVE and press the *ENTER* button.

D) If necessary, set the Port assigned by your network administrator.

If you are behind a firewall, this port needs to be opened in your firewall in order to communicate with the 8585 PC Remote application.

a) *LOCATE* to SET PORT.

The default port is 6201.

b) Press the *ENTER* button to access the SET PORT ADDRESS screen.

c) *LOCATE* to the first number and press the *ENTER* button; repeat until you have selected all the numbers in the Port. When the Port entry is complete, toggle to SAVE and press the *ENTER* button.

E) Connect your network's Ethernet cable to the card.

This completes setup of network parameters.

2. **Prepare the 8585 for direct serial connection through its RS-232 serial port:**

   [Skip this step if you will not be using a direct serial connection.]

   A) Configuring the 8585 network screen settings:

      a) From the main menu, *LOCATE* to SYSTEM SETUP > NETWORK REMOTE > NETWORK.

      b) *LOCATE* to INTERFACE TYPE.

      c) Turn the blue knob until DIRECT appears in the INTERFACE TYPE field.

   B) Set 8585 passcodes as desired. See *Security and Passcode Programming* on page 2-34.

   C) Connect the cable:

      a) Connect one end of a null modem cable to the RS-232 connector on the 8585's rear panel.

      b) Connect the other end to your computer's COM port.

   D) If you have changed the INTERFACE TYPE from ASCII, reboot the 8585 to load the RS-232 port's PPP driver.

You are now ready to connect your computer to your 8585 through a null modem cable connected to your computer's serial port. Refer to *Installing 8585 PC Remote Control Software* (page 2-55).

3. **Prepare the 8585 for modem connection through its RS-232 serial port:**

   [Skip this step if you will not be using a modem connection.]

   A) Configure the network screen settings on your 8585:

      a) From the main menu, *LOCATE* to SYSTEM SETUP > NETWORK REMOTE > NETWORK.

      b) *LOCATE* to INTERFACE TYPE.

      c) Turn the blue knob until MODEM appears in the INTERFACE TYPE field.

   B) Set the modem initialization string:

      a) *LOCATE* to INIT STRING and the SET STRING button.

      b) If the INIT STRING is S0=4, this is correct. Skip to step (C) below.

         S0=4 is the 8585 default setting. This activates auto-answer functionality in the modem.

      c) If the INIT STRING reads UNDEFINED, press the *ENTER* button to access the MODEM INIT STRING screen.

      d) Using the *LOCATE* button, toggle to CLEAR. Then press the *ENTER* button.

         This will clear the INIT STRING field of UNDEFINED so that you can enter your Init String.

e) Set the INIT STRING to S0=4.

LOCATE to the first number and press the *ENTER* button; repeat until you have selected all the numbers in the Init String.

C) Set 8585 passcodes as desired. See *Security and Passcode Programming* on page 2-34.

D) Modem setup:

a) You will need two modems and two available phone lines, one of each for your PC and your 8585.

Reminder: Orban Customer Service supports only the 3Com/U.S. Robotics® 56kbps fax modem EXT on the 8585 side (although other 56kbps modems will often work OK).

b) Connect the modem to the 8585's RS-232 port with a standard (not null) modem cable.

You can use either an internal or an external modem with your PC.

c) Connect the telephone line from the wall phone jack to the wall connection icon on the back of the modem (modem in).

d) Connect the modem cable from the modem to the RS-232 port of the 8585.

e) Set the modem to AUTO ANSWER and turn it on.

For 3Com/U.S. Robotics® 56kbps fax modem EXT, set dip switches 3, 5, and 8 in the down position to activate the AUTO ANSWER setting. All other dip switches should be set to the up position.

E) If you have changed the INTERFACE TYPE from ASCII, reboot the 8585 to load the RS-232 port's PPP driver.

Synchronizing Optimod to a Network Timeserver

1. From the main menu, Locate to System Setup > Place/Date/Time > Time Sync.

A) Use the SYNC PROTOCOL control to choose either TIME PROTOCOL or SNTP.

- Select TIME PROTOCOL if the Optimod is behind a firewall that does not pass UDP packets. TIME PROTOCOL selects the time protocol as described in the standard RFC868. This method uses TCP on port 37.
- Select SNTP if your network timeserver supports the Simple Network Time Protocol as described in standard RFC1769. This method uses UDP on port 123.

Ask your network administrator which protocols are available. SNTP is slightly more accurate.

B) *LOCATE* to SYNC PERIOD. Using the knob, choose how often your Optimod will automatically update its internal clock to the timeserver you selected.

The choices are OFF, 8 HOURS, and 24 HOURS.

If the connection to the timeserver fails (due to network overload or other problems), your Optimod will try once per hour to synchronize until it is successful.

C) *LOCATE* to OFFSET. Using the knob, set it to the difference (in hours) between your time zone and Universal Time (UTC).

UTC is also known as GMT, or Greenwich Mean Time.

- The value can range between –12 and +12 hours. If this value is set to 0, your Optimod's time will be the same as UTC.
- You can empirically adjust this value until the correct time for your location is displayed after you synchronize your Optimod to a timeserver.

2. **Choose a timeserver.**

http://www.boulder.nist.gov/timefreq/service/time-servers.html provides a current list of timeservers available on the Internet. You network may also have a local timeserver; ask your network administrator.

As of April 2006, NIST's list was as shown in Table 2-2 on page 2-53.

3. **Set up timeserver parameters.**

You can specify the timeserver either from your Optimod's front panel or from its PC Remote software. From the front panel, you can only enter the timeserver's IP address (for example, 192.43.244.18). If you specify the timeserver from PC Remote, you can specify either its named address (for example, time.nist.gov) or its IP address.

4. **Specify the time sync parameters from your Optimod's front panel:**

[Skip this step if you wish to specify the timeserver and time sync parameters

Name	IP Address	Location
time-a.nist.gov	129.6.15.28	NIST, Gaithersburg, Maryland
time-b.nist.gov	129.6.15.29	NIST, Gaithersburg, Maryland
time-a.timefreq.bldrdoc.gov	132.163.4.101	NIST, Boulder, Colorado
time-b.timefreq.bldrdoc.gov	132.163.4.102	NIST, Boulder, Colorado
time-c.timefreq.bldrdoc.gov	132.163.4.103	NIST, Boulder, Colorado
utcnist.colorado.edu	128.138.140.44	University of Colorado, Boulder
time.nist.gov	192.43.244.18	NCAR, Boulder, Colorado
time-nw.nist.gov	131.107.1.10	Microsoft, Redmond, Washington
nist1.symmetricom.com	69.25.96.13	Symmetricom, San Jose, California
nist1-dc.glassey.com	216.200.93.8	Abovenet, Virginia
nist1-ny.glassey.com	208.184.49.9	Abovenet, New York City
nist1-sj.glassey.com	207.126.98.204	Abovenet, San Jose, California
nist1.aol-ca.truetime.com	207.200.81.113	TrueTime, AOL facility, Sunnyvale, California
nist1.aol-va.truetime.com	205.188.185.33	TrueTime, AOL facility, Virginia
nist1.columbiacountyga.gov	68.216.79.113	Columbia County, Georgia

Table 2-2: NIST-referenced timeservers

from your Windows XP computer.]

A) *LOCATE* to the SET SERVER button and press *ENTER*.

a) *LOCATE* to CLEAR. Then press the *ENTER* button.

This will allow you to enter the IP address of the desired timeserver.

b) Use the *LOCATE* button, toggle to the first number and then press the *ENTER* button; repeat until you have selected all the numbers in the IP address. When the IP address entry is complete, toggle to SAVE and press the *ENTER* button.

B) *LOCATE* to the SYNC NOW field and press *ENTER* to test your settings. Your Optimod's display should indicate that it is connecting to the IP address that you specified. When the connection is successful, the Optimod's clock will automatically synchronize to the timeserver.

- If the connection is not successful within five seconds, the display will indicate that the connection failed. This means either that the timeserver is too busy or that your setup cannot connect to the timeserver. Double-check the IP address. If you are behind a firewall, make sure that port 123 is open.
- If your connection failed, the gateway address might not be set correctly on your Optimod. The gateway address for the timeserver connection is the same gateway address that you set in step (1.C) on page 2-50. If you do not know the correct gateway address, you can often discover it by connecting a Windows computer to the same Ethernet cable that is ordinarily plugged into your Optimod. Ascertain that the computer can connect to the Internet. At the command prompt, type `ipconfig`. The computer will return the "Default Gateway."

5. Specify the time sync from the Optimod PC Remote software:

[Skip this step if you wish to specify the timeserver and time sync parameters from your Optimod's front panel.]

Optimod PC Remote software can automatically set your Optimod's local time, OFFSET, and TIME SERVER to reflect the Windows settings in the computer running PC Remote software.

See *Installing 8585 PC Remote Control Software* starting on page 2-55 and *Using the 8585 PC Remote Control Software* starting on page 3-64.

If you are running Windows 2000, you cannot specify the timeserver from your computer. However, you can still set your Optimod's clock and offset.

A) In Windows, navigate to the CONTROL PANEL > DATE AND TIME > TIME ZONE tab.

B) Set time zone to correspond to your local time zone.

C) In Windows, navigate to the CONTROL PANEL > DATE AND TIME > INTERNET TIME tab.

D) If you are running Windows XP:

a) Check "Automatically synchronize with an Internet time server" to set your Optimod's SYNC PERIOD to "24."

b) Set "Server" to the desired timeserver.

c) Click the "Update Now" button to synchronize your computer's clock to the selected timeserver. If this is successful, this means that you can connect to the selected timeserver over your network.

- The Internet Time tab is not available in Windows 2000. If you are running Optimod PC Remote on Windows 2000, you must enter the timeserver from your Optimod's front panel as an IP address (step 4 on page 2-53).
- If the timeserver you selected in Windows is a named address (not an IP address), the 8585 will resolve it correctly but the IP address that appears in your Optimod's display will be 0.0.0.0.
- To use PC Remote to turn off your Optimod's automatic synchronization, uncheck "Automatically synchronize with an Internet time server" on your PC. Then click the "Update Now" button on PC Remote.

E) Locate to Optimod PC Remote's SETUP/UTILITY tab and click the SET 8585 CLOCK button.

- If you are running Windows XP, PC Remote will download your computer's currently specified timeserver into your Optimod.
- PC Remote will adjust your Optimod's Offset setting to correspond to your computer's time zone setting.
- PC Remote will synchronize your Optimod's clock with your computer's clock.

F) It is wise to disconnect from PC Remote and then to *LOCATE* to the SYNC NOW field on your Optimod and press *ENTER* [step (4.B) on page 2-54]. This is to test your Optimod's ability to synchronize to the selected timeserver and to ensure that your Optimod's clock is set accurately. If the test fails, see the comments under step (4.B) on page 2-54, particularly those regarding setting the gateway.

NOTE: Manually setting your Optimod's clock via Set Time, Set Date, Daylight Time, and the remote contact closure Reset to Hour and Reset to Midnight will not work when the automatic synchronization function is active. To inactivate this function (thereby permitting manual setting to work), set the SYNC PERIOD to OFF.

Installing 8585 PC Remote Control Software

This section briefly summarizes the procedure for installing 8585 PC Remote software on existing 8585s. If required, you will find more detailed instructions in the .pdf file automatically installed on your computer by Orban's installer program, `Setup8585_x.x.x.x.exe`, where "x.x.x.x" represents the software version you are installing. (For example, for version 1.0 software, this would be 1.0.0.0.)

The PC Remote software is supplied on a CD shipped with your 8585. You can also download it from `ftp.orban.com/8585`.

Instructions for using the PC Remote software are found starting on page 3-64.

Installing the Necessary Windows Services

The 8585 PC Remote application uses Windows' built-in communications and networking services to deal with the low-level details necessary to communicate with the 8585's serial port. (These services are also used to upgrade your 8585's firmware when updates are available from Orban.) The exact process will vary, depending on how you wish to set up the communications. That is:

- If you want to communicate through a local, un-networked PC, you have two choices:
  - Use a crossover Ethernet cable to communicate to your PC through its Ethernet port.
  - Establish a connection between a serial (COM) port of the PC and the RS-232 port of your 8585 through a null modem cable and use Windows Direct Serial Connect to make the basic connection.
- If you want to communicate through a pair of modems, you will use the Windows Dial-Up networking service to make the connection. You must install the appropriate communications services in Windows (if they are not already installed) before you can run 8585 Remote software. *You may therefore need to have access to the Windows install disk(s)—or have their image copied onto your computer's hard drive—before you attempt to use the 8585 PC Remote application.*

> In all cases, regardless of whether your PC communicates to the 8585 through its serial port or Ethernet connector, it uses the ppp and the TCP/IP protocols to communicate with the 8585.

Check Hardware Requirements

To connect your PC to your 8585 you will need the following:

- *If connecting by Ethernet:* a standard Ethernet cable (with RJ45 connectors) to connect to a network hub or router, or a crossover Ethernet cable to connect directly to your PC's Ethernet jack.
- *If connecting by serial cable:* a null modem cable (also called a "reverse" cable). This cable has DB9 female connectors at both ends for connecting the 8585 to

the serial port on your computer. If your computer has a DB25 connector, you must obtain an adapter.

- *If connecting by modem:* a 3Com/U.S. Robotics® 56kbps fax modem EXT and normal (not null) modem cable for the 8585 side of the connection. Note that Orban Customer Service does not support any other type of modem for connecting to the 8585.

- PC running Windows 2000 (SP3 or higher) XP (SP2 or higher), or Vista (SP1 or higher).

8585 PC Remote will not run on older Windows versions.

Recommended Hardware Components

Computer	Pentium III or higher
Available Disk Space	25 MB
RAM	512 MB
Display	1024x768 or higher
COM Port	16550 (or compatible) UART

WARNING!

When connecting your 8585, use shielded cable to protect the pins in the RS-232 connector from electrostatic discharge.

The following subsections provide steps for connecting to your Optimod 8585 software using the Windows 2000/XP Direct Cable Connect or via modem connection.

Running the Orban Installer Program

Insert the installer CD into your computer's CD drive.

The installer should start up and ask you if you wish to install the PC Remote application on your computer. If it fails to do so, navigate to Start \ Run on your computer, and type `X:setup` (where "X" is the drive letter of your CD drive).

Follow the prompts on your screen to install the PC Remote software automatically on your computer.

- You might have obtained the automatic installer application from some other source than Orban's CD, like Orban's ftp site or another computer on your network. If so, just run the application and follow the on-screen instructions.
- This program installs the necessary files and adds an Orban/Optimod 8585 folder to your computer's Start Menu. This folder contains shortcuts to the PC Remote application and to the documentation. If you accepted the option during installation, there is also a shortcut to the PC Remote application on your desktop.

You have now installed all files necessary to use the PC Remote software. If you are using a direct serial or a modem connection, the next step is to install and configure the Windows communications services that allow your computer to communicate with your 8585. *Appendix: Setting Up Serial Communications* on page 2-59 provides details.

Setting Up Ethernet, LAN, and VPN Connections

- If you are using an Ethernet connection and your computer can successfully connect to the Internet through its Ethernet port, it already has the correct (TCP/IP) networking set up to communicate with the 8585. In most cases, all you need is your 8585's IP address, Port, and Gateway, as set in step 1 on page 2-49. You will enter these when you create a "connection" to your 8585 from the 8585 PC Remote application—see step (E) on page 3-65. If your computer does not have a working Ethernet port, you must add one and then following the instructions provided by Microsoft to set it up to enable TCP/IP networking.
- If you are using a crossover Ethernet cable to connect your Optimod directly to your computer, you must set your Windows networking to provide a static IP address for your computer because your Optimod does not contain a DHCP server.
- If you wish to connect to your 8585 through your LAN or VPN (through a WAN or the Internet), consult your network administrator. Note that to cross subnets, you must specify a gateway. If the PC and 8585 are on the same subnet, then it is unnecessary to specify a gateway (although you will still need to specify one if you want your Optimod to synchronize to an Internet timeserver — see *Synchronizing Optimod to a Network Timeserver* on page 2-52).
- If you are behind a firewall, you must open the port you specified in step (1.D) on page 2-50. If the gateway and firewall (if used) are configured correctly, it is possible to connect 8585 PC Remote to an 8585 via a VPN.

Conclusion

By carefully following the instructions in the Appendix, you should have successfully installed the necessary Windows services and connected to your 8585. However, if you experience any problems with this process, or have any other 8585 questions, please contact Orban Customer Service:

phone: +1 510 351-3500 ; email: custserv@orban.com

For details on your new 8585 software, from new features to operational suggestions, refer to our FTP site (`ftp.orban.com/8585`).

Appendix: Setting Up Serial Communications

This appendix provides instructions for setting up both direct serial and modem connections from your 8585 to your PC. You must do this when you define a new connection from the 8585 PC Remote application. The appendix provides procedures for both the Windows 2000 and Windows XP operating systems. (Note that the screen shots were prepared for Orban's Optimod-FM 8300 and refer to that product. They are directly applicable to the 8585 as well.)

Preparing for Communication through Null Modem Cable

1. **Configure your 8585.**

   A) On your 8585's front panel, *LOCATE* to SETUP > NETWORK & REMOTE.

   B) Hold down the PC CONNECT soft button and turn the knob until you see DIRECT on the display.

2. **Connect the cable.**

   A) Connect one end of a null modem cable to the DB9 serial connector on the 8585's rear panel.

   Be sure to use a null modem cable. A normal serial cable will not work.

   B) Connect the other end of the cable to your computer's COM port.

Connecting Using Windows 2000 Direct Serial Connection:

Ordinarily, a direct serial connection through a null modem cable is used only when you are controlling one 8585 per available COM port on your computer. If you wish to control multiple local 8585s, it is better to use an Ethernet network connection. However, in principle you could control multiple 8585s serially from one COM port, using a hardware serial switch to select the 8585 you wish to control. In this case, you should set up a separate 8585 "connection" for each 8585 to be controlled, following the instructions below. All connections should reference the same COM port.

This connection is used both for upgrading your 8585 and for connecting the 8585 PC Remote application to your 8585.

Important: The Direct Serial Connection must have exclusive access to the PC COM port that connects to your 8585. Make sure than any software that monitors this COM port (like HotSync manager, etc) is disabled before running Direct Serial Connection.

If you have already configured your direct serial cable connection, skip to step 2 on page 2-64.

If you cannot access the Internet after making a Direct or Modem connection, you will have to reconfigure certain networking parameters in Windows. Please see *You*

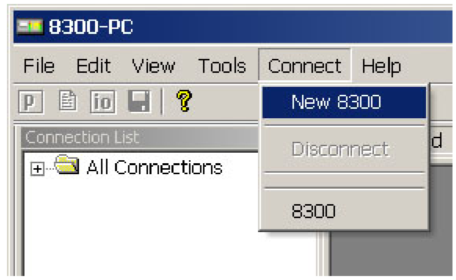
Cannot Access the Internet After Making a Direct or Modem Connection of the 8585 on page 5-8.

1. Add and configure a Direct Connection for Windows 2000:

A) Create a New Windows 2000 Direct Connection:

a) Launch 8585 PC Remote.

b) Choose "Connect > New 8585"

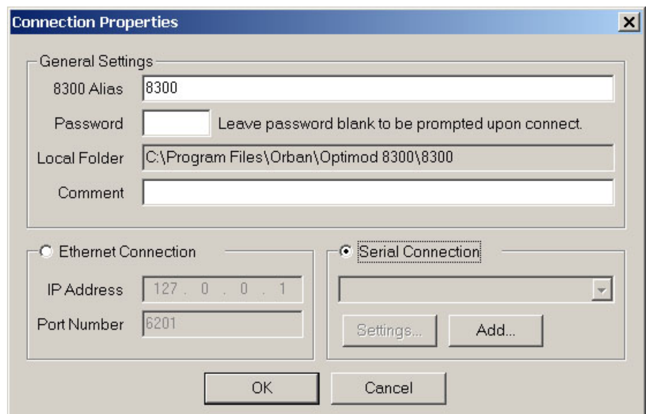


c) Give your 8585 a name (e.g., "KABC") by entering this name in the "8585 Alias" field.

d) If you wish to have 8585 PC Remote remember the password for this Optimod, enter the pass-word in the "Password" field.

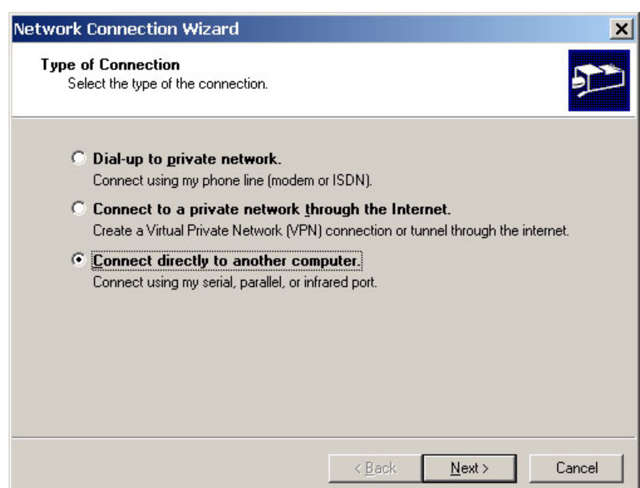
e) Select "Serial Connection."

f) Click "Add."



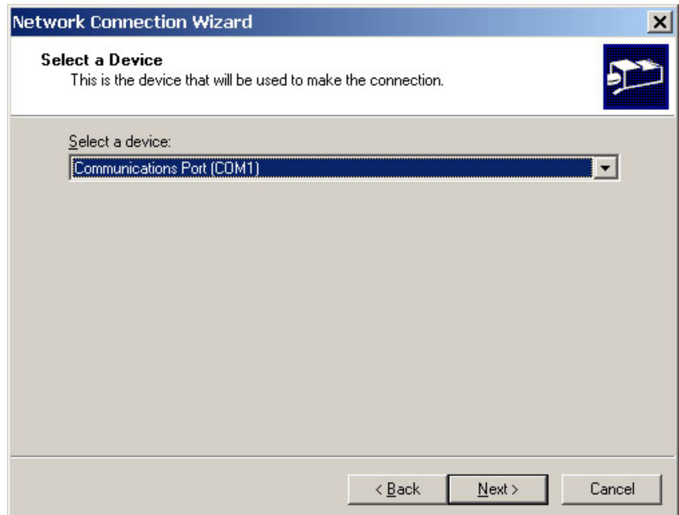
g) Select "Connect Directly to another computer."

h) Click "Next."



i) In the drop-down box, select the serial port you will be using to make the connection.

j) Click "Next."



k) Select either "For all users" or "Only for myself."

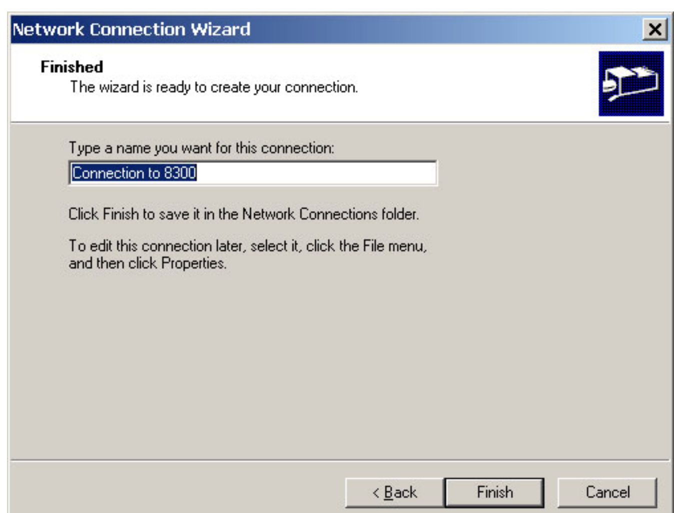
The correct setting depends on how your network and security are configured.

Your wizard may not display this field if your computer is set up for a single user only.

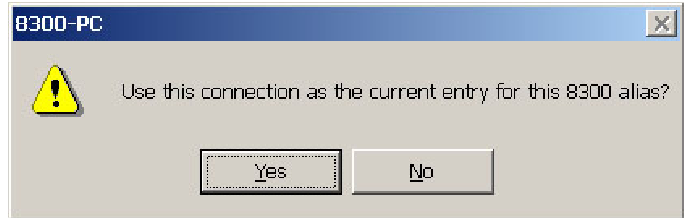
l) Click "Next."

m) Enter a name for your Connection like: "Connection to 8585."

n) Click "Finish."

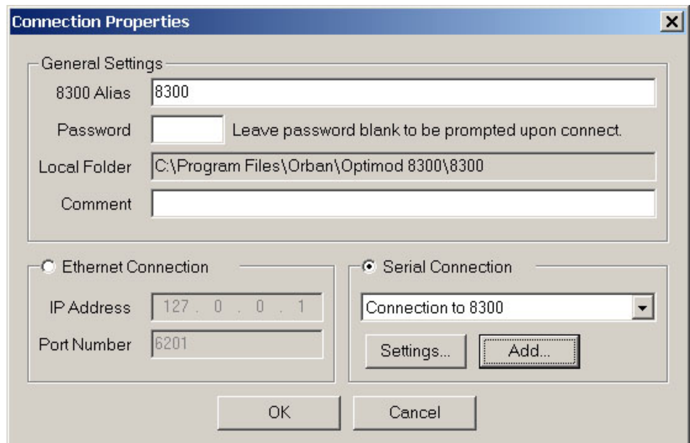


o) Click "Yes."



B) Edit your new Direct Connection properties:

a) Click "Settings."

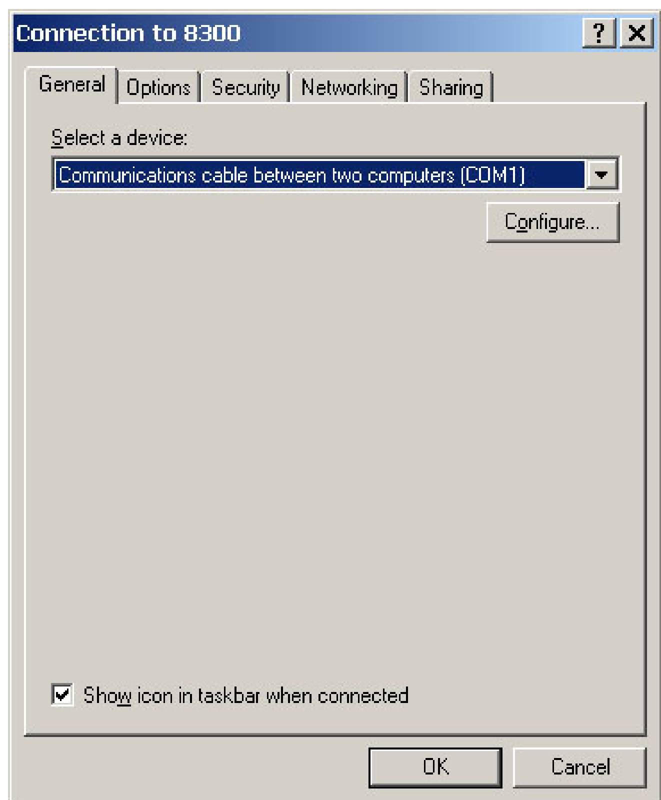


b) Click the "General" tab.

c) Select the device you set up in step (i) on page 2-61.

d) This will usually be "Communications cable between two computers (COM1)."

e) Click "Configure."

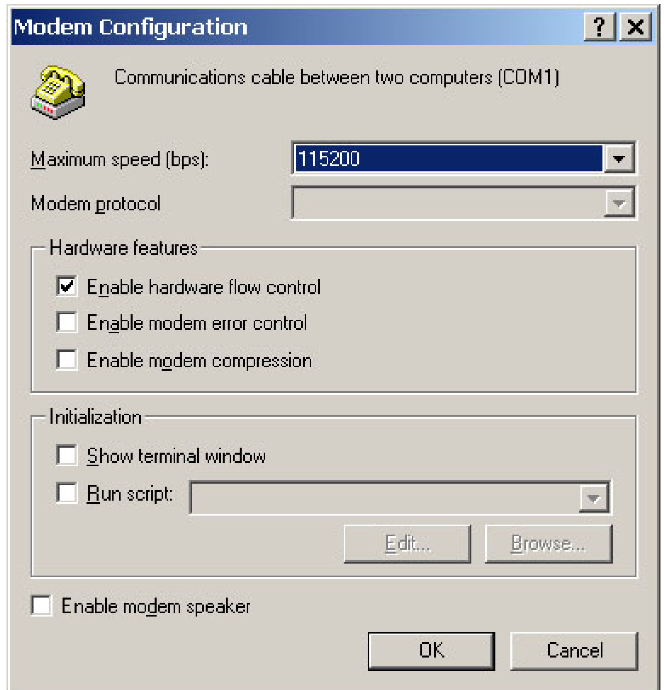


f) Set "Maximum speed (bps)" to "115200."

g) Check "Enable hardware flow control."

h) Make sure that all other boxes are not checked.

i) Click "OK."



j) Select the Networking tab.

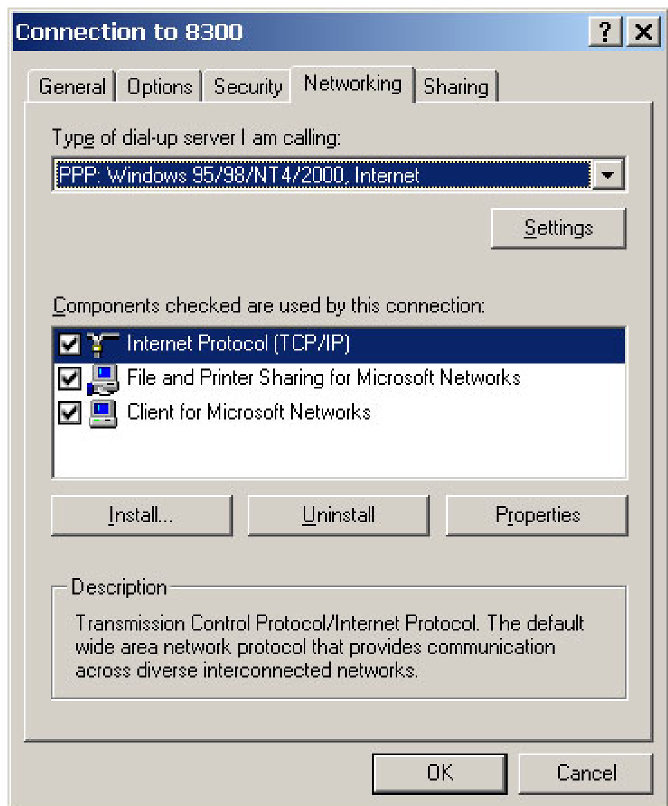
k) Make sure that "PPP: Windows 95/ 98/ NT 4/ 2000, Internet" appears in the "Type of dial-up server I am calling" field.

l) Make sure that "Internet Protocol (TCP/IP) is checked.

You may leave "File and Printer Sharing for Microsoft Networks" and "Client for Microsoft Networks" checked if you like.

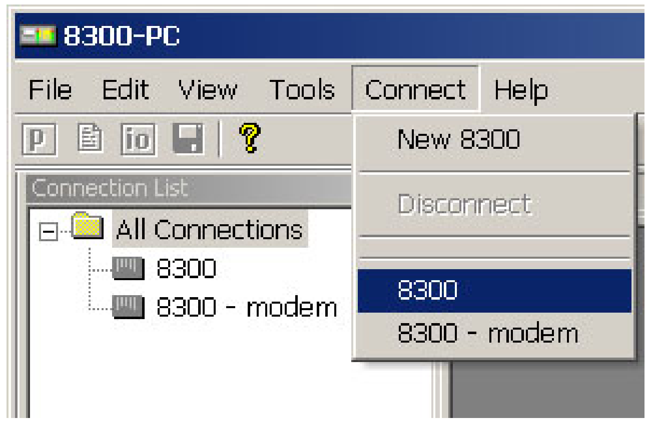
m)Click "OK."

n) When the "Connection properties" window appears, click "OK."



2. Launch an existing Windows 2000 Direct connection.

Once you have set up a "connection" specifying Direct Connect in the 8585 PC Remote application (see *To set up a new connection* on page 3-65), choosing this connection from 8585 PC Remote automatically opens a Windows Direct Connection to your 8585.



You can connect by selecting the desired connection from the drop-down list in the CONNECT menu.

You can also connect by double-clicking the connection in the "Connection List" window.

A dialog bubble will appear on the bottom right hand corner of the screen verifying your connection if the connection is successful.

If you have trouble making a connection, refer to *OS Specific Troubleshooting Advice: Troubleshooting Windows 2000 Direct Connect* on page 5-9. If you have trouble the first time after creating a connection according to the instructions above, try restarting your computer to clear its serial port.

3. To change the properties of an existing connection:

Right-click the connection in the "connection List" window and choose "Properties." The "Connection properties" window opens (see page 2-60).

Connecting Using Windows XP Direct Serial Connection

If you have already configured your direct serial cable connection, skip to step 2 on page 2-68.

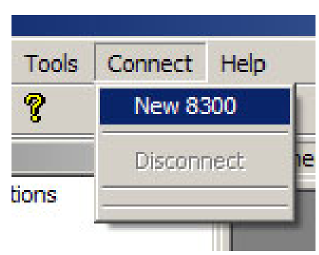
If you cannot access the Internet after making a Direct or Modem connection, you will have to reconfigure certain networking parameters in Windows. Please see *You Cannot Access the Internet After Making a Direct or Modem Connection of the 8585* on page 5-8.

1. Add and configure a Direct Connection for Windows XP:

A) Create a New Windows XP Direct Connection:

a) Launch 8585 PC Remote.

b) Choose "Connect > New 8585"

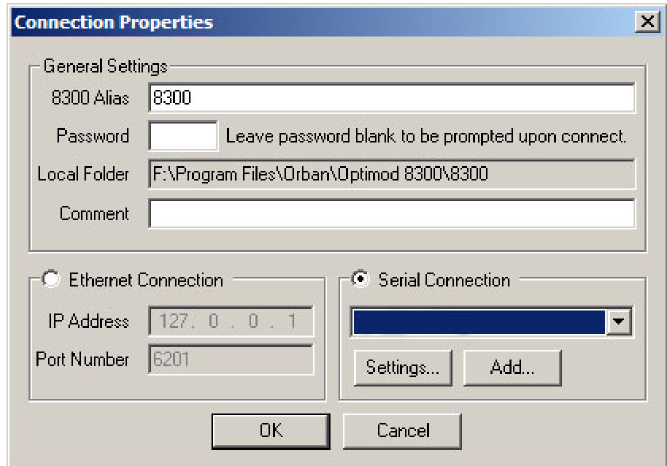


c) Give your 8585 a name (e.g., "KABC") by entering this name in the "8585 Alias" field.

d) If you wish to have 8585 PC Remote remember the password for this Optimod, enter the password in the "Password" field.

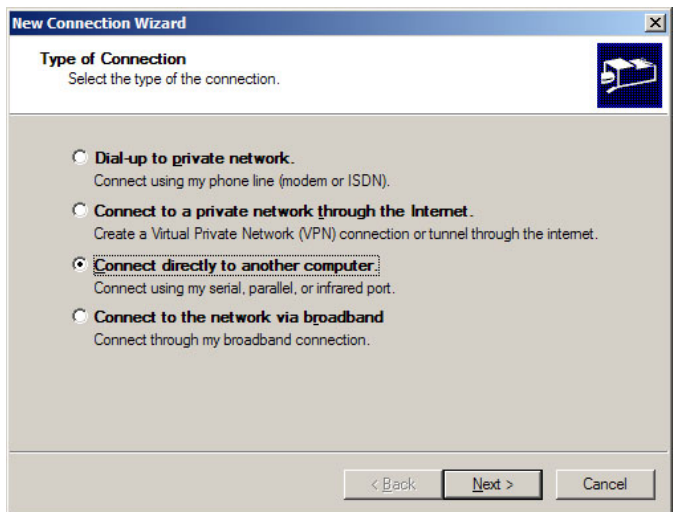
e) Select "Serial Connection."

f) Click the "Add" button.



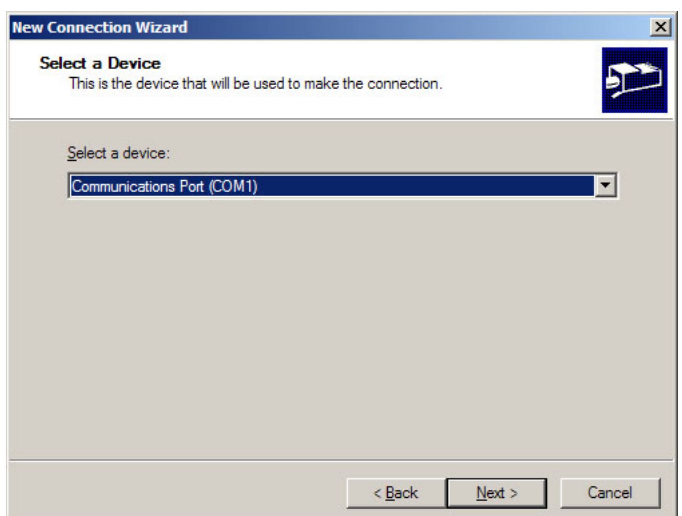
g) Choose "Connect directly to another computer."

h) Click "Next."



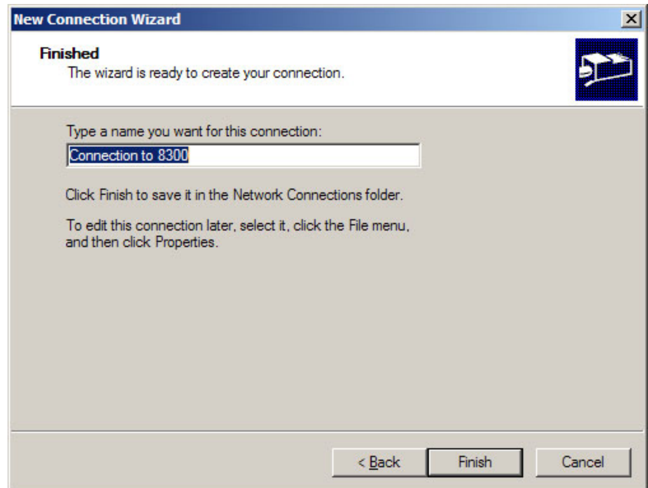
i) In the drop-down box, select the serial port you will be using to make the connection.

j) Click "Next."

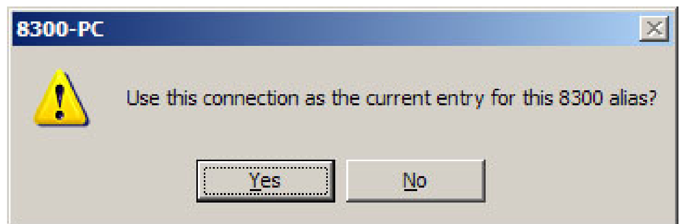


k) Type in a name for your Connection like: "Connection to 8585."

l) Click "Finish."

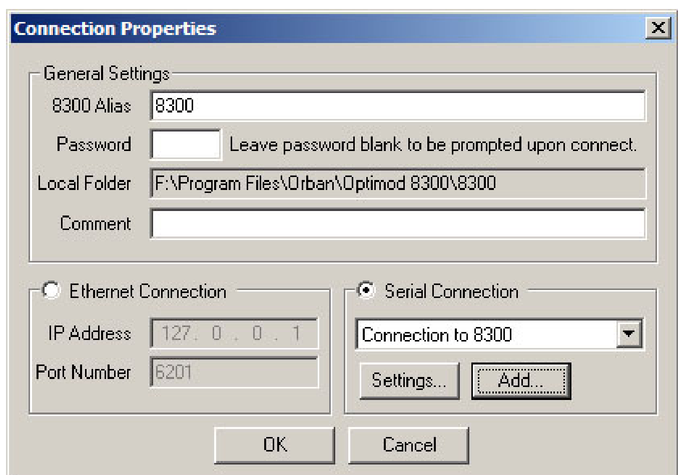


m)Click "Yes."



B) Edit your new Direct Connection properties:

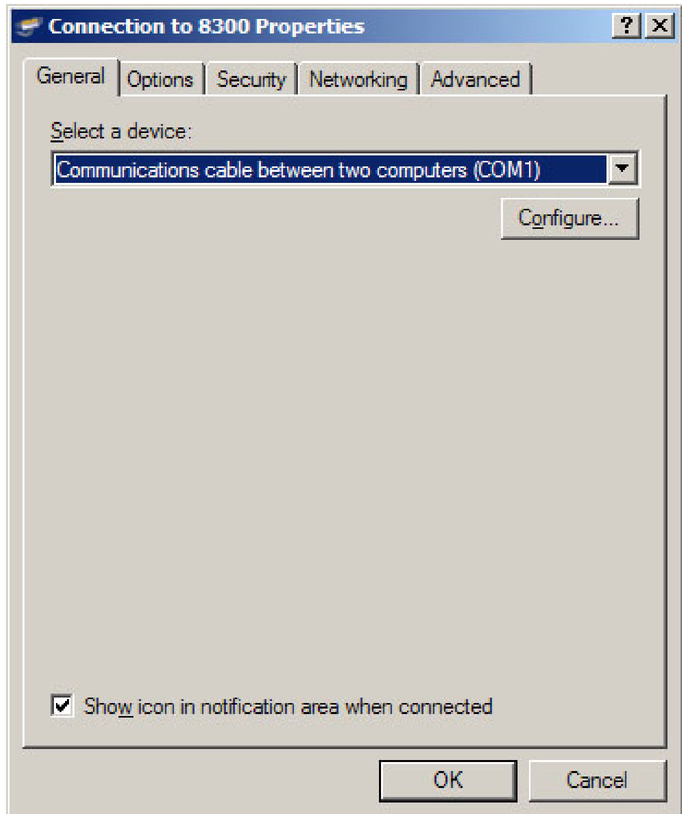
a) Click "Settings."



b) Click the "General" tab.

c) Select the device you set up in step (i) on page 2-65. This will usually be "Communications cable between two computers (COM1)."

d) Click "Configure."

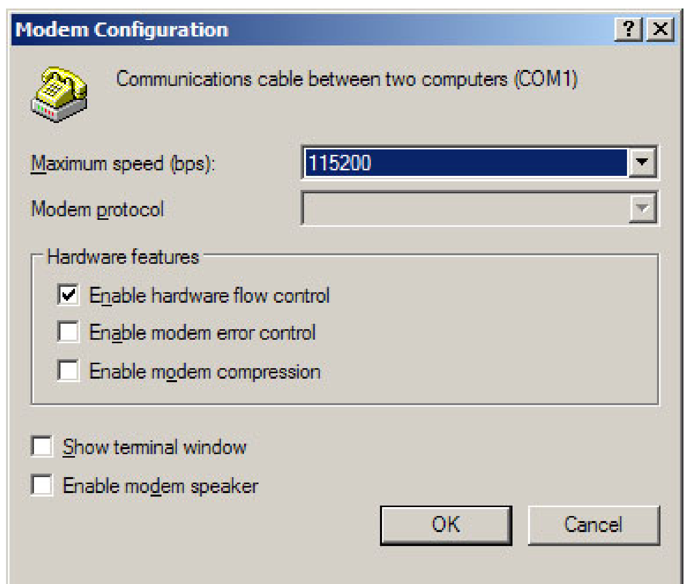


e) Set the "Maximum Speed (bps)" to 115200.

f) Check "Enable hardware flow control."

g) Make sure all other hardware features are unchecked.

h) Click "OK."



i) Select the Networking tab.

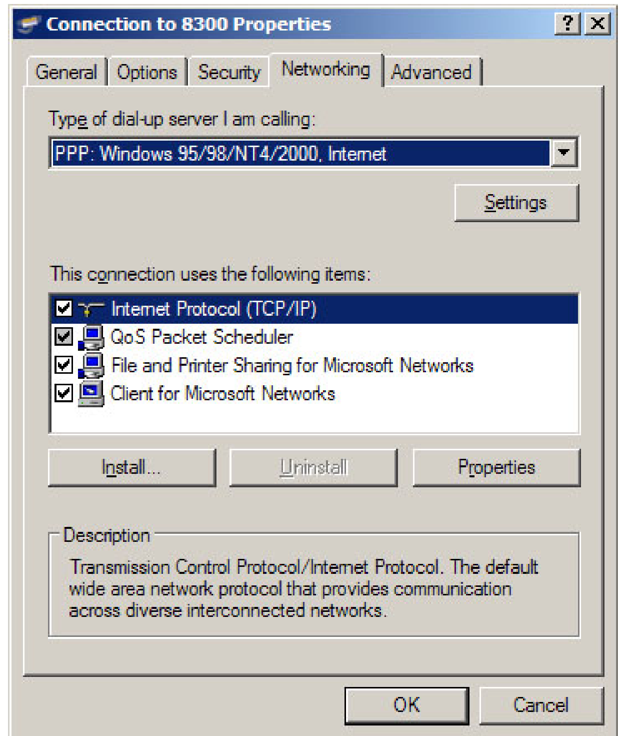
j) Make sure that "PPP: Windows 95/98/NT 4/2000, Internet" appears in the "Type of dial-up server I am calling" field.

k) Make sure that "Internet Protocol (TCP/IP) is checked.

You may leave "File and Printer Sharing for Microsoft Networks" and "Client for Microsoft Networks" checked if you like

l) Click "OK."

m) When the "Connection properties" window appears, click "OK."



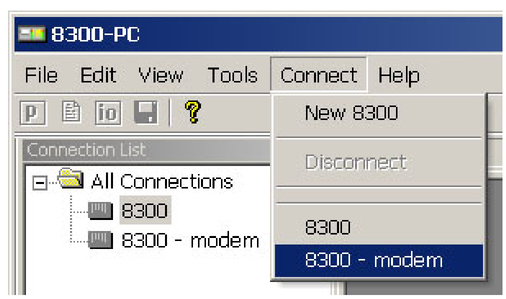
2. Launch an existing Windows XP Direct connection.

Once you have set up a "connection" specifying Direct Connect in the 8585 PC Remote application (see *To set up a new connection* on page 3-65), choosing this connection from 8585 PC Remote automatically opens a Windows Direct Connection to your 8585.

You can connect by selecting the desired connection from the drop-down list in the CONNECT menu.

You can also connect by double-clicking the connection in the "Connection List" window.

A dialog bubble will appear on the bottom right hand corner of the screen verifying your connection if the connection is successful.



If you have trouble making a connection, refer to *Troubleshooting Windows XP Direct Connect* on page 5-11. If you have trouble the first time after creating a connection according to the instructions above, try restarting your computer to clear its serial port.

3. **To change the properties of an existing connection:**

   Right-click the connection in the "connection List" window and choose "Properties." The "Connection properties" window opens (see page 2-60).

Preparing for Communication through Modems

1. **Prepare your 8585 for a modem connection through the serial port.**

   See step 3 on page 2-51.

2. **If you have not already done so, create an 8585 passcode.**

   See step 4 on page 2-35. The default passcode is ADMIN.

3. **Modem setup:**

You will need two modems and two available phone lines, one of each for your PC and your 8585.

> Reminder: Orban supports only the 3Com/U.S. Robotics® 56kbps fax modem EXT on the 8585 side (although other 56kbps modems will often work OK).

Connect the modem to the 8585's serial port with a standard (not null) modem cable.

You can use either an internal or an external modem with your PC.

A) Connect the telephone line from the wall phone jack to the wall connection icon on the back of the modem (modem in).

B) Connect the modem cable from the modem to the serial port of the 8585.

C) Set the modem to AUTO ANSWER and turn it on.

> For 3Com/U.S. Robotics® 56kbps fax modem EXT, set dipswitches 3, 5, and 8 in the down position to activate the AUTO ANSWER setting. All other dipswitches should be set to the up position.

Connecting Using Windows 2000 Modem Connection

This connection is used both for upgrading your 8585 and for connecting the 8585 PC Remote application to your 8585.

1. **Add and configure modem for Windows 2000:**

If your modem is already installed, skip to Launch a Windows 2000 Modem connection *on page 2-74.*

A) Install Windows 2000 modem:

Use either an internal modem or external modem with your computer.

a) If you are using an external modem, connect the modem to a serial port on your PC and make sure the modem is connected to a working phone line.

b) On your PC, click “Start > Settings > Control Panel > Phone and Modem Options.”

c) Click the “Modems” tab.

d) Verify that your modem appears in the list available under “The following Modems are installed.”

e) Verify that your modem is “Attached to” the correct port.

If your modem is unavailable or not attached to the correct port, you must Add it. See your Windows documentation.

f) If your modem is available in the list available under “The following Modems are installed” and it is attached to the correct port, then click “Properties” for that modem.

g) Make sure the port speed is set at 115200.

h) Click “OK.”

B) Create a New Windows 2000 Dial-Up Connection:

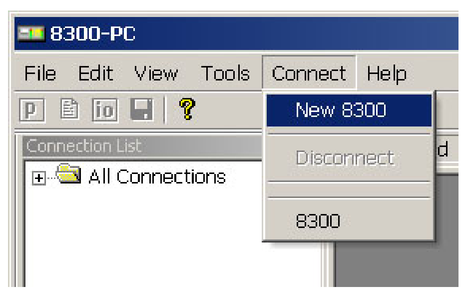
a) Click “Start > Settings > Network and Dial-up Connections > Make New Connection.”

b) Once the New Connection Wizard has opened, Click “Next.”

C) Create a New Windows 2000 Direct Connection:

a) Launch 8585 PC Remote.

b) Choose “Connect > New 8585”

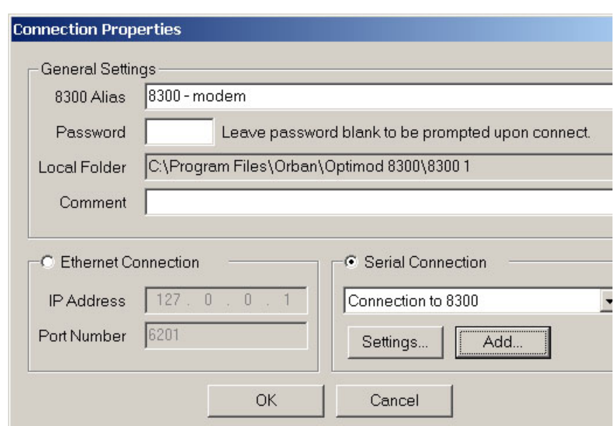


c) Give your 8585 a name (e.g., “KABC”) by entering this name in the “8585 Alias” field.

d) If you wish to have 8585 PC Remote remember the password for this Optimod, enter the password in the “Password” field.

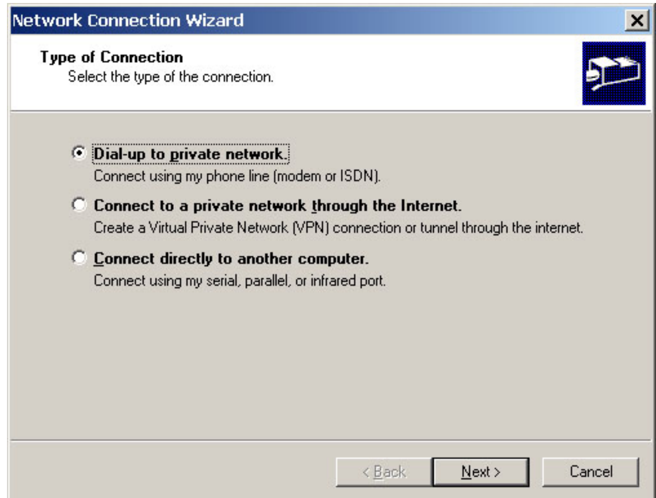
e) Select “Serial Connection.”

f) Click the “Add” button.



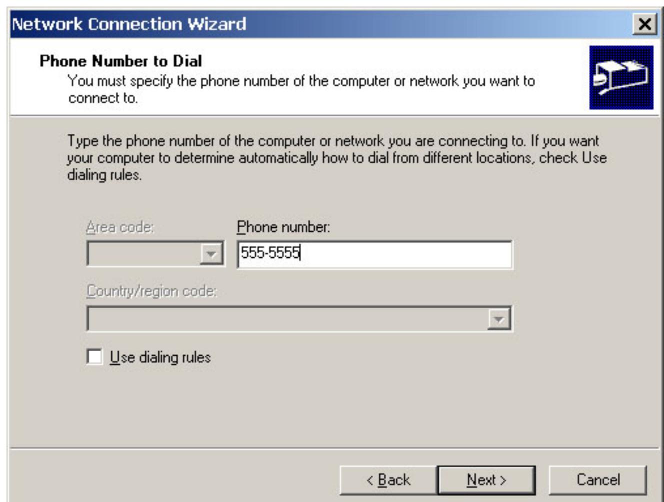
g) Select "Dial-up to private network."

h) Click "Next."



i) Enter the phone number of the modem connected to the 8585 that you are setting up.

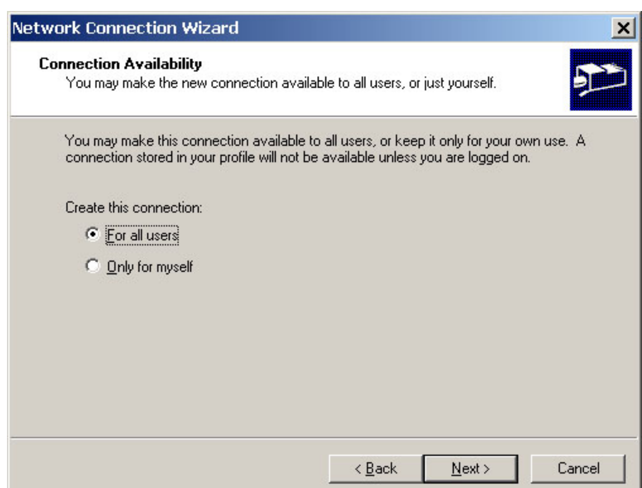
j) Click the "Next" button.



k) Select either "For all users" or "Only for myself."

The correct setting depends on how your network and security are configured.

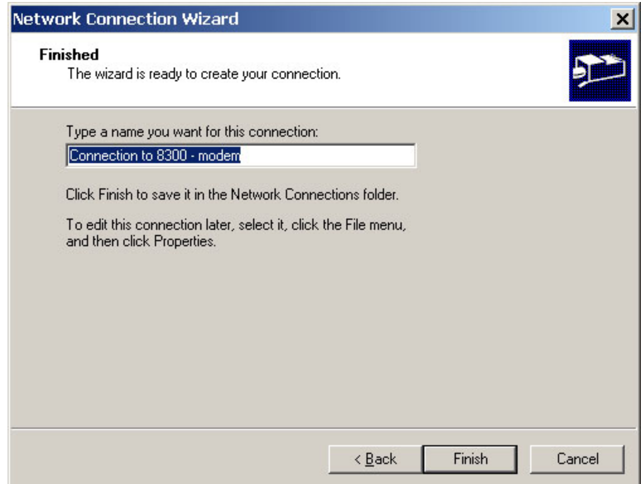
This screen may not appear in computers set up for single users.



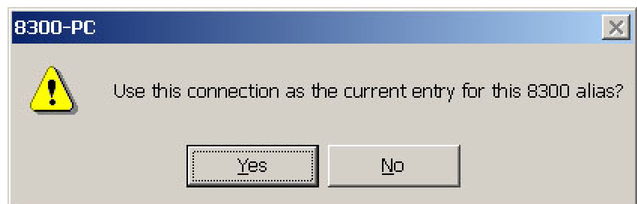
l) Click the “Next” button.

m) Type in a name for your Connection like: “Connection to 8585–Modem.”

n) Click the “Finish” button.

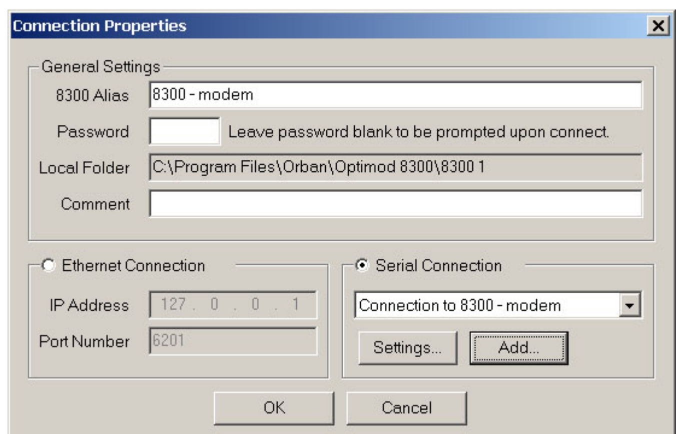


o) Click “Yes.”



D) Edit your new Direct Connection properties:

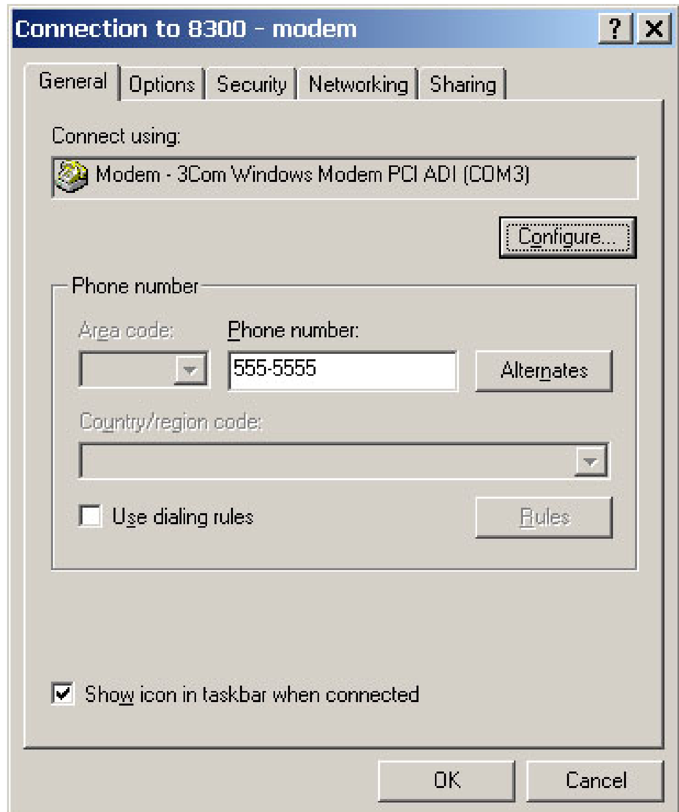
a) Click “Settings.”



b) Click the "General" tab.

c) In the "Connect using" field, select the modem you will be using to make the connection on the PC side.

d) Click "Configure."



e) Set "Maximum speed (bps)" to "115200."

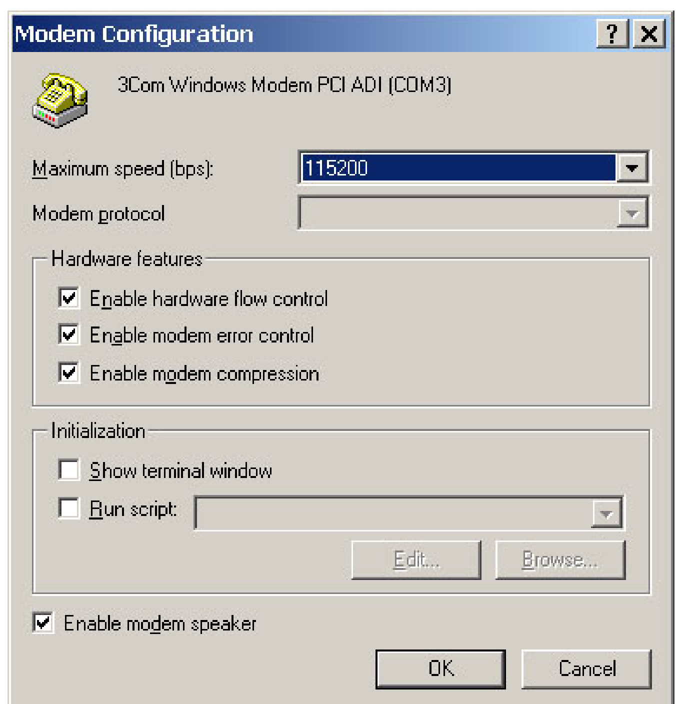
f) Check "Enable hardware flow control."

g) Check "Enable modem error control."

h) Check "Enable mcdem compression."

i) Make sure that all other boxes are not checked.

j) Click "OK."



k) Select the Networking tab.

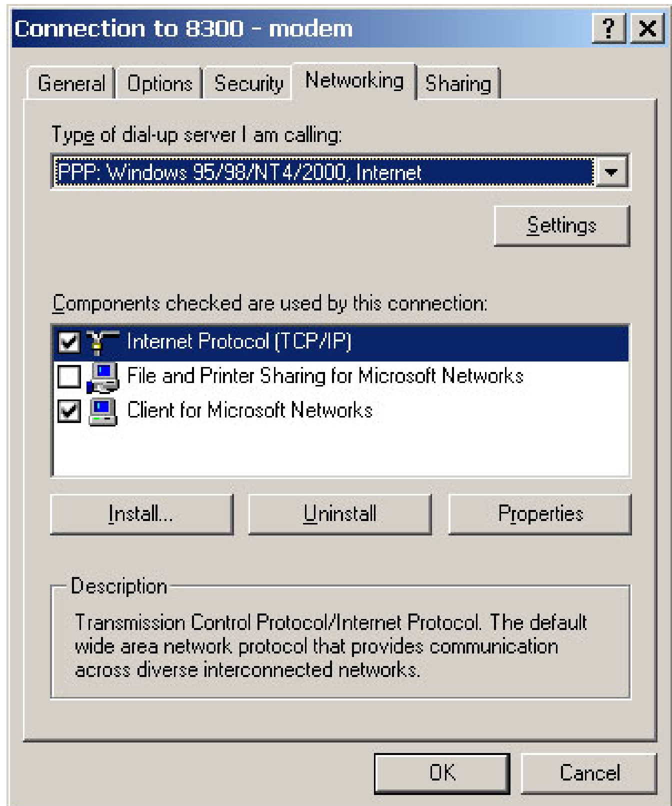
l) Make sure that “PPP: Windows 95/98/NT 4/2000, Internet” appears in the “Type of dial-up server I am calling” field.

m) Make sure that “Internet Protocol (TCP/IP) is checked.

You may leave “Client for Microsoft Neworks” checked if you like.

n) Click “OK.”

o) When the “Connection properties” window appears, click “OK.”



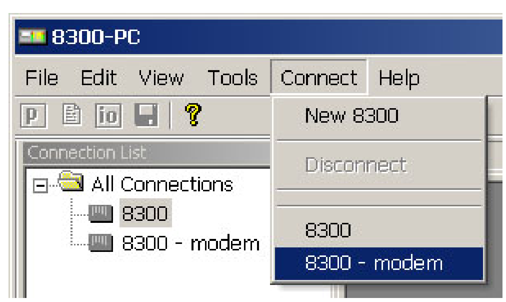
2. Launch a Windows 2000 Modem connection.

Once you have set up a “connection” specifying a modem connection in the 8585 PC Remote application (see *To set up a new connection* on page 3-65), choosing this connection from 8585 PC Remote automatically opens a Windows modem connection to your 8585.

You can connect by selecting the desired connection from the drop-down list in the CONNECT menu.

You can also connect by double-clicking the connection in the “Connection List” window.

If the connection is successful, a dialog bubble will appear on the bottom right hand corner of the screen verifying your connection.



If you have trouble making a connection, refer to *OS Specific Troubleshooting Advice: Troubleshooting Windows 2000 Modem Connect* on page 5-10. If you have trouble the first time after creating a connection according to the instructions above, try restarting your computer to clear its serial port.

3. To change the properties of an existing connection:

Right-click the connection in the "connection List" window and choose "Properties." The "Connection properties" window opens (see page 2-70).

Connecting using Windows XP Modem Connection

1. Add and configure modem for Windows XP:

Skip this step if your modem is already configured and working.

A) Configure the Windows XP PC ports:

Use either an internal modem or external modem with your computer.

a) If you are using an external modem, connect the modem to a serial port on your PC.

b) Make sure the modem is connected to a working phone line.

c) Click "Start > Control Panel > Systems."

d) Go to the "Hardware" tab and click "Device Manager."

e) In the Device Manager dialog box click the "+" next to the "Ports (COM and LPT)" icon.

A list will branch off, showing your available ports.

f) Double-click "Communications Port (COM1) or (COM2)," depending on how you set up your system.

The "Communications Port (Comx) Properties" dialog box opens.

Not all PCs have a COM2.

IMPORTANT: The COM port you choose at this point *must* match the COM port to which you connected your modem.

g) From the tabs at the top, choose "Port Settings" and configure the settings to match your PC modem.

If you are using a U.S. Robotics® external modem, the settings will be: Bits per second= 115200, Data bits = 8, Parity = None, Stop bits = 1, Flow Control = None.

h) When you are finished, click the OK button to close the "Communications Port (Comx) Properties" dialog box.

i) Click the OK button in the "Systems Properties" dialog window.

j) Close the "Control Panel" window.

If your modem is already installed, skip to Launch an existing Windows XP modem connection *on page 2-79.*

B) Install the Windows XP modem:

a) Use either an internal modem or external modem with your computer.

If you are using an external modem, connect the modem to a serial port on your PC and make sure the modem is connected to a working phone line.

b) On your PC, click "Start > Settings > Control Panel > Phone and Modem Options."

c) Click the "Modems" tab.

d) Verify that your modem appears in the list available under "The following Modems are installed."

e) Verify that your modem is "Attached to" the correct port.

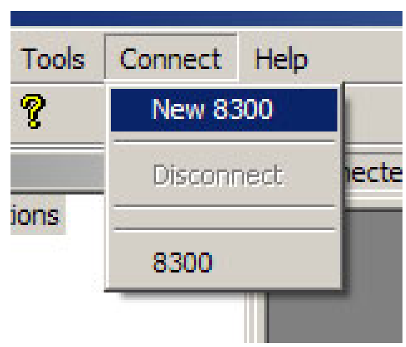
If your modem is unavailable or not attached to the correct port, you must Add it. See your Windows documentation.

f) If your modem is available in the list available under "The following Modems are installed" and it is attached to the correct port, then click "Properties" for that modem.

g) Make sure the port speed is set at 115200.

h) Click "OK."

C) Create a new Windows XP modem connection:

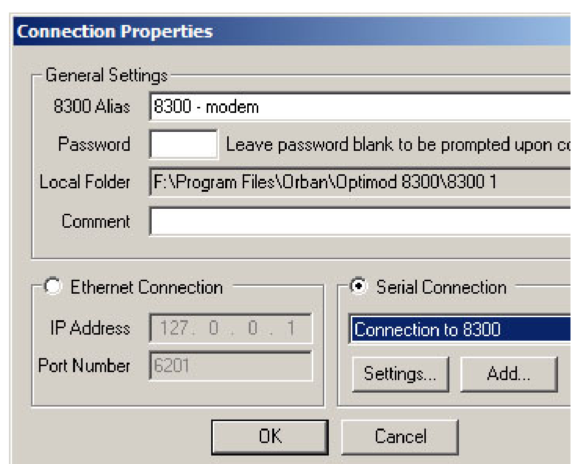


a) Launch 8585 PC Remote.

b) Choose "Connect > New 8585."

The Connection Properties window opens.

c) Give your 8585 a name (e.g., "KABC") by entering this name in the "8585 Alias" field.



d) If you wish to have 8585 PC Remote remember the password for this Optimod, enter the password in the "Password" field.

You must enter a valid password to connect. This means that at least one 8585 passcode must have been assigned via the 8585's front panel. (See step 4on page 2-35.)

e) Click “Add.”

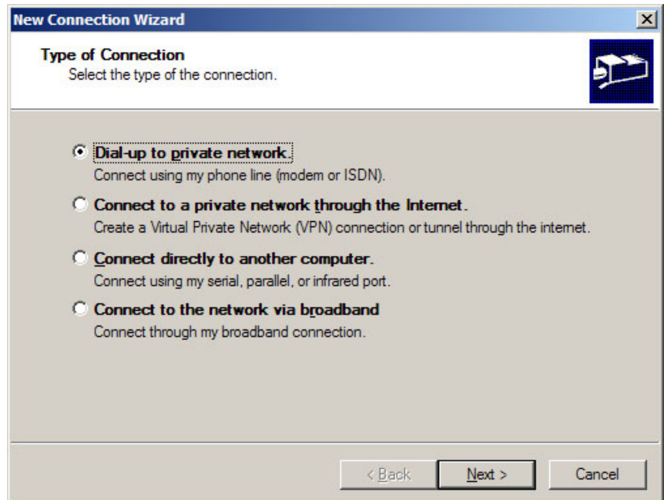
The Windows New Connection Wizard starts up.

f) Select “Serial Connection.”

g) Click the “Add” button.

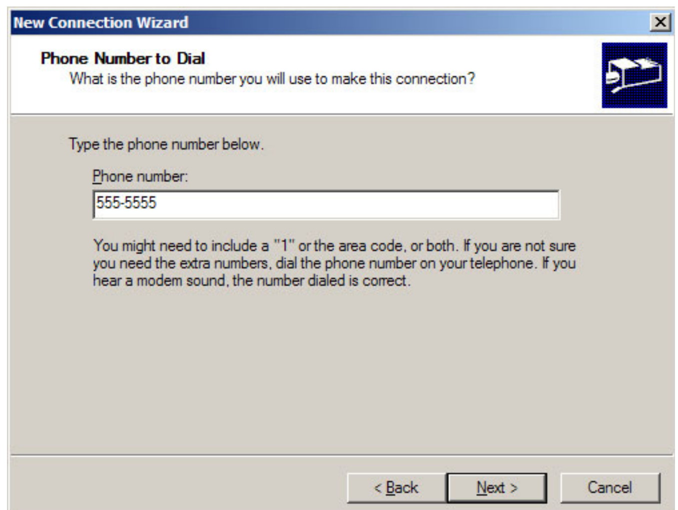
h) Select “Dial-up to private network.”

i) Click “Next.”



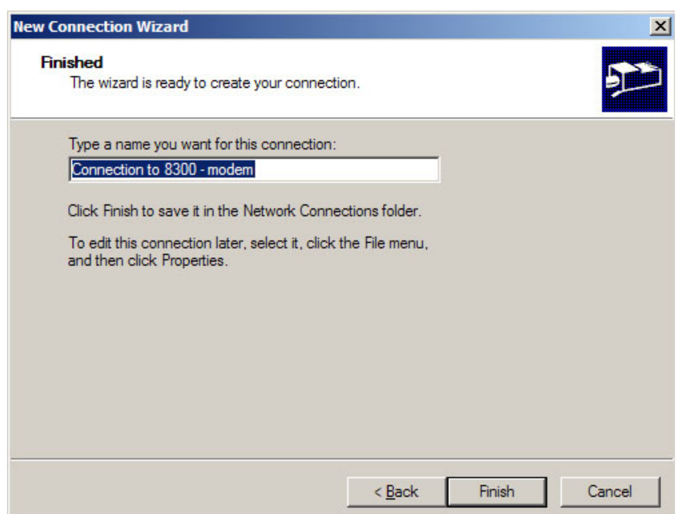
j) Enter the phone number of the modem connected to the 8585 you are setting up.

k) Click “Next.”

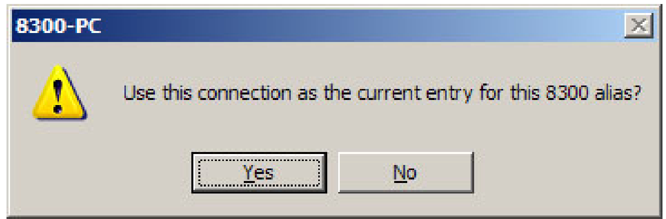


l) Type in a name for your Connection like: “Connection to 8585 – Modem”

m)Click the “Finish” button.

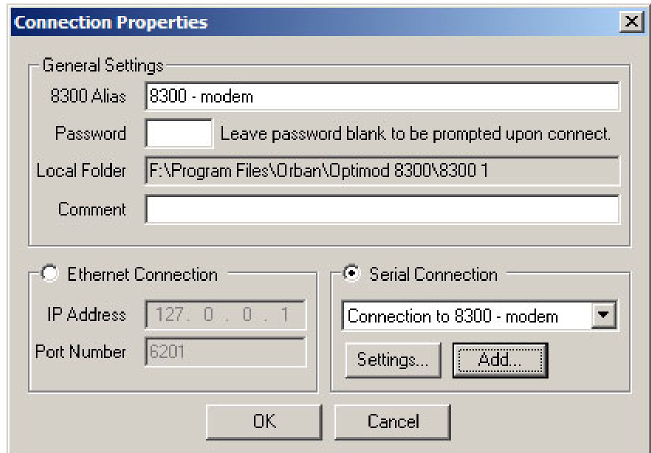


n) Click "Yes."



D) Edit your new Direct Connection properties:

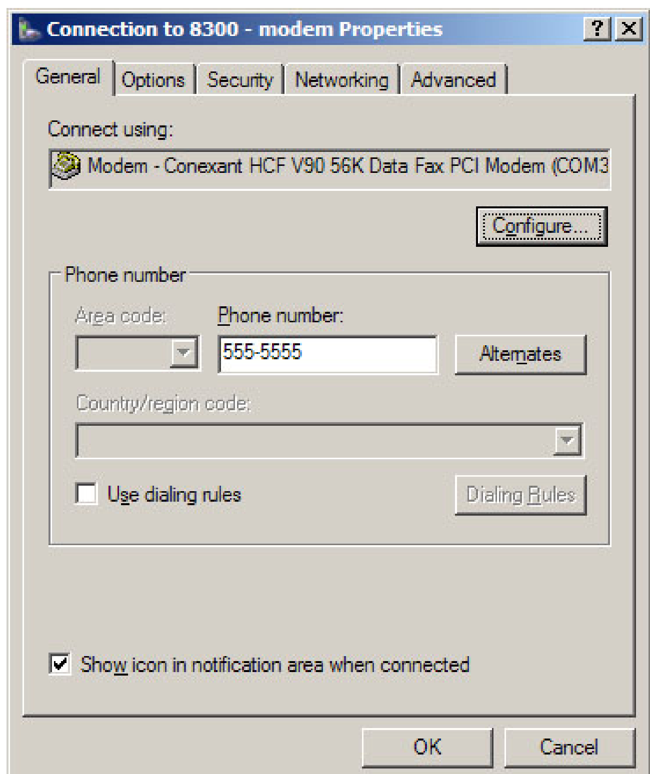
a) Click "Settings."



b) Click the "General" tab.

c) Select the modem you will be using to make the connection on the PC side.

d) Click "Configure."



e) Set "Maximum speed (bps)" to "115200."

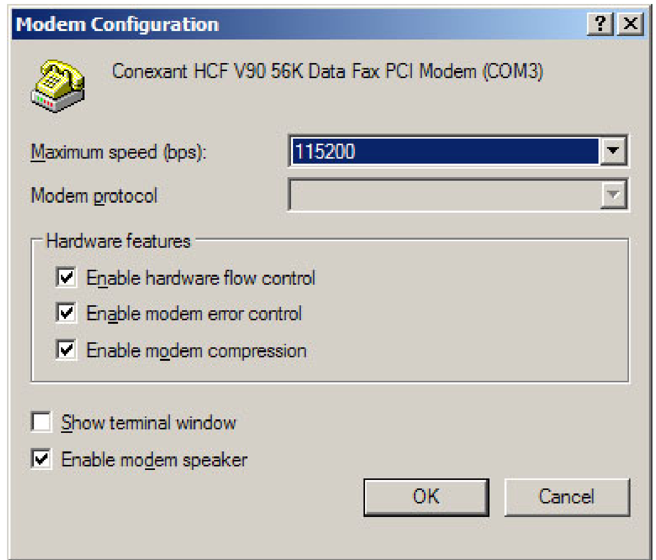
f) Check "Enable hardware flow control."

g) Check "Enable modem error control."

h) Check "Enable mcdem compression."

i) Make sure that no other box is checked.

j) Click "OK."



k) Select the Networking tab.

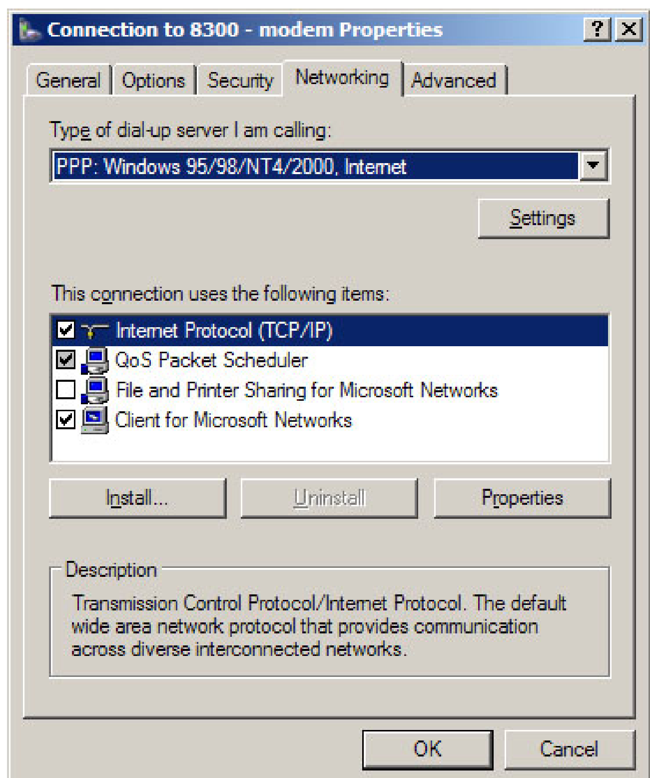
l) Make sure that "PPP: Windows 95/98/NT4/2000, Internet" ap–pears in the "Type of dial-up server I am calling" field.

m)Make sure that "Internet Protocol (TCP/IP) is checked.

You may leave "Client for Microsoft Networks" checked if you like.

n) Click "OK."

o) When the "Connection properties" window ap-pears, click "OK."

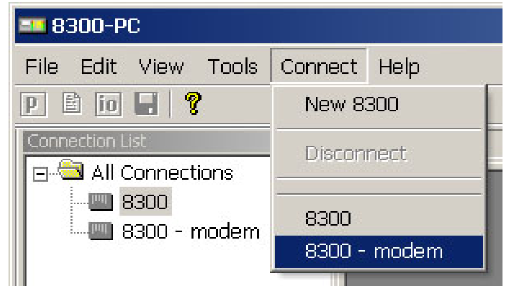


2. Launch an existing Windows XP modem connection.

Once you have set up a "connection" specifying a modem connection in the 8585 PC Remote application (see *To set up a new connection* on page 3-65), choosing this connection from 8585 PC Remote automatically opens a Windows modem connection to your 8585.

You can connect by selecting the desired connection from the drop-down list in the CONNECT menu.

You can also connect by double-clicking the connection in the "Connection List" window.



If the connection is successful, a dialog bubble will appear on the bottom right hand corner of the screen verifying your connection.

If you have trouble making a connection, refer to *Troubleshooting Windows XP Modem Connect* on page 5-12. If you have trouble the first time after creating a connection according to the instructions above, try restarting your computer to clear its serial port.

3. **To change the properties of an existing connection:**

   Right-click the connection in the "connection List" window and choose "Properties." The "Connection properties" window opens (see page 2-70).

Updating your 8585's Software

The software version number of PC Remote must be the same as the version number of the software running within your 8585. If the software version of PC Remote is higher than the version running in your 8585, PC Remote will automatically detect this and will offer to update your 8585's software automatically.

1. **If you have not already done so, prepare your computer and the 8585 for a direct serial, modem, or Ethernet connection.**

   See *Networking and Remote Control* starting on page 2-49.

2. **Install the latest version of 8585 PC Remote software on your computer.**

   This is available from

   ftp://orban.com/8585

   See *Installing 8585 PC Remote Control Software* on page 2-55.

   See the readme8585_x.x.x.x.htm file (where x.x.x.x is the version number) for details about the upgrade not given in this manual. The PC Remote installer will install this file on your computer's hard drive.

3. **If you have not previously done so, start 8585 PC Remote and set up a "connection" to the 8585 you will be updating.**

   See *To set up a new connection* on page 3-65.

4. Update your 8585.

We strong recommend that your computer and 8585 be powered from a UPS when updating.

A) Attempt to initiate communication to your 8585 via your connection.

See ***To initiate communication*** on page 3-65.

8585 PC Remote will automatically detect that the 8585 software version on your 8585 is lower as the version of 8585 PC Remote. PC Remote will then offer to update your 8585 automatically.

This procedure will only work for a connection using an "all-screens" (administrator) passcode.

B) Choose YES and wait for the update to complete. *Note that the audio will be interrupted for approximately three seconds when your 8585 reboots automatically after the update is complete.* If you cannot tolerate such an interruption, choose NO or CANCEL to abort the update.

Please be patient; this will take several minutes. (The exact time will depend on whether the 8585 has to do any "housekeeping" to its flash memory as part of the update.)

Completion will be indicated by the updater's command-line window's closing automatically and your 8585's rebooting.

Your 8585 will continue to pass audio normally while the update is occurring. *However, the audio will be interrupted for approximately three seconds when your 8585 reboots.*

Do not interrupt power to your 8585 or your computer, close PC Remote or the update application's command-line window, or reboot your computer during this time. Doing any of these things will certainly cause the update to fail and might render your 8585 unbootable.

C) When the 8585 screen display returns after its automatic reboot, the 8585 will be running with the updated software.

If the update fails for some reason, try repeating the procedure in steps (0 through (C) again.

D) If the 8585 screen remains blank for more than one minute after the update has completed, manually reboot the 8585 by removing AC power from the 8585 for at least ten seconds and then powering the 8585 back up.

E) The 8585 software update is now complete. You should now be able to connect to your 8585 via PC Remote.

NOTE: If you cannot make a connection after a software upgrade, manually reboot the 8585 with a normal "power-off/power-on" sequence.

Section 3
Operation

8585 Front Panel

- **Headphone Jack** allows you to monitor various outputs of the processing through headphones. Headphone impedance should be 75Ω or higher.
- You can switch the headphone feed to emit the following processor output signals: LF, RF, C, LS, RS, LFE, LB, RB, STEREO L, STEREO R, L DOWNMIX, R DOWNMIX, LF/RF, C, LS/RS, LB/RB, STEREO, DOWNMIX. The first 12 signals are monophonic and are sent to both earpieces. The remaining signals are stereo.

  This control is located on the INPUT/OUTPUT > OUTPUT 5 screen.
- **Headphone Level Control** (the small blue control knob to the right of the jack) adjusts headphone output level.
- The red **Enter** button allows you to choose pop-up menu items, icons and buttons. If you are in the Preset screen, it allows you to put a Factory or User Preset on-air once you have selected it.

  If you edit a Factory Preset, you must save it as a new User Preset to retain your edit permanently. Even if not saved, your edited preset will be retained automatically even if the 8585 is powered down and will be restored on-air upon power-up. If not saved, your edited preset will appear in the RECALL list of available presets as the name of its parent present prefixed by the abbreviation "modif" (for "modified").

  However, if you edit another preset, your old edited preset will be lost—the 8585 automatically retains only one "modified" preset. Therefore, it is wise to rename and save any edited preset you wish to keep, using the 8585's SAVE main menu item. This ensures that your edited preset will not be overwritten accidentally.
- The green joystick, labeled **Locate**, is a pointing device that allows you to locate to settings and controls on each screen. Some main menu items require multiple screens to show all controls. When multiple screens for a given main menu item are available, pressing and holding the knob left or right moves you between screens.
- A yellow **Escape** button allows you to navigate quickly to underlying screens, higher-level screens or the Meters screen and displays the pop-up menu.

When a pop-up item, like Menu, is onscreen, *ESCAPE* always returns you to the underlying screen.

Pressing *ESCAPE* from a secondary screen page, like System Setup > Place > Date > Time 1 takes you back to the top level; in this case, the System Setup screen.

ESCAPE from top-level screens (like the System Setup screen), brings you back to the Meters screen. (If you are already in the Meters screen, *ESCAPE* displays the pop-up Menu.)

- The **Control Knob** is the large blue knob on the front panel. Turning the knob scrolls through displayed lists (like the Preset screen list) or changes a setting that is highlighted onscreen (e.g., the setting last selected by the *Locate* joystick). Pushing the knob in towards the front panel displays the pop-up Menu over the previous screen.
- **Screen Display** supplies control setting information and screen help and displays the gain reduction and level meters (described directly below). In general, separate meters are shown for the multiband and 2.0 (if active) processing.

  The 8585's screen displays the following information, meters and indicators:

  - Which hardware inputs (1/2, 3/4, 5/6, 7/8, 9/10, and 11/12) have valid AES3id signals applied to them (indicated by their being displayed in yellow) and which do not (indicated by their being displayed in red).
  - The current date and time according to the 8585's internal clock.
  - The active processing Preset.
  - The active Setup.
  - The multiband processor's active input (main or backup).

    If you have programmed silence sense to switch the input of the surround processing between two inputs automatically, this indicates if the backup input was activated.
  - IN meters show the peak input level applied to the inputs of each of the 8585's processing channels (up to 7.1) as determined by input routing switcher settings in I/O SETUP. 0 dB = digital full-scale.
  - AGC meters show the gain reduction of the slow AGC processing that precedes the multiband compressor (two-band or five-band). Full-scale is 25 dB gain reduction.

    Because the AGC is a two-band unit with Orban's patented bass coupling system, the two meters indicate the gain reduction of the AGC Master and Bass bands.

    The AGC gains of the surround processing are always stereo-coupled using power (r.m.s.) summation. Therefore, only one gain reduction meter is required for each band. However, the AGC in the 2.0 processing can be adjusted to be fully stereo-coupled, independent, or anywhere in between. Hence, the 2.0 processing's AGC meters are split so that the left and right gain reduction (or channel 1/channel 2 gain reduction in dual-mono mode) are both displayed.

- GATE indicators show silence gate activity. They light up when the input audio falls below the threshold set by the gate threshold controls. For a given processor (surround or 2.0), there are two gates—one for the AGC and one for the multiband limiter—each with its own GATE THRESHOLD control. When gating occurs, the AGC and compressor's recovery times are slowed drastically to prevent noise rush-up during low-level passages.

- MULTIBAND GAIN REDUCTION meters show the gain reduction in the multiband compressors. Full-scale is 25 dB gain reduction. These meters are split, showing main gain reduction (the GR applied all channels but the center) to the left and center channel gain reduction to the right. See *Multiband* starting on page 3-10 for an explanation of how the main and center compressors are coupled.

- LIMITER GAIN REDUCTION meters show how much gain reduction the 8585's look-ahead limiters are producing.

- OUT meters indicate the instantaneous peak output level at the output of the 8585's audio processing before the SURROUND OUTPUT 100% or 2.0 OUTPUT 100% controls.

- HF ENHANCER METERS show how much dynamic high frequency boost the 8585's HF Enhancer is providing.

- LOUDNESS LEVEL meter shows the subjective loudness of the output, measured using the 1981 Jones & Torick CBS Technology Center algorithm. (See page 1-16 for a discussion of this algorithm.)

  There is only one meter for the surround processing and one meter for the 2.0 processing (in stereo mode) because regardless of the number of channels and loudspeakers in the listening room, a given listener has only one perception of loudness. When the 2.0 processing is operated in dual-mono mode, there is one LOUDNESS LEVEL meter for each mono channel.

  The meter for a given processing chain is calibrated with reference to the Dolby Digital® Dialnorm value that you specify in the 8585's active Setup for that processing chain. (See step 9 on page 2-13.) If you adjust the processing so that the Loudness Level meter peaks at 0 dB on dialog and you set up your Dolby Digital encoder so that that you are transmitting this same Dialnorm value to consumer receivers, your transmission will have the correct loudness compared to other correctly set up transmission channels.

- LOUDNESS GAIN REDUCTION shows the amount of gain reduction that the 8585's CBS Loudness Controller is producing.

Introduction to Processing

Some Audio Processing Concepts

Reducing the peak-to-average ratio of the audio increases loudness. If peaks are reduced, the average level can be increased within the permitted modulation limits. The effectiveness with which this can be accomplished without introducing objectionable side effects (like pumping or intermodulation distortion) is the single best measure of audio processing effectiveness.

Compression reduces the difference in level between the soft and loud sounds to make more efficient use of permitted peak level limits, resulting in a subjective increase in the loudness of soft sounds. It cannot make loud sounds seem louder. Compression reduces dynamic range relatively slowly in a manner similar to riding the gain. Limiting and clipping, on the other hand, reduce the short-term peak-to-average ratio of the audio.

Limiting increases audio density. Increasing density can make loud sounds seem louder, but can also result in an unattractive busier, flatter, or denser sound. It is important to be aware of the many negative subjective side effects of excessive density when setting controls that affect the density of the processed sound.

Clipping sharp peaks does not produce any audible side effects when done moderately. Excessive clipping will be perceived as audible distortion.

Look-ahead limiting is limiting that prevents overshoots by examining a few milliseconds of the unprocessed sound before it is limited. This way the limiter can anticipate and control peaks that are coming up.

In Dolby Digital transmission channels, appropriate setting of the DIALNORM metadata parameter will allow enough headroom to keep peak levels below the threshold of the 8585's look-ahead peak limiters. The best sounding limiting is no limiting at all.

Distortion in Processing

In a competently designed processor, distortion occurs only when the processor is controlling peaks to prevent the audio from exceeding the peak modulation limits of the transmission channel. The less peak control that occurs, the less likely that the listener will hear distortion. However, to reduce the amount of peak control, you must decrease the drive level to the peak limiter, which causes the average level (and thus, the loudness) to decrease proportionally.

Loudness and Distortion

In processing, there is a direct trade-off between loudness and distortion. You can improve one only at the expense of one or both of the other two. Thanks to Orban's psychoacoustically optimized designs, this is less true of Orban processors than of any others. Nevertheless, all intelligent processor designers must acknowledge and work within the laws of physics as they apply to this trade-off.

In AM and FM processing, we have long said that there is a direct trade-off between loudness, *brightness*, and distortion, However, because DTV, DAB and netcasting systems don't use preemphasis, there is no problem getting the audio to sound bright and the trade-off is only between loudness and distortion.

Perhaps the most difficult part of adjusting a processor is determining the best trade-off for a given situation. We feel that it is usually wiser to give up ultimate loudness to achieve low distortion. A listener can compensate for loudness by simply adjusting the volume control. However, a listener cannot make an excessively compressed or peak-limited signal sound clean again.

If processing for high quality is done carefully, the sound will also be excellent on small receivers. Although such a signal might fall slightly short of ultimate loudness, it will tend to compensate with an openness, depth, and punch (even on small speakers) that cannot be obtained when the signal is excessively squashed.

If women form a significant portion of the station's audience, bear in mind that women are more sensitive to distortion and listening fatigue than men are. In any format requiring long-term listening to achieve market share, great care should be taken not to alienate women by excessive stridency, harshness, or distortion.

Processing for Low Bit Rate Codecs

8585's Five-Band processing includes PreCode™ technology to minimize codec artifacts. To exploit PreCode technology fully (minimizing "phasey" and "underwater" artifacts in low bit rate codecs), do not set up OPTIMOD 8585 for very bright sound (with large amounts of high frequency energy) because this is likely to exacerbate artifacts. Some appropriate presets include JAZZ, SMOOTH JAZZ, GOLD, ROCK SOFT, and the CLASSICAL presets. Avoid presets like CRISP and EDGE; these are very bright-sounding presets and are more appropriate for uncompressed channels or compressed channels with relatively high bit rates (64 kbps or higher for the aacPlus V2 codec used in Opticodec-PC, for example).

The 8585's sound-for-picture (TVXXXX) presets are all conservative and will not stress properly designed codecs like Dolby AC3 and MPEG4 AAC.

The 8585 has several controls whose settings determine brightness. To minimize brightness when using the Five-band structure:

- Use little or no high frequency boost in the equalization section.
- Set Band 4>5 coupling to 100%.
- Set the band 5 compression threshold to match the codec. Adjust the threshold until you find a good compromise between presence and high frequency codec artifacts. We find the range from –6.0 to +6.0 dB to be useful.
- Use a moderate Band 5 attack time. 25 ms works well.
- If necessary, lower the Band 4 compression threshold.

Starting with one of our suggested presets will help keep you out of trouble when you edit them to create user presets.

We have supplied several presets tuned for the Microsoft WMA (V9) at 32 kbps in stereo. This codec has severe artifacts at this bitrate and no preprocessing can mask them completely. The 8585's WMA presets strictly limit the amount of high frequency energy applied to the codec. To prevent the processing from adding L–R energy, these presets operate with full stereo coupling and without stereo enhancement.

The 8585's ability to maintain source-to-source spectral consistency is also an important advantage. Once you have set up the processing to minimize codec artifacts caused by a given piece of program material, the 8585 will automatically minimize codec artifacts with any program material.

Speech/Music Detector

The Speech/Music Detector allows the 8585 2.0 processing to change its processing parameters depending on whether the input program material is speech or other material (usually music).

The algorithm is straightforward: Speech is detected if (1) the input is mono (for the 2.0 processing) or in the center channel (for the surround processing), and (2) there are syllabic pauses at least once every 1.5 seconds. In the 2.0 channel processor, speech with a stereo music background will usually be detected as "music," or the detector may switch back and forth randomly if the stereo content is very close to the stereo/mono detector's threshold. Mono music with a "speech-like" envelope may be incorrectly detected as "speech." Music incorrectly detected as "speech" will exhibit a slight loss of loudness and punch, but misdetection will never cause objectionable distortion on music.

Speech that is not located in the center of the stereo sound field will always be detected as "music" because the detector always identifies stereo material as "music."

The 8585's surround processing handles speech differently. It does not use an automatic speech/music detector, instead assuming that speech is mainly located in the center channel. The center channel compressor in each frequency band can be tuned differently than the compressors for the remaining channels, which are coupled to preserve imaging. Main-to-center channel coupling controls allow you to set the maximum permitted gain difference between the center channel and the remaining channels.

Sound-for-Picture Applications: Controlling Dynamic Range

The most crucial commandment in sound for picture is this: *dialog must always be intelligible.* Sound for picture is usually heard under less-than-ideal conditions and its dynamic range must be controlled accordingly. Apartment-dwellers must set their volume controls to avoid disturbing neighbors or even other members of the family. At the quiet side, intelligibility of dialog is often impacted by environmental noise like children playing or a dishwasher going in the kitchen.

When one considers that the hearing acuity of a significant portion of the audience is somewhat impaired compared to that of a healthy 20-year-old, one concludes that *the dynamic range of dialog must not exceed 15dB* if it is to be intelligible to 99% of viewers under common domestic viewing conditions. Moreover, research has revealed a "comfort zone" (within which viewers will not adjust the volume controls of their receivers) that is even smaller: +2 to –5 dB as measured on a subjective Loudness Level meter like the 8585's CBS Loudness Level meter or ITU BS.1770. Feature-film dynamic range is inappropriate for home viewing (except in dedicated home theaters) and the dynamic range of a significant portion of video source material must be compressed to best serve the audience. The challenge (which Optimod 8585 effectively meets) is to control dynamic range unobtrusively.

OPTIMOD 8585 can be adjusted so that the output sounds as close as possible to the input at all times (using the Two-Band Protection Limiter preset), *or* so that it sounds open but more uniform in frequency balance than the input (using the Two-Band structure or running the Five-Band Structure with slow release time), or so that it sounds dense, quite squashed, and very loud (using the Five-Band Structure with faster release times).

In television audio, inconsistent loudness between channels or program elements is annoying, so the dense, loud setup is never appropriate. The 8585 offers two-band and five-band presets (whose names begin with "TV") that exploit the AGC's and multiband compressor's compression ratio controls to subtly control dynamic range in sound for picture applications. These presets effectively and unobtrusively maintain dialog intelligibility while retaining a sense of dynamic range, allowing low-level elements to be heard easily. Meanwhile, the CBS Loudness Controller prevents subjective loudness from exceeding a preset ceiling.

The preset tuning controls on the 8585 give you the flexibility to adapt the processing to individual program segments. In most cases, your goal should be to choose the type of processing that best optimizes dynamic range while controlling the loudness of the loudest sounds so that they are not irritating and are consistent with the loudness of other stations or sources. When the 8585 is otherwise set up correctly (so that it is cognizant of the DIALNORM metadata you are transmitting to viewers), its TVxxxx presets achieve this goal most precisely by exploiting the loudness controller. The "radio-style" presets are crafted to match the target loudness as well as can be achieved without use of the loudness controller.

> If you want more consistent loudness from a "radio-style" preset, set its LOUDNESS CONTROLLER THRESH control to –10 dB, turn up its MB LIMITER DRIVE control until the loudness controller gain reduction meter indicates about 3 dB of gain reduction with typical program material, and save the result as a user preset.

Optimod 8585 in Audio-Only Applications: From Bach to Rock

The 8585 can be adjusted so that the output sounds:

- as close as possible to the input at all times (using the Two-Band Protection Limiter preset)
- open but more uniform in frequency balance (and often more dramatic) than the input (using the Two-Band structure or running the Five-Band Structure with slow release time)

- dense, quite squashed, and very loud (using the Five-Band Structure with faster release times)

The dense, loud setup will make the audio seem to jump out of car and table audio systems but may be fatiguing and invite tune-outs on higher quality home receivers. The loudness/distortion trade-off explained above applies to any of these setups.

In professional broadcasting environments, you will achieve best results if Engineering, Programming, and Management go out of their way to communicate and cooperate with each other. It is important that Engineering understand the sound that Programming desires, and that Management fully understands the trade-offs involved in optimizing one parameter (like loudness) at the expense of others (like distortion or excessive density).

Never lose sight of the fact that, while listeners can easily control loudness, they cannot make a distorted signal clean again. If such excessive processing is permitted to audibly degrade the sound of the original program material, the signal is irrevocably contaminated and the original quality can never be recovered.

About the 8585's Signal Processing Features

Simultaneous Stereo (2.0) and Surround (5.1 or 7.1) Processing

The 8585 can process stereo and surround programming simultaneously. You can set the processing parameters for the stereo and surround processors independently. The output of the stereo processing can be applied to its own look-ahead limiters and the output of these can be routed to the hardware output specified in the 8585's output routing switcher. Alternatively, the output of the stereo processing's multiband compressor and Loudness Controller can be mixed with the LF and RF surround signals immediately before the surround processing's LF and RF look-ahead limiters. The first scenario allows you to use the 8585 as two independent processors.

The 2.0 processing is similar to Orban's Optimod 8585 except that the 8585's stereo enhancer is omitted in the 8585. (For example, you might use the 2.0 processing to drive a low bitrate netcast or an ATSC subchannel.) The second scenario allows separate processing of locally originated 2.0 material before it is mixed with (for example) a surround feed from your affiliated network.

Signal Flow

The signal flows through the following main blocks in each of the 8585's processing sections (multiband and 2.0). (See page 6-67.)

- **Input Conditioning**, including sample rate conversion, defeatable highpass (2.0 processing only) and lowpass filters, and defeatable phase rotation

- **Two-Band Gated AGC**, with target-zone window gating and silence gating

- **Equalization**, including high-frequency enhancement
- **Multiband Compression** in either two or five bands, depending on the processing structure
- **Automatic Loudness Control** using Orban's third-generation CBS Loudness Controller™ algorithm
- **Look-Ahead Limiting**

Input Conditioning

A sample rate converter converts the sample rate at the digital input to the 8585's internal 48 kHz rate. This 48 kHz rate accommodates a 20 kHz audio bandwidth with a comfortably wide 4 kHz transition band for the anti-aliasing filter.

> We are aware of no bias-controlled double-blind studies that have ever demonstrated that sample rates higher than 48 kHz are audibly superior to 48 kHz (or even that there is any audible difference at all). Moreover, the noise and distortion produced by a given digital filter at 48 kHz is about 6 dB lower than the N&D produced by a filter having the same frequency response but operating at 96 kHz. The 8585 uses many digital filters, both in its equalizer section and for the crossovers in the multiband compressor. Hence, we believe that 48 kHz is the ideal rate for the 8585's audio processing.

A sharp phase-linear lowpass filter, a sweepable 18 dB/octave highpass filter, and a defeatable phase rotator complete the input-conditioning block. The lowpass filter can present overshoot due to spectral truncation when the 8585 is driving a link that cannot pass full 20 kHz audio bandwidth (like a 32 kHz sample rate link). The highpass filter is useful for production applications where it is necessary to remove low frequency rumble from a recording. The phase rotator makes speech more symmetrical, reducing its peak-to-average ratio by as much as 6 dB without adding nonlinear distortion. Hence, phase rotation can be very useful for loudness processing of speech.

Two-Band Gated AGC

The AGC is a two-band device, using Orban's patented "master/bass" band coupling. It has an additional important feature: target-zone gating. If the input program material's level falls within a user-settable window (typically 3dB), then the release time slows to a user-determined level. It can be slow enough (0.5 dB/second) to effectively freeze the operation of the AGC. This prevents the AGC from applying additional, audible gain control to material that is already well controlled. It also lets you run the AGC with fast release times without adding excessive density to material that is already dense.

The AGC contains a compression ratio control that allows you to vary the ratio between 2:1 and essentially ∞:1. Lower ratios can make gain riding subtler on critical formats like classical and jazz.

The AGC has its own silence-gating detector whose threshold can be set independently of the silence gating applied to the multiband compressor.

The 2.0 AGC can be operated in left/right or sum-and-difference mode. You can set the coupling of the 2.0 AGC's two sidechains (left/right or sum-and-difference) anywhere from 100% stereo coupled to fully independent.

The surround AGC is always 100% stereo coupled. Its sidechain responds to the power sum (r.m.s. sum) of all inputs except for LFE channel.

> The LFE channel is excluded to prevent the LFE energy from audibly modulating the loudness of energy at higher frequencies. However, the gain of the LFE channel follows the gain of the AGC Bass band to keep it in balance with the rest of the spectrum.

The SURROUND OPTIMIZATION control for the active preset determines how the rear channels are weighted:

- SURROUND weights the rear channels 1.5 dB higher than the front channels to compensate for the ear's greater sensitivity to the loudness of these channels when reproduced in surround.
- STEREO weights the rear channels 3.0 dB lower than the front channels to reflect the fact that the default surround > stereo downmix contains each rear channel mixed at –3 dB.
- COMPROMISE weights the rear channels half way between SURROUND and STEREO.

Equalization

The 8585 has a steep-slope bass shelving equalizer and three bands of fully parametric bell-shaped EQ.

You can set the slope of the bass shelving EQ to 6, 12, or 18 dB/octave and adjust the shelving frequency.

The 8585's bass, midrange, and high frequency parametric equalizers have curves that were modeled on the curves of Orban's classic analog parametrics (like the 622B), using a sophisticated, proprietary optimization program. The curves are matched to better than 0.15dB. This means that their sound is very close to the sound of an Orban analog parametric. They also use very high quality filter algorithms to ensure low noise and distortion.

The 8585 HF Enhancer is a program-controlled HF shelving equalizer that intelligently and continuously analyzes the ratio between broadband and HF energy in the input program material. It can equalize excessively dull material without over-enhancing bright material. It interacts synergistically with the five-band compressor to produce sound that is bright and present without being excessively shrill. It can help improve dialog intelligibility. It is gated so that it does not amplify the program material's noise floor.

Multiband Compressor/Limiter

The multiband compressor/limiter can be operated in five-band or two-band mode. In five-band mode, each band compressor has a KNEE and RATIO control. A soft knee and gentle ratio are particularly useful in production and mastering applications, allowing subtle compression that retains as much of the dynamics of the input program material as the operator desires. These features are also exploited in the TV 2B DRAMA and TV 5B DRAMA presets.

Several band-coupling controls allow the gain reduction of a given band's compressor to be affected by the gain reduction in its neighboring band's compressor. These coupling controls allow anything from quasi-wideband compression to fully independent multiband compression.

A clipper, embedded in the crossover, protects bands 1 and 2 from transient overshoot. This clipper has a shape control, allowing you to vary the "knee" of its input/output transfer curve from hard (0) to soft (10).

Each band in the 2.0 multiband compressor has two sidechains—one for the left and one for the right channel. You can separately set the left/right coupling of each band anywhere from 100% stereo coupled to fully independent.

The surround multiband compressor is always stereo coupled and has two main sidechains.

- *The first surround sidechain responds to the power (r.m.s.) sum of all channels.* However, to prevent sibilance in the center channel from ducking high frequencies in the remaining channels, the center channel does not affect the gain reduction in bands 4 and 5.

  As in the AGC, the SURROUND OPTIMIZATION control for the active preset determines how the rear channels are weighted in the r.m.s. sum.

  This sidechain applies the slow "compression" component of the gain reduction identically in all channels except for the center. However, each channel also has an individual "limiting" function that is not stereo coupled. This prevents fast transients in one channel from audibly modulating the gains of the other channels. Because this "limiting" function operates quickly, it does not affect stereo imaging.

  > Do not confuse this "limiting" function with the 8585's look-ahead limiter, which is located after the Loudness Controller in a given processing chain and which has much faster attack and release times.

- *The second surround sidechain responds to the center channel alone*. It provides both a "compression" and "limiting" function.

  The dual-sidechain architecture's main application is to improve dialog intelligibility by preventing strong energy in the non-center channels from drowning out dialog in the center channel even when the original mix was miscalculated. To achieve this, the center channel's gain sometimes needs to be increased with respect to the other channels and the dialog needs to be re-equalized automatically by multiband compression. Moreover, this dual-sidechain architecture permits the multiband compressor to de-ess center channel dialog as necessary without affecting the other channels.

  Completely independent compression of the dialog channel can cause unnatural-sounding level imbalances between the dialog and the remaining program elements. To address this, there are two coupling controls for each frequency band in the multiband compressor. These coupling controls work by constraining the difference (in dB) between the center channel's gain reduction and the main channel's gain reduction. To do this, they clamp the center channel's gain reduction with respect to the main channel but do not affect the gain reduction in the main channel. In other words, the center channel's gain reduction is either the output of the center channel's compression sidechain or a fixed offset from the main channel's gain reduction. There are separate controls to set the maximum positive and negative offsets. The constraints are applied to the entire center gain reduction signal (compression plus limiting).

To preserve intelligibility, it is important to prevent the center channel's gain reduction from becoming too large with respect to the other channels. The BX MAIN>CENTER MAX +DELTA GR control sets the maximum positive gain reduction difference in each band. When the five-band structure is used, it is common to set this control to 0 dB in Bands 1-3. To facilitate de-essing (and because Bands 4 and 5 in the center channel do not contribute to the gain reduction in the main sidechain), we recommend setting the B4 and B5 MAIN>CENTER MAX +DELTA GR controls to allow some extra gain reduction to occur in center channel Bands 4 and 5. It is OK to set this control to OFF in Band 5, which allows unconstrained de-essing above 6 kHz. The TVxxxx factory presets provide examples.

Meanwhile, a BX MAIN>CENTER MAX –DELTA GR sets the maximum negative gain reduction difference in each band, which constrains the amount of dynamic dialog boost. It also constrains the degree to which the center channel compressor can pull up noise. If there are program elements other than dialog panned into the center channel, the control constrains the amount by which the front stereo image can be narrowed. 3 dB is a typical setting.

- The 2.0 processing architecture is intrinsically dual mono but allows stereo coupling of the AGC and multiband gain reductions as well as the AGC and compressor gates. If 2.0 PROC MODE control in the CHANNEL page of the active Setup sets is set to DUAL MONO, all stereo coupling is turned off and two LOUDNESS LEVEL meters, AGC GATE indicators, and MB GATE indicators appear.

  In STEREO mode, there is one LOUDNESS LEVEL meter, AGC GATE indicator, and MB GATE indicator. However, you can still uncouple each band in both the AGC and multiband compressors to a variable extent—anywhere from perfect stereo coupling to completely uncoupled operation. The coupling control determines the maximum amount of gain difference permitted between the left and right channels in a given band and therefore the amount of stereo image shift permitted in each frequency band.

  Although the processing architecture is dual-mono, you cannot adjust setup controls independently on the left and right channels. For most sound-for-picture applications, this is not a significant constraint.

LFE Processing

The LFE channel has its own dedicated compressor with ATTACK TIME and THRESHOLD controls. Its other settings (such as RATIO and BREAKPOINT) track the settings of the B1 (5-band mode) or Bass Band (two-band mode) compressor. To constrain build-up of LFE energy, the B1>LFE COUPLING control clamps the maximum gain of the LFE channel with respect to the band 1 compressor in five-band mode and the Bass band in two-band mode. For example, when this control is set to 3 dB (the factory default) and the B1 compressor exhibits 12 dB of gain reduction, the LFE channel can never have less than 9 dB of gain reduction even if the LFE compressor would have produced less than 9 dB of gain reduction if uncoupled.

Low-IM Look-Ahead Limiter

The 8585's peak limiter prevents overshoots by examining a few milliseconds of the unprocessed sound before it is limited. This way the limiter can anticipate peaks that are coming up.

Dialnorm and Limiting: Unlike some familiar compressors and limiters (whose gain reduction is adjusted via threshold controls), the 8585 limiter's threshold is fixed with respect to the input of the 8585's digital output level control so the limiter's drive level solely determines the gain reduction. Two cascaded gain controls set this drive level. One is MB LIMIT DRIVE; the second is a "hidden" control whose gain is set by the 8585's active DIALNORM value. In the transmitted Dolby Digital bitstream, setting DIALNORM to a less negative value automatically turns down the home receiver's volume control, so the 8585's output level must be turned up by the same amount to maintain a constant loudness at the receiver. Because it is placed before the 8585's look-ahead limiter, the 8585's hidden DIALNORM gain control achieves this while allowing the 8585's look-ahead limiter to prevent digital clipping in the downstream transmission chain regardless of the 8585's DIALNORM setting. This arrangement allows the user to set the correct loudness at the 8585's output solely by adjusting the 8585's active DIALNORM value—it is unnecessary to adjust any other controls within a preset, so all presets (including User Presets) automatically adapt to the 8585's current DIALNORM value.

Look-Ahead Limiting and Low Bitrate Codecs: It is important to minimize audible peak-limiter-induced distortion when one is driving a low bitrate codec because one does not want to waste precious bits encoding the distortion. Look-ahead limiting can achieve this goal; hard clipping cannot.

> One can model any peak limiter as a multiplier that multiplies its input signal by a gain control signal. This is a form of amplitude modulation. Amplitude modulation produces sidebands around the "carrier" signal. In a peak limiter, each Fourier component of the input signal is a separate "carrier" and the peak limiting process produces modulation sidebands around each Fourier component.
>
> Considered this way, a hard clipper has a wideband gain control signal and thus introduces sidebands that are far removed in frequency from their associated Fourier "carriers." Hence, the "carriers" have little ability to mask the resulting sidebands psychoacoustically. Conversely, a look-ahead limiter's gain control signal has a much lower bandwidth and produces modulation sidebands that are less likely to be audible.
>
> Simple wideband look-ahead limiting can still produce audible intermodulation distortion between heavy bass and midrange material. The look-ahead limiter in your Optimod uses sophisticated techniques to reduce such IM distortion without compromising loudness capability.

Loudness Control

The 8585's third-generation CBS Loudness Controller follows the multiband compressor in the 8585's signal flow diagram. However, it takes into account the effect of the following look-ahead limiter so that it effectively monitors the loudness at the limiter's output, not the loudness at the multiband compressor's output. It does so by scaling its sidechain drive by two gain factors: (1) the MB LIMIT DRIVE control and (2) the 858's active DIALNORM value, which is determined either globally or by the active preset depending on the active preset's DIALNORM setting. (See *Low-IM Look-Ahead Limiter* on page 3-13.)

The loudness controller constrains the loudness of most commercials well enough to eliminate viewer annoyance. It works by constantly monitoring the subjective loudness of the 8585's output. The subjective loudness is a single value that represents the listener's impression of the loudness in the listening room. It takes into account the contribution of all stereo and surround channels.

When subjective loudness would otherwise exceed the threshold set by the LOUDNESS THRESHOLD control, the loudness controller reduces the gain of material above 200 Hz, preventing loudness from exceeding the threshold. To prevent the loudness controller from causing too much dynamic bass boost, you can use the LOUDNESS CONTROLLER BASS COUPLE control to limit the maximum difference between the gain of the band below 200 Hz and the band above 200Hz. For example, when this control is set to 3 DB and the loudness controller's gain reduction is 10 dB, the gain reduction below 200 Hz will be 7 dB. However, if the loudness controller's gain reduction is 2 dB, the gain reduction below 200 Hz will be 0 dB because the difference is now less than 3 dB.

The loudness controller is triggered mainly by program material that has a lot of energy between 1 and 7 kHz, which is the ear's most sensitive range. If you are using the two-band structure and you find that the loudness controller is producing audible artifacts because the program forces it to do a great deal of gain reduction, we suggest that you use the five-band structure instead. This will automatically re-equalize such program material and will de-ess extremely sibilant program material before the loudness controller receives it.

The loudness controller's attack and release times are tuned to match the loudness integration times of the ear and are program-adaptive. Only the attack time is user-adjustable.

If you feel that the loudness controller is not controlling the loudness of commercials or other subjectively loud program material sufficiently well, you may wish to set the threshold lower, forcing the loudness controller to do more work. Conversely, if the loudness controller is doing more gain reduction that you would like, you can set the LOUDNESS THRESHOLD control higher.

The loudness controller produces both fast and slow loudness control; the fast control rides on top of the slow control. You can easily see this dual-speed operation on the LOUDNESS GR meter. The LOUDNESS ATTACK control determines how much fast control the loudness controller produces. As the control is turned down toward 0%, it allows longer and longer loudness peaks to pass through.

Because of the system topology, the 8585's loudness level meter assumes that the LOUDNESS ATTACK control is always set to 100% and does not indicate the effect of lower settings. As long as the control is set to 50% or higher, this limitation should not have any material effect on the loudness level meter's accuracy. However, it is wise to double-check the effect of the LOUDNESS ATTACK control on subjective loudness by listening tests and/or use of an external loudness level meter like the free Orban Loudness Meter for Windows, which uses the same algorithm as the 8585's built-in loudness level meter (www.orban.com/meter). The free Orban meter is a two-channel device, but you can use it to assess the effect of the LOUDNESS ATTACK control by testing with stereo program material applied to the 8585's Lf and Rf inputs.

The loudness controller may reduce the dramatic effect of certain sounds in entertainment programming, like gunshots, explosions, or screeching tires. Operators may therefore want to turn the loudness controller on during commercial breaks and off during normal programming. All sound-for-picture presets have the Loudness Controller on. The easiest way to handle this situation is to start with your preferred preset, turn the loudness controller off, and then save the result as a User Preset. Using one of the 8585's remote control mechanisms (like its GPI inputs), recall the "with loudness controller" and "without loudness controller" presets as desired.

Turning down the LOUDNESS ATTACK control provides another way to maintain the dramatic impact of loudness transients in dramatic programming; it can let gunshots and the like through while still constraining long-term loudness to a fixed threshold. While this is an easy solution that does not require your automation system to tell the 8585 when to recall presets, it is not ideal because there are some short-term loudness events, like sibilance, applause, and whistles, that can be annoying to audiences.

In surround mixes with dialog mainly in the center channel, you can effectively control sibilance with the center channel Band 4 and Band 5 compressors. In the 2.0 processor, you can use the Speech-Mode B4 and B5 compressor threshold controls to accomplish the same goal.

Another loudness control strategy is this: Instead of using two presets with and without loudness control (as described above), you can create presets with different settings of the LOUDNESS ATTACK control (and possibly different settings of the LOUDNESS THRESHOLD control as well). Try a slow attack (50% or below) for dramatic programming and a faster attack (70%) for commercial breaks. This will maintain some automatic loudness control for dramatic programming while controlling the loudness of commercial breaks more rigorously.

Note that the loudness controller operates with reference to an absolute subjective loudness threshold that does not adapt to program context. This means that if there is a transition between very quiet program material (like footfalls through rustling leaves) and a commercial, the commercial may *still* seem offensively loud even though the loudness controller is controlling its loudness correctly with reference to other sounds that reach full-scale loudness. Philosophically, this is inevitable; the loudness controller cannot reduce the level of the commercial to the level of rustling leaves without destroying the effectiveness of the commercial and angering the sponsor!

Input/output Delay

The 8585's input/output time delay is typically 25 ms—about three-quarters of an NTSC frame. To make intelligent decisions about how to process, the 8585 needs to look ahead at the next part of the program waveform. As digital transmission processing advances further and further from its analog roots, this is the inevitable price of progress.

A 25ms audio delay does not cause annoying lip-sync problems by itself. However, to facilitate maintaining lip-sync in systems, the 8585 allows you to pad the delay to exactly one frame of 24, 25, or 29.97 fps video, which makes matching audio and video delays convenient. See step 13 on page 3-17.

Customizing the 8585's Sound

The subjective setup controls on the 8585 give you the flexibility to customize your station's sound. Nevertheless, as with any audio processing system, proper adjustment of these controls consists of balancing the trade-offs between loudness, density, and audible distortion. The following pages provide the information you need to adjust the 8585 controls to suit your format, taste, and competitive situation.

When you start with one of our Factory Presets, there are three levels of subjective adjustment available to you to let you customize the Factory Preset to your requirements: Basic Modify, Intermediate Modify, and Advanced Modify.

See page 6-67 for a block diagram of the processing.

Basic Modify

BASIC MODIFY allows you to control two important elements of 8585 processing: the equalizer and the dynamics section (multiband compression, limiting, and clipping). At this level, there is only one control for the dynamics section: LESS-MORE, which changes several different subjective setup control settings simultaneously according to a table that we have created in the 8585's permanent ROM (Read-Only Memory). In this table are sets of subjective setup control settings that provide, in our opinion, the most favorable trade-off between loudness, density, and audible distortion for a given amount of processing. We believe that most 8585 users will never need to go beyond the LESS-MORE level of control because the combinations of subjective setup control settings produced by this control have been optimized by Orban's audio processing experts on the basis of years of experience designing audio processing and upon hundred of hours of listening tests.

Unlike other the LESS-More control in other Optimods, the 8585's LESS-MORE control is designed to always maintain the target loudness that the active Dialnorm value specifies. In general, the LESS-MORE control sets the average amount of dynamic range control provided by the processing, although the spectral balance also changes in some of the "radio-style" presets. As you go from less to more, the loudness of loud sounds will stay about the same but the loudness of quieter sounds will increase. Because of the 8585's sophisticated gating circuits, very quiet material like background sounds, quiet underscoring, hiss, and hum will not be pumped up.

You need not (in fact, cannot) create a sound entirely from scratch. All User Presets are created by modifying Factory Presets or by further modifying Factory Presets that have been previously modified with a LESS-MORE adjustment. It is wise to set the LESS-MORE control to achieve a sound as close as possible to your desired sound before you make further modifications at the Advanced Modify level. If you do so, any changes you make at this level are likely to be smaller and to require resetting fewer controls.

In the 8585, LESS-MORE affects only the dynamics processing (compression, limiting, and clipping). Unlike some of Orban's older digital processors, the 8585's equalization and stereo enhancement are decoupled from LESS-MORE. You can therefore change EQ or stereo enhancement and not lose the ability to use LESS-MORE. When you create a user preset, the 8585 will automatically save your EQ and stereo enhancement settings along with your LESS-MORE setting. When you recall the user preset, you will still be able to edit your LESS-MORE setting if you wish.

Please note that when a given Factory or user processing preset's DIALNORM setting is GLOBAL, the 8585's global DIALNORM setting automatically scales its loudness at the 8585's output. If you want a given preset to produce a predictable loudness level in a non-Dolby transmission environment (particularly when the preset is exported to other 8585 units), you should set the processing preset's DIALNORM value to something other than GLOBAL. This will always override the active Setup's global DIALNORM setting. (See *Low-IM Look-Ahead Limiter* on page3-13 for a discussion of the series connection of the DIALNORM and LIMITER DRIVE controls.)

Intermediate Modify

Intermediate Modify is a compromise between Basic Modify and Advanced Modify. Most people will never have any reason to go beyond Intermediate Modify.

> Intermediate Modify does not provide LESS-MORE control. Furthermore, once you have edited a preset's dynamics parameters in Intermediate Modify, LESS-MORE control is no longer available in Basic Modify and will be grayed-out if you access its screen. As noted above, we recommend using the Basic Modify LESS-MORE control to achieve a sound as close as possible to your desired sound before you make further modifications at the Intermediate Modify level.

Advanced Modify

If you want to create a signature sound that is far out of the ordinary, if your taste differs from the people who programmed the LESS-MORE tables, or if you are using the 8585 in mastering or production applications, you will find Advanced Modify useful. At this level, you can customize or modify any subjective setup control setting to create a sound exactly to your taste. You can then save the settings in a User Preset and recall it whenever you wish. This sort of customization is usually unnecessary for sound for picture but can be very useful for radio and production applications.

Compressor attack time, knee, ratio, and threshold controls are available. These controls can be dangerous in inexperienced hands, leading you to create presets that sound great on some program material but overdrive the look-ahead peak limiter on other material, causing objectionable pumping or distortion. We therefore recommend that you create custom presets at the Advanced Modify level only if you are experienced with on-air sound design and if you are willing to take the time to double-check your work on many different types of program material.

> This constraint is less applicable to Dolby Digital transmissions that use conservative values of Dialnorm like –25 dB. In this case, the 8585's look-ahead limiters will rarely produce gain reduction, so you can adjust the compression parameters more freely without worrying that the limiters will be overdriven.
>
> In production and mastering applications, you will usually be working with one piece of program material at a time. Here, you can use all of Advanced Modify's power to get the sound you want without being concerned about how your settings will sound with other material.

The PC Remote software organizes its controls in tabbed screens. One set of tabs is for surround processing and the other is for 2.0 processing. The EQUALIZATION and LESS-MORE tabs in each set access the Basic Modify controls. The remaining tabs in each set combine the Intermediate Modify and Advanced Modify controls, logically organized by functionality.

> **Important Note:** Once you have edited a preset's dynamics parameters in Intermediate or Advanced Modify, LESS-MORE control is no longer available in Basic Modify. As noted above, we strongly recommend using the LESS-MORE control to achieve a sound as close as possible to your desired sound before you make further modifications at the Full or Advanced Modify levels.

Setting Preset Loudness Correctly for Dolby Digital Transmission

In sound for picture applications that use a Dolby Digital transmission channel to the consumer's receiver, you can use the 8585's LOUDNESS LEVEL meter as a reference for adjusting a user preset's loudness. This meter's calibration tracks the 8585's active DIALNORM value, which is either the DIALNORM value in the active Setup (which applies to any preset whose DIALNORM value is set to GLOBAL) or the DIALNORM value in the active processing preset if this value is not set to GLOBAL.

The controls to which the following procedure refers are described later in Section 3.

A) Make sure that the input reference level in the active preset is correctly adjusted (step 6 on page 3-10).

B) Make sure that the 8585's active DIALNORM value is the same as the Dialnorm value you are transmitting to consumers' receivers (step 9 on page 3-13).

C) *LOCATE* to ADVANCED CONTROL, which is where you can access the controls required to complete the steps below.

D) If the AGC is turned on in the preset, adjust the AGC DRIVE control so that the AGC is producing the desired amount of compression. We recommend 10 dB or less with normal levels.

E) If the AGC's idle gain (i.e. the gain reduction produced by the AGC when its silence gate is on) is inappropriate, adjust it with the AGC IDLE GAIN control.

> If you are using a factory processing preset and you have adjusted the input reference level correctly, there is no need to adjust the AGC DRIVE or AGC IDLE GAIN controls.

F) Adjust the MULTIBAND DRIVE or 2-BAND DRIVE control (depending on whether the five-band or two-band structure is active) to produce the desired amount of multiband gain reduction. We recommend about 5 dB for dialog at normal levels.

G) *If you wish to use the Loudness Controller:* Set the LOUDNESS THRESHOLD control to –10 dB, which matches its threshold to the 8585's active DIALNORM value. Then set the MB LIMIT DRIVE control to make the LOUDNESS GR meter indicate 3 dB of gain reduction with dialog at normal levels.

> You should see the LOUDNESS LEVEL meter peaking around 0 dB when the LOUDNESS GR meter shows that gain reduction is occurring

H) *If you do not wish to use the Loudness Controller: S*et the LOUDNESS THRESHOLD control to OFF. Then adjust the MB LIMITER DRIVE control to produce 0 dB peak indications on the LOUDNESS LEVEL meter with dialog at normal levels.

> Presets with the loudness controller off will produce wider source-to-source loudness variation (as indicated on the LOUDNESS LEVEL meter) than presets with the loudness controller on. When the loudness controller is off, the five-band structure will control loudness better than the two-band structure. When the loudness controller is on, both structures have comparable loudness control.

> If you chose an appropriate DIALNORM value for your transmission, the 8585's limiting meters should rarely indicate any gain reduction.

Gain Reduction Metering

Unlike the metering on some processors, when any 8585 gain reduction meter indicates full-scale (at its bottom), it means that its associated compressor has run out of gain reduction range, that the circuitry is being overloaded, and that various nastinesses are likely to commence. Because the various compressors have 25 dB of gain reduction range, the meter should never come close to 25 dB gain reduction if OPTIMOD 8585 has been set up for a sane amount of gain reduction under ordinary program conditions.

To Create or Save a Preset

There are two kinds of user presets in the 8585: Processing Presets and System Presets. Once you have edited a preset, you can save it as a user preset. The 8585 can store an indefinite number of user presets (typically more than 30), limited only by available memory.

The 8585 preserves any edited, unsaved preset until you recall another preset. This is true even if the 8585 is powered down or reboots. However, to ensure that you do not accidentally lose your work, it is wise to save as a User Preset any edited preset you want to keep. To save a preset:

A) Press the *ESCAPE* button repeatedly until you see the main menu.

B) *LOCATE* to SAVE/SAVE AS and press *ENTER*.

The SAVE PRESET screen appears.

- To save a Processing Preset, use the SAVE PRESET screen.
- To save a Setup, *LOCATE* to the SAVE SETUP screen, which is to the right of the SAVE PRESET screen.

C) Choose a name for your preset.

Some non-alphanumeric characters (like < and >) are reserved and cannot be used in preset names.

D) Use the "virtual keyboard" to create a preset name.

Use the *LOCATE* button to navigate to each character. Then press *ENTER* to accept that character.

The *SHIFT* key on the virtual keyboard changes it between upper and lower case.

E) *LOCATE* to the *SAVE* button and press *ENTER*.

- You cannot give a user preset the same name as a factory preset. If the name that you have selected duplicates the name of a factory preset, a warning box will appear saying:

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Factory presets cannot be overwritten.
```

- If the name you have selected duplicates the name of an existing user preset, the 8585 warns you that you are about to overwrite that preset. Answer YES if you wish to overwrite the preset and NO otherwise. If you answer NO, the 8585 will give you an opportunity to choose a new name for the preset you are saving.

You can save user presets from the 8585 PC Remote application. (See *Using the 8585 PC Remote Control Software* on page 3-64.) Please note that when you save presets from the PC Remote application, you save them in the 8585's memory (as if you had saved them from the 8585's front panel). The PC Remote application also allows you to *archive* presets to your computer's hard drive (or other storage device) and to restore them. However, archiving a preset is not the same as saving it. Archived presets reside on a storage medium supported by your computer, while saved presets reside in the 8585's local non-volatile memory. You cannot archive a preset until you have saved it. (See *To back up user presets, system files, and automation files onto your computer's hard drive* on page 3-67.)

Note that if, for some reason, you wish to save an unmodified preset (either Factory or user) under a new name, you must temporarily make an arbitrary edit to that preset in order to make the SAVE PRESET button appear. After you have saved the preset, reverse the edit and save the preset again.

About the Processing Structures

If you want to create your own User Presets, the following detailed discussion of the processing structures is important to understand. If you only use Factory Presets or if you only modify them with LESS-MORE, you may still find the material interesting but you do not need to understand it to get excellent sound from the 8585. We have carefully designed the 8585's factory presets and most users will not need to go beyond these.

In the 8585, a processing structure is a DSP configuration that operates as a complete audio processing system. There are three basic structures: **Two-Band, Five-Band,** and **Pass-Through**. To make transitions from one structure to the next as smooth as possible, the DSP computes all processing structures simultaneously but only one can be active in the foreground.

The surround and 2.0 processors are essentially independent and can use different structures. For example, the surround processor could be running the five-band structure while the 2.0 processor is running the two-band structure.

To select a structure for the Surround processing, recall a factory preset or user having the desired structure. If the 2.0 section of that preset has the wrong structure, change it by importing a factory or user preset whose 2.0 section has desired structure (see page 3-25). For example, if the TV 5B-GEN PURPOSE factory preset is active, importing the TV 2B-GEN PURPOSE preset will cause the 2.0 processing to change from five-band mode to two-band mode. Once you have the combination of structures you want, save the result as a User Preset, which you can leave unchanged or edit as you wish.

You cannot change the structures of the Surround or 2.0 sections of a given preset by editing them; the only way to choose a structure is to recall (Surround processing) or import (2.0 processing) a preset having that structure.

Switching Between Structures: The AGC, equalizer, and look-ahead limiter are common to both Two-Band and Five-Band processing and therefore stay the same when the 8585 switches between two-band and five-band operation. However, different controls, as appropriate for Two-Band or Five-Band multiband compression, appear in the screens containing dynamics processing controls. The meters also change functionality to display the Two-Band or Five-Band gain reduction.

The Two-Band and Five-Band multiband compressor sidechains are independent and always operate in the background. In the audio path, these structures both use the five-band crossover. Two-Band processing uses bands 2 through 5 as the Master band (above 200 Hz) by forcing their gains to be identical and controlling them with the two-band sidechain. Meanwhile, the Two-Band sidechain creates the Two-Band Bass band (below 200 Hz) by controlling band 1. Hence, switching between Two-Band and Five-Band can be made seamless because the audio chain's structure does not change; the only thing that changes is the gain control sidechain.

To ensure seamless switching between a given two-band and five-band preset, it is important to ensure that both presets are set up for approximately the same loudness or to switch them during silence.

Pass-Through: PASS-THROUGH is a "soft bypass" function and is useful for any program material that has been pre-processed for consistent loudness, like a network feed. PASS-THROUGH defeats the AGC and multiband compressor gain reduction but retains the look-ahead limiter (to prevent digital clipping), the equalizer, and the loudness controller. PASS-THROUGH does not change the audio path like the 8585's BYPASS function. Instead, PASS-THROUGH gain-ramps the AGC and compressor sidechains to produce the desired bypass gain. This ramping occurs within one video frame (approximately 30 ms). This gain ramping and the invariant audio path minimize the likelihood that invoking PASS-THROUGH will causes clicks in the audio when PASS-THROUGH is invoked during program material.

PASS-THROUGH'S most important parameter is the PASS-THROUGH GAIN control. In the factory PASS-THROUGH preset, the equalizer is available but is set "flat" while the Loudness Controller is available, but is set OFF.

> You can set the equalizer non-flat and save the result as a User Preset. Duplicating the equalizer settings of the active preset to or from which you switch may reduce the likelihood that switching to PASS-THROUGH will cause an audio click. However, clicks can only occur if you switch during active audio; you can prevent clicks by switching during silence like the boundary between two program elements. The downside of using non-flat equalization in PASS-THROUGH is that the equalization will color the program material intended for "pass-through," so it is usually not a good idea—switching during silence is far preferable.
>
> You can use the Loudness Controller to monitor and cap the maximum subjective loudness of program material that would ordinarily be passed through uncontrolled—a pathologically loud network commercial, for example.
>
> *Note:* LESS-MORE is not available in the PASS-THROUGH preset.
>
> *Note:* In the PASS-THROUGH preset, the equalizer is unavailable in v1.0 software. It will be made available in a future software release.

Five-Band: The Five-Band structure is very flexible, enabling you to fine-tune your on-air sound. All filters are phase-linear. Band 1 is lowpass, band 2 is highpass, and the remaining bands are bandpass. The Band 1↔2 crossover frequency is switchable between 100 and 200 Hz. The remaining crossover frequencies are fixed at 520 Hz, 1.8 kHz, and 6 kHz.

There are several Factory Presets for the Five-Band structure. You can edit these with the LESS-MORE control. This control affects the sound-for-picture-oriented presets differently than it does the music presets. When a sound-for-picture-oriented preset is on the air, the LESS-MORE control adjusts the average amount of gain reduction by adjusting the drive level to the Five-Band structure's input and adjusting the *idle gain*—the amount of gain reduction in the AGC when it is gated. (It gates whenever the input level to the AGC is below the setting of the AGC GATE THRESH control.) However, LESS-More does not change the loudness controller threshold; it just changes the amount of compression in the AGC and multiband compressor. Dialog at normal levels will still be consistent with the setting of the 8585's DIALNORM parameter. Hence, LESS-MORE determines how much the 8585 will amplify the loudness of quiet parts of the input while ensuring that the program material does not become unpleasantly loud.

When a music preset is on the air, the LESS-MORE control sets the amount of overall processing, making optimum tradeoffs between loudness, brightness, and distortion. In sound for picture, there are no loudness wars; for music presets, there is probably never a need to advance the LESS-MORE control beyond 5.

Two-Band: The Two-Band structure is the same as the Five-Band structure except that the Two-Band compressor sidechain controls the gains of the five bands. The upper four bands are 100% coupled and are controlled by the Master output of the sidechain, while the Bass output of the sidechain controls Band 1.

The Two-Band structure has an open, easy-to-listen-to sound that is similar to the source material if the source material is of good quality. However, if the spectral balance between the bass and high frequency energy of the program material is incorrect, the Two-Band structure (when its BASS COUPLING control is not set to 0 dB) can gently correct it without introducing obvious coloration.

In radio-oriented applications, the Two-Band structure is mainly useful for classical or "fine arts" programming that demands high fidelity to the original program source.

The two-band structure preserves the frequency balance between midrange and high frequency elements in the programming while permitting gentle automatic re-equalization of the balance between these elements (in the "master" band, which is above 200 Hz) and elements in the "bass" band (below 200 Hz). It has a "reverse exponential" release characteristic available, which can be very useful in sound-for-picture applications by correcting large gain difference quickly while not adding significant density to material that is already well controlled.

Factory Programming Presets

Factory Programming Presets are our "factory recommended settings" for various program formats or types. The Factory Programming Presets are starting points to help you get on the air quickly without having to understand anything about adjusting the 8585's sound.

You can easily edit any of these presets with the LESS-MORE control to optimize the trade-off between loudness and distortion according to the needs of your format, although this is often unnecessary. It is OK to use unmodified factory presets on the air. These represent the best efforts of some very experienced transmission processing sound designers. We are sometimes asked about unpublished "programming secrets" for Optimods. In fact, there are no "secrets" that we withhold from users. This manual reveals our "secrets" and the presets embody all of our craft as processing experts. The presets are editable because other sound designers may have different preferences from ours, not because the presets are somehow mediocre or improvable by those with special, arcane knowledge that we withhold from most of our customers.

Start with one of these presets. Spend some time listening critically to your sound. Listen to a wide range of program material typical of your format and listen on several types of audio systems (not just on your studio monitors). Then, if you wish, customize your sound using the information in the Protection Limiter, Two-Band and Five-Band sections that follow.

Each factory preset has full LESS-MORE capability. The table shows the presets, including the source presets from which they were taken and the nominal LESS-MORE setting of each preset. Some of the Five-Band presets appear several times under different names because we felt that these presets were appropriate for more than one format; these can be identified by a shared source preset name.

> **Important!** If you are dissatisfied with the sound available from the factory presets, please understand that each named preset is actually 19 presets that can be accessed via the LESS-MORE control. Try using this control to trade off the amount of dynamic range reduction against processing artifacts and side effects. Once you have used LESS-MORE, save your edited preset as a User Preset.

Do not be afraid to choose a preset other than the one named for your programming if you believe this other preset has a more appropriate sound. Also, if you want to fine-tune the frequency balance of the programming, feel free to use Basic Modify and make small changes to the Bass, Mid EQ, and HF EQ controls. The 8585 lets you make changes in EQ (and stereo enhancement) without losing the ability to use Less-More settings.

> Of course, LESS-MORE is still available for the unedited preset if you want to go back to it. There is no way you can erase or otherwise damage the Factory Presets. So, feel free to experiment.

If a preset has "2B" or "2BAND" in its name, it will activate the Two-Band structure. (The Protection presets are two-band as well.) Other presets use the Five-Band structure.

Each Factory Preset contains parameters for the surround and 2.0 processing. These parameters are identical. If you wish to use separate parameters for the surround and 2.0 processing, you must create a User Preset (see page 3-20). A preset, whether Factory or User, can be edited in three ways to create a new User Preset:

- If you have not previously edited individual parameters in the preset's dynamics processing, you can adjust LESS-MORE in both the Surround and 2.0 sections of the preset
- You can adjust any individual parameter in both the Surround and 2.0 sections of the preset.
- You can bulk-import all of the 2.0 parameters contained in any User Preset or Factory Preset.

When you edit a preset by bulk-importing 2.0 parameters like this, they will overwrite the existing 2.0 parameters in your edited preset, including any that you have might have adjusted before you imported.

To import a 2.0 preset from the 8585's front panel:

A) *LOCATE* to RECALL/IMPORT > IMPORT 2.0 PRESET.

You may have to scroll the display using PREV button until IMPORT PRESET appears.

B) Turn the wheel until the desired preset name appears.

C) Press *ENTER* to recall the preset.

To import a 2.0 preset from PC Remote:

A) Choose IMPORT 2.0 CONTROLS from the FILE menu to bring up the IMPORT 2.0 CONTROLS dialog box.

B) With the mouse, highlight the desired 2.0 source preset, either Factory or User.

C) Click IMPORT.

After importing the 2.0 parameters, you are still free to adjust any individual Surround or 2.0 parameter. When you are satisfied with your work, you can then save this combination of Surround and 2.0 parameters as a new User Preset. You can then use your new User Preset as a source for 2.0 parameters to be imported into any other User Presets you may wish to create or edit. For example, you could have six User Presets with identical 2.0 processing parameters but with different Surround processing parameters. The 2.0 bulk import feature makes this easy.

If you have not edited any parameters in a given 2.0 Factory Preset's dynamics processing, LESS-MORE will continue to be available even if that 2.0 preset has been imported into a User Preset and you are editing that User Preset. Moreover, you can freely create multiple generations of User Presets that retain 2.0 LESS-MORE functionality. The only thing that counts is that the 2.0 parameters in a given User Preset are unchanged compared the original source Factory Preset.

Sound-for-Picture Presets

Sound-for-picture preset names all begin with "TV" or "TVA." Most of these presets have the CBS Loudness Controller turned on. It is set so that loudness is constrained to a level consistent with the active DIALNORM value (see *Loudness Control* on page 3-14). If you wish to use a given preset with the loudness controller turned off, set its LOUDNESS THRESH parameter to OFF and save the result as a User Preset.

Presets beginning with "TVA" are tuned with the assumption that the 2.0 processing is operating with 50μs or 75μs preemphasis and is driving an analog TV transmitter. See step 10 on page 2-25. A given "TVA" preset's surround processing is identical to the surround processing in the corresponding "TV" preset, which is turned with the assumption that the 2.0 processing will operate with no preemphasis (FLAT); see step 9 on page 2-24.

TV 2B–GEN PURPOSE (TV Two-Band General Purpose): This preset accommodates most dramatic programming (particularly older material), providing gentle gain control that limits dynamic range to a level that provides the general audience with consistently intelligible dialog. It sounds very similar to Orban's analog OPTIMOD-TV (Model 8182A) when that unit is adjusted for "General" programming according to the instructions in its operating manual. This preset retains the spectral balance of its input as much as possible. TV 2B-GEN PURPOSE is not the best choice for live news, sports, or films with optical soundtracks. The Five-Band presets (see below) can automatically equalize such program material when its spectral balance is inappro-

Preset Names	Normal Less-More
TV 2B-GEN PURP -LC	5.0
TV 2B-GEN PURPOSE	5.0
TV 5B-GEN PUR W NR	5.0
TV 5B-GEN PURPOSE	5.0
TV 5B-GEN PURP -LC	5.0
TV 2B-DRAMA	5.0
TV 5B-DRAMA	5.0
TV 5B-DRAMA COUPLD	5.0
TV 5B-NEWS	5.0
TV 5B-OPTICAL FILM	5.0
TV 5B-SPORTS	5.0
TV AGC+LC	5.0
TV AGC+LC+DS	5.0
TVA 2B-GEN PURP -LC	5.0
TVA 2B-GEN PURPOSE	5.0
TVA 5B-GEN PUR W NR	5.0
TVA 5B-GEN PURPOSE	5.0
TVA 5B-GEN PURP -LC	5.0
TVA 2B-DRAMA	5.0
TVA 5B-DRAMA	5.0
TVA 5B-DRAMA COUPLD	5.0
TVA 5B-NEWS	5.0
TVA 5B-OPTICAL FILM	5.0

Table 3-1: Factory Programming Presets (Sound-for-picture)

priate and can also apply single-ended dynamic noise reduction.

These presets defeat the AGC and do all gain riding with the two-band compressor, which is set for reverse exponential release. This release characteristic does not significantly increase the density of material whose level is well controlled while still performing fast correction of levels that are too low. The Loudness Controller is active, so this preset controls loudness tightly.

For modern dramatic programming mixed in surround, you may prefer the TV 5B-DRAMA preset, which preserves more of the mixes' original dynamic range.

TV 2B GEN PURP –LC (TV Two-Band General Purpose without Loudness Controller): This preset is the same as TV 2B-GEN PURPOSE except the Loudness Controller is turned off and the MB DRIVE control is backed off by 3 dB to achieve approximately the same loudness as TV 2B-GEN PURPOSE. Because the Loudness Controller is inactive, this preset has more dynamic punch than TV 2B-GEN PURPOSE, but the loudness of highly processed material (like commercials with a lot of midrange boost) may be objectionably loud.

TV 5B-GEN PUR W/NR (TV Five-Band General Purpose with Noise Reduction): provides effective dynamic range control and "automatic re-equalization" of most dramatic material. It uses the Loudness Controller to control loudness tightly. It applies single-ended noise reduction to the material, which will reduce unwanted noise like hiss, hum, or stage rumble. However, it will also reduce ambience. If the program material is carefully produced (as are most contemporary feature-film soundtracks), you may wish to use TV 5B-GEN PURPOSE (which does not apply noise reduction), or, if the material is so well produced that it would not benefit from "automatic re-equalization," use TV 2B-GEN PURPOSE.

TV 5B-GEN PURPOSE (TV Five-Band General Purpose without Noise Reduction): is identical to TV 5B-GEN PUR W/NR except that the single-ended dynamic noise reduction system is off.

TV 5B GEN PURP –LC (TV Five-Band General Purpose without Loudness Controller): This preset is the same as TV 5B-GEN PURPOSE except the Loudness Controller is turned off and the MB DRIVE control is backed off by 3 dB to achieve approximately the same loudness as TV 5B-GEN PURPOSE. Because the Loudness Controller is inactive, this preset has more dynamic punch than TV 5B-GEN PURPOSE. The five-band processing makes the audio spectrum more consistent than does TV 2B-GEN PURP –LC, so TV 5B-GEN PURP –LC controls loudness better than TV 2B-GEN PURP –LC even though the Loudness Controller is inactive.

TV 2B-DRAMA (TV Two-Band Drama): uses the 8585's soft knee compression and AGC RATIO control to regulate loudness while still preserving some of the dynamic range of the original mix. This preset sounds very smooth and natural with modern surround sound mixes for scripted dramas. The 8585's Loudness Controller is exploited to limit loudness to a maximum level. Typically, the Loudness Controller will produce 1 to 3 dB of gain reduction with dialog at normal levels and may produce as much as 12 dB of gain reduction with very loud sound effects or commercials.

Because it preserves some dynamic range, it is important that the input level to the 8585 not be too far awry. Usually, network feeds will meet this requirement but local playout of older material that has not been checked for loudness by a long-term Loudness Level meter like ITU-R BS.1770 may not work well. Use one of the general-purpose presets for this kind of material.

TV 5B-DRAMA (TV Five-Band Drama): like its 2B counterpart, uses the 8585's soft knee compression and AGC RATIO control to regulate loudness while still preserving some of the dynamic range of the original mix. In addition, the five-band compressor automatically re-equalizes material that may otherwise sound spectrally unbalanced. The center channel compressor effectively de-esses dialog without punching holes in the remaining channels. Coupling between the center channel and remaining channels allows the center channel's level to be boosted automatically by as much as 3 dB with respect to the other channels if this is needed to help intelligibility.

We prefer this preset to TV 2B-DRAMA because of its effective, unobtrusive de-essing and because it is more resistant to spectral gain intermodulation, which is program material in one frequency range's audibly pumping material in a different range.

Like its two-band counterpart, this preset is sensitive to input levels because its compression ratio is finite. It also fully exploits the Loudness Controller, which usually shows slight gain reduction with dialog at normal levels.

TV 5B-DRAMA COUPLD (TV Five-Band Drama Coupled): is similar to TV 5B DRAMA but uses more interband band coupling in the five-band compressor and a slower multiband compressor release time so it performs less automatic re-equalization of the program material. This is an alternative to TV 2B DRAMA that de-esses more effectively.

TV 5B-NEWS (TV Five-Band News): rides gain more quickly than the general-purpose presets. Its AGC release time is faster, so it will bring up low-level material more quickly. It is designed for live news programs where input levels may be quite unpredictable. It also automatically re-equalizes substandard audio (which is quite common in live news broadcasts). The dynamic single-ended noise reduction is turned on.

TV 5B-SPORTS (TV Five-Band Sports): is similar to TV 5B-NEWS, except the AGC release time is slower to resist pumping up crowd noise.

TV 5B-OPTICAL FILM (TV Five-Band Optical Film): is designed to make the best of the low-quality audio provided with optical film sound tracks (particularly 16mm). The gate threshold is quite high to avoid pumping up hiss, thumps, and other optical artifacts. The threshold of the single-ended dynamic noise reduction system is also high so that this system can reduce artifacts as far as possible. Release times are slow, because we assumed that material encoded on optical film has already been carefully level-controlled to accommodate the very limited dynamic range of the medium, so little gain riding is therefore required from the 8585.

TV AGC+LC and TV AGC+LC+DS are intended for stations that are prohibited by network or other edict from using multiband processing. The AGC performs gain riding and the loudness controller regulates loudness without aid from the multiband compressor. Both are configured to produce only wideband gain reduction.

- TV AGC+LC uses the five-band structure with all compressors of the multiband compressors except for LFE turned off. Except for independent control of the LFE level, which is important to prevent power in the LFE channel from causing audible midrange pumping in the loudness controller, all gain reduction is strictly wideband.
- TV AGC+LC+DS uses the five-band structure with all multiband compressors except for LFE and B5 turned off. B5 is configured as a de-esser, which, depending on the strictness of a given "wideband-only" edit, may be an acceptable use of frequency-selective gain reduction. (In our experience, there is a significant amount of television material that has not been adequately de-essed in production and thus requires additional de-essing from the on-air processing.)

  This preset sounds better than TV AGC+LC because the loudness controller does not have to de-ess, which it does by using wideband gain reduction. Hence, it is less likely to audibly duck material having heavy "esses."

Protection and Studio AGC Presets

AGC+ FLAT LIMITER: This preset allows the 8585 to serve as a studio AGC, substituting for the AGC in an Optimod at a radio or television transmitter and providing protection limiting for the STL that links the output of the 8585 to the input of the Optimod at the transmitter. It uses the look-ahead limiter to prevent overloading the STL on peaks.

This preset is tuned so that it does not normally trigger gain reduction in the 8585's five-band compressor — the Optimod at the transmitter should be the processor that performs this multiband compression.

LOOK-AHEAD LIMITER: The LOOK-AHEAD LIMITER preset is a Two-Band preset that turns off the stereo enhancer, AGC, equalizer, and two-band compressor so that you can use the processing as a fast look-ahead protection limiter.

This preset's LESS-MORE control is set to 1.0. For most program material, LESS-MORE = 1.0 will produce no look-ahead limiter gain reduction.

- In the surround processing channel, when LESS-MORE = 1.0 and the Lf and Rf channels are both driven, the threshold of the look-ahead limiter is 16 dB above reference level.
- In the 2.0 processing channel, when LESS-MORE = 1.0 and the Lst and Rst channels are both driven, the threshold of the look-ahead limiter is 18 dB above reference level.

  This assumes that the 8585's SURROUND REF LEVEL and 2.0 REF LEVEL controls have been adjusted to produce 10 dB of AGC Master band gain reduction in the surround and 2.0 AGCs respectively when the ROCK-

GENERAL preset is active and the 8585's Lf, Rf, Lst, and Rst inputs are driven by a 400 Hz tone at your facility's reference level. This level is typically either –18 dBfs or –20 dBfs, depending on which standard you have adopted.

To produce look-ahead limiter gain reduction, turn up the LESS-MORE control. Each step of the LESS-MORE control increases the drive level to the look-ahead limiter by 1 dB and increases the input/output gain by 1 dB for signals below the limiter threshold. At LESS-MORE = 10, the processor's gain below threshold has increased to 9 dB.

Instead of adjusting LESS-MORE, you can adjust the FINAL LIMIT DRIVE control (which what LESS-MORE actually does). Do not set the FINAL LIMIT DRIVE control below "0" with this preset; doing so will compromise system headroom.

Adjusting the LESS-MORE or FINAL LIMIT DRIVE controls is equivalent to simultaneously decreasing the threshold and increasing the make-up gain in a protection limiter having threshold and output make-up gain controls.

PASS-THROUGH: This is the only factory preset that invokes the Pass-Through structure (see *Pass-Through* on page 3-22). It usually edited to set the desired pass-through gain and the result is then saved as a User Preset.

PROTECT: This is a two-band preset designed to produce no gain reduction unless it encounters unusually high input levels caused by operator error. It uses the 2B compressor to control excessive levels, so it is more forgiving than the LOOK-AHEAD and PASS-THROUGH presets, which offer only peak limiting.

SOFT KNEE 5B; SOFT KNEE 2B: *These presets are "zeroed-out" starting points for mastering applications*, particularly where soft knee compression is desired. *These presets need to be manually tweaked to complement the program material being processed*. See *Using the 8585 for Production and Mastering* starting on page 3-73.

These presets are phase-linear. They set all equalization flat and turn off the AGC. The multiband compressor (two-band or 5-band) is set to supply a very soft-knee compression characteristic with approximately 5-10 dB of gain reduction. The ratio for a given compressor starts out at 1:1 and ends up at ∞:1 when the input level is 20 dB above threshold.

Mastering engineers will certainly want to adjust the compression thresholds and

Preset Names	Normal Less-More
AGC+FLAT LIMITER	5.0
LOOK-AHEAD LIMITER	1.0
PASS-THROUGH	5.0
PROTECT	1.0
SOFT KNEE 2B	5.0

Table 3-2: Pass-Through, Protection and AGC Presets

band coupling to complement the program material. The ratio and knee controls are adjustable separately for each band's compressor. For example, one might want to use a low ratio and soft knee in bands 1-4 while using a higher ratio and/or harder knee in band 5 (for de-essing).

The 8585's powerful equalization section is, of course, also available. Additionally, these presets set the look-ahead limiter drive control conservatively, which ensures highest quality. However, the 8585's look-ahead limiter can be driven quite hard without objectionable side effects, so the 8585 can create competitively loud masters.

Radio-Style Presets

The radio-style presets (*Table 3-3* on page 3-32) have been named similarly to their radio counterparts in Orban's OPTIMOD 8500 and 6300. Their basic audio texture is very similar to the presets in these products. The loudness controller is turned off.

CLASSICAL: As their names imply, the CLASSICAL 5-BAND and CLASSICAL TWO-BAND presets are optimized for classical music, gracefully handling recordings with very wide dynamic range and sudden shifts in dynamics. The Five-Band version uses heavy inter-band coupling to prevent large amounts of automatic re-equalization, which could otherwise cause unnatural stridency and brightness in strings and horns and which could pump up very low frequency rumble in live recording venues.

The Five-Band preset defeats the AGC, using only the five-band compressor for gain reduction. It also defeats phase rotation to ensure the most transparent Five-Band sound available.

CLASSICAL-5B+AGC uses the AGC set for 2:1 compression ratio. Because of the AGC, it affects more of the total dynamic range of the recording than does the CLASSICAL-5 BAND preset. However, the AGC provides extremely smooth and unobtrusive compression because of the gentle ratio and window gating. This preset uses the Five-Band compressor very lightly with a fast release time as a peak limiter. The AGC does almost all of the compression.

There is also a corresponding two-band preset called CLASSICAL-2B+AGC. Even more transparent, "purist" classical processing is available from this preset, which is phase-linear and which preserves the spectral balance of the original material as much as possible. However, if you need a bit more automatic re-equalization than the CLASSICAL TWO-BAND preset provides, use the CLASSICAL 5-BAND preset.

CLASSICAL-2B SFTKN (Classical using two-band Soft-Knee Compression) defeats the AGC and exploits the 8585's soft-knee two-band compression. Quiet material is gently compressed with a very low compression ratio. The compression ratio increases as the source material gets louder (see *Figure 3-2* on page 3-53). Very quiet material is typically amplified by 10 dB. This level-dependent compression ratio provides very smooth, subtle compression.

Because the CLASSICAL presets preserve a significant amount of the dynamic range present in the source material (including speech), it is wise to use a separate microphone processor to ensure appropriate voice/music balance.

CRISP: CRISP provides a bright upper midrange sound by emphasizing frequencies around 6 kHz. It is a loud preset that is appropriate for mass-appeal music formats. It has the same bass texture as the IMPACT presets.

DANCE ENERGY: This preset is designed to preserve the punch and slam in dance music percussion (like the beater click in kick drums). It is loud and has a bright high

Preset Names	Normal Less-More
CLASSICAL-2 BAND	5.0
CLASSICAL-2B SFTKN	5.0
CLASSICAL-2B+AGC	5.0
CLASSICAL-5 BAND	7.0
CLASSICAL-5B+AGC	5.0
CRISP	9.5
DANCE ENERGY	9.0
EDGE	10.0
GOLD	9.5
GREGG	9.5
GREGG OPEN	9.5
IMPACT	9.5
JAZZ	7.0
LOUD+SLAM	9.0
LOUD-BIG	9.0
LOUD-FAT	7.0
LOUD-HOT	8.5
LOUD-HOT+BASS	9.5
LOUD-PUNCHY	9.0
NEWS-TALK	7.0
ROCK-DENSE	7.0
ROCK-LIGHT	7.0
ROCK-MEDIUM	7.0
ROCK-MEDIUM+LOW BASS	7.0
ROCK-MEDIUM+MID-BASS	7.0
ROCK-OPEN	7.0
ROCK-SOFT	8.5
SMOOTH JAZZ	9.0
SPORTS	7.0
URBAN-HEAVY	7.0
URBAN-LIGHT	7.0
WMA MUSIC	9.5
WMA NEWS-TALK	7.0

Table 3-3: Radio-Style Presets

frequency texture. As LESS-MORE is turned down, this preset get quieter, yet punchier.

EDGE: This preset is designed for hit music broadcasters who prefer extremely punchy bass to fastidious distortion control. It is loud and has a bright high frequency texture.

GOLD: GOLD is loud and "hi-fi"-sounding while still respecting the limitations and basic flavor of the recordings from the era of the 1950s through 1970s.

> For example, we do not attempt to exaggerate high frequency energy in the GOLD preset. The highs in recordings of this era are often noisy, distorted, or have other technical problems that make them unpleasant sounding when the processor over-equalizes them in an attempt to emulate the high frequency balance of recently recorded material.

GREGG: GREGG and GREGG OPEN all use a 200 Hz band1/band2 crossover frequency to achieve a bass sound similar to the classic five-band Gregg Labs FM processors designed by Orban's Vice President of New Product Development, Greg Ogonowski. Dynamically, these presets produce a slight increase in bass energy below 100 Hz and a decrease of bass energy centered at 160 Hz. This bass sound works particularly well with speakers having good bass response.

In terms of loudness, midrange texture, and HF texture, these presets are similar to the LOUD-HOT+BASS presets.

IMPACT: IMPACT is intended for CHR and similar formats where attracting a large audience (maximizing cume) is more important than ensuring long time-spent-listening. This is a bright, "major-market" preset that has a great deal of presence energy to cut through on lower-quality speakers.

Its sound changes substantially as the LESS-MORE control is turned down—fast peak limiting decreases while bass punch and transparency improve. Therefore, exploring various Less-More settings is worthwhile with IMPACT, because, for many circumstances, this preset will be "over the top" if it is not turned down with LESS-MORE.

JAZZ: JAZZ is specifically tailored toward broadcasters that play mostly instrumental music, particularly classic jazz (Coltrane, Mingus, Monk, etc.). It is a quiet preset with a very clean, mellow high end to prevent stridency on saxophones and other horns. It preserves much of the qualities of the original recordings, doing light re-equalization. The preset produces very low listening fatigue, so it is a good choice for broadcasters that want listeners to stay all day. Note that broadcasters programming "smooth jazz" should investigate the SMOOTH JAZZ preset, which is much louder and more "commercial"-sounding.

LOUD: There are several LOUD presets. These were first created for other Optimods and we have retained the same names for the benefit of users who may be familiar with them. In their 8585 manifestation, "loud" is a bit of a misnomer in these presets because their MB LIMITER DRIVE settings have been edit to achieve the target loudness that the 8585's active DIALNORM value specifies.

LOUD-HOT is very bright and present, with up-front vocals. Release time is medium.

LOUD-HOT+BASS is based on LOUD-HOT. It is tuned for the maximum amount of bass we could add without creating objectionable artifacts on some program material. For maximum punch, it uses the HARD bass clipper at higher LESS-MORE settings.

This amount of bass may be excessive with certain consumer systems (particularly "boom-boxes") that already have substantial bass boost. Use it with care.

LOUD+SLAM is similar to LOUD-HOT+BASS, but uses HARD bass clipping mode with a SHAPE of 7.6, a BASS SLOPE of 18 dB/octave. It has modified tuning in the band-1 compressor (to control bass clipping distortion that could otherwise be introduced by Hard bass clipping). This preset provides slamming bass punch, which it trades off against bass cleanliness on certain program material. Because of the 18 dB/octave BASS SLOPE, its advantages will be appreciated most through radios with good low bass response.

LOUD-PUNCHY is the quietest of the "loud" preset family. It is designed for a bright, sizzling top end and very punchy lows. It is a good choice for broadcasters who feel that the LOUD-HOT presets are too aggressive but think that the ROCK presets are insufficiently punchy for their market position.

LOUD-BIG compromises between LOUD-HOT and LOUD-HOT+BASS. It uses a 12 dB/octave bass equalizer slope to achieve punchy bass that still has enough mid-bass boost to help smaller radios.

LOUD-FAT has dramatic punch on percussive material and a very fat-sounding low end. It avoids overt bass distortion despite the full bass sound. It is slightly quieter than the loudest of the "loud" preset family.

NEWS-TALK: This preset is quite different from the others. It is based on the fast multiband release time setting so it can quickly perform automatic equalization of substandard program material, including telephone. It is useful for creating a uniform, intelligible sound from widely varying source material, particularly source material that is "hot from the field" with uncontrolled quality.

SPORTS: Similar to NEWS-TALK except the AGC Release (AGC Release Time) is slower and the Gate Thresh (Gate Threshold) is higher. This recognizes that most sports programming has very low signal-to-noise ratio due to crowd noise and other on-field sounds, so the preset does not pump this up as the NEWS-TALK preset would tend to do.

ROCK: ROCK-DENSE, ROCK-MEDIUM, and ROCK-OPEN are appropriate for general rock and contemporary programming. They provide a bright high end and punchy low end (although not as exaggerated as the URBAN presets). A midrange boost provides enough presence energy to ensure that vocals stand out. A modest amount of high frequency coupling (determined by the Band Clipping 3>4 setting) allows reasonable amounts of automatic HF equalization to correct dull program material, while still preventing exaggerated frequency balances and excessive HF density. Dense, medium, and open refer to the compression density, which is determined by the release time settings in the AGC and multiband compressor sections.

ROCK-LIGHT has an open sound with little audible compression and less brightness than the first three presets. It is a compromise between ROCK-OPEN and ROCK-SOFT.

ROCK-SOFT has a mellow, easy-to-listen-to high frequency quality that is designed for female-skewing formats. It is also a candidate for "Quiet Storm" and "Love Songs" light rock or light urban formats.

ROCK-SMOOTH has the same mellow, easy-to-listen-to high frequency quality as ROCK-SOFT, but with more density. Again, it is a good choice for female-skewing formats, but where you need more compression and density than you get with ROCK-SOFT.

For Contemporary Hit Radio (CHR) we recommend the ROCK-DENSE or ROCK-MEDIUM versions. In competitive situations, you may need to use LOUD-HOT (you can use LESS-MORE to get it even louder) or even LOUD-HOT+BASS or IMPACT. However, the "rock" presets are somewhat cleaner and are therefore more likely to encourage longer times spent listening than are the "loud" presets.

For Album-Oriented Rock (AOR) we recommend the ROCK-MEDIUM or ROCK-OPEN versions, although you might prefer the more conservative ROCK-LIGHT or ROCK-SMOOTH versions.

ROCK-MEDIUM+LOWBASS is an open-sounding preset with a lot of bass punch. Its Five-band Release control is set to Slow2 so that the sound is relaxed and not at all busy. At the same time, the preset is competitively loud. It is an excellent choice for "adult contemporary" and "soft rock" formats where long time-spent-listening is desired.

SMOOTH JAZZ: This preset is designed for commercial broadcasters playing smooth jazz (Kenny G., etc.). It is designed to prevent stridency with saxes and other horns. This preset is based on a custom Optimod-FM 8400 preset that has been used successfully by a major-market smooth jazz station with very good ratings. However, if the loudness/density tradeoff is not to your taste, use LESS-MORE to turn it down, producing lower loudness with less density.

WMA MUSIC: This preset is based on GREGG SLOW but has been edited to minimize artifacts in the Windows Media Audio V9 codec when operated at bitrates below 64 kbps. See *Processing for Low Bit Rate Codecs* on page 3-5.

WMA NEWS-TALK: This preset is based on NEWS-TALK but has been edited to minimize artifacts in the Windows Media Audio V9 codec when operated at bitrates below 64 kbps.

URBAN: There are two URBAN (Rap) preset: HEAVY and LIGHT. These are similar to ROCK-MEDIUM and ROCK-OPEN but with a different bass sound. They use the 3-pole (18 dB/octave) shape on the bass equalizer. URBAN-HEAVY is appropriate for Urban, Rap, Hip-Hop, Black, R&B, Dance and other similar formats. URBAN-LIGHT is appropriate for light R&B formats. Highly competitive Urban broadcasters might also use LOUD-HOT+BASS or LOUD+SLAM, modified versions of LOUD-HOT that maximize bass punch.

Equalizer Controls

The table summarizes the equalization controls available for the Five-Band structure. (Note that "advanced" controls are accessible only from 8585 PC Remote software.)

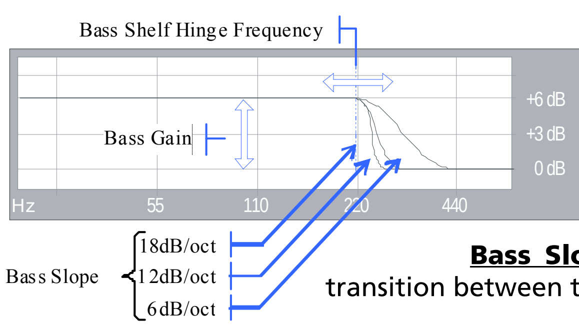
Except for BRILLIANCE and DJ BASS, these equalization controls are common to both the Two-Band and Five-Band structures. The equalizer is located between the AGC and multiband compressor sections of both structures.

Any equalization that you set will be automatically stored in any User Preset that you create and save. For example, you can use a User Preset to combine an unmodified Factory Programming Preset with your custom equalization. Of course, you can also modify the Factory Preset (with Basic Modify, Intermediate Modify, or Advanced Modify) before you create your User Preset.

In general, you should be conservative when equalizing modern, well-recorded program material. This is particularly true with general-purpose video programming. The discussion below applies mainly to radio-style applications

Except for BASS GAIN, most of the factory presets use less than 3 dB of equalization.

Bass Shelf Controls, the Five-Band structure's low bass equalization controls, are designed to add punch and slam to rock and urban music. They provide a parametric shelving equalizer with control over gain, hinge frequency, and slope (in dB/octave).



Bass Hinge Frequency sets the frequency where shelving starts to take effect.

Bass Gain sets the amount of bass boost (dB) at the top of the shelf.

Bass Slope sets the slope (dB/octave) of the transition between the top and bottom of the shelf.

The moderate-slope (12 dB/octave) shelving boost achieves a bass boost that is more audible on smaller receivers, but which can sound boomier on high-quality receivers and home theater systems. The steep-slope (18 dB/octave) shelving boost creates a solid, punchy bass from the better consumer receivers and home theater systems with decent bass response. The 6 dB/octave shelving boost is like a conventional tone control and creates the most mid-bass boost, yielding a "warmer" sound. Because it affects the mid-bass frequency range, where the ear is more sensitive than it is to very low bass, the 6 dB/octave slope can create more apparent bass level at the cost of bass "punch."

There are no easy choices here; you must choose the characteristic you want by identifying your target audience and the receivers they are most likely to be using. Often, you will not want to use any boost at all for general-purpose sound-for-picture programming because this can exaggerate rumble and other low frequency noise. Additionally, large amounts of boost will increase the gain reduction in the lowest band of the multiband compressor, which may have the effect of reducing some frequencies below 100 or 200 Hz (depending on the setting of the B1/B2 XOVER control). So be aware the large fixed bass boosts may have a different effect than you expect because of the way that they interact with the multiband compressor.

On the other hand, stations specializing in pop music programming will usually want to employ some bass boost to maintain the punch of this programming, particularly if urban or rap music is a significant part of the music mix.

Low Frequency Parametric Equalizer is a specially designed equalizer whose boost and cut curves closely emulate those of a classic Orban analog parametric equalizer with conventional bell-shaped curves (within ±0.15 dB worst-case). This provides warm, smooth, "analog-sounding" equalization.

> **LF Frequency** determines the center frequency of the equalization, in Hertz. Range is 20-500Hz.
>
> **LF Gain** determines the amount of peak boost or cut (in dB) over a ±10 dB range.
>
> **LF Width** determines the bandwidth of the equalization, in octaves. The range is 0.8-4.0 octaves. If you are unfamiliar with using a parametric equalizer, 1.5 octaves is a good starting point. These curves are relatively broad because they are designed to provide overall tonal coloration, instead of notching out small areas of the spectrum.

The LF parametric can be used in the mid-bass region (100-300Hz) to add "warmth" and "mellowness" to the sound when boosting. When cutting, it can remove a "woody" or "boxy" sound.

The equalizer, such as the classic Orban analog parametrics like the 622B, has constant "Q" curves. This means that the cut curves are narrower than the boost curves. The width (in octaves) is calibrated with reference to 10 dB boost. As you decrease the amount of EQ gain (or start to cut), the width in octaves will decrease. However, the "Q" will stay constant.

"Q" is a mathematical parameter that relates to how fast ringing damps out. (Technically, we are referring to the "Q" of the poles of the equalizer transfer function, which does not change as you adjust the amount of boost or cut.)

The curves in the 8585's equalizer were created by a so-called "minimax" ("minimize the maximum error" or "equal-ripple") IIR digital approximation to the curves provided by the Orban 622B analog parametric equalizer. Therefore, unlike less sophisticated digital equalizers that use the "bilinear transformation" to generate EQ curves, the shapes of the 8585's curves are not distorted at high frequencies.

Midrange Parametric Equalizer is a parametric equalizer whose boost and cut curves closely emulate those of an analog parametric equalizer with conventional bell-shaped curves.

MID Frequency determines the center frequency of the equalization, in Hertz. Range is 250-6000Hz.

MID Gain determines the amount of peak boost or cut (in dB) over a ±10 dB range.

MID Width determines the bandwidth of the equalization, in octaves. The range is 0.8-4.0 octaves. If you are unfamiliar with using a parametric equalizer, 1 octave is a good starting point.

With Five-Band presets, the audible effect of the midrange equalizer is closely associated with the amount of gain reduction in the midrange bands. With small amounts of gain reduction, it boosts power in the presence region. This can increase the loudness of such material substantially. As you increase the gain reduction in the midrange bands (by turning the MULTIBAND DRIVE (Multiband Drive) control up), the MID GAIN control will have progressively less audible effect. The compressor for the midrange bands will tend to reduce the effect of the MID frequency boost (in an attempt to keep the gain constant) to prevent excessive stridency in program material that already has a great deal of presence power. Therefore, with large amounts of gain reduction, the density of presence region energy will be increased more than will the level of energy in that region. Because the 3.7 kHz band compressor is par-

Equalizer Controls

Group	Basic/ Intermediate Modify Name	Advanced Name	Range
Bass Shelf	Bass Frequency	Bass Frequency	80, 85, 90, 95, 100, 105, 110, 115, 120, 125, 130, 135, 140, 145, 150, 160, 170, 180, 190, 200, 210, 220, 230, 240, 250, 270, 290, 310, 330, 350, 380, 410, 440, 470, 500Hz
	Bass Gain	Bass Gain	0 … 12 dB
	Bass Slope	Bass Slope	6,12,18 dB/Oct
Low	LF Frequency	Low Frequency	20 ... 500 Hz
	LF Gain	Low Gain	–10.0 … +10.0 dB
	LF Width	Low Width	0.8 ... 4 octaves
Mid	Mid Frequency	Mid Frequency	250 ... 6000 Hz
	Mid Gain	Mid Gain	–10.0 … +10.0 dB
	Mid Width	Mid Width	0.8 ... 4 octaves
High	High Frequency	High Frequency	1.0 … 15.0 kHz
	High Gain	High Gain	–10.0 … +10.0 dB
	High Width	High Width	0.8 ... 4 octaves
Brilliance	Brilliance	BRILLIANCE	0.0 … +6.0 dB
HF Enhancer	HF Enh	High Frequency Enhancer	0 … 15
DJ Bass	DJ Bass	DJ Bass Boost	Off, 1… +10 dB
Highpass Filter (2.0 processing only)	Highpass	Highpass Filter	Off, 20, 30, 40, 50, 60, 70, 80, 90, 100, 110, 120, 130, 140, 150, 170, 200 Hz
Lowpass Filter	Lowpass	Lowpass Filter	10 … 20 kHz; 1 kHz steps
Phase Rotate	Phase Rotator	Phase Rotator	In, Out *(2.0 processing only)*

Table 3-4: Five-Band Equalizer Controls

tially coupled to the gain reduction in the 6.2 kHz band in most presets, tuning MID FREQUENCY to 2-4 kHz and turning up the MID GAIN control will decrease energy in the 6.2 kHz band—you will be increasing the gain reduction in both the 3.7 kHz and 6.2 kHz bands. You may wish to compensate for this effect by turning up the BRILLIANCE control.

With Two-Band presets, the midrange equalizer will behave much more as you might expect because the two-band structure cannot automatically re-equalize midrange energy. Instead, increasing midrange energy will moderately increase the Master band's gain reduction.

Use the mid frequency equalizer with caution. Excessive presence boost tends to be audibly strident and fatiguing. Moreover, the sound quality, although loud, can be very irritating. We suggest a maximum of 3 dB boost, although 10 dB is achievable. In some of our factory music presets, we use a 3 dB boost at 2.6 kHz to bring vocals more up-front.

High Frequency Parametric Equalizer is an equalizer whose boost and cut curves closely emulate those of an analog parametric equalizer with conventional bell-shaped curves.

> **High Frequency** determines the center frequency of the equalization, in Hertz. The range is 1-15 kHz
>
> **High Gain** determines the amount of peak boost or cut over a ±10 dB range.
>
> **High Width** determines the bandwidth of the equalization, in octaves. The range is 0.8-4.0 octaves. If you are unfamiliar with using a parametric equalizer, one octave is a good starting point.

Excessive high frequency boost can exaggerate hiss and distortion in program material that is less than perfectly clean. We suggest no more than 4 dB boost as a practical maximum, unless source material is primarily from high-quality digital sources. In several of our presets, we use this equalizer to boost the upper presence band (4.4 kHz) slightly, leaving broadband HF boost to the BRILLIANCE and/or HF ENHANCE controls.

Brilliance controls the drive to Band 5 in the 5-Band structure only. (This control is nonfunctional in the two-band structure.) The Band 5 compressor/limiter dynamically controls this boost, protecting the final limiter from excessive HF drive. We recommend a maximum of 4 dB of BRILLIANCE boost and most people will prefer substantially less.

DJ Bass ("DJ Bass Boost") control determines the amount of bass boost produced on some male voices. In its default OFF position, it causes the gain reduction of the lowest frequency band to move quickly to the same gain reduction as its nearest neighbor when gated. This fights any tendency of the lowest frequency band to develop significantly more gain than its neighbor when processing voice because voice will activate the gate frequently. Each time it does so, it will reset the gain of the lowest frequency band so that the gains of the two bottom bands are equal and the response in this frequency range is flat. The result is natural-sounding bass on male voice. This is particularly desirable for most sound-for-picture programming.

If you like a larger-than-life, "chesty" sound on male voice, set this control away from OFF. When so set, gating causes the gain reduction of the lowest frequency band to move to the same gain reduction (minus a gain offset equal to the numerical setting of the control) as its nearest neighbor when gated. You can therefore set the maximum gain difference between the two low frequency bands, producing considerable dynamic bass boost on voice. This setting might be appropriate for news and sports.

> The difference will never exceed the difference that would have otherwise occurred if the lowest frequency band were gated independently. If you are familiar with older Orban processors like the 8282, this is the maximum amount of boost that would have occurred if you had set their DJ BASS BOOST controls to ON.
>
> The amount of bass boost will be highly dependent on the fundamental frequency of a given voice. If the fundamental frequency is far above 100Hz, there will be little voice energy in the bottom band and little or no audio bass boost can occur even if the gain of the bottom band is higher than the gain of its neighbor. As the fundamental frequency moves lower, more of this energy leaks into the bottom band, and you hear more bass boost. If the fundamental frequency is very low (a rarity), there will be enough energy in the bottom band to force significant gain reduction, and you will hear less bass boost than if the fundamental frequency were a bit higher.
>
> This control is only available in the Five-Band structure.
>
> If the GATE THRESH (Gate Threshold) control is turned OFF, the DJ BASS boost setting is disabled.

HF Enhance ("High Frequency Enhancer") is a program-adaptive 6 dB/octave shelving equalizer with a 4 kHz turnover frequency. It constantly monitors the ratio between high frequency and broadband energy and adjusts the amount of equalization in an attempt to make this ratio constant as the program material changes. It can therefore create a bright, present sound without over-equalizing material that is already bright. Used gently, it is useful for improving dialog intelligibility, particularly with the two-band structure because, unlike the five-band structure, the two-band structure cannot automatically re-equalize high frequencies.

Highpass Filter determines if a sweepable 18 dB/octave highpass filter will be placed in-circuit before other processing. This filter is useful for reducing low frequency noise, particularly when the 8585 is being used for production or mastering. This filter is available only in the 2.0 processing chain.

Lowpass Filter control sets the bandwidth (and therefore the amount of high frequency signal the 8585 passes) from 10 kHz to 20 kHz. The lowpass filter can replace any anti-aliasing filters in downstream equipment. Set the filter to 20 kHz (full bandwidth) for downstream equipment with sample rates of 44.1 or 48 kHz. Set the filter to 15 kHz for 32 kHz sample rate. For other sample rates, set the filter so that it is as close as possible to 45% of the sample rate without exceeding 45%.

This setting is unique to the preset in which it resides. Regardless of its setting, the 8585 will not permit the system bandwidth to exceed the bandwidth set by the MAX LOWPASS FILTER parameter located I/O Setup.

Phase Rotator determines if the phase rotator will be in-circuit. The purpose of the phase rotator is to make voice waveforms more symmetrical. Because it can slightly reduce the clarity and definition of program material, we recommend leaving it OUT unless program material is mainly speech, where it may result in cleaner sound because it can substantially reduce the amount of gain reduction that the 8585's look-ahead limiter produces on speech waveforms.

AGC Controls

The AGC is common to the Two-Band and Five-Band structures.

Five of the AGC controls are common to the Intermediate Modify and Advanced Modify screens, with additional AGC controls available in the Advance Modify screen, as noted in the following table. Some of the AGC controls are available only in the 2.0 processing chain because the channels in the surround AGC are always fully coupled.

AGC Off/On control activates or defeats the AGC.

It is usually used to defeat the AGC when you want to create a preset with minimal processing (like a CLASSICAL preset). The AGC is also ordinarily defeated if you are using a studio level controller. However, in this case it is better to defeat the AGC globally in System Setup.

AGC Drive control adjusts signal level going into the slow dual-band AGC, there-

AGC Controls		
Intermediate Names	**Advanced Name**	**Range**
AGC On/Off	AGC Off/On	Off/On
Bass Coupling	AGC Bass Coupling	Off, 12…0 dB
Drive	AGC Drive	–10 ... 25 dB
Gate Thresh	AGC Gate Threshold	Off, –44 ... –5 dB
AGC Release	AGC Master Release	0.5, 1.0, 1.5, 2 … 20 dB/S
---	AGC Crossover	Allpass, LinearNoDelay, Linear
---	AGC Master Attack	0.2 … 6
---	AGC Bass Attack	1 … 10, Off
---	AGC Bass Release	1 … 10 dB/sec
---	AGC Bass Threshold	–12.0 … 12.0 dB
---	AGC Idle Gain	–10 … +10 dB
---	AGC Ratio	∞:1, 4:1, 3:1, 2:1
---	AGC Window Release	0.5 … 20 dB
---	AGC Window Size	–25 … 0 dB
---	AGC Matrix *(2.0 only)*	L/R, sum/diff
---	Master Delta Threshold *(2.0 only)*	–6.0 … +6.0 dB
---	Bass Delta Threshold *(2.0 only)*	–6/0 … +6.0 dB
---	Maximum Delta GR *(2.0 only)*	0.0 … 24.0, Off dB

Table 3-5: AGC Controls

fore determining the amount of gain reduction in the AGC. This control also adjusts the "idle gain"—the amount of gain reduction in the AGC section when the structure is gated. (It gates whenever the input level to the structure is below the threshold of gating.)

The total amount of gain reduction in the Five-Band structure is the sum of the gain reduction in the AGC and the gain reduction in the multiband compressor. The total system gain reduction determines how much the loudness of quiet passages will be increased (and, therefore, how consistent overall loudness will be). It is determined by the setting of the AGC DRIVE control, by the level at which the console VU meter or PPM is peaked, and by the setting of the MULTIBAND DRIVE (compressor) control.

AGC Release control provides an adjustable range from 0.5 dB/second (slow) to 20 dB/second (fast). The increase in density caused by setting the AGC RELEASE control to fast settings sounds different from the increase in density caused by setting the five-band's MULTIBAND RELEASE control to FAST. You can trade the two off to produce different effects.

Unless it is purposely speeded-up (with the AGC RELEASE control), the automatic gain control that occurs in the AGC prior to the multiband compressor makes audio levels more consistent without significantly altering texture. Then the multiband compression and associated multiband clipper audibly change the density of the sound and dynamically re-equalize it as necessary (booming bass is tightened; weak, thin bass is brought up; highs are always present and consistent in level).

The various combinations of AGC and compression offer great flexibility:

- Light AGC + light compression yields a wide sense of dynamics, with a small amount of automatic re-equalization.
- Moderate AGC + light compression produces an open, natural quality with automatic re-equalization and increased consistency of frequency balance.
- Moderate AGC + moderate compression gives a more dense sound, particularly as the release time of the multiband compressor is sped up.
- Moderate AGC + heavy compression (particularly with a FAST multiband release time) results in a "wall of sound" effect, which may cause listener fatigue.

Adjust the AGC (with the AGC DRIVE control) to produce the desired amount of AGC action, and then fine-tune the compression and look-ahead limiting, and loudness control.

AGC Gate Threshold control determines the lowest input level that will be recognized as program by the 8585; lower levels are considered to be noise or background sounds and cause the AGC or multiband compressor to gate, effectively freezing gain to prevent noise breathing.

In sound for picture, the settings of the gate threshold controls are quite critical if you want the processing to be undetectable to the audience. If these controls are set too low, then the 8585 will pump up quiet sounds like ambience and underscoring to unnaturally high levels.

There are two independent silence-gating circuits in each of the 8585's processing chains. The first affects the AGC and the second affects the multiband compressor. Each has its own threshold control.

AGC Idle Gain on page 3-44 explains how the AGC gate's no-signal gain is determined.

AGC Bass Coupling control sets the balance provided in the AGC between bass and the rest of the frequency spectrum.

The AGC processes audio in a master band for all audio above approximately 200 Hz and a bass band for audio below approximately 200 Hz. The gain reduction in the BASS audio path is either the output of the Bass compressor sidechain or the output of the Master band sidechain. The AGC BASS COUPLING control sets the switching threshold. For example, if the AGC BASS COUPLING control is set to 4 dB and the master gain reduction is 10 dB, the bass gain reduction cannot decrease below 6 dB even if the gain reduction signal from the Bass compressor sidechain is lower. However, the audio path bass gain reduction can be larger than the master gain reduction without limit. In the previous example, the bass gain reduction could be 25 dB.

A typical setting of the AGC BASS COUPLING control is 0 dB, which allows the AGC bass band to correct excessive bass as necessary but does not permit it to provide a dynamic bass boost.

Advanced AGC Controls

The following AGC controls are found only in the Advanced Modify screen and in 8585 PC Remote.

AGC Window Size determines the size of the floating "slow zone" window in the master band of the AGC. (The Bass band is not windowed.)

The window works by slowing down changes in the AGC gain reduction that are smaller than the WINDOW SIZE. The window has 2:1 asymmetry around the current AGC gain reduction. For example, if the WINDOW SIZE is set to 4 dB, the window extends 4 dB in the release direction and 2 dB in the attack direction.

If the AGC needs to respond to a large change in its input level by making a gain change that is larger than the window, then the AGC's attack and release controls determine the AGC's response time. However, if the change in input level is smaller than the window size, the WINDOW RELEASE control determines the attack and release times. This is usually much slower than the normal AGC time constants. This prevents the AGC from building up density in material whose level is already well controlled.

The previous explanation was somewhat simplified. In fact, the window has "soft edges." Instead of switching abruptly between time constants, the attack and release times morph smoothly between the setting of the WINDOW RELEASE control and the setting of the AGC master release and attack controls.

The most useful range of the AGC WINDOW SIZE is 3 to 6 dB.

AGC Window Release (see AGC WINDOW SIZE above.)

AGC Ratio determines the compression ratio of the AGC. The compression ratio is the ratio between the change in input level and the resulting change in output level, both measured in units of dB.

The 8585 compressor can be operated at a compression ratio as low as 2:1. This can add a sense of dynamic range and is mostly useful for subtle fine arts formats like classical and jazz.

AGC Bass Threshold determines the compression threshold of the bass band in the AGC. It can be used to set the target spectral balance of the AGC.

As the AGC BASS COUPLING control is moved towards 0 dB, the AGC BASS THRESHOLD control affects the sound less and less.

The interaction between the AGC BASS THRESHOLD control and the AGC BASS COUPLING control is a bit complex, so we recommend leaving the AGC BASS THRESHOLD control at its factory setting unless you have a good reason for readjusting it.

AGC Idle Gain. The "idle gain" is the target gain of the AGC when the silence gate is active. Whenever the silence gate turns on, the gain of the AGC slowly moves towards the idle gain.

The idle gain is primarily determined by the AGC DRIVE setting—a setting of 10 dB will produce an idle gain of –10 dB (i.e., 10 dB of gain reduction) when the AGC IDLE GAIN control = 0 dB. However, sometimes you may not want the idle gain to be the same as the AGC DRIVE setting. The AGC IDLE GAIN control allows you to add or subtract gain from the idle gain setting determined by the AGC DRIVE setting.

You might want to do this if you make a custom preset that otherwise causes the gain to increase or decrease unnaturally when the AGC is gated. For example, to make the idle gain track the setting of the AGC DRIVE control, set the AGC IDLE GAIN control to zero. To make the idle gain 2 dB lower than the setting of the AGC DRIVE control, set the AGC IDLE GAIN control to –2.

AGC Bass Attack sets the attack time of the AGC bass compressor (below 200Hz). The calibration is approximate.

AGC Master Attack sets the attack time of the AGC master compressor (above 200Hz). The calibration is approximate.

AGC Bass Release sets the release time of the AGC bass compressor.

AGC Crossover allows you to choose ALLPASS, LINEAR or LINEARNODELAY modes.

ALLPASS is a phase-rotating crossover that introduces one pole of phase rotation at 200 Hz. The overall frequency response remains smooth as the two bands take different amounts of gain reduction—the response is a smooth shelf without extra peaks or dips around the crossover frequency. The two bands are down 3 dB at the crossover frequency. However, this mode adds group delay distortion and is therefore subtly less transparent-sounding than the LINEARNODELAY mode.

LINEARNODELAY (Linear-Phase; no delay) is a phase-linear crossover whose upper band is derived by subtracting its lower band from the crossover's input. When the upper and lower bands have the same gain, their sum is perfectly flat with no phase rotation. However, when the upper and lower bands have different gains, peaks and dips appear in the frequency response close to the crossover frequency.

> LINEARNODELAY is useful if you need a crossover with low delay and no phase distortion when flat. Its downside is the possibility of coloration when the gains of the two bands are widely disparate.

LINEAR is a phase-linear crossover whose upper band is derived by subtracting its lower band from the crossover's input, as passed through a delay equal to the group delay of the lowpass crossover filter. The overall frequency response remains smooth as the two bands take different degrees of gain reduction—the response is a smooth shelf without extra peaks or dips around the crossover frequency. The two bands are each down 6 dB at the crossover frequency. This crossover has constant delay even when the two bands have unequal gains.

> While LINEAR has the ideal combination of no phase distortion (even when non-flat) and smooth shelving behavior, it adds about 4 ms to the overall delay (compared to ALLPASS and LINODLY), so it is not a good choice if you need to drive talent headphones.

AGC Controls Exclusive to 2.0 Processing:

AGC Matrix (2.0 processing only) allows you to operate the AGC in left/right mode or in sum/difference mode. Usually you will operate in left/right mode. However, sum/difference mode can give a type of stereo enhancement where the L–R signal is allowed to have a higher gain than the L+R signal. This will only work if you allow the two channels of the AGC to have different gains. To do this, set the AGC MAX DELTA GR control greater than zero.

> The AGC in the surround processing is always stereo coupled. Its gain reduction is proportional to the r.m.s. sum of the channels.

AGC Max Delta GR (2.0 processing only) determines the maximum gain difference permitted between the two channels of the AGC. Set it to "0" for perfect stereo coupling.

> This control works the same regardless of whether the AGC operates in left/right or sum/difference MATRIX modes, in both cases controlling the maximum gain difference between the "channels." Depending on the Matrix mode setting, the "channels" will handle left and right signals or will handle sum and difference signals. When the AGC operates in

sum/difference MATRIX mode, this control determines the maximum amount of width change in the stereo soundfield.

Master Delta Threshold (2.0 processing only) allows you to set the difference between the compression thresholds of the sum and difference channels. (This control is only useful when you set the AGC MATRIX to SUM/DIF.) By setting the threshold of the difference channel lower than the sum channel, you can have the AGC automatically produce more gain reduction in the difference channel. This will reduce the separation of material with an excessively wide stereo image (like old Beatles records). To make this work, you must set the MAX DELTA GR control away from zero. For example, to limit an excessively wide image while preventing more than 3 dB difference in gain between the sum and difference channels, set the MAX DELTA GR control to 3.0 and the MASTER DELTA THRESHOLD control to some positive number, depending on how much automatic width control you want the 8585 to perform

Bass Delta Threshold (2.0 processing only) works the same as MASTER DELTA THRESHOLD, but applies to the bass band. You will usually set it the same as MASTER DELTA THRESHOLD.

Distortion Control

The distortion control adjustments are common to the Two-Band and Five-Band structures except as noted in the descriptions on the following pages.

Bass Clip Threshold controls Orban's patented embedded bass clipper.

The bass clipper is embedded in the multiband crossover so that harmonics created by clipping are rolled off by part of the crossover filters. The threshold of this clipper is ordinarily set anywhere between 0 dB and 6 dB below the threshold of the look-ahead limiter, depending on the setting of the LESS-MORE control in the parent preset upon which you are basing your Advanced Control adjustments and depending on how much look-ahead limiting the preset causes with typical program material. This provides headroom for contributions from the other four bands so that bass transients don't smash against the look-ahead limiter, causing audible intermodulation distortion between the bass and higher frequency program material.

The threshold of the bass clipper is user-adjustable to trade off bass punch against

Distortion Control Adjustments	
Name	**Range**
AGC Final Limit Drive	–10.0 … +12.0 dB
Multiband Final Limit Drive	–20.0 … +24.0 dB
Bass Clip Shape	0.0 … 10.0
Bass Clip Threshold	–6.0 … +6.0 dB, OFF
Center Bass Clip Threshold (surround only)	–6.0 … +6.0 dB, OFF
Speech Bass Clip Threshold (2.0 only)	–6.0 … +6.0 dB, OFF
Transient Enhance	0…10 ms
Dialnorm	–31…–11 dB, Global

Table 3-6: Distortion Control Adjustments

look-ahead limiter distortion control. The range (with reference to the look-ahead limiter threshold) is –6 dB to +6 dB (and OFF). As you raise the threshold of the clipper, you will get more bass but also more distortion and pumping. Be careful when setting this control; do not adjust it casually. Listen to program material with heavy bass combined with spectrally sparse midrange material (like a singer) and listen for IM distortion induced by the bass' pushing the midrange into the look-ahead limiter. Although the low-IM technology in the 8585's look-ahead limiter substantially reduces this distortion, overdriving the limiter hard enough can still cause problems.

Because the sound-for-picture presets typically produce little or no look-ahead limiting with reasonable values of DIALNORM, the bass clipper is not needed and is turned off to prevent its adding unnecessary distortion.

In the Five-Band structure, band 1 drives the clipper. In the Two-Band structure, the Bass band drives the clipper.

For 2.0 processing, note that the SPEECH BASS CLIP THRESHOLD control overrides the BASS CLIP THRESHOLD control when OPTIMOD-PC automatically detects speech (see *Speech/Music Detector* on page 3-6). For surround processing, the center channel (which usually carries dialog) has an independent CENTER BASS CLIP THRESHOLD control.

Bass Clip Shape allows you to change the knee of the input/output gain curve of the bass clipper. It allows you to control the shape of the "knee"—the transition between no clipping and flat topping. "0" provides the hardest knee, where the transition between linear operation and flat topping occurs abruptly as the clipper's in-

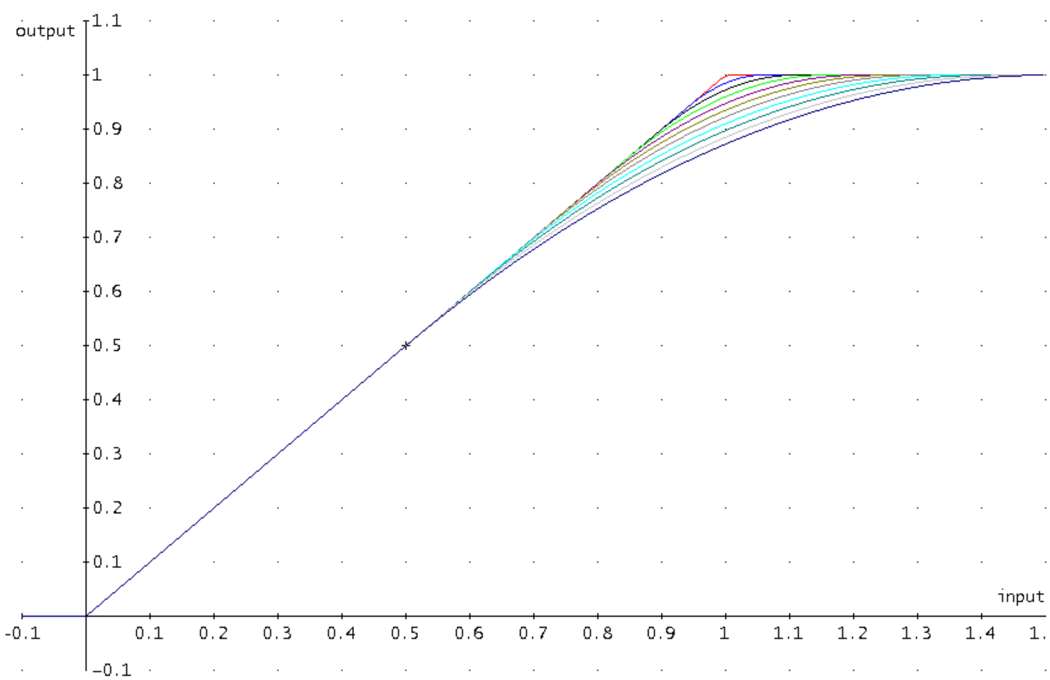


Figure 3-1: Bass Clipper Input/Output Transfer Curves as Bass Clip Shape Control is Varied from 0.0 (Hard) to 10.0 (Soft)

put level is changed. "10" is the softest knee, where the transition starts 6 dB below BASSCLIPTHRESH setting and occurs gradually. The factory default setting is "7.6." (See Figure 3-1.)

Final Limit Drive controls (AGC and MB) adjust the level of the audio driving the low-IM look-ahead limiters that the 8585 uses to control fast peaks, thereby adjusting the peak-to-average ratio of the processed audio. The FINAL LIMIT DRIVE controls primarily determine the loudness/distortion trade-off.

Only one of the two LIMIT DRIVE controls is active at a given time. Depending on the setting of the SURROUND OUTPUT SOURCE and 2.0 OUTPUT SOURCE controls in the active Setup, a given processing channel's look-ahead limiter receives either the AGC's output or the multiband compressor/limiter's output. This determines which LIMIT DRIVE control is active.

Turning up the FINAL LIMIT DRIVE control drives the look-ahead limiter harder, reducing the peak-to-average ratio at the 8585's output and increasing the loudness at the consumer's receiver. When the amount of limiting is increased, the audible intermodulation distortion caused by limiting increases, even though special algorithms minimize the increase compared to less sophisticated designs. Lower settings reduce loudness, of course, but result in a cleaner sound.

> Note that the active FINAL LIMIT DRIVE control is cascaded with a hidden gain control whose value is determined by the active DIALNORM setting. See *Low-IM Look-Ahead Limiter* 3-13.

Transient Enhance is mainly useful in mastering. This control allows you to insert an audio delay in the sidechain of the five-band compressor. By delaying the gain control signal, this allows attack transients to pass through the multiband compressor uncompressed, which can increase punch. There is a tradeoff between this control and the activity of the look-ahead limiter, which will have to eliminate attack transients exceeding the look-ahead limiter's threshold. For any material, there will be an optimum setting for the TRANSIENT ENHANCE control that provides the most punch without triggering look-ahead limiter artifacts.

The Two-Band Structure

The Two-Band structure consists of a slow two-band gated AGC for gain riding, an equalization section, a gated two-band compressor, and a low-IM look-ahead limiter. A CBS Loudness Controller, which is primarily useful for sound-for-picture applications, can be activated to control subjectively perceived loudness.

The 8585's Two-Band Structure can be made phase-linear throughout to maximize sonic transparency. However, you can also choose an allpass crossover structure (see AGC CROSSOVER on page 3-44).

The Two-Band structure has an open, easy-to-listen-to sound that is similar to the source material if the source material is of good quality. We recommend using it when you want to preserve the spectral balance of the source material while not significantly increasing program density. Hence, it is mainly useful for unobtrusive gain riding in sound-for-picture applications and in fine arts programming.

> If you need processing for loudness and/or processing that automatically corrects spectral balance inconsistency in the source material, we recommend using the Five-Band structure instead. We tend to prefer the Five-Band structure in sound-for-picture applications because it can use the AGC for gentle two-band gain riding while using the five-band compressor/limiter to de-ess dialog without causing gain pumping.

There are several Two-Band presets for sound-for-picture and radio-style processing. See Table 3-2 on page 3-30, Table 3-3 on page 3-32, and Table 3-1 on page 3-26.

Customizing the Settings

Each Two-Band Factory Preset has a LESS-MORE control (located in the Basic Modify screen) that adjusts on-air loudness. LESS-MORE simultaneously adjusts all of the processing controls to optimize the trade-offs between unwanted side effects as processing levels are decreased or increased.

If you wish, you may adjust the Modify parameters to your own taste. Always start with LESS-MORE to get as close to your desired sound as possible. Then edit the Modify parameters using the Basic, Intermediate or Advanced Modify screen, and save those edits to a User Preset.

The Two-Band Structure's Full and Advanced Setup Controls

The tables below show a summary of the Two-Band controls in the dynamics section.

AGC, Equalizer, and Clipper controls are common to both Two-Band and Five-Band structures and are described in the pages above.

Some of the Two-Band controls are common to the Intermediate Modify and Advanced Modify screens, with additional Two-Band controls available in the Advanced Modify screen. (Note that "advanced" controls are accessible only from 8585 PC Remote software.)

2B Drive control adjusts signal level going into the two-band compressor, determining the amount of gain reduction in the two-band compressor.

Regardless of the release time setting, we feel that the optimal amount of gain reduction in the two-band compressor for sound-for-picture applications is 10-15dB. For fine arts formats, operating with 0-10 dB of gain reduction (with the gain riding AGC set to OFF) maintains a sense of dynamic range while still controlling levels effectively.

2B Release control determines how fast the two-band compressor releases (and therefore how quickly loudness increases) when the level of the program material decreases. This release time only applies when the silence gate does not gate the Two-Band Compressor.

The control can be adjusted from 0.5 dB/second (slow) to 20 dB/second (fast). Settings toward 20 dB/second result in a more consistently loud output, while settings toward 0.5 dB/second allow a wider variation of dynamic range. Both the setting of the 2B RELEASE control and the dynamics and level of the program material determine the actual release time of the compressor.

With faster 2B RELEASE control settings (above 8 dB/second), the sound will change substantially with the amount of gain reduction in the two-band compressor. This means that you should activate the gain-riding AGC to ensure that the two-band compressor is always driven at the level that produces the amount of gain reduction desired. Decide based on listening tests how much gain reduction gives you the density that you want without creating a feeling of over-compression and fatigue. For most applications, we recommend using slower release rates because applications that could use faster Two-Band release rates are usually better suited to five-band processing. Five-band processing minimizes the undesirable artifacts that fast release rates can produce.

The release rate (in dB/second) in the two-band compressor automatically becomes faster as more gain reduction occurs. This makes the program progressively denser,

Two-Band		
Intermediate Name	**Advanced Name**	**Range**
2B Bass Coupling	2B Bass Coupling	0 … 100 %
2B Drive	2B Drive	–10 … 25 dB
2B Gate	2B Gate Threshold	Off, –44 … –5 dB
2B Release	2B Release	0.5 … 20 dB/second
2B Rel Shape	2B Release Shape	Linear, Exponential
Loudness Threshold	Loudness Controller Threshold	Off, 0.0 … -24.0 dB
Loudness Attack	Loudness Controller Attack	0…100%
Loudness Bass Couple	Loudness Controller Bass Couple	0…12 dB, Off
---	2B Master Knee	0 … 50 dB
---	2B Bass Knee	0 … 50 dB
---	2B Master Ratio	1:1 … infinity:1
---	2B Bass Ratio	1:1 … infinity:1
---	2B Master Break(point)	1 … 50 dB
---	2B Bass Break(point)	1 … 50 dB
---	2B Master Compression Threshold	–15 … 0 dB, Off
---	2B Bass Compression Threshold	-10.0 … 5.0 dB, Off
---	2B Master Attack	4 … 50, Off
---	2B Bass Attack	4 … 50, Off
---	2B Master Comp Ratio	1:1 … ∞:1
---	2B Bass Comp Ratio	1:1 … ∞:1
---	2B Master Knee	0 … 50 dB
---	2B Bass Knee	0 … 50 dB
---	LFE Threshold	–10…+5 dB, Off
---	LFE Attack	4…50 ms
---	Bass>LFE Couple	12…0 dB, Off
---	Master Main>Center Max +Delta GR	0…24 dB, Off
---	Master Main>Center Max -Delta GR	0…24 dB, Off
---	Bass Main>Center Max +Delta GR	0…24 dB, Off
---	Bass Main>Center Max -Delta GR	0…24 dB, Off

Table 3-7: Two-Band Controls

creating a sense of increasing loudness although peaks are not actually increasing. At the gain reduction values set by the 2B MASTER BREAKPOINT and 2B BASS BREAKPOINT controls, the release rate for these bands becomes constant and density does not increase with additional amounts of gain reduction.

2B Release Shape selects a LINear or EXPonential release shape.

Linear causes the Two-Band compressor to release at a constant number of dB per second above the 2B BREAKPOINT setting and proportionally to the amount of gain reduction otherwise.

Despite its name, EXPONENTIAL actually offers a reverse-exponential characteristic: It causes the release to commence slowly and then speed up as it progresses. The EXPONENTIAL shape allows you to create the open sound of a slow release time with program material whose level is well controlled while permitting the processing to quickly correct excessively low input levels. We recommend using Exponential for general-purpose sound-for-picture programming. For program material dominated by music, LINEAR may be a better choice because Exponential may create unnatural side effects. (If the 2B Release control is set between about 0.5 and 2 dB/second, an Exponential release shape should cause no problems even with music.)

Note: The BREAKPOINT controls do nothing when EXPONENTIAL release is chosen.

2B Gate ("2B Gate Threshold") threshold control determines the lowest input level that will be recognized as program material by OPTIMOD 8585; lower levels are considered to be noise or background sounds and will cause the AGC or two-band compressor to gate, effectively freezing gain to prevent noise breathing.

There are two independent gating circuits in the 8585 Two-Band structure. The first affects the *AGC* and the second affects the *two-band compressor*. Each has its own threshold control.

The two-band gain reduction will eventually recover to 0 dB (when the RELEASE SHAPE is set to LINEAR) or to the setting of the 2B DRIVE control (when the RELEASE SHAPE is set to EXP). However, recovery is slow enough to be imperceptible. This avoids OPTIMOD 8585's getting stuck with a large amount of gain reduction on a long, low-level musical passage immediately following a loud passage.

> In EXP release mode, the two-band gate's gated gain reduction is the same as the setting of the 2B DRIVE CONTROL, which is similar to the behavior of the AGC gate. This is because EXP release is mainly useful in sound-for-picture processing and is used in the TV 2B GEN PURPOSE and TV 2B GEN PURP+LC presets. In these presets, the AGC is defeated so that all gain riding can occur in the two-band compressor. See *AGC Idle Gain* on page 3-44 for a more complete discussion.

It is common to set the 2B GATE control between approximately –35 dB and –25 dB. Higher values are useful in sound-for-picture processing to prevent background sounds and underscoring from being pumped up, while lower settings are more common with musical programming.

2B Bass Coupling is used to set the balance between bass and the rest of the frequency spectrum.

The two-band compressor processes audio in a master band for all audio above approximately 200Hz, and a bass band for audio below approximately 200Hz. The BASS CPL control determines how closely the on-air balance of material below 200Hz matches that of the program material above 200Hz.

Bass coupling is set to 100% on all of the two-band presets because these presets are designed to do gentle gain riding without increasing program density or significantly modifying the spectral balance of the program. When bass coupling is set to 100%, the bass band will usually have the same amount of gain reduction as the master band. Only with material having unusually heavy bass will you see additional gain reduction in the bass band.

Bass Clip ("Bass Clip Threshold"): See page 3-46.

Loudness Threshold sets the maximum subjective loudness allowed by the processing with reference to the input of the 8585's MB look-ahead limiter. (See *Loudness Control* on page 3-14.)

Advanced Two-Band Controls

The following Two-Band controls are only accessible from the 8585 PC Remote software:

2B Master Compression Threshold sets the level where gain reduction starts to occur in the Master (above 200Hz) band of the Two-Band Compressor.

2B Bass Threshold determines the compression threshold of the bass band (below 200 Hz) in the Two-Band Compressor. It can be used to set the target spectral balance of the Two-Band Compressor.

LFE Threshold determines the compression threshold of the LFE channel in the Two-Band Compressor.

Bass>LFE Couple control determines the extent to which the gain of the LFE channel is determined by and follows the gain of the Bass band. Set towards 0 dB (fully coupled) this control reduces the amount of dynamic LFE boost, preventing unnatural exaggeration of material in the LFE channel.

The gain reduction in the LFE audio path is either the output of the Bass compressor sidechain or the output of the LFE compressor's band sidechain. The BASS>LFE COUPLING control sets the switching threshold. For example, if the BASS>LFE COUPLING control is set to 4 dB and the Bass gain reduction is 10 dB, the LFE gain reduction cannot decrease below 6 dB even if the gain reduction signal from the LFE compressor sidechain is lower. However, the LFE gain reduction can be larger than the bass gain reduction without limit. In the previous example, the LFE gain reduction could be 25 dB.

A typical setting of the Bass>LFE BASS COUPLING control is 3 dB, which caps the possible dynamic LFE boost at 3 dB. Some may prefer 0 dB, which precludes any dynamic LFE boost.

2B Master Attack sets the attack time of the Two-Band Compressor master compressor (above 200Hz).

2B Bass Attack sets the attack time of the Two-Band Compressor bass compressor (below 200Hz).

2B Master Comp Ratio and **2B Bass Comp Ratio** set the compression ratio of the Master compressor and Bass compressor respectively at their thresholds of compression. Beyond threshold, the ratio increases with increased gain reduction until it becomes ∞:1 at the amount of gain reduction (in dB) set by the 2B MASTER KNEE control. When you adjust these controls, the thresholds of the multiband compressors change automatically so that the total amount of gain reduction stays approxi-

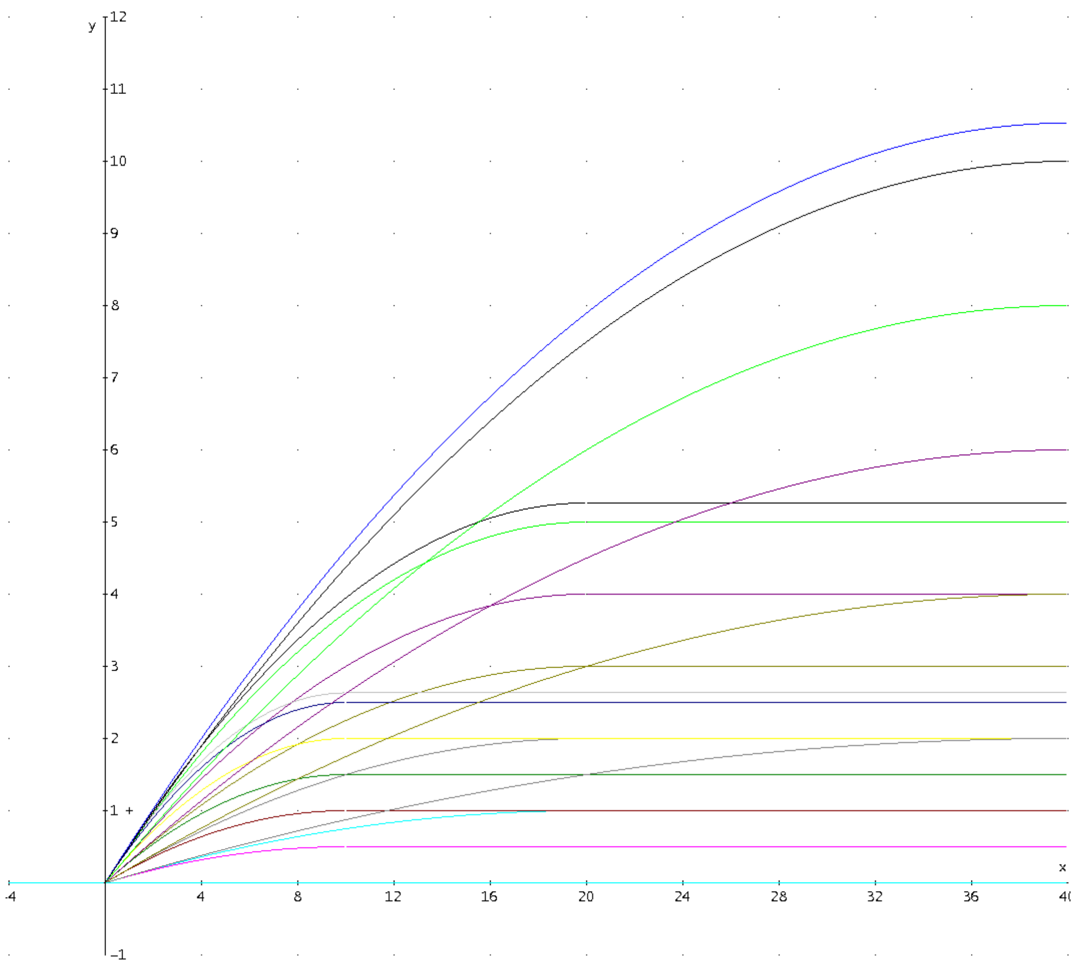


Figure 3-2: Output level in dB (y) for a given input level in dB (x) at various settings of the KNEE and RATIO control

mately the same. (This automatic adjustment is internal to the 8585's DSP; the MB THRESH controls' displayed settings do not show it.)

To achieve a classic soft knee characteristic, set the 2B MASTER COMP RATIO control to 1:1 and set the KNEE control to the gain reduction in dB at which you wish the compression ratio to level off to ∞:1. The maximum setting produces the softest knee. Setting the KNEE to 0 dB produces a classic hard knee curve with ∞:1 compression ratio regardless of the setting of the 2B MASTER COMP RATIO control.

See *Figure 3-2* on page 3-53 for the curves of output level vs. input level for various settings of the KNEE and RATIO controls.

2B Knee (see 2B MASTER COMP RATIO above).

2B Breakpoint The release rate (measured in dB/second) in the 8585's compressors is constant when the gain reduction is higher than the control's setting, and exponential when the gain reduction is lower than the control's setting.

When the release is exponential, the release rate is proportional to the amount of gain reduction. Do not confuse this with the reverse exponential characteristic triggered by setting the 2B RELEASE SHAPE control to EXPONENTIAL. In this case, release commences slowly and then speeds up as it progresses.

The 2B BREAKPOINT control is only active when the 2B RELEASE SHAPE control is set to LINEAR.

Compression-induced audio density remains constant when the gain reduction is above the 2B BREAKPOINT setting. When the gain reduction is below the 2B BREAKPOINT setting, density decreases proportionally to the amount of gain reduction.

For example, if the 2B BREAKPOINT is set to 10 DB, the release rate (in dB/second) will be constant when the gain reduction is above 10 dB. Between 10 dB and 0 dB gain reduction, the release rate will slow down more and more.

The calibration of the BREAKPOINT controls is only accurate when KNEE = 0 dB and/or RATIO = infinity:1 — i.e., when the compression ratio is essentially infinite. When the ratio is less than infinite, the effective breakpoint of the compressor will be lower than 2B BREAKPOINT setting.

The main use of the 2B BREAKPOINT control is to prevent the compressor from objectionably increasing audio density when using low compression ratios and a significant amount of gain reduction—for example, 10 dB. The 2B BREAKPOINT control is best adjusted by ear. If you find that density increases too much as gain reduction increases, lower the 2B BREAKPOINT control's setting. If you want more density at high amounts of gain reduction, increase the 2B BREAKPOINT control's setting. 10 dB is a good starting point for setting this control.

Loudness Controller Attack: See *Loudness Control* on page 3- 14.

Loudness Controller Bass Couple: See *Loudness Control* on page 3- 14.

Master Main>Center Max +Delta GR: Along with the other XXX DELTA GR controls, this control is explained in *Multiband* , starting on page 3-10.

The Five-Band Structure

The Five-Band structure consists of a stereo enhancer, a slow gain-riding two-band AGC, an equalization section, a five-band compressor, a dynamic single-ended noise reduction system, an output mixer (for the five bands), a loudness controller, and a low-IM look-ahead limiter.

Unlike the Two-Band structure, whose two-band compressor has a continuously variable release time, the release time of the Five-Band compressor is switchable to seven increments between slow and fast. Each setting makes a significant difference in the overall flavor and quality of the sound.

When the input is noisy, you can sometimes reduce the noise by activating the single-ended noise reduction system. Functionally, the single-ended noise reduction system combines a broadband downward expander with a program-dependent lowpass filter. This noise reduction can be valuable in reducing audible hiss, rumble, or ambient studio noise on-air. We use it for the news and sports factory presets.

Using the Five-Band Structure

The Five-Band structure is very flexible, enabling you to fine-tune your on-air sound for your target audience and desired market position. There are several basic Factory Presets for the Five-Band structure. Each of these presets can be edited with the LESS-MORE control. This control affects the sound-for-picture-oriented presets differently than it does the music presets (presets with “music” in their names). When a sound-for-picture-oriented preset is on the air, the LESS-MORE control adjusts the average amount of gain reduction by adjusting the drive level to the Five-Band structure's input. This also adjusts the idle gain—the amount of gain reduction in the AGC section when the structure is gated. (It gates whenever the input level to the structure is below the threshold of gating.)

When a music preset is on the air, the LESS-MORE control sets the amount of overall processing, making optimum tradeoffs between loudness, brightness, and distortion. In sound for picture, there are no loudness wars; for music presets, there is no need to advance the LESS-MORE control beyond its setting in the Factory Presets.

The five-band compressor/limiter in the Surround structure is always stereo-coupled. The five-band compressor/limiter in the 2.0 processing can be stereo-coupled to any extent via the various Bx MAX DELTA GR controls.

Note that the active DIALNORM setting greatly influences the loudness of a given preset. See *Low-IM Look-Ahead Limiter* on page 3-13.

Customizing the Settings

The controls in the Five-Band structure give you the flexibility to customize your station sound. However, as with any audio processing system, proper adjustment of these controls requires proper balancing of the trade-offs explained above. The following provides the information you need to adjust the Five-Band structure controls to suit your programming and taste.

The Five-Band Structure's Full and Advanced Setup Controls

The tables below summarize the Multiband and Band Mix controls in the dynamics section. The AGC, Equalizer, Stereo Enhancer, and Clipper controls are common to both the Two-Band and Five-Band structures and are discussed in their own sections in Section 3.

MB Drive ("Multiband Drive") control adjusts the signal level going into the multiband compressor, and therefore determines the average amount of gain reduction in the multiband compressor. Range is 25dB.

Adjust the MULTIBAND DRIVE control to your taste and programming requirements. Used lightly with a slow or medium release time, the Five-Band compressor produces an open, re-equalized sound that is appropriate for most sound-for-picture programming. The Five-Band compressor can increase audio density when operated at a fast or medium-fast release because it acts more and more like a fast limiter (not a compressor) as the release time is shortened. With fast and medium-fast release times, density also increases when you increase the drive level into the Five-Band compressor because these faster release times produce more limiting action. Increasing density can make loud sounds seem louder, but can also result in an unattractive busier, flatter, or denser sound. It is very important to be aware of the many nega-

Multiband Controls		
Full Name	**Advanced Name**	**Range**
MB Drive	Multiband Drive	0 ... 25
MB Gate Threshold	Multiband Gate Threshold	Off, –44 ... –5 dB
Loudness Threshold	Loudness Controller Threshold	Off, 0.0…–24.0 dB
Loudness Attack	Loudness Controller Attack	0…100%
Loudness Bass Couple	Loudness Controller Bass Cou-ple	0…12 dB, Off
MB Downward Expander	Downward Expander	Off, –18.0 … 12.0 dB
---	Downward Expander Stereo Couple	On, Off [2.0 only]
---	B5 Down Expander Delta Threshold	–18.0…+12.0 dB
---	B1/B2 XOVER	100 Hz, 200 Hz
---	B1 MaxDeltGr	0 … 24 dB, Off
---	B2 MaxDeltGr	0 … 24 dB, Off
---	B3 MaxDeltGr	0 … 24 dB, Off
---	B4 MaxDeltGr	0 … 24 dB, Off
---	B5 MaxDeltGr	0 … 24 dB, Off
---	LFE Threshold	–16…0 dB, Off
---	LFE Attack	4…50 ms
---	B1>LFE Couple	12…0 dB, Off

Table 3-8: Multiband Controls

tive subjective side effects of excessive density when setting controls that affect the density of the processed sound.

Because the 8585's AGC algorithm uses sophisticated window gating, it is preferable to make the AGC do most of the gain riding (instead of the multiband compressor), because the AGC can ride gain quickly without adding excessive density to program material that is already well controlled. Use the multiband compressor lightly, so it can achieve automatic re-equalization of material that the AGC has already controlled without adding excessive density to the audio or re-equalizing to an unnatural extent.

The MULTIBAND DRIVE interacts with the MULTIBAND RELEASE. With slower release time settings, increasing the MULTIBAND DRIVE control scarcely affects density. Instead, the primary danger is that the excessive drive will cause noise to be increased excessively when the program material becomes quiet. You can minimize this effect by activating the single-ended noise reduction and/or by carefully setting the MULTIBAND GATE THRESHOLD control to freeze the gain when the input gets quiet.

When the release time of the Five-Band compressor is set towards fast, the setting of the MULTIBAND DRIVE control becomes much more critical to sound quality because density increases as the control is turned up. Listen carefully as you adjust it. With these fast release times, there is a point beyond which increasing the Five-Band compressor drive will no longer yield more loudness and will simply degrade the punch and definition of the sound. Instead, let the AGC do most of the work.

Because excessive loudness is an irritant in sound for picture, there is almost never any reason to push processing to the point where it degrades the audio. We recommend no more than 10dB gain reduction as shown on the meters for Band 3. More than 10dB, particularly with the fast release time, will often create a wall of sound effect that many find fatiguing.

To avoid excessive density with fast Five-Band release time, we recommend using no more than 5dB gain reduction in band 3, compensating for any lost loudness by speeding up the AGC RELEASE instead.

MB Release control can be switched to any of seven settings. To understand how to adjust this control for sound-for-picture programming, please see the discussion above under MB DRIVE.

In the 2.0 processing, the SPEECH MB RELEASE control overrides the MB RELEASE control when speech is automatically detected (page 3-6). You may wish to set the SPEECH MB RELEASE control faster for speech (to maximize smoothness and uniformity) and slower on music (to prevent excessive build-up of density).

In the surround processing, the CENTER MB RELEASE control always sets the release time of the center channel compressor. This allows you to optimize the center channel for speech processing.

Bx Compression Threshold sets the compression threshold for each band in units of dB. We recommend making small changes around the factory settings to preserve the internal headroom built into the processing chain. These controls will affect the spectral balance of the processing above threshold.

You can use the Bx SPEECH COMPRESSION THRESHOLD control to set independent frequency balances for music and speech in the 2.0 processing chain, (page 3-6). The Bx CENTER COMPRESSION THRESHOLD control performs a similar function in the surround processing. It is particularly useful when setting up the center channel to de-ess dialog. The SPEECH and CENTER controls appear only in Advanced Control.

MB Gate Threshold control determines the lowest input level that will be recognized as program by OPTIMOD 8585; lower levels are considered to be noise or background sounds and cause the AGC or multiband compressor to gate, effectively freezing gain to prevent noise breathing.

The multiband gate only works appropriately when the KNEE and RATIO controls of all bands are set identically, which is typically true in broadcast applications. We recommend turning off the multiband gate if the individual KNEE and RATIO settings are unequal.

There are two independent gating circuits in the 8585. The first affects the AGC and the second affects the multiband compressor. Each has its own threshold control.

The multiband silence gate causes the gain reduction in bands 2 and 3 of the multiband compressor to move quickly to the average gain reduction occurring in those bands when the gate first turns on. This prevents obvious midrange coloration under gated conditions, because bands 2 and 3 have the same gain.

The gate also independently freezes the gain of the two highest frequency bands

MB Attack/Release/Threshold		
Full Name	**Advanced Name**	**Range**
MB Release	Multiband Release	Slow, Slow2, Med, Med2, MFast, MFast2, Fast
---	Speech Multiband Release	Slow, Slow2, Med, Med2, MFast, MFast2, Fast [2.0 only]
---	Center Multiband Release	Slow, Slow2, Med, Med2, MFast, MFast2, Fast [surround only]
Bx THR	Bx Compression Threshold	–16.00 … 0.0, Off
---	Bx Speech Compression Thresh	–16.00 … 0.0, Off [2.0 only]
---	Bx Center Compression Thresh	–16.00 … 0.0, Off [surround only]
---	Bx Attack	4.0 … 50.0 ms, Off
---	Bx Speech Attack	4.0 … 50.0 ms, Off [2.0 only]
---	Bx Center Attack	4.0 … 50.0 ms, Off [surround only]
---	Bx Limiter Attack	0 … 100%
---	Bx Delta Release	–6 … 6
---	Bx Compression Ratio	1:1 … ∞:1
---	Bx Knee	0 … 50 dB
---	Bx Break	1 … 50 dB
---	Bx Main>Center Max +Delta GR	0…24 dB, Off
---	Bx Main>Center Max –Delta GR	0…24 dB, Off
---	Transient Enhance	0 … 10 ms

Table 3-9: MB Attack/Release Controls

(forcing the gain of the highest frequency band to be identical to its lower neighbor), and independently sets the gain of the lowest frequency band according to the setting of the DJ BASS boost control (in the Equalization screen). Thus, without introducing obvious coloration, the gating smoothly preserves the average overall frequency response "tilt" of the multiband compressor, broadly maintaining the "automatic equalization" curve it generates for a given piece of program material.

> If the MB GATE control is turned OFF, the DJ BASS control (in the Equalization screen) is disabled.

MB Downward Expander determines the level below which the single-ended noise reduction system's downward expander begins to decrease system gain, and below which the high frequencies begin to become low-pass filtered to reduce perceived noise. Activate the single-ended dynamic noise reduction by setting the MB DOWNWARD EXPANDER control to a setting other than OFF.

The single-ended noise reduction system combines a broadband downward expander with a program-dependent low-pass filter. These functions are achieved by introducing extra gain reduction in the multiband compressor. You can see the effect of this extra gain reduction on the gain reduction meters.

Ordinarily, the gating on the AGC and multiband limiter will prevent objectionable build-up of noise, and you will want to use the single-ended noise reduction only on unusually noisy program material. In sound for picture, it is particularly useful in live news and sports.

Please note that it is impossible to design such a system to handle all program material without audible side effects. You will get best results if you set the MB DOWNWARD EXPANDER control of the noise reduction system to complement the program material you are processing. The MB DOWNWARD EXPANDER should be set higher when the input is noisy and lower when the input is relatively quiet. The best way to adjust the MB DOWNWARD EXPANDER control is to start with the control set very high. Reduce the control setting while watching the gain reduction meters. Eventually, you will see the gain increase in sync with the program. Go further until you begin to hear noise modulation—a puffing or breathing sound (the input noise) in sync with the input program material. Set the MB DOWNWARD EXPANDER control higher until you can no longer hear the noise modulation. This is the best setting.

Obviously, the correct setting will be different for a sporting event than for classical music. It may be wise to define several presets with different settings of the MB DOWNWARD EXPANDER control, and to recall the preset that complements the program material of the moment.

Note also that it is virtually impossible to achieve undetectable dynamic noise reduction of program material that is extremely noisy to begin with, because the program never masks the noise. It is probably wiser to defeat the dynamic noise reduction with this sort of material (traffic reports from helicopters and the like) to avoid objectionable side effects. You must let your ears guide you.

MB Band Mix controls determine the relative balance of the bands in the multiband compressor. Because these controls mix *after* the band compressors, they do not affect the compressors' gain reductions and can be used as a graphic equalizer to fine-tune the spectral balance of the program material over a ±6 dB range.

> The range of the band mix controls has been purposely limited because the only gain control element after these controls is the look-ahead limiter, which can produce considerable audible distortion if overdriven. You should make large changes in EQ with the bass and parametric equalizers and the HF enhancer, because these are located *before* the compressors. The compressors will therefore protect the system from look-ahead limiter overloads caused the chosen equalization. Use the multiband mix controls only for fine-tuning.
>
> You can also get a similar effect by adjusting the compression threshold of the individual bands. This is comparably risky with reference to look-ahead limiter overload, but unlike the MB BAND MIX controls, does not affect the frequency response when a given band is below threshold and is thus producing no gain reduction.

On/Mute switches allow you to listen to any band (or any combination of bands) independently. This is a feature designed for intermediate or advanced users and developers when they are creating new 8585 presets. The mute control works by muting the input of compressor in that band. This prevents the muted compressor's sidechain from producing a gain reduction signal that could couple into unmuted bands through the various band-coupling controls.

Please note that a single band will interact with the look-ahead limiter quite differently than will that band when combined with all of the other bands. Therefore, do not assume that you can tune each band independently and have it sound the same when the clipping system is processing all bands simultaneously.

B3>B4 Couple ("Band 3>4 Coupling") control determines the extent to which the gains of bands 4 (centered at 3.7 kHz) and 5 (above 6.2 kHz) are determined by and follows the gain of band 3 (centered at 1 kHz). Set towards 100% (fully coupled) this control reduces the amount of dynamic upper midrange boost, preventing unnatural upper midrange boost. The gain of band 5 is further affected by the BAND 4>5 COUPLING control.

Band Mix		
Full Name	**Advanced Name**	**Range**
B2>B1 CPL	B2>B1 Coupling	0 ... 100 %
B2>B3 CPL	B2>B3 Coupling	0 ... 100 %
B3>B2 CPL	B3>B2 Coupling	0 … 100 %
B3>B4 CPL	B3>B4 Coupling	0 ... 100 %
B4>B5 CPL	B4>B5 Coupling	0 ... 100 %
B1 OUT	B1 Output Mix	–6.0 … +6.0 dB
B2 OUT	B2 Output Mix	–6.0 … +6.0 dB
B3 OUT	B3 Output Mix	–6.0 … +6.0 dB
B4 OUT	B4 Output Mix	–6.0 … +6.0 dB
B5 OUT	B5 Output Mix	–6.0 … +6.0 dB

Table 3-10: MB Band Mix Controls

The COUPLING controls use an "OR" algorithm: the final gain reduction in a given band is the higher of (1) the gain reduction that would have been produced in that band with no coupling, OR (2) the gain reduction in the adjacent coupled band multiplied by the setting of the COUPLING control.

For example, assume that Band 4 would produce 10 dB of gain reduction with no B3>B4 coupling. If the BAND 3>4 COUPLING control is set to 50%, Band 3 will not affect Band 4's gain reduction unless Band 4 is producing more than 20 dB of gain reduction. At this point, every 2 dB increase in Band 4's gain reduction will cause a 1 dB increase in Band 3's gain reduction.

B4>B5 Couple ("Band 4>5 Coupling") controls the extent to which the gain of band 5 (6.2 kHz and above) is determined by and follows the gain of band 4.

The sum of the high frequency limiter control signal and the output of the BAND 4>5 COUPLING control determines the gain reduction in band 5. The BAND 4>5 COUPLING control receives the independent left and right band 4 gain control signal. Range is 0 to 100% coupling.

B3>B2 Couple and **B2>B3 Couple** controls determine the extent to which the gains of bands 2 and 3 track each other.

When combined with the other coupling controls, these controls can adjust the multiband processing to be anything from fully independent operation to quasi-wideband processing.

B2>B1 Couple control determines the extent to which the gain of band 1 (below 100Hz or 200Hz, depending on crossover setting) is determined by and follows the gain of band 2 (centered at 400Hz). Set towards 100% (fully coupled), it reduces the amount of dynamic bass boost, preventing unnatural bass boost. Set towards 0% (independent), it permits frequencies below 100Hz (the "slam" region) to have maximum impact in modern rock, urban, dance, rap, and other music where bass punch is crucial. Accordingly, it can be useful in music video oriented formats.

Bx Out ("Band x Output Mix") controls determine the relative balance of the bands in the multiband compressor. Because these controls mix *after* the band compressors, they do not affect the compressors' gain reductions and can be used as a graphic equalizer to fine-tune the spectral balance of the program material over a ±3 dB range.

Their range has been purposely limited because the only gain control element after these controls is the back-end clipping system (including the multiband clipper/distortion controller), which can produce considerable audible distortion if overdriven. The thresholds of the individual compressors have been tuned to prevent audible distortion with almost any program material. Large changes in the frequency balance of the compressor outputs will change this tuning, leaving the 8585 more vulnerable to unexpected audible distortion with certain program material. Therefore, you should make large changes in EQ with the bass and parametric equalizers and the HF enhancer, because these are located *before* the compressors. The compressors will thus protect the system from unusual overloads caused the chosen equalization. Use the multiband mix controls only for fine-tuning.

You can also get a similar effect by adjusting the compression threshold of the individual bands. This is comparably risky with reference to clipper overload, but unlike the MB BAND MIX controls, the threshold adjustments do not affect the frequency response when a given band is below threshold and is thus producing no gain reduction.

Advanced Five-Band Controls

B1-B5 Attack (Time); Speech B1-B5 Attack (2.0); Center B1-B5 Attack (surround) controls set the speed with which the gain reduction in each band responds to level changes at the input to a given band's compressor. These controls affect the sound of the processor in many subtle ways. The main trade-off is "punch" (achieved with slower attack times) versus distortion and/or pumping produced in the look-ahead limiter (because slower attack times increase overshoots that the look-ahead limiter must eliminate). The results are strongly program-dependent and must be verified with listening tests to a wide variety of program material.

The ATTACK time controls are calibrated in arbitrary units that very approximately correspond to milliseconds. Higher numbers correspond to slower attacks.

In the 2.0 processing, there are separate controls for music and speech (page 3-6), so you can set attack times faster for speech (to minimize look-ahead limiter artifacts) and slower for music (to maximize punch and transient definition). In the surround processing, there are separate controls for the center channel.

B1-B5 Limiter Attack controls allow you to set the limiter attack anywhere from 0 to 100% of normal in the Five-Band compressor/limiters. Because the limiter and compressor characteristics interact, you will usually get best audible results when you set these controls in the range of 70% to 100%. Below 70%, you will usually hear pumping because the compressor function is trying to create some of the gain reduction that the faster limiting function would have otherwise achieved. If you hear pumping in a band and you still wish to adjust the limiter attack to a low setting, you can sometimes ameliorate or eliminate the pumping by slowing down the compressor attack time in that band.

Setting these controls to around 50% can increase punch when you are using low compression ratios with small amounts of gain reduction.

B1-B5 Delta Release controls are differential controls. They allow you to vary the release time in any band of the Five-Band compressor/limiter by setting an offset between the MULTIBAND RELEASE setting and the actual release time you achieve in a given band. For example, if you set the MULTIBAND RELEASE control to medium-fast and the BAND 3 DELTA GR control to –2, then the band 3 release time will be the same as if you had set the MULTIBAND RELEASE control to medium and set the BAND 3 DELTA GR control to 0. Thus, your settings automatically track any changes you make in the MULTIBAND RELEASE control. In our example, the release time in band 3 will always be two "click stops" slower than the setting of the MULTIBAND RELEASE control.

If your setting of a given DELTA RELEASE control would otherwise create a release slower than "slow" or faster than "fast" (the two end-stops of the MULTIBAND

RELEASE control), the band in question will instead set its release time at the appropriate end-stop.

B1>LFE Couple See *Bass>LFE Couple* on page 3-52.

B1-B5 Compression Ratio: See page 3-53.

Note that the multiband gate only works appropriately when the KNEE and RATIO controls of all bands are set identically, which is typically the case in broadcast applications. We recommend turning off the multiband gate if the individual KNEE and RATIO settings are unequal.

B1-B5 Knee: See page 3-54.

B1-B5 Breakpoint: See page 3-54.

B1/B2 Crossover (Band 1 to Band 2 Crossover Frequency) sets the crossover frequency between bands 1 and 2 to either 100 Hz or 200 Hz. It significantly affects the bass texture, and the best way to understand the differences between the two crossover frequencies is to listen.

B1-B5 Main>Center Max +Delta GR; B1-B5 Main>Center Max –Delta GR: See *Multiband* starting on page 3-10 for an explanation of these controls.

Setup: Test				
Parameter Labels	**Units**	**Default**	**Range (CCW to CW)**	**Step**
Mode	---	Operate	Operate, Bypass, Tone	---
Bypass Gain	dB	0.0	–18 … +25	1
Tone Frequency	Hz	400	16, 20, 25, 31.5, 40, 50, 63, 80, 100, 125, 160, 200, 250, 315, 400, 500, 630, 800, 1000, 1250, 1600, 2000, 2500, 3150, 4000, 5000, 6300, 8000, 9500, 10000, 12500, 13586.76, 15000, 20000* [*44.1 kHz and higher output SR only]	LOG
Tone Level	%	100	0 … 121	1
Lf Tone	---	Bypass	On, Bypass	---
Rf Tone	---	Bypass	On, Bypass	---
Ls Tone	---	Bypass	On, Bypass	---
Rs Tone	---	Bypass	On, Bypass	---
C Tone	---	Bypass	On, Bypass	---
LFE Tone	---	Bypass	On, Bypass	---
Lb Tone	---	Bypass	On, Bypass	---
Rb Tone	---	Bypass	On, Bypass	---
L 2.0 Tone	---	Bypass	On, Bypass	---
R 2.0 Tone	---	Bypass	On, Bypass	---

Table 3-11: Test Modes

Test Modes

The Test Modes screen allows you to switch between OPERATE, BYPASS, and TONE. When you switch to BYPASS or TONE, the 8585 saves the preset you had on-air and will restore it when you switch back to OPERATE. Even if you had been editing a preset and did not yet save these changes as a User preset, you will not lose the edits you made.

Table 3-11: Test Modes on page 3-63 shows the facilities available, which should be largely self-explanatory.

In TONE mode, any channel can be set to ON (the tone is on) or BYPASS (equivalent to placing that channel in BYPASS mode). When bench testing the 8585, you can cause one hardware output to emit a tone while leaving the remaining channels in BYPASS. Using a BNC/BNC patch cable, you can apply the tone to any 8585 input for testing. This eliminates the need for an external test oscillator.

The tone oscillator tracks the WORD LENGTH and DITHER settings for that channel's output. Resolution as high as 24 bits is available. Activating dither will result in ideal tones with no measurable harmonic distortion.

In the 2.0 processing, test modes function identically in 2.0 stereo and dual-mono modes. For example, in dual mono mode, setting TONE CHAN to LEFT applies signal to channel 1 but not to channel 2.

Using the 8585 PC Remote Control Software

8585 PC Remote control software allows you to access any front-panel 8585 control remotely. The software also gives you the ability to backup user presets, system files, and automation files to your computer's storage devices (hard drives, etc.) and to restore them later to your 8585.

The 8585 PC Remote software can connect to your 8585 via modem, direct serial cable connection, or Ethernet network. It communicates with your 8585 via the TCP/IP protocol, regardless of how it is connected to your 8585.

> PC Remote works best on large, high-resolution displays. Scroll bars will appear when using lower resolutions.

Before running 8585 PC Remote, you must have installed the appropriate Windows communications services on your computer. By default, the installer installs a shortcut to 8585PC.exe on your desktop and in your Start Menu under Orban\Optimod 8585.

8585 PC Remote can control only one 8585 at a time, but it can readily switch between several 8585s. 8585 PC Remote has a built-in "address book" that allows it to select and connect to:

- any 8585 on the same network as the PC,

- any 8585 that can be accessed through a modem connected to the PC via dial-up networking, and,
- any 8585 that is connected directly to one of the PC's serial ports.

Before your PC can communicate with a given 8585, you must first set up a "connection," which is information that allows PC Remote to locate and communicate with the 8585.

To set up a new connection:

A) Launch 8585PC.exe.

B) Create a new 8585 connection by choosing New 8585 from the Connect file menu or by right clicking on the All Connections icon in the Connections List and selecting New 8585.

The Connection Properties dialog box opens.

C) Enter an Alias name for your 8585 (like "KABC").

D) Leave the password field blank to prompt the user to enter a password when initiating a connection.

> Refer to *Security and Passcode Programming* on page 2-34.

Otherwise, enter a password to allow PC Remote to connect to your 8585 without requiring a password when the connection is initiated.

> For successful connection, a password must have already been entered into your 8585 unit.

E) If you are communicating with your 8585 through a network, select the Ethernet radio button. See also *Setting Up Ethernet, LAN, and VPN Connections* on page 2-*58*.

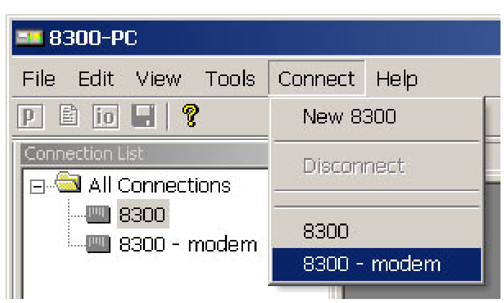
F) If you are communicating via a direct serial cable connection or a modem connection, follow the appropriate procedure described in *Appendix: Setting up Serial Communications,* starting on page 2-59.

G) Click OK after entering all required information.

To initiate communication:

Initiate communication by double-clicking on the desired 8585 alias in the Connections List, or by selecting the desired 8585 alias from the Connect drop down menu.

- If a warning message appears stating: "No password is set at the 8585…" go to your 8585 unit and create a passcode.



- If an Enter Passcode dialog box appears, enter a valid passcode and the 8585 PC Remote software will initiate a connection to the 8585 unit.

When run, the Orban PC Remote software installer makes copies of all 8585 factory preset files on your local hard drive. The PC Remote software reads these files to speed up its initialization. If any of these files have been deleted or damaged, the PC Remote software will refresh them by downloading them from the 8585. If the PC Remote software needs to do this, it can substantially increase the time required for the software to initialize, particularly through a slow modem connection.

When this download is finished, the main meters will appear.

- A wheel mouse is the quickest and easiest interface to use—you will rarely (if ever) have to use the keyboard.
- A bubble containing help about a given control will appear if you drag your mouse over that control.

To modify a control setting:

A) Choose PROCESSING PARAMETERS from the EDIT menu or click the second-to-the-left button on the button bar.

B) There are separate menu tabs for the surround and 2.0 processing channels. Select appropriate menu tabs for LESS-MORE and EQ to access Basic Modify controls. All other menu tabs contain Full or Advanced Modify controls for a given processing channel.

> You can reset any Basic Modify Control without losing LESS-MORE functionality; Full and Advanced modify control adjustments will cause LESS-MORE to be grayed-out.

To set a control, click it (it will become highlighted) and then adjust it by dragging it with the mouse or moving the wheel on the mouse.

> You can also use the + and – keys on the numeric keypad to adjust any control.

To recall a preset:

Presets, whether Factory or User, contain settings for both the surround and 2.0 processing. Recalling a preset overwrites both the surround and 2.0 controls.

If you wish instead to recall only the 2.0 settings in a given preset while leaving the surround processing unchanged, you must Import the 2.0 section of a Factory or User preset into the currently active preset (see *To import a preset into the 2.0 processing* below).

A) Choose RECALL PRESET from the FILE menu to bring up the OPEN PRESET FILE dialog box. You can also click the leftmost button on the button bar.

B) Click the desired preset within the dialog box to select it.

C) Double-click the desired preset or select it and click the RECALL PRESET button to put it on-air.

Continually clicking the RECALL PRESET button will toggle between the current and previous on-air presets.

D) Click DONE to dismiss the OPEN PRESET FILE dialog box.

The folder on your hard drive containing the preset files (both Factory and User) is automatically synchronized to the contents of its associated 8585's non-volatile memory each time 8585 PC Remote connects to that 8585. The 8585's memory is the "master." This means that if you delete a user preset from the 8585's memory (whether locally via its front panel or via 8585 PC Remote), 8585 PC Remote will automatically erase this preset from this folder on your computer. *To archive a preset permanently, you must use the Backup function* (see page 3- 67).

To import a preset into the 2.0 processing:

This procedure allows you to recall only the preset settings that affect the 2.0 processing. The surround processing does not change.

A) Choose IMPORT 2.0 PRESET from the FILE menu to bring up the IMPORT 2.0 PRESET FILE dialog box.

B) Click the desired preset within the dialog box to select it.

C) Double-click the desired preset or select it and click the IMPORT button to activate it.

D) Click DONE to dismiss the IMPORT PRESET FILE dialog box.

To save a user preset you have created:

A) Select SAVE PRESET AS from the FILE menu to bring up the SAVE AS Dialog Box. The current preset name will appear in the File Name field.

B) Click in the field, and edit it.

C) Click SAVE to save the preset to the 8585's internal memory as a User Preset.

If you have made edits to a previously existing user preset, you can select SAVE PRESET from the FILE menu to overwrite the pre-existing user preset automatically.

This operation saves both the surround and 2.0 portions of the preset. You can "mix and match" surround and 2.0 settings by using the Import function to bring the 2.0 settings of any preset into the current preset. You can then save the result as a new User Preset.

To back up User Presets, system files, and automation files onto your computer's hard drive:

A) Select BACKUP TO PC from the FILE Menu.

B) Click OK.

PC Remote will offer three options:

- Save Backup Files (User Presets, Setups [system files], and automation) in plain text.

  This allows the presets and files to be read with any text editor program and to be readily exchanged between Optimod users.

- Save Backup Files using the session passcode to encrypt them.

- Save Backup Files using the password of your choice to encrypt them.

  The encryption options prevent archived presets, system files, and automation files from being restored if the user does not have the password used for the encryption. *There is no "back door"— Orban cannot help you to decrypt a preset whose password is unknown.*

All User Preset, Setup, and automation files are copied from your Optimod's internal memory to a folder called "backup" on your PC. This folder is a subfolder of the folder named the same as the alias of the Optimod that you are backing up.

This folder name ("backup") and location are hard-coded into the software. If you wish to move the backup files somewhere else later, use a file manager (like Explorer) on your computer.

To make more than one backup archive, rename the current backup folder (for example, to "Backup1"). 8585 PC Remote will create a new backup folder the next time you do a backup, leaving your renamed backup folder untouched. Later, you will be able to restore from any folder—the Restore dialog box allows you to choose the folder containing the files to be restored

If you attempt to back up a preset with the same name as a preset existing in the Backup folder, but with a different date, 8585 PC Remote will warn you and will allow you to overwrite the preset in the Backup folder or to cancel the operation. If you wish to keep the existing archived preset, you can first use a file manager to move the existing user preset in the Backup folder to another folder and then repeat the backup operation.

To restore archived presets, Setups, and automation files:

In addition to restoring archived presets, Setups, and automation files to their original Optimod, you can also copy these archived files from one Optimod to another. The Optimod whose connection is active will receive the file.

If the preset, Setup, or automation file was encrypted when it was originally saved, PC Remote will request the password under which it was encrypted.

All User Presets are compatible with all 8585 software versions. If Orban adds new controls to a software version, the new software will assign a reasonable default value to any control missing in an old User Preset. If you archive such a User Preset after restoring it, the newly written archive file will now include the new controls (with the default values, unless you edit any of these values before you re-archive the preset).

A) Select RESTORE FROM PC from the FILE menu.

A standard Windows dialog box will open.

B) Select the type of files you want to restore using the FILES OF TYPE field at the bottom of the dialog box.

You can select to restore all user presets (*.orb8585user), 8585 user presets (*.orb8585user), Setups (*.orb8585setup), and automation files (*.orb8585autom).

If you want to restore files from a different directory (i.e., that might have been created on a different 8585), navigate to that directory from within the dialog box.

C) To restore a single user preset:

a) Set the FILES OF TYPE field to a user preset file type (*.orb8585user).

b) Select the desired preset in the dialog box.

c) Click the RESTORE button.

D) To restore all the user presets from a specific location:

a) Set the FILES OF TYPE field to a user preset file type (*.orb8585user)

b) Highlight all the user presets in the dialog window

c) Click the RESTORE button.

E) To restore a Setup file:

a) Set the FILES OF TYPE field to the System Setup file type (*.orb8585setup).

b) Select the desired system file in the dialog box.

c) Click the RESTORE button.

F) To restore an automation file:

a) Set the FILES OF TYPE field to the Automation file type (*.orb8585autom)

b) Select the desired automation file in the dialog box

c) Click the RESTORE button.

G) Click DONE to dismiss the RESTORE dialog box.

To modify the active SETUP:

Choose SETUP from the TOOLS menu or click the third-from-the-left button on the button bar.

To set a control, click it (it will become highlighted) and then use the wheel on the mouse to adjust it. You can also use the + and – keys on the numeric keypad to adjust any control.

To modify AUTOMATION:

A) Choose AUTOMATION from the TOOLS menu.

An Automation Dialog box will open.

B) Click the NEW EVENT to create a new event

Controls to set the event type and time are available on the right hand side of the dialog box.

C) Check the ENABLE AUTOMATION check box at the top of the dialog box to enable automation.

To group multiple 8585s:

Right-click ALL CONNECTIONS in the Connections List and select NEW GROUP.

You can add multiple 8585 to a single group to help organize a network of 8585. However, only one 8585 from within a group can be connected to 8585 PC Remote at any one time.

Navigation Using the Keyboard

In general, PC Remote uses standard Windows conventions for navigation.

Navigate around the screens using the TAB key. Use CTRL-TAB to move to the next tabbed screen in PC Remote.

Use the + and – keys or the left and right arrow keys on the numeric keypad to adjust control settings.

To Quit the Program

Use standard Windows conventions: Press ALT-F4 on the keyboard, or click the X on the upper right corner with the mouse.

About Aliases created by Optimod 8585 PC Remote Software

When you ADD A NEW 8585 using Optimod 8585 PC Remote, your 8585 automatically receives an 8585 Alias name to differentiate it from other 8585s. You can change the name anytime in the 8585 Properties window inside 8585 PC Remote.

When you add a new 8585 or change the name of an existing 8585 Alias, an Alias folder is created in the same location as the executable for Optimod 8585 PC Remote (usually \Program Files\Orban\Optimod 8585). The folder has the same name as the Alias name. Once you establish the initial connection to the 8585, all presets for that 8585 are automatically copied to the Alias folder—the folder contains all the preset files for that 8585, both Factory and User. If you have backed up the 8585 using 8585 PC Remote, these will appear in a "backup" subfolder located within the Alias folder.

> Archived user preset files are text files and can be opened in a text editor (like Notepad) if you want to examine their contents. Of course, you will only see a meaningful display if the files were archived in plaintext (i.e., not encrypted).

Alias folders and their associated backup subfolders are registered in your PC's Registry. This prevents folders from being accidentally deleted or moved. If you move or delete Alias folders from the PC, the Alias folders recreate themselves in the previous location and restore their contents by copying it from their associated 8585s when 8585 PC Remote connects to such an 8585.

Multiple Installations of Optimod 8585 PC Remote

Rarely, you may want to have more than one installation of 8585 PC Remote on your computer. There are a few extra things to know if you have multiple installations.

If you install a new version of the Optimod 8585 PC Remote software on your PC, any Alias folders and backup subfolders created in an earlier software version still remain in their original location on your PC (and in its registry).

The version of 8585 PC Remote must match the version of the software in the 8585 controlled by it. Therefore, you will only need multiple installations of PC Remote (having separate version numbers) if:

- you are controlling multiple 8585s, and
- not all of your 8585s are running the same version of 8585 software, and
- you do not want to upgrade at least one controlled 8585 to the latest version of 8585 PC Remote software.

Each version of 8585 PC Remote has its own top-level folder, normally under \Program Files\Orban. (The default folder is \Program Files\Orban\Optimod 8585.) When you install a new version of 8585 PC Remote, the default behavior is to overwrite the old version, which is usually the desired behavior. To prevent the installer from overwriting the old version, you must specify a different installation folder when you install the new version (for example, \Program Files\Orban\Optimod 8585v2).

Each version of 8585 PC Remote will display *all* 8585 Aliases, even those pointing to 8585s with incompatible version numbers. If you attempt to connect to an older version of 8585 from a newer version of 8585 PC Remote, 8585 PC Remote will offer to upgrade the software in the target 8585 so that it corresponds to the version of 8585 PC Remote that is active. If you attempt to connect to newer version of 8585 from an older version of 8585 PC Remote, it will refuse to connect and will emit an error message regarding incompatible versions.

If you decide to install the new software to a different location on your PC, new Aliases created using the new software will not be located in the same place as the old Aliases.

To Move Alias Folders:

Even though each version of 8585 PC Remote can see all aliases, you may wish to move the corresponding folders so they are under the folder corresponding to the highest version of 8585 PC Remote that is currently installed on your computer (although this is not required). If your Alias folders reside in different locations, you can move all the Alias folders to the same location by using the PC Remote software. *Do not use an external file manager (like Windows Explorer) to do this.* The old Alias folders need to be re-created under the Optimod 8585 PC Remote software you wish to use (so that the registry entries can be correctly updated). You can do this two different ways.

- **Rename the Alias** (preferred): Start the Optimod 8585 PC Remote executable you wish to use and rename your old Aliases with a slightly different name. A new Alias folder with the new name will be created in the same location as the Optimod 8585 PC Remote executable.

- **Delete and Recreate the Alias:** Start the Optimod 8585 PC Remote executable you wish to use. Delete the old 8585 Aliases and create new ones to replace them. New Alias folders will be created in the same location as the Optimod 8585 PC Remote executable.

  Important: The deletion process will automatically erase its associated folder, including the Backup directory. If you have anything in the Backup directory that you wish to keep, you should therefore move that directory elsewhere (or transfer the desired files to another, active backup directory).

  Ordinarily, the erasure process will move the Backup directory to your computer's Recycle Bin, so you can recover a Backup directory that you have accidentally deleted in this way.

To share an archived User Preset between 8585s:

A) Navigate to the directory containing the desired User Preset from within the RESTORE FROM PC dialog box

B) Click the RESTORE button.

   This User Preset will be downloaded to the 8585 to which 8585 PC Remote is currently connected.

   If the User Preset is encrypted, PC Remote will request its password.

Using the 8585 for Production and Mastering

The 8585 can be a useful tool for mastering and production applications in the professional audio industry, like preparation of equalized, level-controlled, peak limited CD, DVD, or BluRay masters. We have frequently used the 8585 in this context, achieving excellent results.

We strongly recommend using 8585 PC Remote software for controlling the 8585 when mastering. PC Remote shows all meters at once and allows easier access to operating controls.

Because of their broadcast origins, most of the 8585's presets provide more processing than would ordinarily be required for mastering. In addition, we would expect that the mastering engineer would want to tweak a preset carefully to complement the program material being mastered. The 8585 provides important tools to allow a mastering engineer to fine-tune the processing to complement the program material:

- Three bands of parametric equalization with low-noise filter structures and curves modeled after classic second-order analog bell-shaped EQ.

- A powerful, low-noise parametric bass shelving equalizer with sweepable frequency and a choice of 6, 12, or 18 dB/octave slopes.

- Two-band and five-band compressor/limiters with phase-linear crossovers and powerful controls, including attack time, release time, threshold, knee, and ratio for each band. These compressor/limiters also offer user-adjustable interband coupling, allowing the user to operate them anywhere from quasi-wideband to fully independent.

- A look-ahead peak limiter with advanced, proprietary distortion reduction algorithms.

You cannot create a user preset "from scratch"; you must create it by modifying an existing preset, factory or user. Each preset has an "easy adjustment" facility called LESS-MORE, which is a one-knob provision for turning the amount of processing up or down.

Systematically, the following is a good method for creating mastering presets. It assumes that you have already set the processor mixer controls to achieve normal drive levels.

A) Connect to the 8585 via 8585 PC Remote software. Compared to using the 8585's front panel, using PC Remote gives you more convenient access to the 8585's many tuning controls.

Note that by drawing a marquee around several controls by clicking and dragging with your computer's mouse, you can temporarily couple them so you can adjust several bands' controls (for example, the LIMITER ATTACK controls) simultaneously. The coupling will remain active until you click outside the area that the marquee encloses.

B) Decide whether you are going to use two-band or five-band processing.

> Two-band processing retains any fixed equalization originally applied to the program (except for a mild amount of dynamic adjustment to bass below 200 Hz); five-band processing performs an "automatic re-equalization" function. Both flavors of processing can be extremely smooth and unobtrusive. Because the five-band compressor/limiter offers user-adjustable interband coupling that determines the "discreteness" of the multiband compression, it is usually the best choice.

If you are going to use two-band processing, recall the 2B SOFT KNEE preset. If you are going to use five-band processing, recall the 5B SOFT KNEE preset. If you want to do look-ahead peak limiting without any other dynamics processing, recall the LOOK-AHEAD LIMITER preset. See page 3-26 for a description of these presets.

C) If you have started with one of the SOFT KNEE presets, the AGC will already be OFF. If you need a very large amount of compression for an application like processing material intended for in-flight entertainment systems, you can either edit the preset to turn the AGC on or start with a preset other than SOFT KNEE.

> You can turn the AGC off globally for all presets, which is convenient if you don't expect to use it in the future. (See step 2 on page 2-19.)

D) Unless you will be using a large amount of compression for special applications, set the MB GATE THRESHOLD to OFF.

> In the SOFT KNEE and LOOK-AHEAD LIMITER presets, this is already done.
>
> The multiband gate only works appropriately when the KNEE and RATIO controls of all bands are set identically, which is typically true in broadcast applications. We recommend turning off the multiband gate if the individual KNEE and RATIO settings are unequal.

E) Adjust the 2B DRIVE control (two-band) or MB DRIVE control (five-band) to achieve the desired amount of multiband gain reduction.

F) Adjust the release time control (2B RELEASE or MB RELEASE) to achieve the desired compression density.

> If you are using the Five-Band structure, you can use the DELTA RELEASE controls to fine-tune the release time of each band independently.
>
> The release characteristic is always "automatic" (i.e., with program-dependent time constants) and the RELEASE control simply scales this process. This, combined with multiband operation, makes the compression remarkably resistant to the usual compressor pumping and squashing.

G) Adjust the ATTACK TIME controls on the individual compressors to trade off overshoot control against transient punch.

H) Adjust the RATIO and KNEE controls in each band to taste.

The RATIO control sets the compression ratio at the threshold of compression. To achieve a classic soft knee characteristic, set the RATIO to 1:1 and adjust the softness of the knee with the KNEE control.

The KNEE control's setting is the gain reduction in dB at which the compression ratio reaches ∞:1. (See page 3-53 for a description of the RATIO, KNEE, and BREAKPOINT controls.)

I) After you adjust the RATIO and KNEE controls, adjust the THRESHOLD controls in the individual bands to achieve the desired amount of gain reduction.

The KNEE control automatically and invisibly changes a given band's internal compression threshold to keep the compressor's output level constant whenever the drive level is high enough to move the gain reduction into the ∞:1 range. This means that the internal threshold decreases with softer knee settings (higher settings of the KNEE control). However, the indicated threshold the 8585's user interface does not change. This behavior ensures that the THRESHOLD control alone determines the maximum output level of the compressor, regardless the KNEE control's setting.

J) Adjust the LIMITER ATTACK TIME controls to taste.

These controls allow you to set the limiter attack anywhere from 0% to 100% of normal in the Five-Band compressors, each of whose gain reduction has a fast-release (limiter) and slow-release (compressor) component. Because the limiter and compressor characteristics interact, you will usually get best audible results when you set these controls in the range of 70% to 100%. Below 70%, you will usually hear pumping because the compressor function is trying to create some of the gain reduction that the faster limiting function would have otherwise achieved. If you hear pumping in a band and you still wish to adjust the limiter attack to a low setting, you can sometimes ameliorate or eliminate the pumping by slowing down the compressor attack time in that band.

Of course, sometimes artistic pumping is desired for certain styles of music and/or recording. The LIMITER ATTACK TIME controls can help achieve this sound.

If you are using low compression ratios and small amounts of gain reduction, setting the LIMITER ATTACK TIME controls as low as 50% can often increase punch.

K) Adjust the TRANSIENT ENHANCE control to taste.

This control allows you to insert an audio delay of up to 10 ms in the sidechain of the five-band compressor. Delaying the gain control signal, allows attack transients to pass through the multiband compressor uncompressed, which can increase punch. There is a tradeoff between this control and the amount of gain reduction in the look-ahead limiter, which will have to eliminate attack transients exceeding the look-ahead limiter's threshold.

L) Adjust equalization as necessary.

As discussed above, there is a versatile program equalizer available between the AGC and multiband compressor. In five-band mode, there is also a five-band mix control (functioning as a phase-linear graphic equalizer) after the five-band compressor. In five-band mode, any fixed equalization will be partially "undone" by the dynamic re-equalization effect of the five-band compression, so two-band mode is most useful when you are relying on the 8585's fixed EQ or on external EQ earlier in the signal path.

Note also that you can use the individual band compression threshold controls, the BASS COUPLING control, and HF COUPLING control to affect the amount of automatic re-equalization performed by the five-band compression. As you set these controls closer to 100%, they permit progressively less dynamic LF and HF program-adaptive boost. If you feel that the dynamic re-equalization is not producing enough brightness when the program material lacks high frequencies, you should turn the BAND 3>4 and BAND 4>5 COUPLING closer to 0%. Similarly, if weak bass is not sufficiently boosted, turn the BAND 2>1 COUPLING closer to 0%.

M) Set the amount of peak limiting with the MB LIMIT DRIVE control.

In general, the less peak limiting you use, the better sounding the result will be. However, if your client demands a "loud" result, the 8585's look-ahead peak limiter is a powerful tool for achieving this with minimum distortion or other side effects. Nevertheless, be aware that this function is not like some familiar "look-ahead" limiters. The release time is in the order of a few milliseconds and is not user adjustable. The purpose of the limiter is *only* to limit peaks that pass through the earlier compressors because of their finite attack times. Functionally it is used like a peak clipper, but it has vastly reduced modulation distortion by comparison to a clipper, whether "soft knee" or "hard knee."

The main potential side effects of the look-ahead limiter are gain breathing and a "warbling" sound in the midrange when heavy bass is simultaneously present. Listen carefully for this intermodulation effect (particularly on vocals) when you are adjusting the FINAL LIMIT control.

N) Adjust the Bass Clip Threshold and Bass Clip Shape controls to complement the amount of final limiting.

For most mastering applications, you can set the BASS CLIP THRESHOLD to OFF. However, if you hear pumping or "warbling" distortion in the look-ahead limiter caused by heavy bass transients, you can reduce this effect by setting the BASS CLIP to a lower level. (The BASS CLIP control is calibrated in "dB below the look-ahead limiter threshold.") It is most effective when the B1/B2 CROSSOVER control is set to 100 Hz, as this setting prevents intermodulation between vocals and instrumental bass in the clipper.

O) If you wish to compare your processed sound to the unprocessed original, recall the LOOK AHEAD LIMITER preset and toggle between it and your processing preset. If there is a gross loudness disparity, you may wish to edit the gain within the LOOK AHEAD LIMITER preset and save this as a user preset.

P) Save your preset using File/Save Preset.

Once you have created one "mastering" preset, you can edit it to create others and save them under different names.

Q) For a 44.1 or 88.2 kHz output sample rate, set the digital output level (step 8 on page 2-22) to approximately –0.5dBfs; this will prevent overshoots caused by sample rate conversion. For a 48 or 96 kHz output sample rate, set the digital output level to –0.1dBfs.

At 44.1 kHz, the output samples are not exactly the same ones that the look-ahead limiter controlled at the internal 48 kHz sample rate, so slight overshoot can occur. At 48 kHz output sample rate, overshoot will be less than 0.1dB.

If your mastered audio is intended for transmission via a lossy codec like AAC, MP3 or WMA, be aware that the codec's decoder may overshoot and cause audible clipping distortion. See *Setting Output/Modulation Levels* on page 1-19. If the 8585's output is applied directly to a lossy codec, decrease the setting of the 8585's output level control to allow the necessary headroom. If the 8585's output is applied to a linear PCM storage medium (like a CD), it is better to use the entire dynamic range of the linear medium by setting the 8585's output level close to 0 dBfs. Then compensate for codec overshoots by reducing gain when you transcode from the linear PCM recording to the codec.

Section 4
Maintenance

Routine Maintenance

The Optimod 8585 Audio Processor uses highly stable analog and digital circuitry throughout. Recommended routine maintenance is minimal.

1. **Periodically check audio level and gain reduction meter readings.**

   Become familiar with normal audio level meter readings, and with the normal performance of the G/R metering. If any meter reading is abnormal, see Section 5 for troubleshooting information.

2. **Listen to the 8585's output.**

   A good ear will pick up many faults. Familiarize yourself with the "sound" of the 8585 as you have set it up, and be sensitive to changes or deterioration. However, if problems arise, please do not jump to the conclusion that the 8585 is at fault. The troubleshooting information in Section 5 will help you determine if the problem is with OPTIMOD 8585 or is somewhere else.

3. **Periodically check for corrosion.**

   Particularly in humid or salt-spray environments, check for corrosion at the input and output connectors and at those places where the 8585 chassis contacts the rack.

4. **Periodically check for loss of grounding.**

   Check for loss of grounding due to corrosion or loosening of rack mounting screws.

5. **Clean the front panel when it is soiled.**

   Wash the front panel with a mild household detergent and a damp cloth. Do not use stronger solvents; they may damage plastic parts, paint, or the silk-screened lettering. Do not use paper-based cleaning towels or use cleaning agents containing ammonia, or alcohol. An acceptable cleaning product is "Glass Plus." For best results when cleaning the lens, use a clean, lint-free cloth.

Subassembly Removal and Replacement

See page 6-27 for the *Circuit Board Locator and Basic Interconnections* diagram.

1. Removing the Top Cover.

To access the main boards, power supply board or display assembly, you must remove the top cover.

A) Disconnect the 8585 and remove it from the rack.

Be sure power is disconnected before removing the cover.

Hazardous voltage is exposed when the unit is open and the power is ON.

B) Set the unit upright on a padded surface with the front panel facing you.

C) Remove seventeen thread-forming screws and five machine screws holding the top cover in place and lift the top cover off.

Use a #1 Phillips screwdriver.

2. Removing the Input/Output Assembly.

A) Make sure that AC power is disconnected from the 8585.

B) Remove the 14-conductor ribbon cable from the base board at JP600.

C) Remove the two 40-conductor ribbon cables from the DSP board at J602 and J603.

D) Remove the power cable at J601.

E) Remove the three Phillips screws holding the rear of the Input/Output assembly to the floor of the chassis.

F) Remove the ten Phillips screws holding the input/output assembly to the rear panel.

G) Remove the Input/Output assembly.

3. Removing the DSP Board.

A) Make sure that AC power is disconnected from the 8585.

B) If you have not done so yet, remove the top cover (step 1 on page 4-2).

Disconnect the ribbon cable from J504.

C) Disconnect the two ribbon cables from the DSP board to J602 and J603 on the Input/Output assembly

D) Remove the ribbon cable from J701 on the DSP board

E) Remove the cable assembly from J200 of the DSP board.

F) Remove the six Phillips screws holding the DSP board to the bottom of the chassis.

G) Remove the DSP board.

4. Removing the Front Panel.

To service the headphone amplifier, the color LCD display, the pushbuttons, or the rotary encoder, it is first necessary to remove the front panel assembly.

A) Make sure that AC power is disconnected from the 8585.

B) Remove the ribbon cable from J200 on the display interface board.

C) Remove the cable assembly that connects through the fire wall to the headphone amplifier board.

D) Remove the six Phillips head screws that hold the front panel to the main chassis.

These are located in two groups of three on the sides of the main chassis, close to the front panel.

E) Pull the front panel toward you to remove it.

Do not stress the cables connecting the front panel to the main chassis.

To protect the assembly from cosmetic damage, set it down on a soft surface like foam rubber, a quilt, or a blanket.

5. Removing the Headphone Amplifier Board.

Because they are socketed, you can remove and replace the headphone amplifier driver chips without further disassembly.

If you need to remove the headphone amplifier circuit board (to access components other than the headphone amplifier driver chip):

A) Make sure that AC power is disconnected from the 8585.

B) Pull the friction-fit knob off the headphone volume control.

C) Remove three Phillips screws.

This will free the board.

6. Preparing to Remove the Rotary Encoder Board.

The circuit board containing the pushbuttons, joystick, and rotary encoder is mounted on a metal shield plate. To remove the plate, remove three screws and lift the plate off at a 45-degree angle, following the axis of the rotary encoder.

7. Removing the Rotary Encoder Board.

Remove the four screws holding the board to the standoffs and lift the board from the standoffs.

All of the knobs and buttons are friction-fit and can be removed, if necessary, by pulling them off their shafts. However, to avoid possibly damaging the rotary encoder, we advise not removing its knob unless necessary. Instead, to access the screw partially blocked by the rotary encoder's knob, use a small screwdriver and attack the screw head from a slight angle, avoiding the edge of the knob to prevent cosmetic damage.

The pushbutton switches, joystick, and rotary encoder are all soldered to this board and can be replaced by normal solder rework techniques.

8. Removing the Color LCD Display and carrier board.

A) Make sure that AC power is disconnected from the 8585.

B) Remove the cable assembly from J14 on the base board.

C) Remove the 33-conductor flat ribbon cable from the display interface board at J103:

a) Carefully disconnect the cable by rotating the black "wing" at the rear of the connector 90° from horizontal to vertical.

b) Slide the cable out of the connector.

You may find it easier to first remove the display interface board from the control module stack.

D) Remove the four screws that hold the display carrier board to the standoffs on which it is mounted. Then lift the assembly off the standoffs.

9. Removing the Serial Port Connector Board:

A) If you have not done so yet, remove the top cover (step 1, above).

B) Using a 3/16-inch hex nut driver, remove the six hex nuts holding the serial port connectors to the chassis.

C) Unplug the serial port interface assembly from the base board.

10. Removing the CPU Module.

A) The Display Board and CPU Board are a "sandwich" assembly. The CPU board is located on top of the Display Board and is plugged into it.

B) Make sure that AC power is disconnected from the 8585.

C) Remove the RJ45 network cable from the control module

D) Remove the four Phillips screws from the control module.

E) Carefully unplug the module by pulling it evenly away from the display interface board.

11. Removing the Display interface Board.

You must first remove the CPU Module before removing the Display Interface Board.

A) Unscrew the four standoffs that had supported the CPU board before it was removed.

B) Carefully pull the Display Interface Board evenly away from the Base Board, being careful not to stress any ribbon cables still connected to it.

C) Unplug any ribbon cables from the Display Interface Board, which now can be removed completely. Refer to step (8.C)to disconnect the 33-conductor ribbon cable to J103.

12. Removing the Base Board.

You must have completed steps 9, 10, and 11 first.

A) Make sure that AC power is disconnected from the 8585.

B) Remove the three power ribbon cables from the power supply and dress them away from the Base Board.

C) Using a 3/16-inch nut driver, remove the two jackscrews and lock washers holding the DB25 connector to the rear panel.

D) Remove the four Phillips screws and four standoffs holding the Base Board to the bottom of the chassis.

E) Verify that all connectors have been removed.

F) Remove the Base Board.

13. Removing the Power Supply assembly.

To remove the power supply it is necessary to remove the 8585 from the rack and to remove the top cover. It is most convenient to remove the Power Supply Assembly if the Base Board, RS-232 Board, CPU Module, and Display Interface Module have been removed.

A) Be sure that the AC line cord is disconnected from the power supply.

B) Unplug the three ribbon cables from the power supply.

C) Unplug the two cable assemblies from the power transformer by squeezing the locking tab and removing the connector.

D) Remove the nut securing the green ground wire to the chassis.

E) Remove the two Phillips screws securing the mains input connector to the rear of the chassis

F) Remove the three Phillips screws at the bottom edge of the power supply

G) Remove the four Phillips screws holding the power supply assembly to the top apron of the chassis.

H) Remove the power supply assembly.

14. Replacing the Power Supply Assembly:

A) Hold power supply board into main chassis, so that it aligns with the four mounting holes on the top apron of the chassis.

B) Replace the four Phillips screws holding the power supply assembly to the top apron of the chassis, but do not fully tighten them yet.

C) Replace but do not fully tighten the two Phillips screws that hold the IEC connector.

D) Replace and fully tighten the three Phillips screws at the bottom edge of the power supply

E) Fully tighten the four Phillips screws holding the power supply assembly to the top apron of the chassis

F) Fully tighten the two Philips that hold the IEC connector.

G) Replace the two cable assemblies from the power transformer.

H) Replace the nut securing the green ground wire to the chassis.

I) Reattach the three ribbon cables to the power supply.

J) Reattach the two cable assemblies from the power transformer.

15. Replacing the I/O Board and DSP board:

Referring to steps 2 and 3, follow the instructions in reverse.

16. Replacing the Base Board.

Referring to step 12, follow the instructions in reverse.

Note that you cannot replace the Serial Port board, Display Interface Board, and the CPU board until you have replaced the base board.

17. Replacing the Display Interface Board.

Referring to step 11, follow the instructions in reverse.

- To avoid bent pins or other damage, verify that all connector pins are aligned before applying force.
- Verify that pin one of the ribbon cables (red stripe) is oriented correctly. Pin 1 is indicated by the number “1” or a square pad.
- Note that you cannot replace the CPU board until you have replaced the Base Board and the display interface board.

18. Replacing the CPU Board:

To avoid bent pins or other damage verify that all connector pins are aligned before applying force.

Referring to step 10, follow the instructions in reverse.

19. Replacing the Serial Port Board:

Referring to step 9, follow the instructions in reverse.

20. Reassembling the Color LCD Display and carrier board.

Referring to step 8, follow the instructions in reverse.

Verify that pin one of the ribbon cables (red stripe) is oriented correctly.

Pin 1 is indicated by the number “1” or a square pad.

21. Replacing the Rotary Encoder Board.

Referring to steps 6 and 7, follow the instructions in reverse.

Verify that pin one of the ribbon cables (red stripe) is oriented correctly.

Pin 1 is indicated by the number “1” or a square pad.

22. Replacing the Headphone Amplifier Board.

Referring to step 5, follow the instructions in reverse.

23. Replacing the Front Panel.

Referring to step 4, follow the instructions in reverse.

24. Check your work.

Referring to the cable wiring diagram on page 6-27, verify that all cables have been securely reattached.

Verify that all removed hardware has been replaced and is secure.

25. Replace the Top Cover.

Place top on the unit and reattach the seventeen thread-forming screws and five machine screws.

The 8585 can now be returned to service.

Field Audit of Performance

Required Equipment:

- Bitstream analyzer that can accept AES3id inputs

  Audio Precision System 2

NTI Digilyzer DL1 or equivalent

- Digital voltmeter (for testing power supply voltages)

  Accurate to ±0.1%.

- Oscilloscope

  DC-coupled, triggered sweep, with 5M Hz or greater vertical bandwidth.

- Two short 75Ω jumper cables terminated by male BNC connectors
- One 75Ω BNC “Tee” connector, male to two females.
- Optional: Distortion analyzer with analog input (for checking the performance of the analog outputs)

  Audio Precision System 2 or equivalent

- Optional: Two 620Ω ±5% resistors (for terminating the analog outputs)

It is assumed that the technician is thoroughly familiar with the operation of this equipment.

This procedure is useful for detecting and diagnosing problems with the 8585's performance. It assesses the performance of the digital inputs, digital outputs, and digital-to-analog converters and verifies that the digital signal processing section (DSP) is passing signal correctly. If it is doing so, there is a high probability that the DSP is performing the dynamic signal processing correctly. There is therefore no need to measure such things as attack and release times—these are defined by software and will automatically be correct if the DSP is otherwise operating normally.

If you do not have a signal analyzer with a digital input (like the Audio Precision System 2), you may use the 8585’s two analog outputs to drive an analyzer with analog inputs. However, this will limit the resolution of your measurements.

The procedure uses the 8585’s built-in high-resolution sinewave oscillator to generate test tones. An external tone generator is not required.

It is often more convenient to make measurements on the bench away from high RF fields which could affect results. For example, in a high RF field it is very difficult to accurately measure the very low THD produced by a properly operating 8585 at most frequencies. However, in an emergency it is usually possible to detect many of the more severe faults that could develop in the 8585 circuitry even in high-RF environments.

See the assembly drawings in Section 6 for component locations. Be sure to turn the power off before removing or installing circuit boards.

Follow these instructions in order without skipping steps.

Note: To unbalance the analog output, connect pin 1 (ground) to pin 3, and measure between pin 1 (ground) and pin 2 (hot).

Note: All analog output measurements are taken with a 620Ω ±5% resistor tied between pin 2 and 3 of the XLR connector.

1. **Save your existing System Setup.**

   To facilitate testing the 8585, we supply several Setups to be recalled as you work through the testing procedure below. Recalling a Setup will cause you to lose any unsaved adjustments you have made to the 8585's setup parameters. Therefore, to allow you to restore your existing settings later, save them as a System Setup before you start testing the 8585. (See step 4 on page 2-19 and step 9 on page 2-24.)

2. **Test the power supply**

   A) If the power supply is entirely dead and the fuse is not blown, verify that the primary winding of the power transformer is intact by measuring the resistance of the power supply at the IEC AC line connector.

   - For 115-volt operation, the resistance should be approximately 7.6Ω.
   - For 230-volt operation, the resistance should be approximately 27Ω.

   B) The green LED power indicator on the upper right of the front panel display monitors the DC power supply outputs. If one or more power supply voltages are out of tolerance, red flashes will report them according to the table below. If there are multiple values out of tolerance, they are reported one after another in a continuous loop, with one green flash indicating the beginning of each count.

Number of Red Flashes	Problem With
1	+ unregulated supply
2	+15V or –15V
3	+5V or –5V
4	+5V Digital
5	Analog ↔Digital ground connection broken
6	DSP A +3.3V supply
7	DSP B +3.3V supply
8	CPU +3.3V supply
9	CPU +2.5V supply

Table 4-1: Decoder Chart for Power Supervisor

You can monitor power supply voltages at connector J7 on the power supply board (see page 6-41 for the parts locator drawing and page 6-42 for the schematic). When one faces the connector, the voltages can be found on the pins in the following pattern:

(1) + unreg.	(3) digital gnd	(5) +15V	(7) +5 V digital	(9) –5V analog
(2) - unreg	(4) chassis gnd	(6) -15V	(8) +5V analog	(10) NC

Table 4-2: Layout Diagram of J7, with expected voltages on each pin

C) Measure the regulated voltages at J7 with the DVM and observe the ripple with an oscilloscope, AC-coupled. The following results are typical:

Power Supply Rail	DC Voltage (volts)	AC Ripple (mV p-p)
+15VDC	+15 ± 0.5	<20
–15VDC	–15 ± 0.5	<20
+5VDC	+5 ± 0.25	<20
–5VDC	–5 ± 0.25	<20
Digital +5VDC	+5 ± 0.25	[Obscured by noise]

Table 4-3: Typical Power Supply Voltages and AC Ripple

3. Adjust Analog Output Level Trim; Verify Analog Output THD and Noise.

A) *LOCATE* to RECALL/IMPORT>RECALL SETUP>AUDIT1 and press the *ENTER* button. This will recall the AUDIT1 Setup.

B) Connect the distortion analyzer to the left analog output.

C) Using the distortion analyzer's level meter, adjust output trim VR200 to make the meter indicate +10.0 dBu. (0 dBu = 0.775V rms.) Verify a frequency reading of 400 Hz.

D) Verify a THD+N reading of <0.03% using a 22 kHz low pass filter in the distortion analyzer.

E) *Optional: LOCATE* to SYSTEM SETUP>TEST MODES>TONE FREQUENCY. Using the distortion analyzer, measure the level and THD+N at 20 Hz, 50 Hz, 100 Hz, 400 Hz, 5 kHz, and 20 kHz. (Set the frequencies with the 8585's knob.) Verify that frequency response is within ±0.1 dB of the level at 400 Hz and that THD+N does not exceed 0.03% at any of these frequencies.

F) Using VR201, repeat steps (B) through (E) for the right analog output.

G) Recall the AUDIT2 Setup.

H) Verify a reading (noise) of <–80 dBu at the left and right analog outputs.

4. Test Digital I/O and Sync for Input/Output 1/2 (Lf/Rf).

A) Recall the AUDIT3 Setup. This uses the 2.0 processing chain as a test tone generator to test the surround channels.

B) Using a 75Ω BNC/BNC jumper cable, the 8585's OUTPUT 11/12 BNC connector to its INPUT 1/2 BNC connector and verify that the 1/2 indicator on the 8585's front panel turns yellow, indicating that the 8585's INPUT 1/2 AES3id receiver has locked to the signal emitted from OUTPUT 11/12.

C) Connect the digital analyzer to the 8585's OUTPUT1/2 BNC connector and verify that the THD+N is below –100 dBfs and that the sample rate is 48 kHz, as locked to the input sample rate.

D) AUDIT3 emits its test signal at a 48 kHz sample rate. To test 32 kHz, 44.1 kHz, 88.2 kHz, and 96 kHz sample rates, recall AUDIT4, AUDIT5, AUDIT6, and AUDIT7 in turn. Use the AES3id analyzer to do the following for each sample rate:

a) Measure the THD+N and verify that it is below –100 dBfs (0.001%).

b) Listen to the AES3id analyzer's decoded analog output and verify that the output sounds clean and glitch-free.

c) Verify that the frequencies measured at the 8585's OUTPUT 1/2 follow the values in the chart below within given tolerances.

Sample Rate	Tolerance (PPM)	Tolerance (Hz)
32.0 kHz	100 PPM	±3.20 Hz
44.1 kHz	100 PPM	±4.41 Hz
48.0 kHz	100 PPM	±4.80 Hz
88.2 kHz	100 PPM	±8.82 Hz
96.0 kHz	100 PPM	±9.60 Hz

5. **Test Digital I/O and Sync for Input/Output 3/4 (C/LFE).**

   Connect the 8585's OUTPUT 11/12 BNC connector to its INPUT 3/4 BNC connector, connect the analyzer to OUTPUT 3/4, and follow the procedure in step 4 by analogy. Use Setups AUDIT8 through AUDIT12.

6. **Test Digital I/O and Sync for Input/Output 5/6 (Ls/Rs).**

   Connect the 8585's OUTPUT 11/12 BNC connector to its INPUT 5/6 BNC connector, connect the analyzer to OUTPUT 5/6, and follow the procedure in step 4 by analogy. Use Setups AUDIT13 through AUDIT17.

7. **Test Digital I/O and Sync for Input/Output 7/8 (Lb/Rb).**

   Connect the 8585's OUTPUT 11/12 BNC connector to its INPUT 7/8 BNC connector, connect the analyzer to OUTPUT 7/8, and follow the procedure in step 4 by analogy. Use Setups AUDIT18 through AUDIT22.

8. **Test Digital I/O and Sync for Input/Output 9/10 (routed to Lf/Rf).**

   Connect the 8585's OUTPUT 11/12 BNC connector to its INPUT 9/10 BNC connector, connect the analyzer to OUTPUT 9/10, and follow the procedure in step 4 by analogy. Use Setups AUDIT23 through AUDIT27.

9. **Test Digital Output 11/12 and Sync Input.**

   A) Connect the BNC "Tee" connector to the 8585's SYNC input.

   B) Connect OUTPUT 7/8 to one end of the "Tee" connector.

   C) Connect INPUT 9/10 to the other end of the "Tee" connector.

   D) Connect the AES3id analyzer to OUTPUT 11/12.

   E) Follow the procedure in step 4 by analogy. Use Setups AUDIT28 through AUDIT32.

10. Test RS-485 (metadata) serial ports.

This test uses the "loopback" technique to allow the 8585 to self-test its RS-485 serial ports.

A) Disconnect AC power from the 8585.

B) By using jumpers or constructing an appropriate cable, connect the input and output RS-485 serial connectors as follows:

a) Connect pin 2 of connector J2 (RS-485 METADATA INPUT) to pin 2 of J1 (RS-485 METADATA OUTPUT).

b) Connect pin 7 of J2 to pin 7 of J1.

C) Re-power the 8585.

D) *LOCATE* to diagnostic screen 3 at the unit or, after connecting via PC Remote, open the PC diagnostic dialog box. Verify that the last line reads "485 loopback ok."

- If the loopback fails, no text will be displayed—there is no "error message."
- The line above the loopback shows the current Dialnorm value received. Valid values are 11-31. 00 indicates that no Dialnorm is being received.

```
8585 V 1.0.x.xx
Station Name: undefined
Access Level: 0: all access
Bootup: Sat Jan 01 02:26:37 2000
Ethernet Adapter's MAC Address: xx-xx-xx-xx-xx-xx
Memory Total: 16121856
Memory Available: 6598384
Available Space: 8504 Kbytes
Dialnorm value=00
485 loopback ok
```

Table 4-4: Sample screenshot showing a successful test

11. Optional tests.

A) *GPI (Remote Interface) inputs:* You can test each GPI input for functionality in the obvious way, by programming a function for it and then verifying that the function executes when you activate the input. To connect to the GPI inputs, see step 5 on page 2-3. To program a GPI input, see *Remote Control Interface Programming* on page 2-48.

B) *Tally outputs:*

a) Connect them according to step 6 on page 2-3.

b) Program them for each of the conditions listed in step (20.B) on page 2-31 and verify that they respond accordingly. AESxx input errors can be tested most simply by disconnecting the AES3id signal from the input programmed to trigger the tally.

This test also verifies the 8585's Silence Sense functionality (see step 19 on page 2-30).

C) *RS-232 Port:* You can test the RS-232 for functionality by verifying that you can connect to a PC through a null modem cable. See *Networking and Remote Control* on page 2-49 (in particular, step 2 on page 2-51).

12. Return OPTIMOD 8585 to service.

A) Remove the 620Ω resistors connected across the outputs.

B) Restore your normal operating parameters by recalling the Setup you saved in step 1 on page 4-9: *LOCATE* to RECALL/IMPORT>RECALL SETUP. Highlight the Setup using the knob or joymouse. Then press *ENTER.*

Section 5
Troubleshooting

Problems and Potential Solutions

Always verify that the problem is not the source material being fed to the 8585, or in other parts of the system.

Refer to Section 3 for discussions of the controls referred to below.

Loudness incorrect compared to other Dolby Digital Transmissions

- Review *Setting Preset Loudness Correctly for Dolby Digital Transmission* on page 3-18.
- Be sure that a full bandwidth signal has not been applied accidentally to the LFE input of the processing. If this has occurred, the 8585's Loudness Level meter and Loudness Controller will not operate correctly.
- Be sure that the active DIALNORM setting in the 8585 is the same as the DIALNORM setting you are transmitting to consumers. Use a device like the Dolby LM100 Loudness Meter to read out the Dialnorm you are transmitting to your audience (or simply check the Dialnorm setting of your Dolby Digital encoder). See step 9 on page 2-13.
- Be sure that the 8585's input reference level is set to produce normal amounts of gain reduction. See step 6 on page 10.

  Note that if you are using a "radio-style" preset, loudness control will be looser than if you use a TVxxxx preset because the TVxxxx presets have the 8585's CBS Loudness Controller turned on, which ensures tightest loudness control. Any radio-style preset can be edited to activate the Loudness Controller.

  The 8585's LFE processing does not apply any band limiting and operates under the assumption that (1) the input signal has been previously filtered to 120 Hz or lower, and (2) the LFE channel will receive a 10 dB gain boost when reproduced by the consumer's receiver.
- If the loudness controller is on, be sure that the LOUDNESS THRESHOLD control is set to –10 dB.

  This matches the loudness controller's threshold to the 8585's active DIALNORM value.

- Once DIALNORM is correct, be sure that your active preset is causing the 8585's LOUDNESS GAIN REDUCTION meter to indicate approximately 3 dB of gain reduction on normal dialog. Adjust its MB LIMIT DRIVE control if it does not. When the loudness controller is operating normally, the 8585's LOUDNESS LEVEL meter should be peaking around 0 dB on dialog. If it is not and you are using a custom preset, you might get better loudness control by slightly tweaking the LOUDNESS THRESHOLD control to make the LOUDNESS LEVEL meter peak around 0, bearing in mind that the correct setting is –10 dB for typical sound-for-picture processing. A maximum variation of ±1 dB will typically suffice.

  If the 8585's active DIALNORM setting is not the same as the DIALNORM setting you are transmitting to your audience, the 8585's Loudness Level meter will be calibrated incorrectly, so even if the meter is peaking at 0 dB, loudness at the consumer's receiver will not be correct.

  Note that because the 8585's Loudness Level meter shares the loudness controller's filterbank, the meter does not show the effect of the LOUDNESS ATTACK control, which shapes the loudness controller's gain reduction signal outside the loudness controller's feedback loop. Therefore, if you are using values of LOUDNESS ATTACK below about 50%, the loudness of transient events may be significantly higher than the Loudness Level meter indicates.

Loudness Controller reduces transient punch of programming

- Reduce the amount of fast gain reduction in the loudness controller by setting the LOUDNESS ATTACK control closer to 0 %. This will allow more short loudness peaks to pass through without attenuation by the loudness controller. We believe that the range from 50% to 70% offers the most useful tradeoffs between reducing punch and allowing irritating short-term loudness bursts to pass through uncontrolled.

Transient loudness events (like esses in speech) sound obtrusively loud

- Set the LOUDNESS ATTACK control closer to 100%. This will allow the loudness controller to do more de-essing but may decrease transient impact as a side effect.

- Set the TRANSIENT ENHANCE control to 0 ms.

- If "ess" sounds in speech (particularly with women's voices) seem too pronounced, one solution is to use the five-band structure and tune it for de-essing (which we have done already in the TVxxx preets). Set the SPEECH B5 THRESHOLD control (for 2.0 processing) or CENTER B5 THRESHOLD control more negative. For surround processing, make sure that the B5 MAIN>CENTER MAX +DELTA GR is set to 10 dB or more. This will allow the center band 5 compressor to produce as much extra gain reduction as needed to control "esses."

Commercials too loud in sound for picture applications

- Make sure that the Loudness Controller is activated on the preset that you are using—the LOUDNESS CONTROLLER THRESH control must not be set OFF (see page 3-52) and is normally set to –10 dB.

- If the Loudness Controller is active but, based on its gain reduction meter, you do not believe it is working hard enough, set its threshold lower using the LOUDNESS CONTROLLER THRESH control.

  Note that the Loudness Controller controls subjective loudness to an absolute threshold and does not understand the context of the program. Therefore, if a commercial follows a piece of very quiet program material, the commercial may still seem loud even though the Loudness Controller is working properly.

  See *Loudness Control* on page 3-14.

LFE channel is unbalanced with respect to the rest of the audio spectrum

- Adjust the LFE COMPRESSION THRESHOLD control.
- Adjust the B1>LFE COUPLING control.
- Adjust the LC BASS COUPLING control.

Dialog is buried by music and/or effects

- In the surround processing, set the BX MAIN>CENTER MAX –DELTA GR controls to a higher value. This will allow the center channel compressor to have more gain with respect to the other channels.

Dialog is muffled

- Use the five-band structure and set the B3>B4 COUPLING and B4>B5 COUPLING controls to a higher value. This will allow the processing to apply more dynamic high frequency boost. In the surround processing, adjust these controls in the center channel compressor.
- Set the B4 COMPRESSOR THRESHOLD control to a higher value (i.e., closer to 0 dB). This will produce less gain reduction in the presence region.
- Try using the 8585's HF Enhancer. To do so, *LOCATE* to the EQUALIZER screen and set the HF ENHANCE control to taste. For most TV programming, very low settings (like 0.25) are appropriate because they minimize the possibility of increasing noise.

Shrill, harsh sound

- This problem can be caused by excessive HF boost in the HF Equalizer and HF Enhancer. It could also be caused by an excessively high setting of the band 4 or band 5 compression threshold control (if you are using the Five-Band Structure), or by excessively high settings of the BAND 4 MIX and BAND 5 MIX controls (located in Full and Advanced Modify).

Dull sound

- If you are using the Two-Band structure, dull-sounding source material will sound dull on the air. The Five-Band Structure will automatically re-equalize such dull-sounding program material to make its spectral balance more consistent with other program material.

- Particularly if you are using the Two-Band structure, try using the 8585's HF Enhancer. See *Dialog is muffled* above.

Too much bass when the loudness controller is producing large amounts of GR

- The loudness controller is producing too little gain reduction in the below-200 Hz band. Set the LOUDNESS BASS COUPLE control closer to 0 dB. See *Loudness Control* on page 3-14.

RFI, hum, clicks, or buzzes

- For good RFI resistance, always use balanced analog outputs and be sure that the cables connected to the digital inputs and outputs are well shielded.

  The 8585 has been designed with very substantial RFI suppression on its analog and digital input and output ports, and on the AC line input. It will usually operate adjacent to high-powered transmitters without difficulty. In the most unusual circumstances, it may be necessary to reposition the unit to reduce RF interference, and/or to reposition its input and output cables to reduce RF pickup on their shields.

  The AES3id inputs and output are transformer-coupled and have very good resistance to RFI.

Poor peak modulation control

- The 8585 ordinarily controls peak modulation to an accuracy of ±2% when operated with 48 kHz output sample rate. As explained in Section 1, output sample rate conversion will slightly compromise this control because the peak control occurs with reference to individual sample values at 48 kHz. The converted samples no longer have the same peak values as the 48 kHz samples; some values can be slightly higher. However, the overshoot of the converted signal almost never exceeds 0.5dB and is therefore not a significant problem.

- Using the analog output will cause similar amounts of overshoot because the peaks in the reconstructed analog waveform are not necessarily synchronous with the peak-controlled samples in the 8585. Moreover, analog connections can cause analog-domain overshoot if the connection is not phase-linear and does not have a –3dB low-frequency cutoff below 0.15Hz.

Audible distortion

- Make sure that the problem can be observed on more than one monitoring system.

- Verify that the source material at the 8585's audio inputs is clean. Heavy processing can exaggerate even slightly distorted material, pushing it over the edge into unacceptability.

- The subjective adjustments available to the user have the potential to cause distortion when too much fast gain reduction occurs in the multiband compressors and/or look-ahead peak limiters. Watch the gain reduction meters and do not let them go to full scale. You can turn down the gain reduction in the multiband compressors via the MB DRIVE (five-band) and 2-BAND DRIVE (two-band) controls.

The normal gain reduction in the look-ahead limiters should not exceed 6 dB. Advancing the MB LIMIT DRIVE control too far will cause distortion by creating large amounts of gain reduction in the look-ahead limiters. Setting DIALNORM to high levels will do the same thing. We do not recommend using DIALNORM values higher (i.e., closer to 0) than –18 dBfs unless you are specifically trying to make "loud" masters in mastering applications. (We strongly discourage that because decades of broadcast experience has shown that over-processing audio cause subliminal listening fatigue and audience tune-outs.) DIALNORM values of –25 dB and below are preferred because these will cause very little gain reduction in the look-ahead limiters.

- If you are using an external processor ahead of the 8585, be sure it is not clipping or otherwise causing problems.

Audible noise

(See also "RFI, Hums, Clicks, or Buzzes" on page 5-1.)

- Excessive compression will always exaggerate noise in the source material. The 8585 has two systems that fight this problem. The *silence gates* freeze the gain of the AGC and compressor systems whenever the input noise drops below a level set by the threshold control for the processing section in question, preventing noise below this level from being further increased.
- There are two independent silence gates in each processing channel of the 8585. The first affects the AGC and the second affects the Multiband Compressor. Each has its own threshold control. (See MB GATE on page 3-57.)
- In sound for picture, the setting of the GATE THRESHOLD control is quite critical if you want the processing to be undetectable to the audience. If this control is set too low, then the 8585 will pump up quiet sounds like ambiance and underscoring to unnaturally high levels. Refer to Section 3 of this manual for a further discussion.
- In the Five-Band Structure, *dynamic single-ended noise reduction* (see DWNEXP THR on page 3-59) can be used to reduce the level of the noise below the level at which it appears at the input.

  The 8585's AES3id inputs are capable of receiving words of up to 24 bits. A 24-bit word has a dynamic range of approximately 144 dB. The 8585's digital input will thus never limit the unit's noise performance even with very high amounts of compression.

- See *Routing Audio to and from the 8585* starting on page 1-11 for a discussion of pitfalls that can compromise audio quality.

System will not pass line-up tones at 100% modulation

- This is normal. Sine waves have a very low peak-to-average ratio by comparison to program material. The processing thus automatically reduces their peak level to bring their average level closer to program material, promoting a more consistent and well-balanced sound quality.

- The 8585 can generate test tones itself. The 8585 can also be put into Bypass mode (locally or by remote control) to enable it to pass externally generated tones at any desired level. (See *Test Modes* on page 3-64.)

System will not pass Emergency Alert System ("EAS" USA Standard) tones at the legally required modulation level

- See *System Will Not Pass Line-Up Tones at 100% Modulation* (directly above) for an explanation. These tones should be injected into the transmitter after the 8585, or the 8585 should be temporarily switched to a PASS-THROUGH preset to pass the tones.

System Receiving 8585's digital output will not lock

- Be sure that the sample rate at the 8585's output is set to match the sample rate that the driven system expects. (Use the SURROUND OUTPUT RATE or 2.0 OUTPUT RATE control as appropriate.)

- Be sure that the 8585's output mode (AES3 or SPDIF) in the active Setup is set to match the standard expected by the driven system.

- In synchronous systems like TV facilities, be sure that you have set up the 8585's digital outputs to lock to your desired reference, which can be an AES3id signal applied any 8585 input or a word clock reference applied to the 8585's Sync input. See step (8.B) on page 2-22 for 2.0 outputs and step (11.B) on page 2-28 for surround outputs.

AES Channel Status Bits will not set the 8585's 2.0 processing to Stereo or Dual-Mono mode.

- Be sure that the equipment driving the 8585 is set in AES3 or AES/EBU mode. (SPDIF will not work.) Similarly, you must set the 8585's digital output mode (via the SURROUND OUTPUT FORMAT or 2.O OUTPUT FORMAT control) to AES in order to send AES channel status bits to downstream equipment. (See step 12 on page 2-16.)

Equipment receiving the 8585's 2.0 Processing output changes operation mode unexpectedly.

- Some equipment will respond incorrectly to AES Channel status bits:. Try turning these off in the 8585. (See step 12 on page 2-16.)

General dissatisfaction with subjective sound quality

- The 8585 is a complex processor that can be adjusted for many different tastes. For most users, the factory presets, as augmented by the gamut offered by the LESS-MORE control for each preset, are sufficient to find a satisfactory "sound." However, some users will not be satisfied until they have accessed other Modify Processing controls and have adjusted the subjective setup controls in detail to their satisfaction. Such users *must* fully understand the material in Section 3 of this manual to achieve the best results from this exercise.

- Section 1 of this manual provides a thorough discussion of system engineering considerations, particularly with regard to minimizing overshoot and noise.

Security passcode lost (when unit is locked out)

- Please see *If you have forgotten your "All Access" passcode…*on page 2-38.

Connection Issues between the 8585 and a PC, Modem, or Network

- **User Interface Slowdown**: The more user presets you make, the more slowly the 8585 will respond to front-panel commands. Delete any user presets you do not need.

- **Software Updates**: Close any running Windows programs before attempting to update.

- **Interrupted Software Updates**: If you canceled an update before it completed, wait at least one minute before attempting your next update.

- **Software Updates via Modem**: If you are updating via the modem, do not change the "connection type" parameter on the 8585 while the modem is connected or attempting to connect.

- **Security Passcode**: An ALL ACCESS (administrator) security passcode is required for upgrading, regardless of whether you are using a Direct, Modem, or Ethernet connection.

- **Passcode Format**: The passcode is case-sensitive. When entering it into Windows' Dial-up Connection dialog box, it must be typed exactly as it was originally entered into the Security screen.

Troubleshooting Connections

- If you get an error message such as "the specified port is not connected" or "There is no answer"…

  A) You may have the wrong interface type set on your 8585. *LOCATE* to SETUP > NETWORK & REMOTE > NETWORK > SERIAL INTERFACE TYPE and check the interface setting. See *Connecting to the 8585's Ethernet Port or RS-232 Port Using TCP/IP* on page 2-45.

  B) If you are connecting via Direct Serial Connection or modem, review the Properties you have set on that connection. Double-check to ensure that you have set Windows parameters as described in *Appendix: Setting Up Serial Communications* on page 2- 59.

- If your Direct Connect does not work:

  A) Check to make sure that the cables are connected properly.

  B) Check that you are using a null modem cable.

C) Ensure that the null modem cable is connected to the 8585's serial connector.

- If your Modem Connect does not work:

A) Ensure that the modem cables and phone lines are connected properly.

B) Check that you have entered the correct phone number for connection.

C) Check that you have entered the passcode correctly on the 8585 and the passcode has been entered correctly on your PC.

D) Ensure that you enabled the correct PC modem port settings.

E) Ensure that the external modem attached to your 8585 is set to AUTO ANSWER.

F) Make sure that the only "Allowed Network Protocol" is TCP/IP. "NetBUI" and "IPX > SPX Compatible" must *not* be checked.

- If you cannot connect to your computer through a crossover Ethernet cable:

You must set your Windows networking to provide a static IP address for your computer because your Optimod does not contain a DHCP server.

You Cannot Access the Internet After Making a Direct or Modem Connection to the 8585:

If you are connected to the 8585 via modem or direct connect, *you cannot access any other TCP/IP connection*. The PPP connection becomes the default protocol and the default gateway defaults to the 8585 unit's IP address. This means that all existing network connections point to the 8585 unit. To correct this:

A) In Start > Settings > Network and Dialup Connections, open the direct or modem connection you are using to connect to 8585.

B) Select "Properties."

C) Click the tab that reads "Networking."

D) Highlight "Internet protocol (TCP/IP)."

E) Select "Properties."

F) Select "Advanced."

G) Uncheck the "Use default gateway on remote network" box.

H) Select "OK."

If this "Use default gateway on remote network" box is not selected, the gateway will not point to the 8585 unit when you establish a direct or modem connection.

OS-Specific Troubleshooting Advice

Troubleshooting Windows 2000 Direct Connect:

If you are having trouble establishing a connection, check your New Connection's properties to make sure they are set up correctly:

A) Click "Start > Programs > Accessories > Communications > Network and Dialup Connections" to bring up the Network Connections screen.

B) In the "Network Connections" window, right-click "Optimod 8585 - Direct" and choose "Properties."

C) The "Properties" window opens for "Optimod 8585 - Direct

D) Click the "Networking" tab.

E) Set "Type of dial-up server I am calling" to "PPP: Windows 95/98/NT4/2000, Internet."

F) Select the "Settings" button and make sure all PPP settings are unchecked. Then click "OK."

G) In "Components checked are used by this connection," uncheck all except for "Internet Protocol (TCP/IP)."

H) Select "Internet Protocol (TCP/IP)" and then click the "Properties" button. The "Internet Protocol (TCP/IP) Properties" window opens.

I) Choose "Obtain an IP address automatically" and "Obtain DNS server address automatically"

J) Click the "Advanced…" button on the "Internet Protocol (TCP/IP)" Window.

K) In the "Advanced TCP/IP Settings" select the "General" Tab; make sure that no check boxes are checked.

L) In the "Advanced TCP/IP Settings" select the "DNS" Tab.

M) In the "Advanced TCP/IP Settings" select the "WINS" Tab.

N) Click "OK" to dismiss the "Advanced TCP/IP Settings" window.

O) Click "OK" to dismiss the "Internet Protocol (TCP/IP) Properties" window.

P) Click "OK" to dismiss the window whose name is your new connection.

Q) Click "Cancel" to dismiss the "Connect [nnnn]" dialog box

R) Restart your computer. (This resets the serial port and reduces the likelihood that you will encounter problems connecting to the 8585.)

S) If you see: "Error 777: The connection failed because the modem (or other connecting device) on the remote computer is out of order":

The "remote computer" is actually the 8585 and it is not out of order; you just need to set the Maximum Speed (Bits per second) to 115200. If you already set this speed when you configured your PC ports, you shouldn't have this problem.

The 8585 communicates at 115200 bps. COM ports on some older PCs are incapable of communications at this rate and may not work reliably. Most newer PCs use 16550-compatible UARTS, which support the 115200 bps rate.

If you do see this warning message, you can reset the Maximum BPS Speed by accessing PROPERTIES for the connection:

a) Click START > PROGRAMS > ACCESSORIES > COMMUNICATIONS > NETWORK AND DIAL-UP CONNECTIONS.

b) Right click the name of your connection and access "PROPERTIES."

c) Go to the "GENERALS" TAB and select the "CONFIGURE" button.

d) Set the MAXIMUM SPEED (BPS) to 115200.

e) Select OK and try your connection again.

T) If you see: "Error 619: The specified port is not connected."

Make sure the INTERFACE TYPE on the 8585 is correct:

a) On the 8585, go to Setup > Network & Remote > Network.

b) Set PC CONNECT to DIRECT.

c) Try your connection again.

Troubleshooting Windows 2000 Modem Connect:

If you are having trouble establishing a connection, check your New Connection's properties to make sure they are set up correctly:

A) Click "Start > Programs > Accessories > Communications > Network and Dialup Connections" to bring up the Network Connections screen.

B) In the "Network Connections" window, right-click "Optimod 8585 - Modem" and choose "Properties."

C) The "Properties" window opens for "Optimod 8585 – Modem."

D) Click the "Properties" button.

E) Select the "General" tab and make sure that "Connect Using" displays the correct modem and port.

F) Click the "Configure…" button.

G) Set the "Maximum Speed (bps) to 115200.

H) Check the "Enable hardware flow control," make sure all other hardware features are unchecked. Then click "OK."

I) Click the "Networking" tab on the "Properties" window.

J) Set "Type of dial-up server I am calling" to "PPP: Windows 95/98/NT4/2000, Internet."

K) Select the "Settings" button and make sure all PPP settings are unchecked. Then click "OK."

L) In "Components checked are used by this connection," uncheck all except for "Internet Protocol (TCP/IP)."

M) Select "Internet Protocol (TCP/IP)" and then click the "Properties" button. The "Internet Protocol (TCP/IP) Properties" window opens.

N) Choose "Obtain an IP address automatically" and "Obtain DNS server address automatically"

O) Click the "Advanced…" button on the "Internet Protocol (TCP/IP)" Window.

P) In the "Advanced TCP/IP Settings" select the "General" Tab; make sure that no check boxes are checked.

Q) Click "OK" to dismiss the "Advanced TCP/IP Settings" window.

R) Click "OK" to dismiss the "Internet Protocol (TCP/IP) Properties" window.

S) Click "OK" to dismiss the window whose name is your new connection.

T) Click "Cancel" to dismiss the "Connect [nnnn]" dialog box

U) Restart your computer.

Although not strictly necessary, this resets the serial port and reduces the likelihood that you will encounter problems connecting to the 8585.

Troubleshooting Windows XP Direct Connect:

If you are having trouble establishing a connection, check your New Connection's properties to make sure they are set up correctly:

A) Click "Start > Programs > Accessories > Communications > Network Connections" to bring up the Network Connections screen.

B) In the "Network Connections" window, right-click "Optimod 8585 - Direct" and choose "Properties."

C) The "Properties" window opens for "Optimod 8585 - Direct."

D) Click the "Networking" tab.

E) Set "Type of dial-up server I am calling" to "PPP: Windows 95/98/NT4/2000, Internet"

F) Select the "Settings" button and make sure all PPP settings are unchecked, then click "OK."

G) In "This connection uses the following items," uncheck all except for "Internet Protocol (TCP/IP)." You can also leave "QoS Packet Scheduler" checked if you like.

H) In "This connection uses the following items," select "Internet Protocol (TCP/IP)" and then click the "Properties" button. The "Internet Protocol (TCP/IP) Properties" window opens.

I) Choose "Obtain an IP address automatically" and "Obtain DNS server address automatically"

J) Click the "Advanced…" button on the "Internet Protocol (TCP/IP)" Window.

K) In the "Advanced TCP/IP Settings" select the "General" Tab; make sure that no check boxes are checked.

L) Click "OK" to dismiss the "Advanced TCP/IP Settings" window.

M) On the "Properties" window for "Optimod 8585 – Modem" click the "Advanced" tab.

N) Click "OK" to dismiss the window whose name is your new connection.

O) Click "Cancel" to dismiss the "Connect [nnnn]" dialog box

P) Restart your computer.

This resets the serial port and reduces the likelihood that you will encounter problems connecting to the 8585.

Troubleshooting Windows XP Modem Connect:

If you are having trouble establishing a connection, check your New Connection's properties to make sure they are set up correctly.

A) Click "Start > Programs > Accessories > Communications > Network Connections" to bring up the Network Connections screen.

B) In the "Network Connections" window, right-click "Optimod 8585 - Modem" and choose "Properties."

The "Properties" window opens for "Optimod 8585 - Modem."

C) Click the "Networking" tab.

D) Set "Type of dial-up server I am calling" to "PPP: Windows 95/98/NT4/2000, Internet"

E) Select the "Settings" button. Make sure all PPP settings are unchecked and then click "OK."

F) In "This connection uses the following items," uncheck all except for "Internet Protocol (TCP/IP)." You can also leave "QoS Packet Scheduler" checked if you like.

G) In "This connection uses the following items," select "Internet Protocol (TCP/IP)" and then click the "Properties" button.

The "Internet Protocol (TCP/IP) Properties" window opens.

H) Choose "Obtain an IP address automatically" and "Obtain DNS server address automatically."

I) Click the "Advanced…" button on the "Internet Protocol (TCP/IP)" Window.

J) In the "Advanced TCP/IP Settings," select the "General" Tab; make sure that no check boxes are checked.

K) Click "OK" to dismiss the "Advanced TCP/IP Settings" window.

L) Click "OK" to dismiss the window whose name is your new connection.

Restart your computer. (This resets the serial port and reduces the likelihood that you will encounter problems connecting to the 8585.)

Technical Support

If you require technical support, contact Orban customer service. Be prepared to describe the problem accurately. Know the serial number of your 8585 — this is located on the rear panel of the unit. Current contact information is found at http://www.orban.com/contact/.

Please check Orban's website, www.orban.com, for Frequently Asked Questions and other technical tips about 8585 that we may post from time to time. Manuals (in .pdf form) and 8585 software upgrades will be posted there too—click "Downloads" from the home page.

Factory Service

Before you return a product to the factory for service, we recommend that you refer to this manual. Make sure you have correctly followed installation steps and operation procedures. If you are still unable to solve a problem, contact our Customer Service for consultation. Often, a problem is relatively simple and can be quickly fixed after telephone consultation.

If you must return a product for factory service, please notify Customer Service by telephone, *before* you ship the product; this helps us to be prepared to service your unit upon arrival. Also, when you return a product to the factory for service, we recommend you include a letter describing the problem.

Please refer to the terms of your Limited One-Year Standard Warranty, which extends to the first end user. After expiration of the warranty, a reasonable charge will be made for parts, labor, and packing if you choose to use the factory service facility. Returned units will be returned C.O.D. if the unit is not under warranty. Orban will pay return shipping if the unit is still under warranty. In all cases, the customer pays transportation charges to the factory (which are usually quite nominal).

Shipping Instructions

Use the original packing material if it is available. If it is not, use a sturdy, double-walled carton no smaller than 7″ (H) x 15.5″ (D) x 22″ (W) — 18 cm (H) x 40 cm (D) x 56 cm (W), with a minimum bursting test rating of 200 pounds (91 kg). Place the chassis in a plastic bag (or wrap it in plastic) to protect the finish, then pack it in the carton with at least 1.5 inches (4 cm) of cushioning on all sides of the unit. "Bubble" packing sheets, thick fiber blankets, and the like are acceptable cushioning materials; foam "popcorn" and crumpled newspaper are not. Wrap cushioning materials tightly around the unit and tape them in place to prevent the unit from shifting out of its packing.

Close the carton without sealing it and shake it vigorously. If you can hear or feel the unit move, use more packing. Seal the carton with 3-inch (8 cm) reinforced fiberglass or polyester sealing tape, top and bottom in an "H" pattern. Narrower or parcel-post type tapes will not withstand the stresses applied to commercial shipments.

Mark the package with the name of the shipper, and with these words in red:

DELICATE INSTRUMENT, FRAGILE!

Insure the package properly. Ship prepaid, not collect. Do not ship parcel post. Your **Return Authorization Number** must be shown on the label, or the package will *not* be accepted.

Section 6

Technical Data

Specifications

It is impossible to characterize the listening quality of even the simplest limiter or compressor based on specifications, because such specifications cannot adequately describe the crucial dynamic processes that occur under program conditions. Therefore, the only way to evaluate the sound of an audio processor meaningfully is by subjective listening tests.

Certain specifications are presented here to assure the engineer that they are reasonable, to help plan the installation, and make certain comparisons with other processing equipment.

Performance

Frequency Response (Bypass Mode): *Surround Processing:* ±0.10 dB, 20 Hz–20 kHz for 44.1 kHz or higher input/output sample rates. At 32 kHz input and/or output sample rate, the passband is reduced to approximately 14.7 kHz.

Noise: Output noise floor will depend upon how much gain the processor is set for (Limit Drive, AGC Drive, Two-Band Drive, and/or Multiband Drive), gating level, equalization, noise reduction, etc. The dynamic range of the A/D Converter, which has a specified overload-to–noise ratio of 110 dB, primarily governs it. The dynamic range of the digital signal processing is 144 dB.

Polarity (Bypass Mode; Operate Mode when processing chain is configured for linear phase): Absolute polarity maintained. Positive-going signal on input will result in positive-going signal on output.

Internal Processing Sample Rate: 48 kHz. We believe this provides maximum audible transparency by minimizing numerical “noise” in the equalizers and filters while still preserving a pure, transparent sound. The double-precision equalizers and crossover filters used throughout the 8585 produce at least 6 dB lower noise and nonlinear distortion than they would at 96 kHz.

Processing Resolution: Internal processing has 24 bit (fixed point) or higher resolution; uses 12 Freescale (formerly Motorola) 150 MHz DSP56367 DSP chips.

Delay: The minimum available input/output delay is approximately 20 ms with look-ahead limiting active and 6 ms with look-ahead limiting bypassed. This can be padded to exactly one frame of 24, 25, 29.97, or 30 frames/second video up to a maximum delay of 50 ms.

Surround Processing Stereo Coupling: All channels of the AGC and compressors are coupled using r.m.s. summation. The user can select whether or not the LFE channel contributes to the r.m.s. sum in the AGC and compressor control sidechains. Peak limiters in the multiband compressor limiter and look-ahead limiters all operate uncoupled to prevent transients in a given channel from causing audible loudness modulation in other channels.

2.0 Processing Stereo Coupling: Stereo or dual-mono. In dual-mono mode, both processing channels have the same subjective adjustments (as determined by the active preset) but are otherwise independent, making this mode appropriate for dual-language transmissions. In stereo mode, the user can set the maximum permitted gain difference between the channels in each band of the multiband compressor/limiter. 2.0 Stereo/Dual-Mono operating mode can be set via GPI, Ethernet and serial connections, internal clock-based automation, and AES3 Status Bits.

Loudness Level Meter (x2): One meter for the surround processing and one meter for the 2.0 processing, both meters realized in software. Meter can be displayed on the 8585's front-panel screen and on its PC Remote software. In ITU terminology, this meter measures "short-term" loudness. Its display time constants are matched to the loudness integration time of the human ear, reaching steady-state level in approximately 200 ms and having a decay time constant of approximately 300 ms. Meter uses the Jones & Torick algorithm developed at CBS Technology Center. (B. L. Jones & E. L. Torick: "A New Loudness Indicator for Use in Broadcasting," J. SMPTE, September 1981, pp 772-777.)

Installation

Digital Audio Inputs (x5)

Configuration: Each of five hardware inputs accepts two audio channels per AES3id standard, 24 bit resolution. Internal programmable switcher allows any of the 10 physical input channels to be routed to the LF, RF, C, LS, RS, LFE, LB, RB, STEREO L, or STEREO R inputs of the audio processing. For the 2.0 processing, unit can detect Stereo or Two-Channel status bits appearing at Input #1 and switch the 2.0 processor between stereo and dual-mono modes. The default routing is: AES3id input #1=Lf/Rf, #2=Ls/Rs, #3=C/LFE, #4=Lb/Rb (applies to 7.1 processing only), and #5=Stereo (2.0).

Sampling Rate: 32, 44.1, 48, 88.2, or 96 kHz, automatically selected.

Connector: BNC, female, shell bypassed to chassis via 1000 pF capacitor, EMI-suppressed. 75Ω impedance, terminated.

Input Reference Level: Variable from –40 dBfs to –10 dBfs (VU) or –33 to –3 dBfs (PPM).

Filtering: RFI filtered.

Digital Audio Outputs (x6)

Configuration: AESid. Internal, remote-controllable routing switcher allows sending LF, RF, C, LS, RS, LFE, LB, RB, STEREO L, STEREO R, DOWNMIX L, and DOWNMIX R to any hardware output channel

Sample Rate: Internal free running at 32, 44.1, 48, 88.1 or 96 kHz, selected in software. Can also be synced to the AES3id Input #1,or to the sync input (which supports AES11id and word clock) at 32, 44.1, 48, 88.1 or 96 kHz, as configured in software. (Passband is limited to approximately 14.7 kHz when using 32 kHz input and/or output sample rate.)

Word Length: Software selected for 24, 20, 18, or 16-bit resolution. First-order highpass noise-shaped dither can be optionally added, Dither level is automatically adjusted to complement the word length.

Connector: BNC, female, shell bypassed to chassis via 1000 pF capacitor, EMI-suppressed. 75Ω impedance, terminated.

Output Level (100% peak modulation): –6.0 to 0.0 dBfs software controlled.

Filtering: RFI filtered.

Analog Audio Outputs

Configuration: One pair of outputs, which can be configured in software to emit LF, RF, C, LS, RS, LFE, LB, RB, STEREO L, STEREO R, DOWNMIX L, DOWNMIX R, LF/RF, C, LS/RS, LB/RB, STEREO L/R, and DOWNMIX L/R signals.

Source Impedance: 50Ω, electronically balanced and floating.

Load Impedance: 600Ω or greater, balanced or unbalanced. Termination not required or recommended.

Output Level (100% peak modulation): Adjustable from –6 dBu to +24 dBu peak, into 600Ω or greater load, software-adjustable.

Signal-to-Noise: ≥ 100 dB unweighted (Bypass mode, 20 Hz–20 kHz bandwidth, referenced to 100% modulation).

Distortion: ≤ 0.01% THD (Bypass mode, de-emphasized) 20 Hz–20 kHz bandwidth.

Connectors: Two XLR-type, male, EMI-suppressed. Pin 1 chassis ground, Pins 2 (+) and 3 electronically balanced, floating and symmetrical.

D/A Conversion: 24 bit 128x oversampled.

Filtering: RFI filtered.

Sync Input

Configuration: Can accept word clock or AES11id (75Ω) sync, automatically selected.

Connector: Female BNC, shell grounded to chassis.

Termination: Unterminated. Use an external 75Ω terminator if the 8585 is the last item in the chain.

Remote Computer Interface

Configuration: TCP/IP protocol via direct cable connect, modem, or Ethernet interface. Modem is not supplied.

Serial Port: 115 kbps RS–232 port DB–9 male, EMI-suppressed.

Ethernet Port: 100 Mbit/sec on RJ45 female connector.

RS-485 Serial Interface (x2)

Hardware: 115 kbps RS–485 port DB–9 male, EMI-suppressed.

Compatibility: Designed to be hardware-compatible with Dolby Digital® hardware that sends and receives Dolby Digital metadata. (Metadata I/O is not supported by 8585 V 1.0 software. We expect to support it in a future software release.)

Remote Control (GPI) Interface

Configuration: Eight (8) inputs, opto-isolated and floating.

Voltage: 6–15V AC or DC, momentary or continuous. 12 VDC provided to facilitate use with contact closure.

Connector: DB–25 male, EMI-suppressed.

Control: User-programmable for any eight of user presets, factory presets, bypass, test tone, stereo or mono modes, analog input, digital input.

Filtering: RFI filtered.

Tally Outputs

Circuit Configuration: Two NPN open-collector outputs.

Voltage: +15 volts maximum. Do not apply negative voltage. When driving a relay or other inductive load, connect a diode in reverse polarity across the relay coil to protect the driver transistors from reverse voltage caused by inductive kickback.

Current: 30 mA maximum

Indications: Tally outputs can be programmed to indicate a number of different operational and fault conditions.

Power

Voltage: 100–132 VAC or 200–264 VAC, switch-selected on the rear panel, 50–60 Hz, 50 VA.

Connector: IEC, EMI-suppressed. Detachable 3-wire power cord supplied.

Safety Standards: ETL listed to UL standards, CE marked.

Environmental

Operating Temperature: 32° to 122° F/0° to 50° C for all operating voltage ranges.

Humidity: 0–95% RH, non-condensing.

Dimensions (W x H x D): 19” x 5.25” x 15.5”/48.3 cm x 8.9 cm x 39.4 cm. Depth shown indicates rack penetration; overall front-to-back depth is 17.75”/45.1 cm. Three rack units high.

Humidity: 0–95% RH, non-condensing.

RFI/EMI: Tested according to Cenelec procedures. FCC Part 15 Class A device.

Shipping Weight: 40 lbs./18.1 kg

Warranty

Two Years, Parts and Service: Subject to the limitations set forth in Orban's Standard Warranty Agreement.

Because engineering improvements are ongoing, specifications are subject to change without notice.

Circuit Description

This section provides a detailed description of user-serviceable circuits used in the 8585. We do not provide detailed descriptions of the digital circuitry because most of this is built with surface-mount components that cannot be removed or replaced with typical tools available in the field. Field repair ordinarily consists of swapping entire PC boards.

The section starts with an overview of the 8585 system, identifying circuit sections and describing their purpose. Then each user-repairable section is treated in detail by first giving an overview of the circuits followed by a component-by-component description.

The drawing on page 6-27 shows circuit board locations.

Overview

The Control Circuits control the DSP, display, and input/output sections of the 8585 system.

The Input Circuits include the connectors and RF filtering for the analog and digital audio inputs, as well as the circuitry to interface these inputs to the digital processing.

The Output Circuits include the connectors and RF filtering for the analog and digital audio outputs and the circuitry to interface the digital processing to these outputs.

The DSP Circuits implement the bypass, test tone, and audio processing using digital signal processing.

The Power Supply provides power for all 8585 circuit sections.

A block diagram of the DSP signal processing appears on page 6-67.

Control Circuits

The control circuit is based on an AMD Elan SC520 microprocessor, which is a 586-class processor running an Orban executable program over a third-party real-time operating system. A flash memory emulates a hard drive. The memory is non-volatile and does not rely on a battery to retain information when mains power is off.

The flash memory holds the operating system, the Orban executable program, and all preset files, both factory and user. It also contains a write-protected “boot segment” that functions as a boot ROM.

The control circuits process and execute user-initiated requests to the system. The source of these requests is the front panel buttons, joymouse, and rotary encoder, the rear panel RS-232 ports, Ethernet port, and the optically isolated General Purpose Interface. These changes affect hardware function and/or DSP processing. The control circuits also send information to the LCD display.

The control circuit communicates with the DSP and display circuitry through the SC520’s general-purpose bus.

The SC520 periodically refreshes a watchdog timer. If the timer times out without being refreshed, it assumes that the control program has crashed and automatically reboots the SC520. The DSP chips will continue to process audio until the time comes in the boot process to reload DSP program code into them. At this point, the audio will mute for about two seconds until the DSP code download has finished. If you hear a two-second audio mute on air, you can assume that the 8585 has rebooted for some reason. Be prepared to convey this fact to Orban customer service if you call for technical assistance.

The control board is divided into two assemblies: a "base board," which has interface circuitry, and a "CPU controller module," which plugs into the base board and which contains the CPU, the Ethernet interface chip, the flash memory, the DRAM, the LCD graphics controller, and the real-time clock, which keeps time for the 8585's automation functions.

The real-time clock is backed up by a DL2032 battery so that it keeps accurate time even when the 8585 is powered down. Expected battery life is about three months when the 8585 is not powered up and many years when the 8585 is powered. The battery is socketed and can be readily accessed by removing the 8585's top cover; the battery is located on the foil (top) side of the CPU controller module.

User Control Interface and LCD Display Circuits

The user control interface enables the user to control the 8585's functionality. A rear panel GPI connector allows optically isolated remote control of certain functions, like recalling presets, via contact closure. An Ethernet port and an RS-232 serial connector allow you to connect a modem or computer to the 8585. Two RS-485 serial connectors (labeled SERIAL PORT 2 and SERIAL PORT 3) allow the 8585 to send and receive Dolby E (SMPTE RDD 6-2008) metadata. Front panel pushbutton switches select between various operational modes and functions. A rotary encoder allows the user to adjust parameters and enter data.

1. Remote Interface and RS-232 Interfaces

Located on base board

A remote interface connector and circuitry implements remote control of certain operating modes; OPTIMOD-FM 8585 has eight remote contact closure inputs.

A valid remote signal is a momentary pulse of current flowing through remote signal pins. Current must flow consistently for 50msec for the signal to be interpreted as valid. Generally, the 8585 will respond to the most recent control operation, regardless of whether it came from the front panel, remote interface, or RS-232.

Component-Level Description:

After being current-limited by resistors, the GPI control signals are applied to two quad optoisolators, U10, 12, and then to the control circuitry.

Octal driver U1 buffers the RS-232 port, which is located on a small daughter board.

U10, 12 and U1 are socketed for easy field replacement in the event of overload, lightning damage, etc. All other circuitry is surface-mount and is not field-repairable.

2. Color LCD Display

The color LCD is an active-matrix quarter-VGA panel. The CPU addresses its controller chip through the CPU's ISA bus. The controller is on a board sandwiched between the CPU module and the base board: The graphics controller plugs into the base board and the CPU module plugs into the graphics controller.

The backlight on the display has a finite lifetime (normally a few years of continuous operation). Therefore, the 8585 always implements a screen-saver timeout. This is not user-adjustable.

Input Circuits

This circuitry interfaces the digital inputs to the DSP. The digital input receivers accepts AES3-format digital audio signals from the digital input connector and sample rate-converts them as necessary. The digital audio from the A/D and SRC is transmitted to the DSP.

1. Digital Input Receiver and Sample Rate Converter (SRC)

Located on Input/output board

The digital input receivers IC301A, 302A, 303A, 401A, 402A accept digital audio signals using the AES3id interface format (AES3-1992). They apply their outputs to sample rate converters IC304B, 305B, 306B. These accept and sample-rate convert any of the "standard" 32 kHz, 44.1 kHz, 48 kHz, 88.2 kHz, and 96 kHz rates in addition to any digital audio sample rate within the range of 32 kHz and 96 kHz. The SRC converts the input sample rate to 48 kHz for processing by the DSP.

Receiver IC403A accepts sync signals in AES3id or AES11id format from J403A. The signal at J403A is also applied to word clock receiver/PLL receiver IC501. Either IC403A or IC501 generates a reference sample rate for the 8585's output sample rate converters.

These chips are surface-mounted and not field-replaceable without surface-mount rework equipment.

Output Circuits

This circuitry interfaces the DSP to the analog and digital audio outputs. The digital audio from the DSP is transmitted to the digital-to-analog converter (D/A) and output sample rate converters (SRC). The digital-to-analog (D/A) converter converts the digital audio words generated by the DSP to analog audio. The analog output stages scale and buffer the D/A output signal to drive the analog output XLR connectors with a low impedance balanced output. The digital output transmitter accepts the digital audio words from the output sample rate converter (SRC) and transmits them as AES3id-format digital audio signals on the digital output connector.

1. Stereo Digital-to-Analog (D/A) Converter

Located on Input/output board

The D/A, IC200, is a stereo, 24-bit delta-sigma converter. It receives the serial left and right audio data samples from the DSP at 48 kHz sample rate and converts them into audio signals requiring further, relatively undemanding analog filtering. IC211 is surface-mounted and is not field-replaceable without surface-mount rework equipment.

2. Analog Output Stages

Located on Input/output board

The left and right analog signals emerging from IC200 are each filtered, amplified, and applied to a floating-balanced integrated line driver, which has a 50Ω output impedance. The line driver outputs are applied to the RF-filtered left and right analog output connectors. These analog signals can represent either the transmitter or monitor output of audio processing.

Component-Level Description:

IC201 and associated components filter the left channel signal emerging from IC200. The purpose of these stages is to reduce the out-of-band noise energy resulting from IC200's noise-shaping filter and to translate the differential output of IC200 into single-ended form. The components associated with IC201 apply a 3rd order low-pass filter to the differential signal from the D/A. This filter does not induce significant overshoot of the processed audio, which would otherwise waste modulation.

IC203B and associated components form a low-frequency servo amplifier to remove residual DC from the signal. The 0.1Hz −3 dB frequency prevents tilt-induced overshoot in the processed audio.

The buffered output of IC201 is applied to IC204, a balanced output line driver. This driver emulates a floating transformer. One side of its output can be grounded without affecting its differential output level. IC204 and its right channel counterpart IC205 are socketed for easy field replacement. All other circuitry is surface-mounted.

The corresponding right channel circuitry is functionally identical to that just described.

3. Digital Sample Rate Converter (SRC) and Output Transmitter

Located on Input/output board

Output sample rate converter (SRC) chips IC304, 305, 306, 404, 405, 406 convert the 8585's 48 kHz system sample rate to any of the standard 32 kHz, 44.1 kHz, 48 kHz, 88.2 kHz, and 96 kHz rates for the 8585's six AES3id outputs. The sample rate converters drive digital audio interface transmitters IC301, 302, 3030, 401, 402, 403, which encode digital audio signals using the AES3id interface format. These chips are surface-mounted and are not field-replaceable without surface-mount re-work equipment.

DSP Circuit

The DSP circuit consists of 12 Motorola DSP56367 24-bit fixed-point DSP chips that execute DSP software code to implement digital signal processing algorithms. The algorithms filter, compress, and limit the audio signal. The 12 DSP chips, each operating at approximately 150 million instructions per second (MIPS), for a total of 1600 MIPS, provide the necessary signal processing. An internal sampling rate of 48 kHz is used.

System initialization normally occurs when power is first applied to the 8585 and can occur abnormally if the 8585's watchdog timer forces the SC520 to reboot. Upon initialization, the SC520 CPU downloads the DSP executable code stored in the flash memory. The time between application of power and completion of DSP code download is approximately 7 seconds. Once a DSP chip begins executing its program, execution is continuous. The SC520 provides the DSP program with parameter data (representing information like the settings of various processing controls), and extracts the front panel metering data from the DSP chips.

During system initialization, the SC520 queries the DSP hardware about its operational status and will display an error message on-screen if the DSP fails to initialize normally. Please note any such messages and be ready to report them to Orban Customer Service.

The DSP chips are located on the DSP board—see the drawings starting on page 6-50. IC703 is a local voltage regulator on the DSP board that derives the +2.5 V supply for the DSP chips from the +RAW unregulated system voltage.

Power Supply

Warning! Hazardous voltages are present in the power supply when it is connected to the AC line.

The power supply converts an AC line voltage input to various power sources used by the 8585. To ensure lowest possible noise, four linear regulators provide ±15VDC and ±5VDC for the analog circuits. A switching regulator provides high current +5VDC for the digital circuits. An unregulated voltage feeds local regulators.

The power supply circuits are straightforward and no explanation is required beyond the schematic itself. Be aware that C1, C4, C5, and C12 in the switching regulator are premium-quality low-ESR capacitors and must be replaced with equivalent types to ensure proper operation of the switching supply.

The output of the power supply is monitored by the power-indicator LED circuit, which causes the power LED to flash according to a preset code to diagnose problems with the various power supplies in the 8585. See step (2.B) on page 4-9.

Abbreviations

Some of the abbreviations used in this manual may not be familiar to all readers:

A/D (or A to D)	analog-to-digital converter
AES	Audio Engineering Society
AGC	automatic gain control
A-I	analog input
A-O	analog output
BAL	balanced (refers to an audio connection with two active conductors and one shield surrounding them).
BBC	British Broadcasting Corporation
BNC	a type of RF connector
CALIB	calibrate
CIT	composite isolation transformer
CMOS	complementary metal-oxide semiconductor
COFDM	Coded Orthogonal Frequency Division Multiplex—a robust type of digital modulation using many narrow-bandwidth, low data rate, mutually non-interfering carriers to achieve an aggregate high data rate with excellent multipath rejection.
COM	serial data communications port
D/A (or D to A)	digital-to-analog converter
dBm	decibel power measurement. 0 dBm = 1mW applied to a specified load. In audio, the load is usually 600Ω. In this case only, 0 dBm = 0.775V rms.
dBu	decibel voltage measurement. 0 dBu = 0.775V RMS. For this application, the dBm-into-600Ω scale on voltmeters can be read as if it were calibrated in dBu.
DI	digital input
DJ	disk jockey, an announcer who plays records in a club or on the air
DO	digital output
DOS	Microsoft disk operating system for IBM-compatible PC
DSP	digital signal processor (or processing). May also refer to a special type of microprocessor optimized for efficiently executing arithmetic.
EBU	European Broadcasting Union
EBS	Emergency Broadcasting System (U.S.A.)
EMI	electromagnetic interference
ESC	escape
FCC	Federal Communications Commission (USA regulatory agency)
FDNR	frequency-dependent negative resistor—an element used in RC-active filters
FET	field effect transistor
FFT	fast Fourier transform
FIFO	first-in, first-out
G/R	gain reduction
HF	high-frequency
HP	high-pass
IC	integrated circuit
IM	intermodulation (or “intermodulation distortion”)
I/O	input/output
ITU	International Telecommunications Union (formerly CCIR). ITU-R is the arm of the ITU dedicated to radio.
JFET	junction field effect transistor
LC	inductor/capacitor
LCD	liquid crystal display
LED	light-emitting diode
LF	low-frequency

LP	low-pass
LVL	level
MHF	midrange/high-frequency
MLF	midrange/low-frequency
MOD	modulation
N&D	noise and distortion
N/C	no connection
OSHOOT	overshoot
PC	IBM-compatible personal computer running a Microsoft Windows® operating system
PCM	pulse code modulation
PPM	peak program meter
RAM	random-access memory
RC	resistor/capacitor
REF	reference
RF	radio frequency
RFI	radio-frequency interference
RMS	root-mean-square
ROM	read-only memory
S/PDIF	Sony/Philips digital interface (standardized as IEC958)
TRS	tip-ring-sleeve (2-circuit phone jack)
THD	total harmonic distortion
TX	transmitter
μs	Microseconds. For pre-emphasis, the +3 dB frequency is $1/(2 \pi \tau)$, where τ is the pre-emphasis time constant, measured in seconds.
VCA	voltage-controlled amplifier
VU	volume unit (meter)
XLR	a common style of 3-conductor audio connector
XTAL	crystal

Parts List

Many parts used in the 8585 are surface-mount devices (“SMT”) and are not normally field replaceable because specialized equipment and skills are necessary to remove and replace them. The list below includes substantially all of the parts used in the 8585 (including surface-mount devices) and inclusion of a part in this list does not imply that the part is field-replaceable.

See the following assembly drawings for locations of components.

Obtaining Spare Parts

Special or subtle characteristics of certain components are exploited to produce an elegant design at a reasonable cost. It is therefore unwise to make substitutions for listed parts. Consult the factory if the listing of a part includes the note “selected” or “realignment required.”

Orban normally maintains an inventory of tested, exact replacement parts that can be supplied quickly at nominal cost. Standardized spare part kits are also available.

When ordering parts from the factory, please have available the following information about the parts you want:

Orban part number
Reference designator (e.g., C3, R78, IC14)
Brief description of part
Model, serial, and “M” (if any) number of unit — see rear-panel label

To facilitate future maintenance, parts for this unit have been chosen from the catalogs of well-known manufacturers whenever possible. Most of these manufacturers have extensive worldwide distribution and can be contacted through their web sites.

Base Board

		BASE BOARD
PART #	***DESCRIPTION***	***COMPONENT IDENTIFIER***
42008.020Q	Subassembly Flat Cable-40P-2""	J7
16013.000.01	Heatsink, Clip On TO 220	H1
20040.604.01	Resistor, METALFIM, 1/8W, 1%, 604 Ω	R28, 30, 33, 35, 37, 39, 44, 46, 48, 49, 50, 51, 52, 53, 54, 55
20080.301.01	Resistor, METALFIM, 1/2W, 1%, 301 Ω	R47
20121.100.01	Resistor, METALFIM, 1/8W, 1%, 10Ω, 1206	R43, 45
20121.750.01	Resistor, THIN FILM, 1/8W, 1%, 75 Ω	R82, 83, 84
20128.002.01	Resistor 2.0 Ω 1% 0805	R22, R23, R24, R25
20129.301.01	Resistor, 301Ω, 0805	R59, R77
20130.100.01	Resistor, 1.00K 1% 0805	R79
20130.162.01	Resistor, 1/8W, 1%, 1.62K, 0805	R41, 42
20130.200.01	Resistor, 2.00K, 0805	R4, R56, R62
20130.249.01	Resistor, 1/8W, 1%, 2.49K, 0805	R76
20130.562.01	Resistor, 1/8W, 1%, 5.62K, 0805	R57
20131.100.01	Resistor, 10K, 0805	R5, 6, 15, 16, 17, 26, 60, 61, 63, 65, 67, 68, 69, 70, 71, 73, 74, 75, 80, 81, 102, 103, 104
20131.140.01	Resistor, 14.0K, 0805	R58, 64
20131.301.01	Resistor, 30.1K, 0805	R72
20132.100.01	Resistor, 100K, 0805	R1, 2, 3, 7, 8, 9, 10, 11, 12, 13, 14, 20, 27, 29, 31, 32, 34, 36, 38, 40, 66, 85, 86, 87, 88, 89, 90, 91, 92, 93
20132.332.01	Resistor, 332K, 0805	R78
21139.000.01	Capacitor, X7R, 0.1uF, 10%, 0805	C3, 6, 7, 8, 9, 10, 11, 12, 13, 18, 21, 24, 30, 32, 33, 34, 35, 38, 39, 43
21147.022.01	Capacitor, 22pf, 0805, 1%	C40, 41
21319.610.01	Capacitor, 10uf, Tantalum, SMT	C1, 4, 14, 15, 17, 19, 22, 36, 37
21322.547.01	Capacitor, 4.7uf, Tantalum, 6032B	C2, 5, 20, 23

		BASE BOARD
PART #	*DESCRIPTION*	*COMPONENT IDENTIFIER*
22016.000.01	Diode, MMSZ5231B, SOD-123	D12
22083.015.01	Diode, VOLTAGE SUPPRESSOR, 15 VOLT	D11
22101.001.01	Diode, 1N4148WT/R	D1, 3, 4, 5, 6, 9, 10
22209.000.01	Diode, SCHOTTKY 1A, 60V, SMD	REF, , NO, STUFF, D7, D8
23214.000.01	Transistor NPN MMBT3904	Q1, Q3, Q4, Q5
23606.201.01	Transistor, PWR, NPN	Q2
24635.000.01	IC 74HCT374	U4
24900.000.01	IC, HEX INVERTER, SMT	U11, U13
24967.000.01	IC, 74ACT245DW	U3, U5
24978.000.01	IC, 74ACT244SC	U14, 15
24979.000.01	IC, BAT54C-7	D13, 14, 15, 16, 17
24982.000.01	IC, 74HC4051M	U19
24983.000.01	IC, 7064STC100-10	U1
24984.000.01	IC, LP2987IM-5.0	U20
25008.000.01	IC, PS2506-4	U10, 12
25112.001.01	LED, Red/Green, Bi-Color/POLR	
27017.025.01	Connector, Right Angle, PC Board Mount, 25P	J10
27147.018.01	IC, Socket, DIP, 18 PIN, DUAL	SU18
27223.002.01	Cable, Flat, 2 Long, 14 Conductor	J8
27371.040.01	Connector Header PC104 Stack 40P	Header2
27371.064.01	Connector Header PC104 Stack 64P	Header1, Header3
27406.014.01	Connector, Socket, Strip, 14 PIN	J2
27421.004.01	Connector, Header, Double ROW, 4P, 2 X 2	J3B, J6
27421.006.01	Connector, Header, Double ROW, 6P, 2 X 3	J5
27421.010.01	Connector, Header, Double ROW, 23", 2 X 5	J12
27421.050.01	Connector Header STR .23 2x25	J9
27426.003.01	Connector, Header, 3 Pin, Single Row	J11
27451.005.01	Connector, STR, Double Row, 26 PIN	J4
27451.024.01	Header, STR, Double Row, PC MOUNT	J1
27500.000.01	Connector MOL53047-0510 5PIN	J14
28086.000.01	Crystal, 4.0 MHz, HC49US	X1
29521.000.01	Inductor, 3.9uH, JM391K	L1, L2, L3
32166.000.06	Circuit Board, Base Board	
44093.100.01	Software PIC 8300 U18	U18

		BASE BOARD
PART #	**DESCRIPTION**	**COMPONENT IDENTIFIER**
47010.016.01	Subassembly RECPTL-W/SHRINK	J3A
47010.017.01	Subassembly RECPTL-W/SHRINK	J3A

CPU Module

		CPU MODULE
PART #	**DESCRIPTION**	**COMPONENT, IDENTIFIER**
20128.010.01	Resistor, 10Ω,0805	R31, R34
20128.022.01	Resistor, 22Ω 1% 0805	R5, R6
20128.332.01	Resistor, 33.2Ω,0805	R10, R11, R14
20128.499.01	Resistor, 49.9Ω 1% 0805	R19, R20, R21, R22, R23
20129.160.01	Resistor, 160Ω 1% 0805	R24, R25
20129.330.01	Resistor, 330Ω 1% 0805	R12, R16
20129.470.01	Resistor, 470Ω 1% 0805	R13, R15
20130.100.01	Resistor, 1.00K 1% 0805	R17, R35
20130.475.01	Resistor, 4.75KΩ,0805	R3, R4, R7, R8, R26, R27, R28, R29, R30, R32
20130.931.01	Resistor, 9.31KΩ, 1%, 0805	R33
20131.100.01	Resistor, 10KΩ,0805	R1, R2, R9
20131.147.01	Resistor, 1/8W,1%,14.7KΩ,0805	R18
20233.102.01	Resistor Network 1K CTS745C 8R BUSSED	RN1
20233.472.01	Resistor Network 4.7K CTS745C 8R BUSS	RN2, RN3, RN4
20237.472.01	Resistor NETWORK 8R, ISO, 5%	RN5
21139.000.01	Capacitor, X7R,0.1uF,10%,0805	C8, C9, C20, C21, C177, C179, C182
21141.000.01	Capacitor, NPO,1000pF,1%,0805	C10
21142.000.01	Capacitor, NPO,100pF,1%,0805	C2
21146.310.01	Capacitor, .01uF,0805,10%	C11, 126, 127, 133, 134, 150, 152, 154, 156, 158,160, 162, 180
21167.047.01	Capacitor, 4.7pF 50V X7R 0805	C1
21170.018.01	Capacitor, 18pF 1% 50V COG 0805	C3, C4, C5, C6, C7
21171.105.01	Capacitor, 1uF X7R 0805	C14, 17, 125, 132, 151, 153, 155, 157, 159, 161, 175, 176, 178, 181, 183
21322.547.01	Capacitor, 4.7uF,Tantalum,6032B	C12
21325.610.01	Capacitor, 10uF 10% Tantalum 6032-B	C13, C15, C16, C18
22101.001.01	Diode,1N4148WT/R	D1, D2, D3

		CPU MODULE
PART #	**DESCRIPTION**	**COMPONENT, IDENTIFIER**
24331.025.01	IC Voltage Regulator LT1963-2.5 SOT223	U14
24331.033.01	IC Voltage Regulator LT1963-3.3 SOT223	U15
24541.000.01	IC SDRAM MT48LC16 TSOP54P	U2, U3
24542.000.01	IC Flash Memory E28F128 TSOP56	U4
24543.000.01	IC CY2305 0DLYBuF 8P	U11
24544.000.01	IC NM93C46 SEEPROM TSSOP	U12
24653.000.01	IC PWRST MIC8114 SOT143	U5
24670.000.01	IC 10/100BT NIC NATIONAL	U10
24965.000.01	IC,74ALVC164245DGG	U7, U8, U9
24972.520.01	IC Microprocessor ELANSC520 BGA388	U1
27306.000.01	Connector RJ45 PCMT W/MAGS	J1
27370.040.01	Connector Socket PC104 40pin	P2
27370.064.01	Connector Socket PC104 64pin	P1, P3
28031.000.01	Holder, Battery, Lithium Cell	BT1HLDR
28041.000.01	Cell,Coin,Battery,Lithium,3V	BT1
28089.000.01	Oscillator 33MHZ SG636 4P SMD	X1
28090.000.01	IC TCXO DS32KHZ 36P BGA	U13
28091.000.01	Crystal 25MHZ RXD MP35L SMD	Y1
32201.000.02	PCB Control Module 8500	
44094.100.01	Firmware 8500 U6 20LV8D	

Serial I/O Board

		SERIAL I/O BOARD
PART #	**DESCRIPTION**	**COMPONENT IDENTIFIER**
27459.006.01.1	Header 1X6 .100 PC-Mount W/LK	J6 (NO STUFF)
20129.110.01.1	Resistor 0805 110 Ω 1% 1/8W	R3 (NO STUFF)
20128.000.01.1	Resistor 0 Ω 0805	R4 R5 (NO STUFF)
44121.000.01.1	Firmware IC PIC MCU U5	
21325.610.01.1	Capacitor 10uF 10% Tantalum 3528	C13 C16 C20
21139.000.01.1	Capacitor X7R 0.1uF 10% 0805	C1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C15 C17 C18 C19 C21 C22 C23 C24 C25
20130.100.01.1	Resistor 1.00K 1% 0805	R1 R2 R11 R14 R15 R16 R17
20165.110.01.1	Resistor 110 Ω 1% 1210	R6 R7 R8 R9
24792.128.01.1	IC PIC24FJ128GA106 MCU	U5

		SERIAL I/O BOARD
PART #	***DESCRIPTION***	***COMPONENT IDENTIFIER***
24343.000.01.1	IC TPS76933DBVR LDO REG	U6
27459.005.01.1	Header 1X5 .100 PC-Mount with Lock	J5
24623.000.01.1	IC Octal Buffer/Line Driver 20	U7
25102.000.01.1	LED Yellow WATER CLR 1206	D3
20129.475.01.1	Resistor 475 Ω 1% 1/8W 0805	R18
23214.000.01.1	Transistor NPN MMBT3904	Q1 Q2
20237.472.01.1	Resistor Network 8R ISO 5%	RN1
20131.100.01.1	Resistor 10K 0805	R10 R12 R13
32336.000.02.1	Circuit Board RS-232/485 Board	
27147.014.01.1	IC Socket,DIP,14 Pin ,Dual	SU2 SU3
27018.009.01.1	Connector, DB9, Female, Filter	J2 J3
24966.000.01.1	IC, QUAD UART, ST16C554DC	U4
27147.124.01.1	IC Socket DIP 24 pin Dual	SU1
27017.009.01.1	Connector Right-Angle PC-Mount 9P MAL	J1
24968.000.01.1	IC MAX208ECNG+	U1
24778.000.01.1	IC RS-485 Transceiver 14DIP	U2 U3
29521.000.01.1	Inductor 3.9uH 10M391KLF	L1 NO STUFF
27421.050.01.1	Connector Header STR .23 2X25	J4
22209.000.01.1	Diode Shottky 1A 60V SMD	D1 D2 NO STUFF
21141.000.01.1	Capacitor NPO 1000PF 1% 0805	C14

Power Supply

		POWER SUPPLY
PART #	***DESCRIPTION***	***COMPONENT IDENTIFIER***
10012.404.01	Screw MS SEM P/P 4-40 X 1/4	
15025.000.01	Transistor, Mounting Kit, TO 220	HW1, HW2, HW3, HW4, HW5
15061.005.01	LED Mount, 1 Position, 0.240" HIGH	H1, H2, H3, H4
20020.025.01	Resistor, 1/4W, 0Ω, (JUMPER)	R1
21129.410.01	Capacitor, Axial Leads, 0.1uF, 50V, 20%	C6, C10, C11, C12, C15, C19, C20, C21
21227.710.01	Capacitor, Radial Leads 100uF 16V HFS	C1
21227.747.01	Capacitor, Radial Leads 470uF 16V HFS	C4, C5
21230.710.01	Capacitor, Radial Leads 100uF 50V HFS	C22
21255.000.01	Capacitor, Snap-In, 6800uF, 16V, 20%	C13, C14
21256.000.01	Capacitor, Radial Leads, 1000uF, 35V, 20%	C17, C18
21263.710.01	Capacitor, Radial Leads, 100uF, 25V, 10%	C2, C3, C8, C9
21307.522.01	Capacitor, Radial Leads, 2.2uF, 35V, 10%	C7, C16
22004.056.01	Zener-Diode-1W-5%-5.6V-1N	CR19, CR20
22015.000.01	Diode-Shottky Rectifier-SBL	CR21, CR22, CR23
22083.022.01	Diode, Voltage Suppressor, 22 Volt	CR2, CR13, CR14

		POWER SUPPLY
PART #	*DESCRIPTION*	*COMPONENT IDENTIFIER*
22083.033.01	Diode, Voltage Suppressor, 33 Volt	CR9, CR10
22083.068.01	Diode, Voltage Suppressor, 6.8 Volt	CR4, CR17, CR18
22201.400.01	Diode, Rectifier IN4004 PRV400V	CR5, CR6, CR7, CR8, CR11, CR12, CR15, CR16
22208.040.01	Diode, Shottky-31DQ04-3.3	CR3
22500.271.01	Zener, Transorb, Varistor	V1, V2
24303.901.01	IC, Linear, Dc Regulator, 15V NEG	U2
24304.901.01	IC, Regulator	U1
24307.901.01	IC, Linear, Dc Regulator, 5V POS	U3
24308.901.01	IC, Linear, Dc Regulator, 5V NEG	U4
24323.000.01	IC, Simple Switch, 0 TO 220	U5
26143.000.01	Switch, Slide, Volt, 115/230	SW1
26146.000.01	Switch, Slide, SPDT, Vertical Mount	SW2
27060.000.01	Connector, VERTICAL Header	J1
27421.010.01	Connector, Header, Double Row , 23", 2 X 5	J7
27426.003.01	Connector, Header, 3-PIN, Single Row	J6 (Optional Fan Connector)
27451.003.01	Header, STR, Double Row, PC-Mount	J3
27451.004.01	Header, STR, Double Row, PC-Mount	J4
27451.024.01	Header, STR, Double Row, PC-Mount	J5
27493.000.01	Connector, Vertical, Header, 6 POS.	J2
27711.206.01	Terminal, Crimp, Ring, Insulated, 6R	LUG
28004.150.01	Fuse, 3AG, SLOBLO,1/2 AMP	F1
28112.003.01	Knob-Fuse-DOM-GRY-FOR 281	H7
28112.005.01	Body-Fuseholder-PC Mount	H6
29262.000.01	Line Filter, PC Mount, 1A	A1
29519.000.01	Inductor-Torodial- 7.7UH	L2
29526.000.01	Inductor, PE92108K	L1
50286.000.02	Heatbar Power Supply 8500/8585	HS1

Input/Output (I/O) Board

		INPUT/OUTPUT BOARD
PART #	*DESCRIPTION*	*COMPONENT, IDENTIFIER*
44123.100.01.1	Firmware PIC 8585 IO IC600	
44122.100.01.1	Firmware PIC 8585 IO IC500	
20129.110.01.1	Resistor 0805 110 Ω 1% 1/8W	R229 R230 R306 R307 R308 R406 R407 R408
21140.000.01.1	Capacitor NPO 470PF 1% 0805	C214 C215 C216 C217 C222 C223 C224 C225
20132.100.01.1	Resistor 100K R0805 1% 1/8W	R505 R506 R507 R508 R607 R608 R609
20128.075.01.1	Resistor 75 Ω 1% 0805	R300 R301 R302 R400 R401 R402 R604 R605 R606

		INPUT/OUTPUT BOARD
PART #	***DESCRIPTION***	***COMPONENT, IDENTIFIER***
20129.210.01.1	Resistor 0805 210 Ω 1% 1/8W	R303 R304 R305 R403 R404 R405
20128.000.01.1	Resistor 0 Ω 0805	R309 R310 R311 R409 R410 R411
24326.000.01.1	IC DDT3-LT1086-3.3V	IC701
21153.322.01.1	Capacitor 0805 0.022uF 5% NPO	C506
27426.005.01.1	Header UNSHRD	J500
27426.003.01.1	Connector Header 3PIN SINGLE RW	J304 J305 J306 J307 J308 J309 J404 J405 J406 J407 J408 J409
21137.447.01.1	Capacitor 0.47uF 25V 10% 1206	C220 C221
21325.610.01.1	Capacitor 10uF 10% Tantalum 3528	C702 C703 C704 C705 C706 C707 C708 C709 C710 C711 C712 C713 C714 C715 C716 C717 C718 C719 C720 C721 C722
27451.007.01.1	Connector DOUBLE RW PC MNT 40 PIN	J602 J603
27421.010.01.1	Connector Header DOUBLE RW 23" 2 X 5	J600
24993.000.01.1	IC EPM7256AE24995TC100-10	IC600
24948.000.01.1	IC 74LVC2244 DRVR20-SOIC	IC602 IC603 IC604 IC605 IC606
24337.000.01.1	IC LDO Voltage Regulator 1.8V 200m	IC700
24772.000.01.1	IC PIC18LF4420 Microcontroller	IC500
24769.000.01.1	IC 2-channel SRC	IC304 IC305 IC306 IC404 IC405 IC406
24768.000.01.1	IC 2-Channel AES Re-ceiver/Transmitter	IC301 IC302 IC303 IC401 IC402 IC403
27057.000.01.1	Connector Dual BNC PC-Mount Internal Capacitor	J301 J302 J303 J401 J402 J403
27630.001.01.1	Jumper PC-Mount Test Point	TP700
29539.000.01.1	Choke Common Mode 1K Ω SM	L208 L209
27451.004.01.1	Header Strip Double Row PC Mount	J700
27408.003.01.1	Connector 3pin Socket Strip	SL200 SL201 SL202 SL203
27406.014.01.1	Connector Socket Strip 14 pin	JP600
21139.000.01.1	Capacitor X7R 0.1uF 10% 0805	C203 C204 C205 C206 C207 C208 C209 C210 C211 C212 C213 C300 C301 C302 C303 C304 C305 C306 C307 C308 C309 C310 C311 C312 C313 C314 C400 C401 C402 C403 C404 C405 C406 C407 C408 C409 C410 C411 C412 C413 C414 C500 C501 C502 C503 C601 C602 C603 C604 C605 C606 C607 C608 C609 C610 C723 C724 C725 C726 C727 C728 C729 C730 C731 C732 C733 C734 C735 C736 C737 C738 C739 C740 C741 C742 C743 C744 C745 C746 C747 C748 C749 C750 C751 C752 C753 C754 C755 C756 C757 C758 C759 C760 C761 C762 C763
29015.000.01.1	AES3 Transformer Surface Mount SCIENTI	T300 T301 T302 T303 T304 T305 T400 T401 T402 T403 T404 T405
20135.002.01.1	Resistor 0805 5% 2ohm	R700 R701 R702 R703 R704 R705
29532.000.01.1	Inductor Axial 560uH 370MA	L600 L601
29537.102.01.1	Inductor 0805 Ferrite 1000 Ω	L700 L701 L702 L703 L704 L705 L706 L707 L708 L709 L710 L711
20129.604.01.1	Resistor 0805 604 Ω 1% 1/8W	R509

		INPUT/OUTPUT BOARD
PART #	DESCRIPTION	COMPONENT, IDENTIFIER
21177.000.01.1	Capacitor 0805 0.22uF X7R	C505
29508.210.01.1	Filter EMI Suppression 100V 10	L200 L201 L202 L203
29506.001.01.1	Bead Ferrite On Wire	L300 L301 L302 L303 L304 L305 L306 L307 L308 L309 L310 L311 L400 L401 L402 L403 L404 L405 L406 L407 L408 L409 L410 L411
27147.008.01.1	IC Socket DIP 8 Pin Dual	SL204 SL205
27053.003.01.1	Connector Male Insert Right-Angle	J200 J201
24997.000.01.1	IC DAC AK4393VSP VSOP	IC200
24979.000.01.1	IC BAT54C-7	CR500 CR501
24960.000.01.1	IC OPA2134UA	IC201 IC202 IC203
24958.000.01.1	IC DRV134PA	IC204 IC205
24900.000.01.1	IC Hex Inverter SMT	IC601
22106.000.01.1	Diode VSTT SMCJ26 DO214	CR200 CR201 CR202 CR203
21319.610.01.1	Capacitor 10uf Tantalum SMT	C700 C701
21171.105.01.1	Capacitor 1uf X7R 0805	C200 C201 C202
21146.310.01.1	Capacitor 0.01uf 0805 10%	C507 C764
21143.000.01.1	Capacitor NPO 1500PF 1% 0805	C218 C219 C504
20511.310.01.1	Trimpot 10K 10% 3/8TOP ADJ	VR200 VR201
20133.100.01.1	Resistor 0805 1.0M 1% 1/8W	R227 R228
20131.825.01.1	Resistor 1/8W 1% 82.5K 0805	R213 R214 R215 R216
20131.113.01.1	Resistor 0805 11.3K 1% 1/8W	R223 R224 R225 R226
20131.100.01.1	Resistor 10K 0805	R200 R201 R202 R500 R501 R502 R503 R504
20130.845.01.1	Resistor 1/8W 1% 8.45K 0805	R203 R204 R205 R206 R207 R208 R209 R210 R211 R212
20130.348.01.1	Resistor 1/8W 1% 3.48K 0805	R217 R218 R219 R220 R221 R222
20130.100.01.1	Resistor 1.00K 1% 0805	R600 R601 R602 R603
24676.000.01.1	IC TRANS CS8427 28 PIN	IC501
29535.000.01.1	Inductor 3.9uH CHIP 1008	L204 L205 L206 L207

DSP Board

		DSP BOARD
PART #	DESCRIPTION	COMPONENT IDENTIFIER
20119.020.01.1	Resistor 0.02 Ω 1/4W 1% Surface-Mount	(R701 R702 R712 NO STUFF)
32246.000.08.1	Circuit Board, DSP, 8500/8585	
27451.002.01.1	Header STR Double Row PC-Mount	J604
21305.610.01.1	Capacitor Radial Leads 10uF 20V 10%	C766
27468.006.01.1	Connector 6P MOLEX PC-Mount	J200
21175.000.01.1	Capacitor 6800PF 10% X7R 0805	C101 C103 C105 C107 C109 C111 C113 C115 C117 C119 C121 C123
24757.000.01.1	IC DSPB56367AG150 150MHZ	IC101 IC102 IC103 IC104 IC105 IC106 IC107 IC108 IC109 IC110 IC111 IC112
16021.000.01.1	Heatsink, Vertical Mount, Black Anodized	HS700 Use Compound
24944.000.01.1	IC EPM 7064AETC44-10 SMT	IC503
21137.447.01.1	Capacitor .47uF 25V 10% 1206	C102 C104 C106 C108 C110 C112 C114

		DSP BOARD
PART #	***DESCRIPTION***	***COMPONENT IDENTIFIER***
		C116 C118 C120 C122 C124
27451.007.01.1	Connector Double Row PC-Mount 40 PIN	J504
27451.003.01.1	Header STR Double Row PC-Mount	J701
27421.010.01.1	Connector Header Double Row 23" 2 X 5	J603
27421.002.01.1	Connector Header Double Row 2P 2 X 1	J500
24993.000.01.1	IC EPM7256AE24995TC100-10	IC603
24964.000.01.1	IC,LM2576T-3.3 FLOW LB03	IC700
24946.000.01.1	IC-8 Bit-Dual Transceiver W/3	IC502
20221.101.01.1	Resistor Network SIP 2% 100K 10PIN	R501
24948.000.01.1	IC 74LVC2244 DRVR20-SOIC	IC601 IC602 IC604
27630.001.01.1	Jumper PC MNT TEST PT	TP702 TP200 TP201 (TP700 TP701 TP703 TP704 NO STUFF)
42008.020.03.1	Subassembly Flat Cable 40P 2"	J601 J602
24622.000.01.1	IC 74AHCT04 Invert SOIC	IC807
21139.000.01.1	Capacitor X7R 0.1uF 10% 0805	C202 C203 C233 C234 C235 C500 C701 C702 C703 C704 C705 C706 C707 C708 C709 C710 C711 C712 C713 C714 C715 C716 C718 C719 C720 C721 C723 C724 C725 C726 C727 C728 C729 C730 C731 C732 C733 C734 C739 C740 C741 C742 C743 C744 C745 C746 C747 C748 C749 C750 C751 C752 C753 C754 C755 C756 C757 C758 C759 C760 C762 C786 C787 C788 C789 C790 C791 C792 C793 C794 C795 C796 C797 C798 C799 C800 C802 C805 C809 C810 C811 C812 C813 C814 C815 C816 C817 C818 C819 C820 C821 C822 C823 C824 C825 C826 C827 C828 C829 C830 C831 C832 C839
24549.000.01.1	IC SRAM 16MB TSSOP	IC803 IC808 IC809
24945.000.01.1	IC 74AHC541 Octal Buffer SOL20	IC501 IC504
20128.332.01.1	Resistor 33.2 Ω 0805 1% 1/8W	R615
20130.499.01.1	Resistor R0805 4.99K 1% 1/8W	R100 R510 R705
20130.200.01.1	Resistor 2.00K 0805	R707 R708 R709 R710
29527.000.01.1	Inductor, Toroidal 8.06uH FIT44-4	L701
29512.000.01.1	Choke Shield 1670-1 250UH	L702
28083.000.01.1	Oscillator, Crystal Clock-27MHZ 3V	IC804
20128.000.01.1	Resistor 0 Ω 0805	(R714 R715 R716 R717 R718 NO STUFF)
22104.000.01.1	Diode SCHOT Rectifier 1N5818	CR706 CR707
22208.040.01.1	Diode-Shottky-31DQ04-3	CR701
24333.000.01.1	IC-ST23-LM4041-ADJ	IC702
24334.000.01.1	IC LT1767 MS8E 1.8V 1.5A	IC701
29537.102.01.1	Inductor 0805 Ferrite 1000 Ω	L800 L801 L802
29504.150.01.1	Inductor 2A PE53113	L700
24997.000.01.1	IC DAC AK4393VSP VSOP	IC211
24960.000.01.1	IC OPA2134UA	IC201
24938.000.01.1	IC Single 2 Input SMT	IC810 IC811

		DSP BOARD
PART #	***DESCRIPTION***	***COMPONENT IDENTIFIER***
23214.000.01.1	Transistor NPN MMBT3904	Q700
22101.001.01.1	Diode 1N4148WT/R	CR704 CR705
22083.068.01.1	Diode Voltage Suppressor 6.8 V	CR702
22083.033.01.1	Diode Voltage Suppressor 33 V	CR700
21319.610.01.1	Capacitor 10uF Tantalum SMT	C735 C736 C801 C804 C850 C851 C852 C853 C854 C855 C856 C857 C858 C859 C860 C861
21230.710.01.1	Capacitor RAD LDS 100uF 50V HFS	C763
21227.747.01.1	Capacitor RAD LDS 470uF 16V HF	C764 C765 C842
21171.105.01.1	Capacitor 1uF X7R 0805	C200 C201 C232 C737 C738 C767 C768
21146.310.01.1	Capacitor .01uF 0805 10%	C773 C774 C775 C776 C777 C778 C779 C780 C781 C782 C783 C784 C785 C833 C834 C835 C836 C837 C838 C840
21145.000.01.1	Capacitor NPO 5% 100V 33PF-1206	C231
21143.000.01.1	Capacitor NPO 1500PF 1% 0805	C769 C770 C771
21142.000.01.1	Capacitor NPO 100PF 1% 0805	C772
21140.000.01.1	Capacitor NPO 470PF 1% 0805	C217 C218
20132.100.01.1	Resistor 100K R0805 1% 1/8W	R504 R507 R601 R602 R603 R703
20131.499.01.1	Resistor 1/8W 1% 49.9K 0805	R704 R706
20131.249.01.1	Resistor 1% 24.9K 0805	R203 R209 R213 R216
20131.100.01.1	Resistor 10K 0805	R237 R505 R711 R901
20130.845.01.1	Resistor 1/8W 1% 8.45K 0805	R201 R202 R207 R208 R211 R212 R214 R215
20129.150.01.1	Resistor 1/8W 1% 150 Ω 0805	R616
20128.075.01.1	Resistor 75 Ω 1% 0805	R238 R508 R509
20128.022.01.1	Resistor 22 Ω 1% 0805	R806 R807 R808 R809 R810 R811
24766.000.01.1	IC PLL1707DBQ	IC812
12004.408.01.1	Nut Hex STL C2 4-40 X 1/4	HS700
10009.406.01.1	Screw MS SEM P/P 4-40 X 3/8	HS700

Interface Board

		INTERFACE BOARD
PART #	***DESCRIPTION***	***COMPONENT IDENTIFIER***
20128.000.01	Resistor, 0Ω, 0805	R102, R103, R104, R105, R116, R117, R128, R129, R130, R131, R138, R139, R140, R209
20128.010.01	Resistor, 10Ω, 0805	R121
20130.100.01	Resistor, 1.00K 1% 0805	R107, R126, R127, R165, R166, R167, R202
20131.100.01	Resistor, 10KΩ, 0805	R133, R134, R135, R136, R137, R203, R204, R205, R206, R207
20132.100.01	Resistor, 100KΩ, 0805	R118, R119, R120, R141, R142, R143, R144, R145, R146, R147, R148, R149, R150, R151, R152, R153, R154, R155, R156, R157, R158, R159, R160, R161, R162, R163, R164, R201, R208
21139.000.01	Capacitor, X7R, 0.1uF, 10%, 0805	C100, C101, C102, C203, C204, C205, C206, C207, C208, C212, C213, C214, C215, C216, C217, C218

		C219, C223, C224
21151.020.01	Capacitor, 20pf, 0805	C221, C222
21171.105.01	Capacitor 1uf X7R 0805	C202
21319.610.01	Capacitor, 10uf, TANTALUM, SMT	C200, C201
23214.000.01	Transistor NPN MMBT3904	Q100
24747.000.01	IC, MAX6501, TEMP 65c	IC201
24756.000.01	IC, GRAPHICS, S1D13706F00A	IC104
24965.000.01	IC, 74ALVC164245DGG	IC100, IC101, IC102
24994.000.01	IC, 74ACT04, SOIC 14P	IC103
27183.018.01	Connector Socket DIP 18-PIN SMT	IC202
27373.040.01	Connector Socket PC104 Stack-ing	J100
27373.064.01	Connector Socket PC104 Stack-ing	J101, J102
27414.016.01	Header PIN 2X8 RIGHT-ANGLE	J200
27756.000.01	Connector, HOUSING, RT AGL SMT	J105
27757.033.01	Connector, FPC, 33PIN Rot-Lock	J103
28089.000.01	Oscillator 33MHZ SG636PCE 4P SMD	Y100
28092.000.01	Crystal, 4.000MHZ, SMD	Y200
44105.100.01	Firmware PIC DISP INT 8500	IC202

Headphone Board

		HEADPHONE BOARD
PART #	***DESCRIPTION***	***COMPONENT IDENTIFIER***
20039.100.01	Resistor, MF, 1/8W, 1%, 10 Ω	R2, R3, R8
20131.100.01	Resistor, 10K, 0805	R1, R6
20131.499.01	Resistor, 1/8W, 1%, 49.9K, 0805	R10, R13
20543.103.01	Trimpots, Audio, 10K, TAPER A	R12
21139.000.01	Capacitor, X7R, 0.1uF, 10%, 0805	C5, C6, C7, C8, C9, C10, C11, C12
21142.000.01	Capacitor, NPO, 100PF, 1%, 0805	C2, C4
21445.510.01	Capacitor, Metalized Polyester, 1.0uF, 50V, 5%	C1, C3
24025.000.01	IC, BUF634P, DIP8	U2, U3, U4
24960.000.01	IC, OPA2134UA	U1
27090.000.01	Jack, Socket, 1/4" Phone, Right Angle	J1
27147.008.01	IC, Socket, DIP, 8 PINS, DUAL	SU2, SU3, SU4
27408.003.01	Connector, 3P Socket STRIP	SL1, SL2, SL3
27758.006.01	Connector 6P Molex Right Angle	J2
29508.210.01	Filter-EMI Suppression-50V-	L1, L2, L3
32091.000.05	Circuit Board Headphone Board	

		HEADPHONE BOARD
PART #	***DESCRIPTION***	***COMPONENT IDENTIFIER***
57148.000.01	Bracket, Phone 8500 TYPE	

Encoder Board

		ENCODER BOARD
PART #	***DESCRIPTION***	***COMPONENT IDENTIFIER***
15061.003.01	LED MOUNT, T-1, 0.220	LEDMNT
21129.410.01	Capacitor, AXL LDS, 0.1uF, 50V, 20%	C1
25122.000.01	LED, T 1 3/4 RED/GRN	LED, 1
26088.000.01	Encoder, Rotary, Noble 8500	EN1
26128.000.01	Switch, Joymouse, Push, 8500	A1
26304.001.01	Switch, Push-Mom, SPST	SW1, SW2
27421.016.01	Connector, Header, STR, .23", 2 X 8	JP1
32101.000.03	Circuit Board Encoder DPL/DEL	

LCD Carrier Board

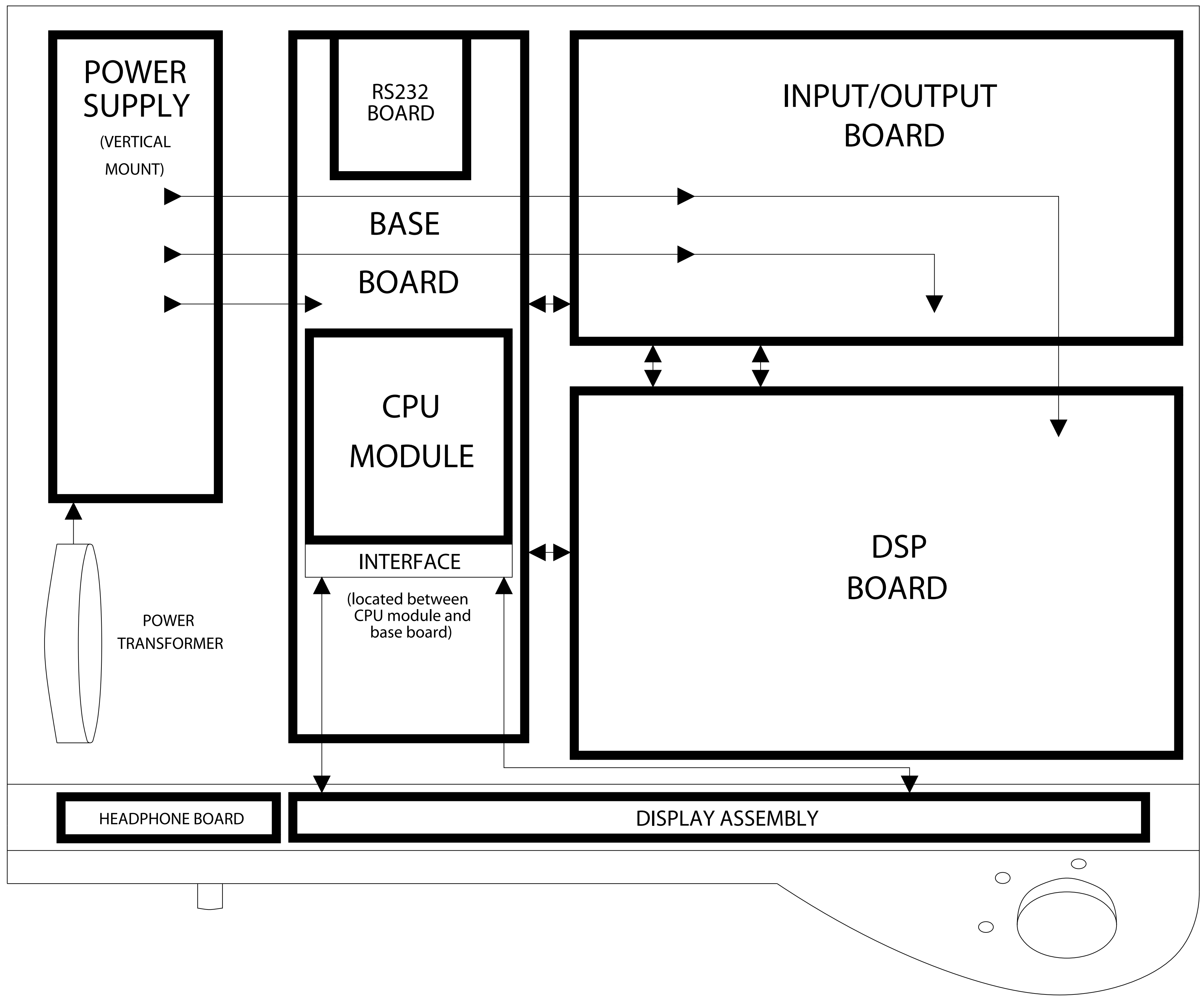
		LCD CARRIER BOARD
PART #	***DESCRIPTION***	***COMPONENT IDENTIFIER***
11568.000.01	SCREW, THREAD-FORM 3x6MM	
21112.282.01	Capacitor, CERAMIC, 0.0082uF, 1KV, 10%	C1
22106.000.01	Diode, SMCJ26C, TRANZORB	D3
22209.000.01	Diode, SHOT 1A, 60V, SMD	D1, D2
24758.000.01	LCD Backlight Driver/CCFT	A1
25409.000.01	LCD Display 320 X 240	LCD1
27420.002.01	Connector 2 PIN Right Angle	J1
27757.033.01	Connector, FPC, 33PIN Rot-Lock	J2, J3

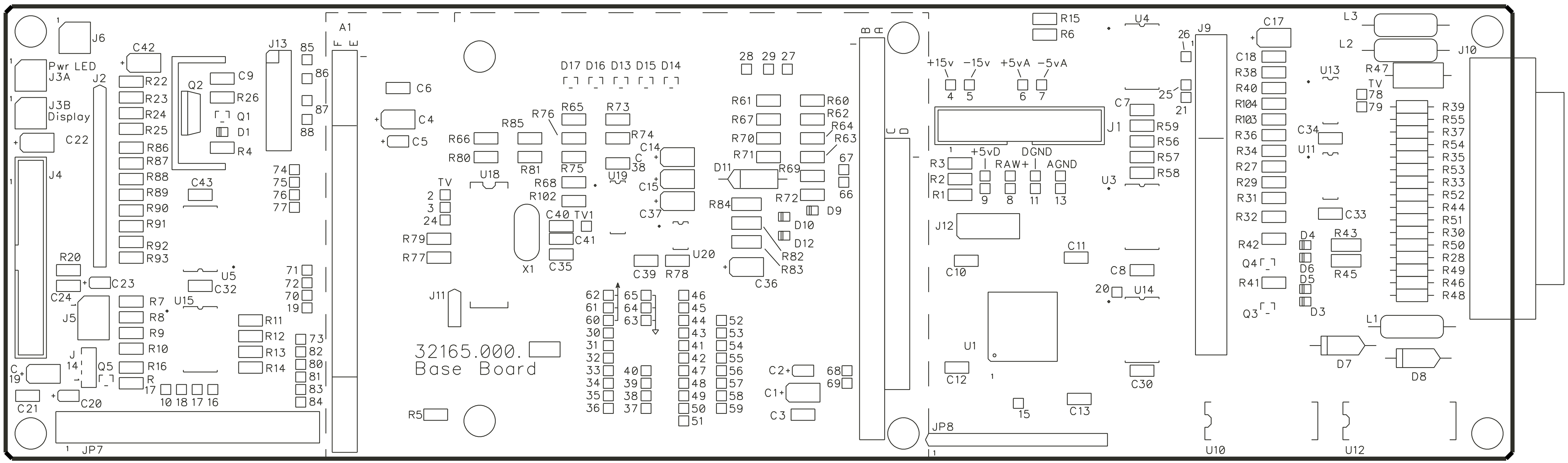
Schematics and Parts Locator Drawings

These drawings reflect the actual construction of your unit as accurately as possible. Any differences between the drawings and your unit are probably due to product improvements or production changes since the publication of this manual.

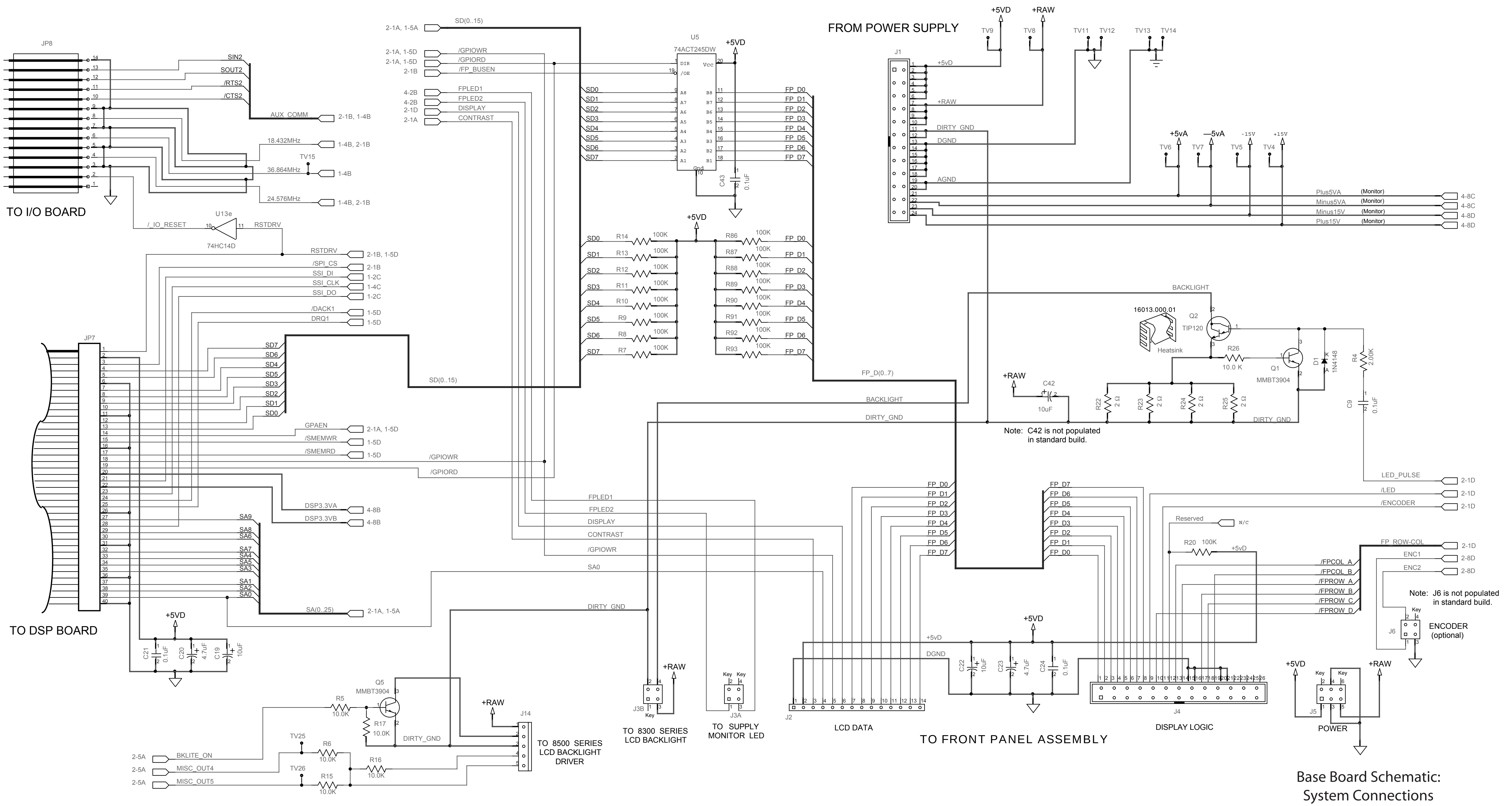
If you intend to replace parts, please read page 6-11. Please note that because surface-mount parts are used extensively in the 8500, few parts are field-replaceable. Servicing ordinarily occurs by swapping circuit board assemblies. However, many vulnerable parts connected to the outside world are socketed and can be readily replaced in the field.

Function	Description	Drawing	Page
Chassis	Circuit Board Locator and basic interconnections	Top view (not to scale)	6-27
Base Board	Glue logic; supports CPU module and RS-232 daughterboard. ***Contains***:	Parts Locator Drawing	6-28
	System Connections	Schematic 1 of 4	6-29
	CPU module interface	Schematic 2 of 4	6-30
	Power Supply Monitor	Schematic 3 of 4	6-31
	CPLD, General Purpose Interface, and Remotes	Schematic 4 of 4	6-32
CPU Module	Control microprocessor. Services front panel, serial port, Ethernet, DSP board, and control board. Resides on base board. ***Contains***:	Parts Locator Drawing	6-33
	Ethernet	Schematic 1 of 5	6-34
	General Purpose Bus	Schematic 2 of 5	6-35
	Memory	Schematic 3 of 5	6-36
	Miscellaneous Functions	Schematic 4 of 5	6-37
	Power and Ground Distribution	Schematic 5 of 5	6-38
RS-232 Board	Supports Serial Port	Parts Locator Drawing	6-39
		Schematic 1 of 1	6-40
Power Supply	±15V analog supply; ±5V analog supply; +5V digital supply	Parts Locator Drawing	6-41
		Schematic 1 of 1	6-42
I/O Board	Analog Output AES3 Input/output ***Contains:***	Parts Locator Drawing	6-43
	Analog Outputs	Schematic 1 of 6	6-44
	Digital I/O and SRC 1-6	Schematic 2 of 6	6-45
	Digital I/O and SRC 7-12	Schematic 3 of 6	6-46
	Control and Miscellaneous	Schematic 4 of 6	6-47
	Interface	Schematic 5 of 6	6-48
	Power Distribution	Schematic 6 of 6	6-49
DSP Board	DSP Chips; Local +3.3V regulator. ***Contains:***	Parts Locator Drawing	6-50
	DSP Extended Serial Audio Interface (ESAI)	Schematic 2 of 9	6-51
	DSP Host Interface	Schematic 3 of 9	6-52

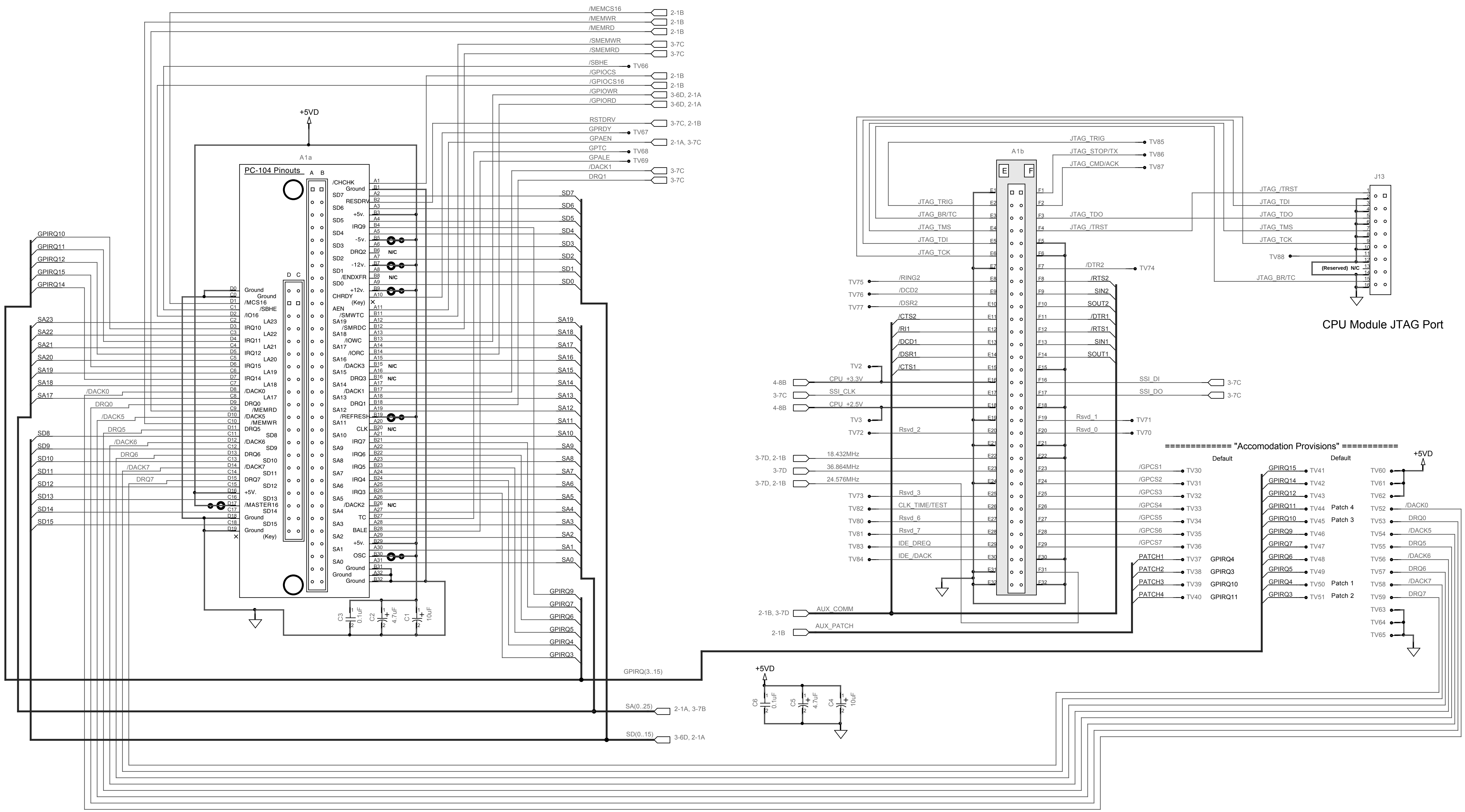

POWER SUPPLY
(VERTICAL MOUNT)
RS232 BOARD
BASE BOARD
INPUT/OUTPUT BOARD
CPU MODULE
INTERFACE
(located between CPU module and base board)
DSP BOARD
POWER TRANSFORMER
HEADPHONE BOARD
DISPLAY ASSEMBLY



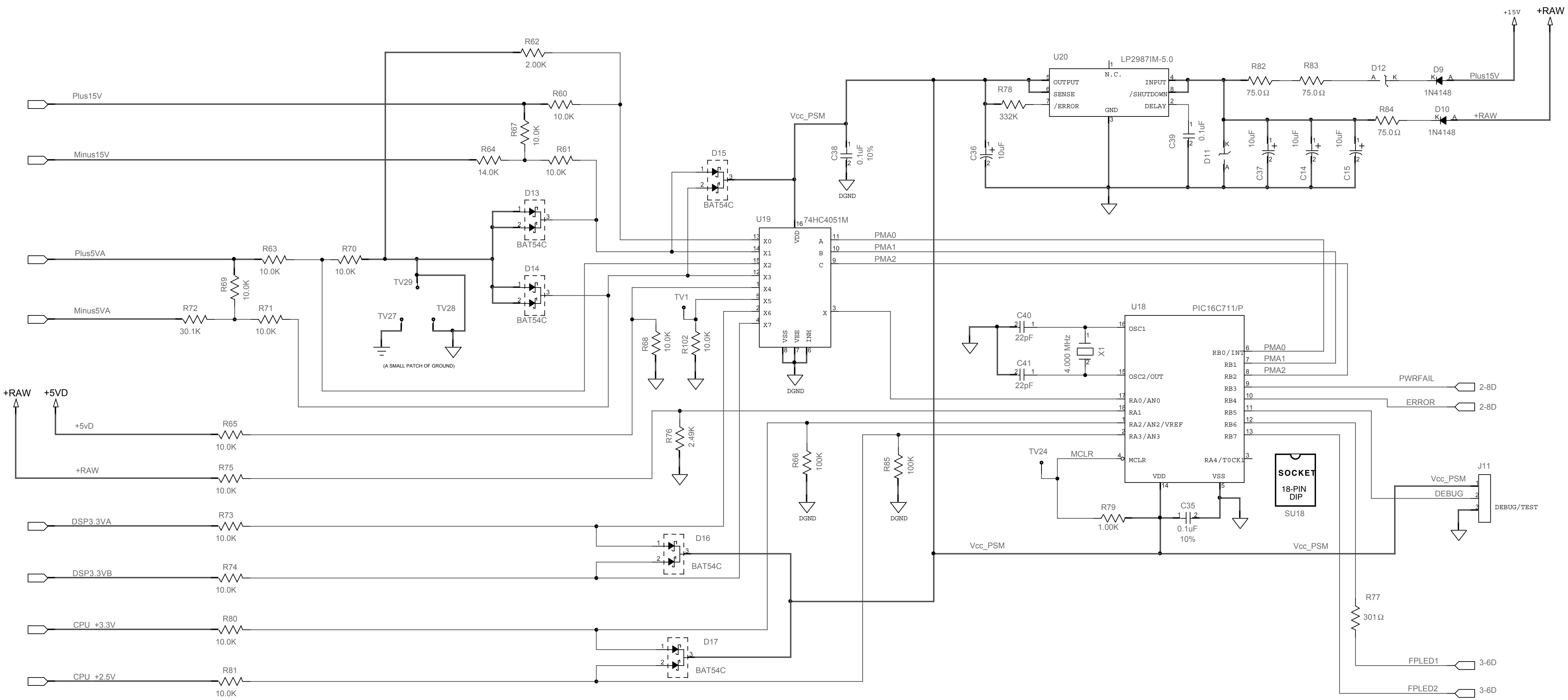
Base Board Parts Locator Drawing
(for schematic 62165.000.06)



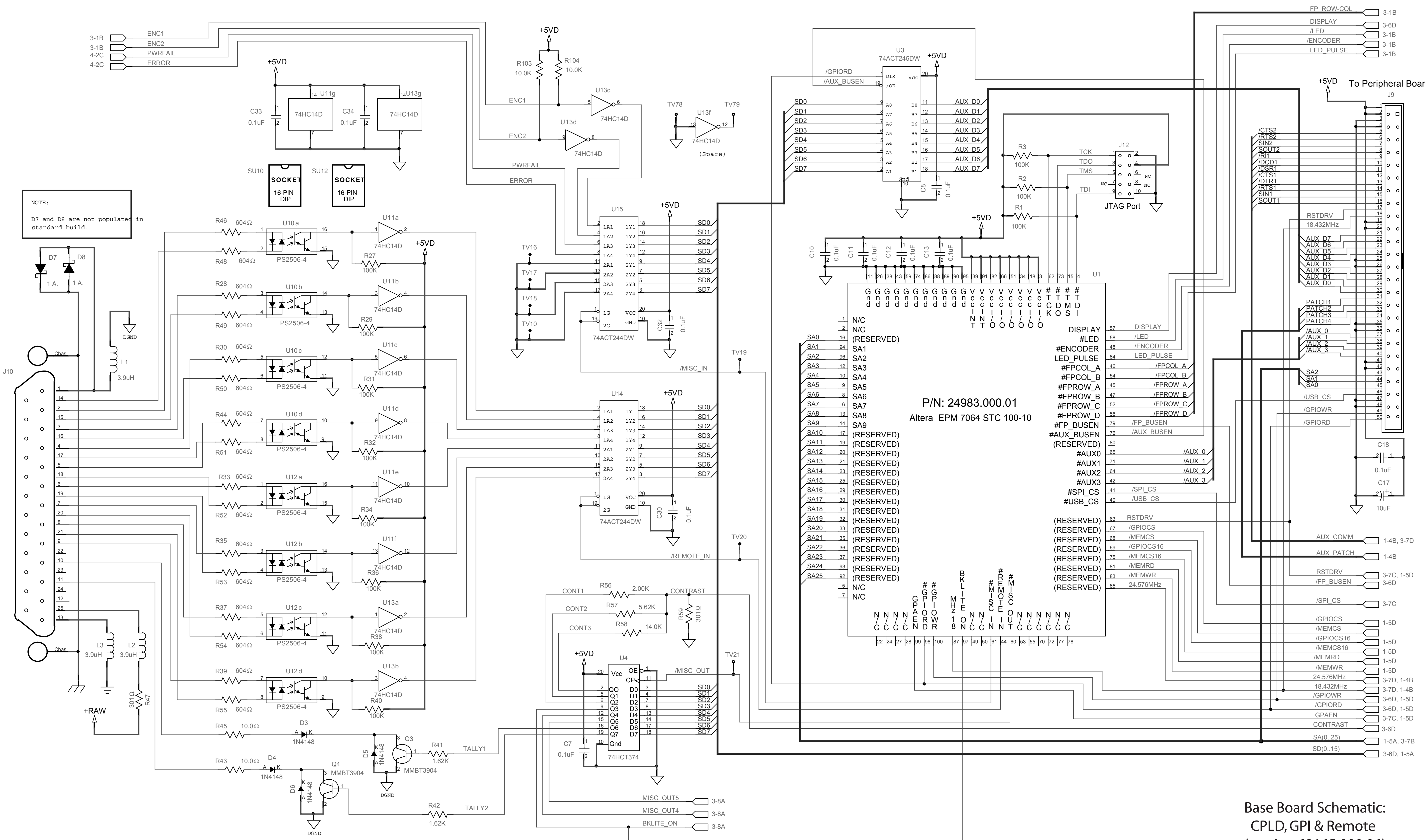
Base Board Schematic:
System Connections
(version 62165.000.06)
Sheet 1 of 4



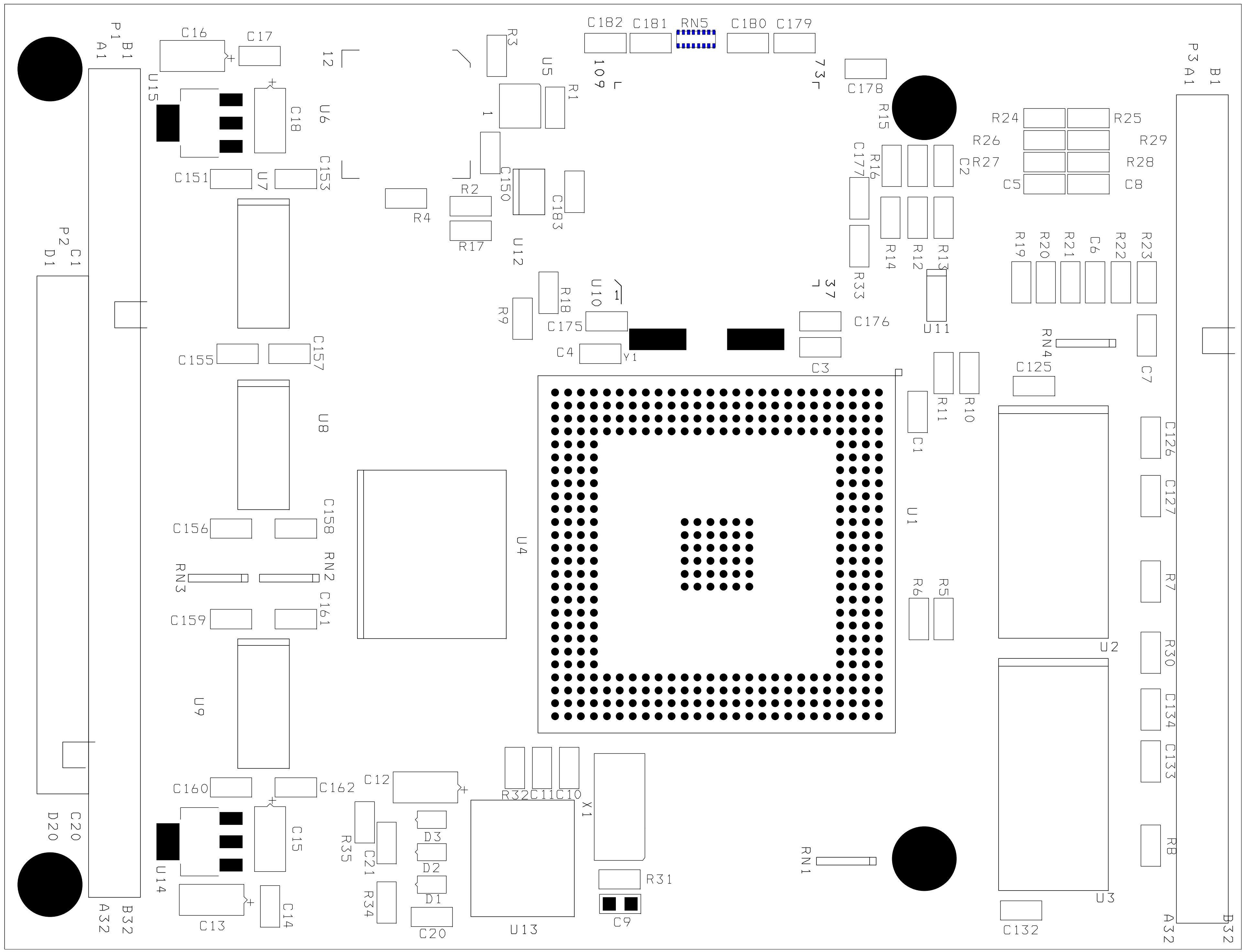
Base Board Schematic:
CPU Module Interface
(version 62165.000.06)
Sheet 2 of 4



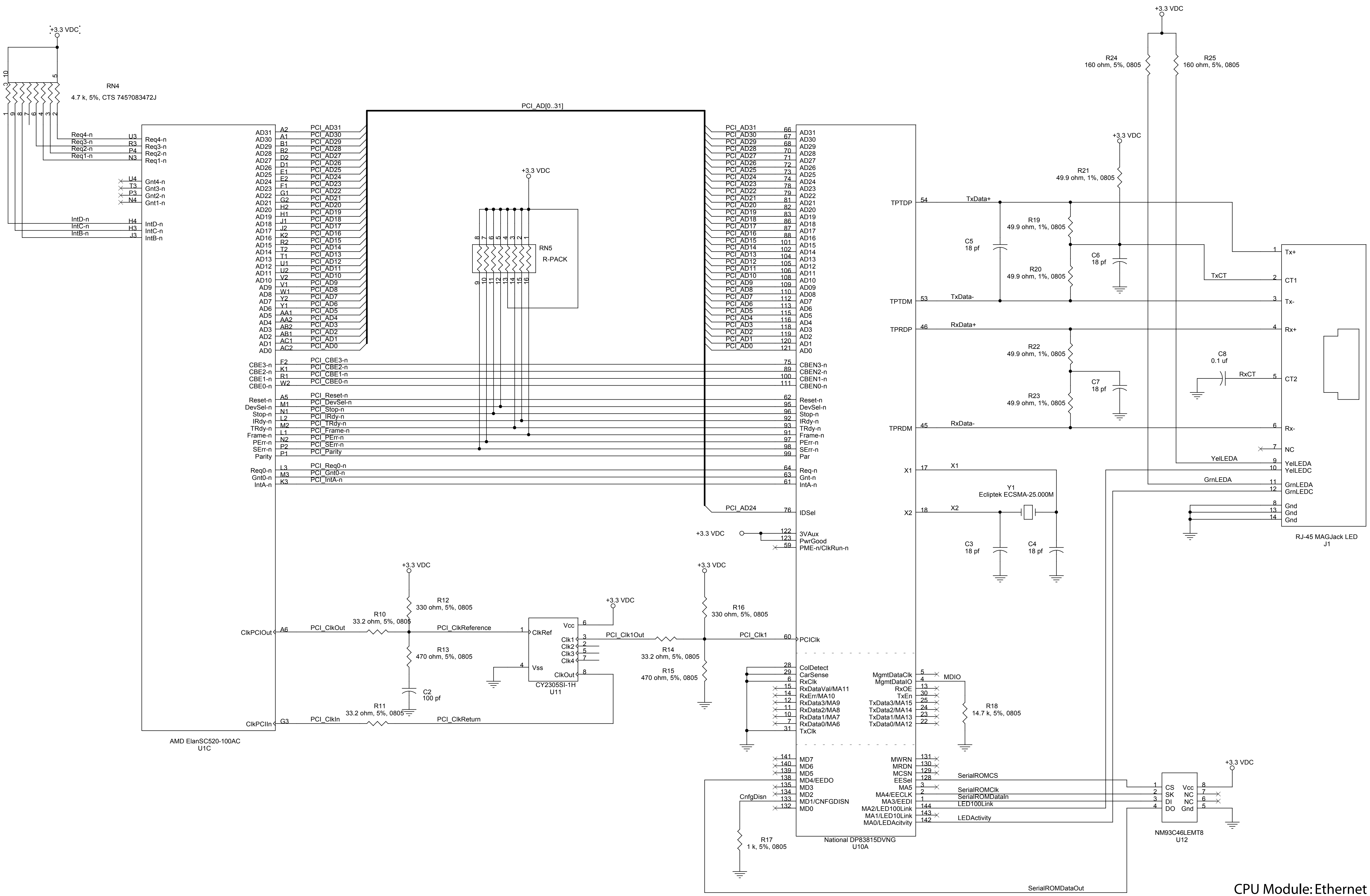
Base Board Schematic:
Power Supply Monitor
(version 62165.000.06)
Sheet 3 of 4



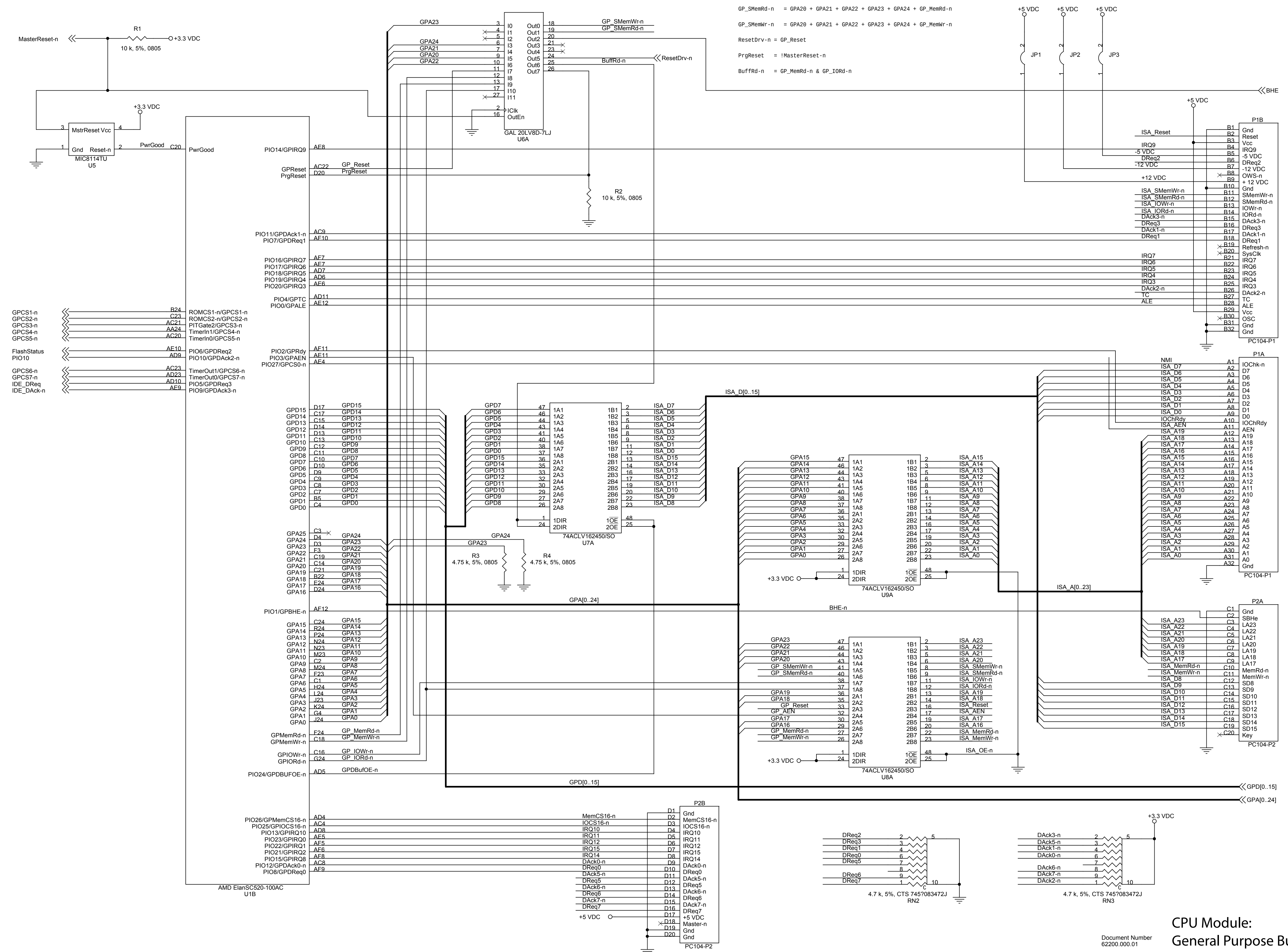
Base Board Schematic:
CPLD, GPI & Remote
(version 62165.000.06)
Sheet 4 of 4



CPU MODULE
Drawing 32200.000.02

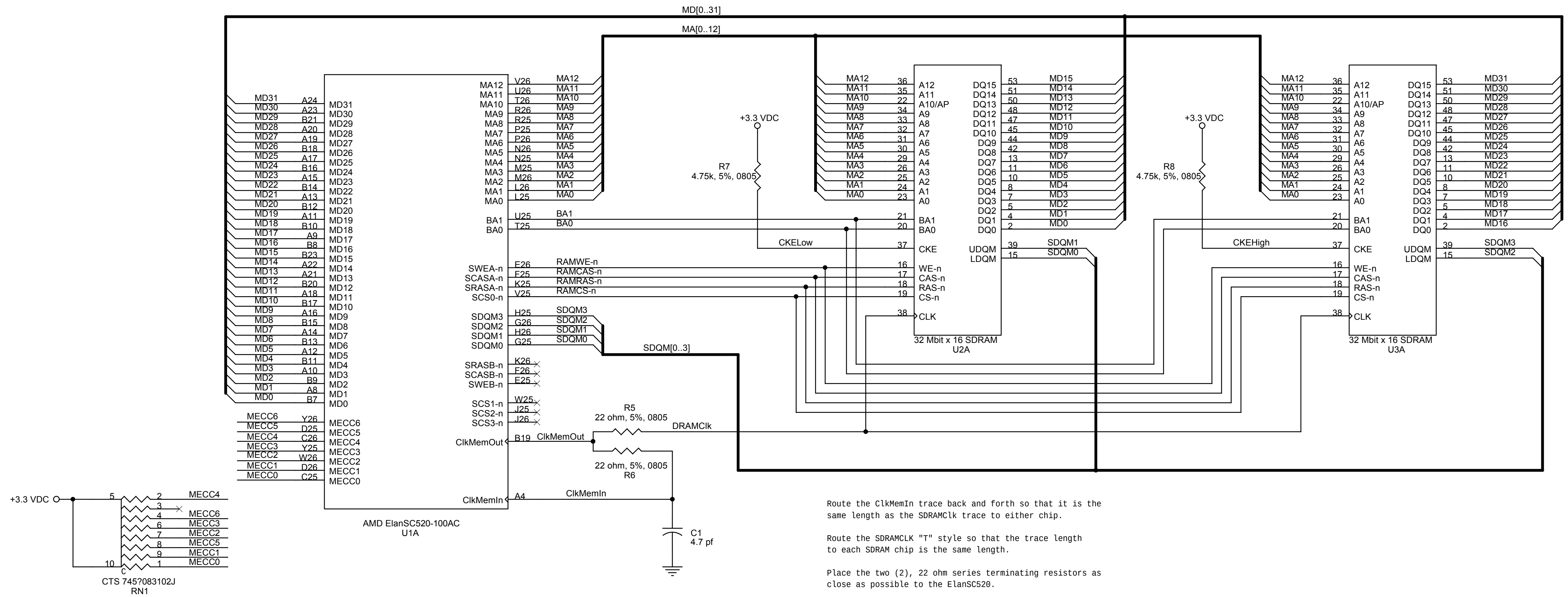


CPU Module: Ethernet



CPU Module:
General Purpose Bus

Document Number
62200.000.01



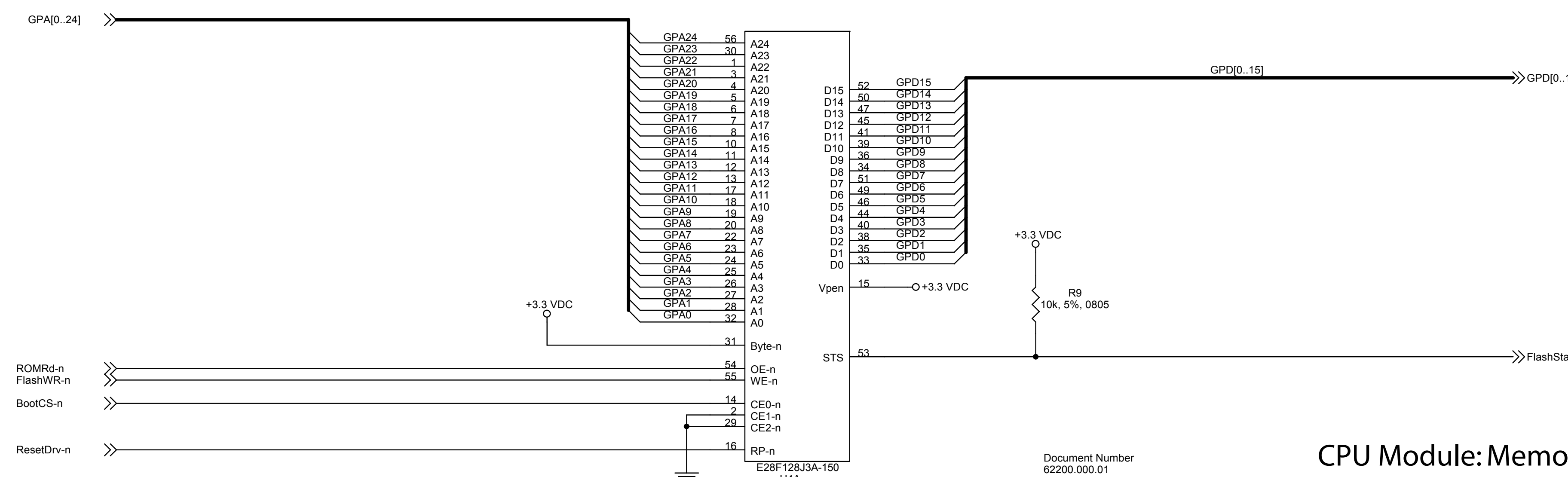
Route the ClkMemIn trace back and forth so that it is the same length as the SDRAMClk trace to either chip.

Route the SDRAMCLK "T" style so that the trace length to each SDRAM chip is the same length.

Place the two (2), 22 ohm series terminating resistors as close as possible to the ElanSC520.

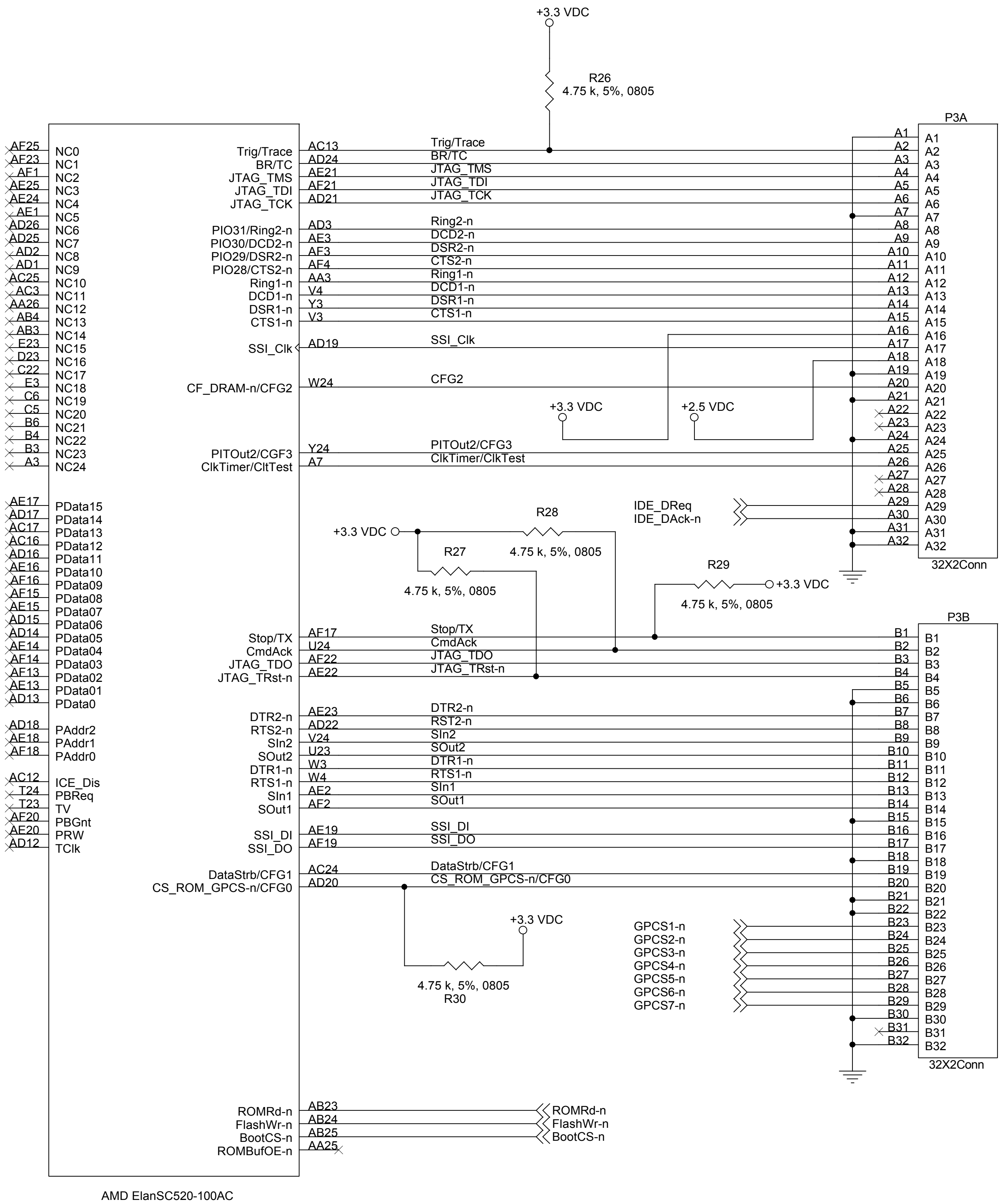
Place the 4.7 fp capacitor as close as possible to the Elan SC520. Adjust the value to equalize loading on SDRAMCLK and ClkMemIn nets.

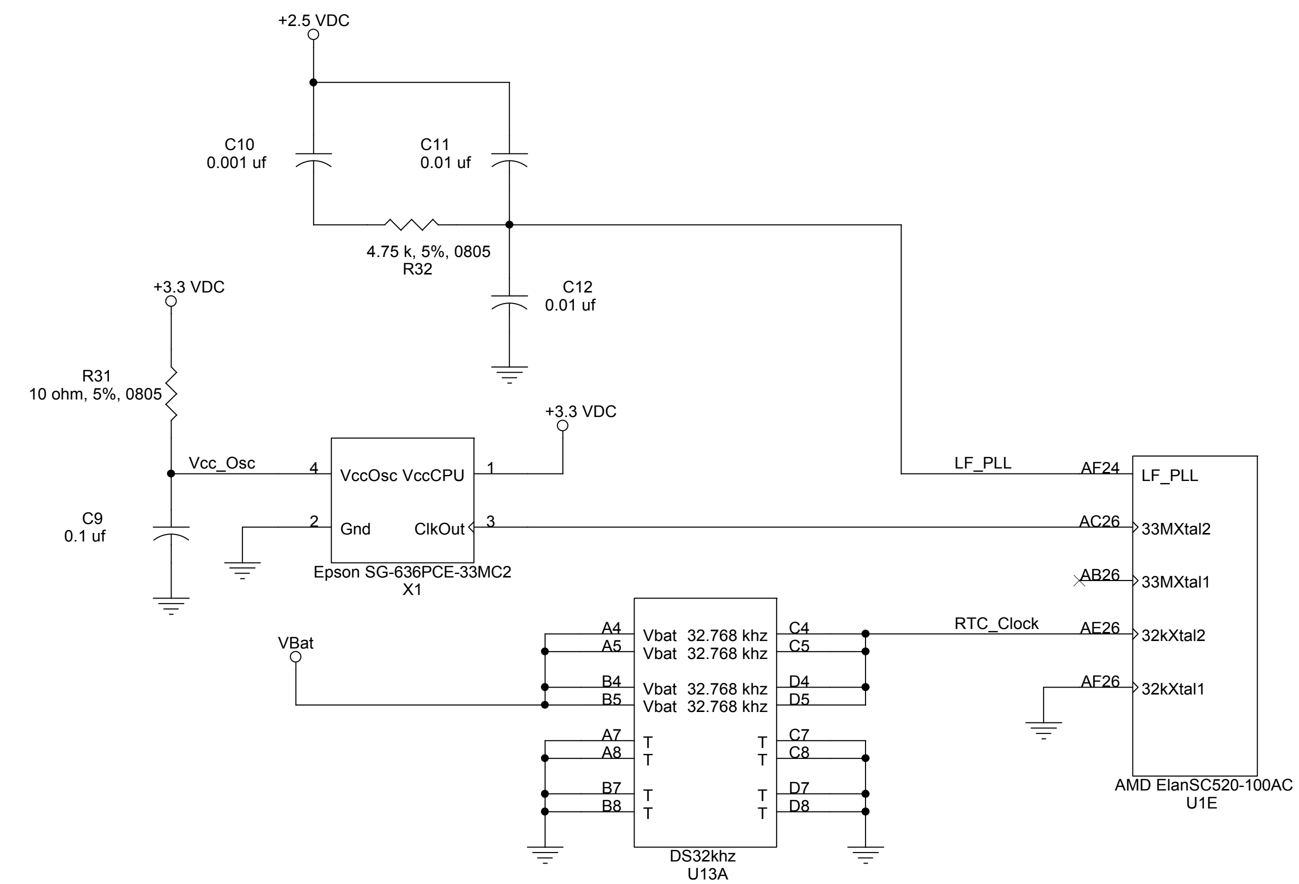
Flash Circuitry



Document Number
62200.000.01

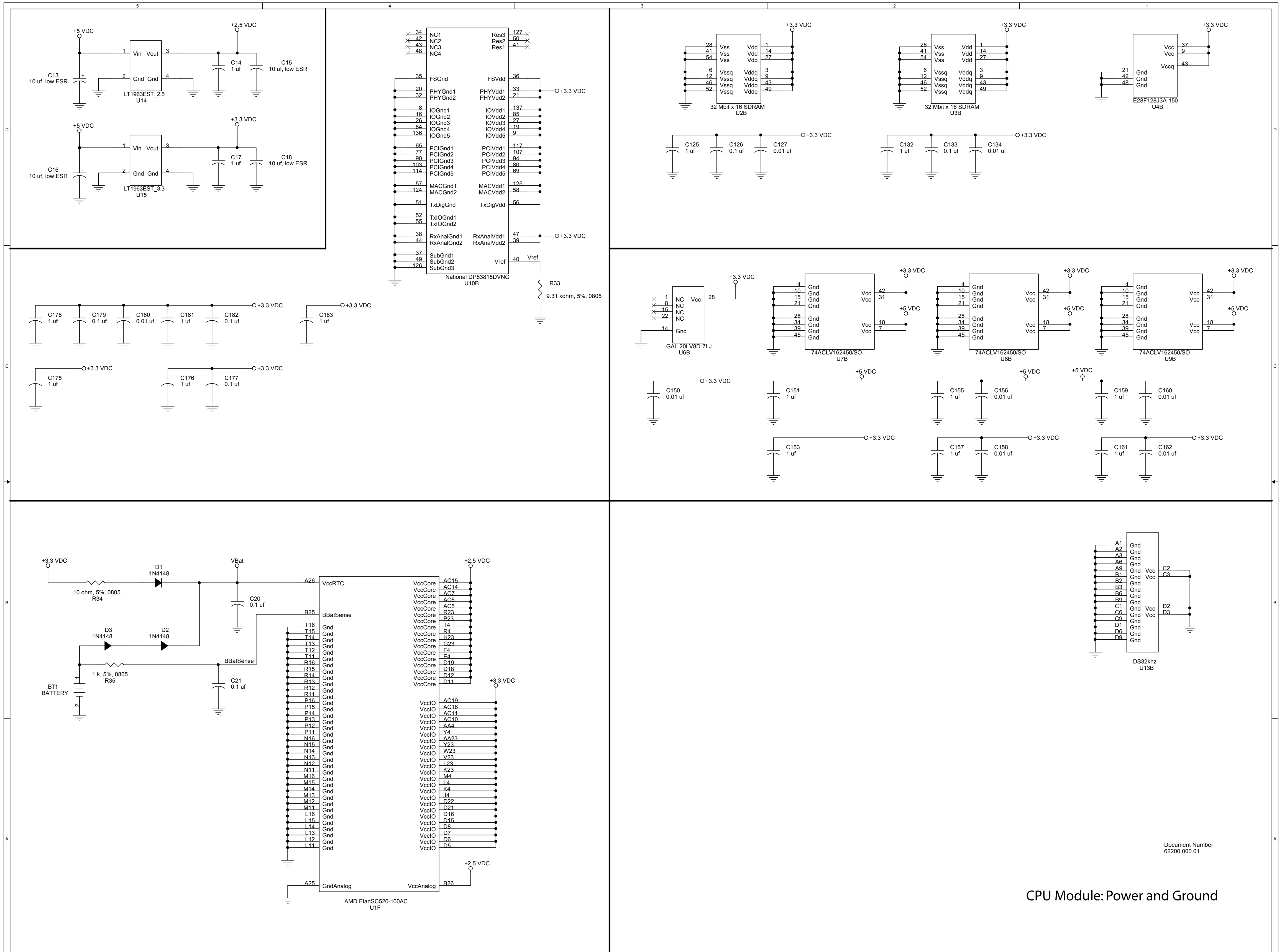
CPU Module: Memory





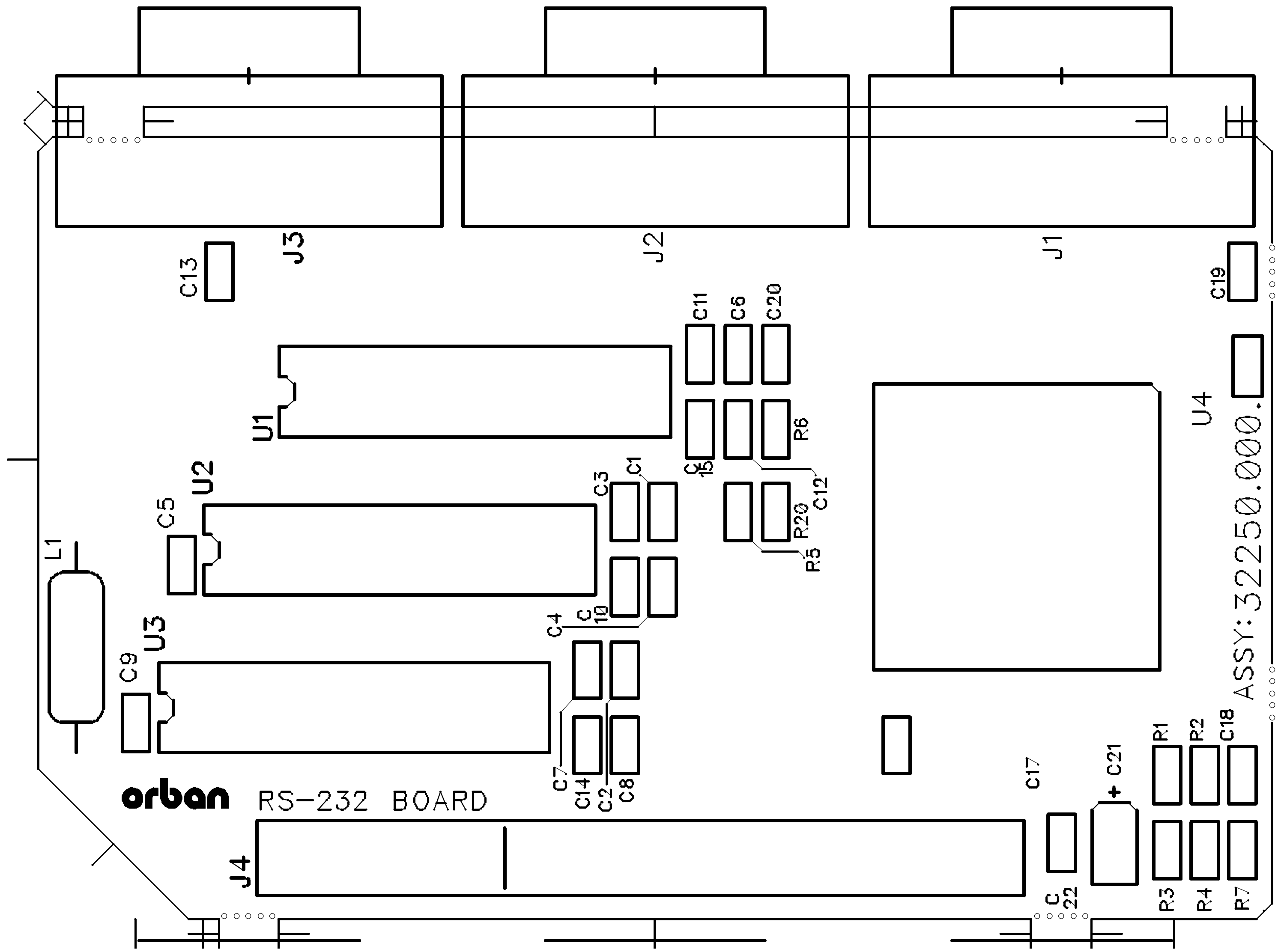
Document Number
62200.000.01

CPU Module: Miscellaneous



Document Number
62200.000.01

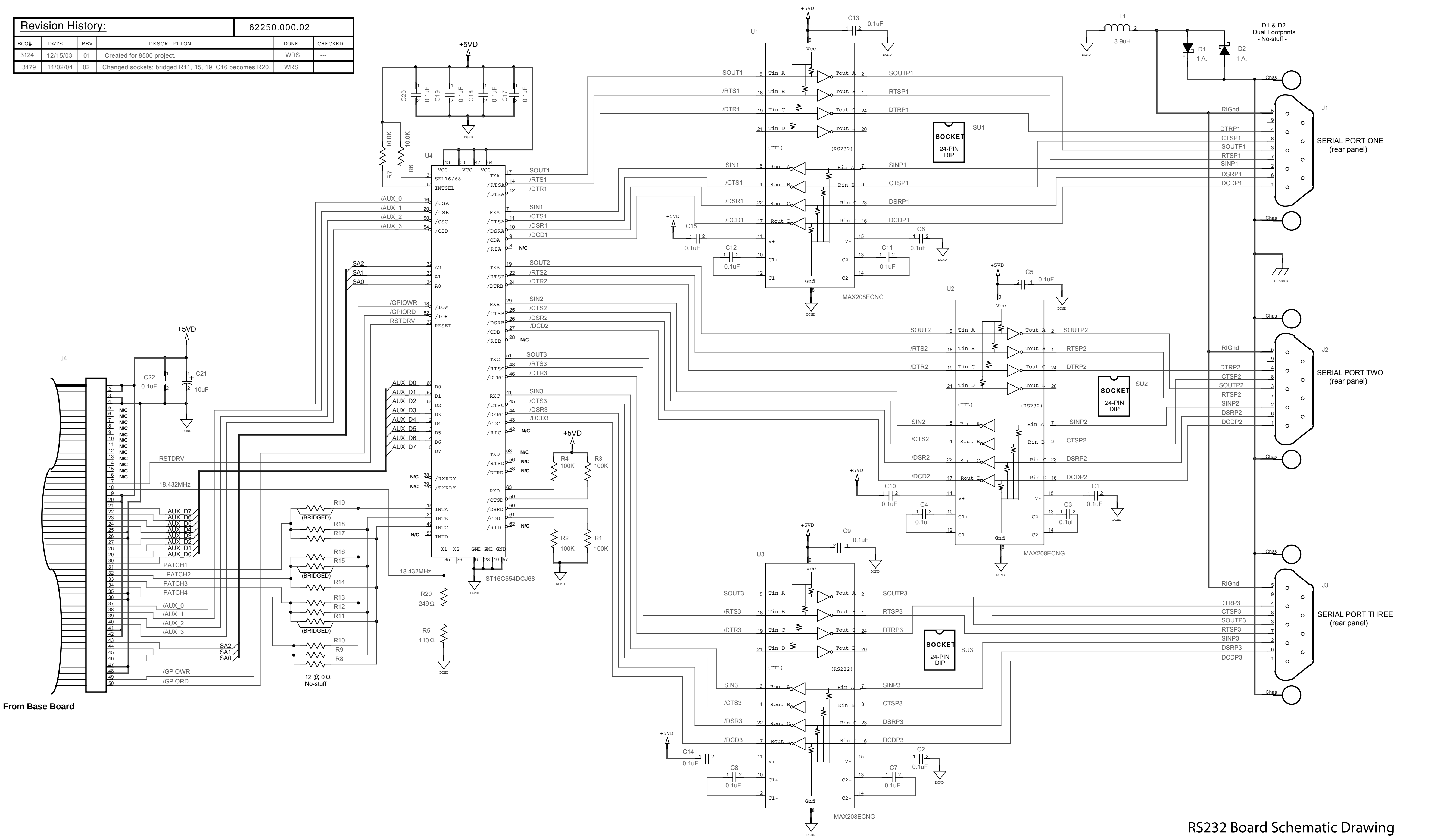
CPU Module: Power and Ground



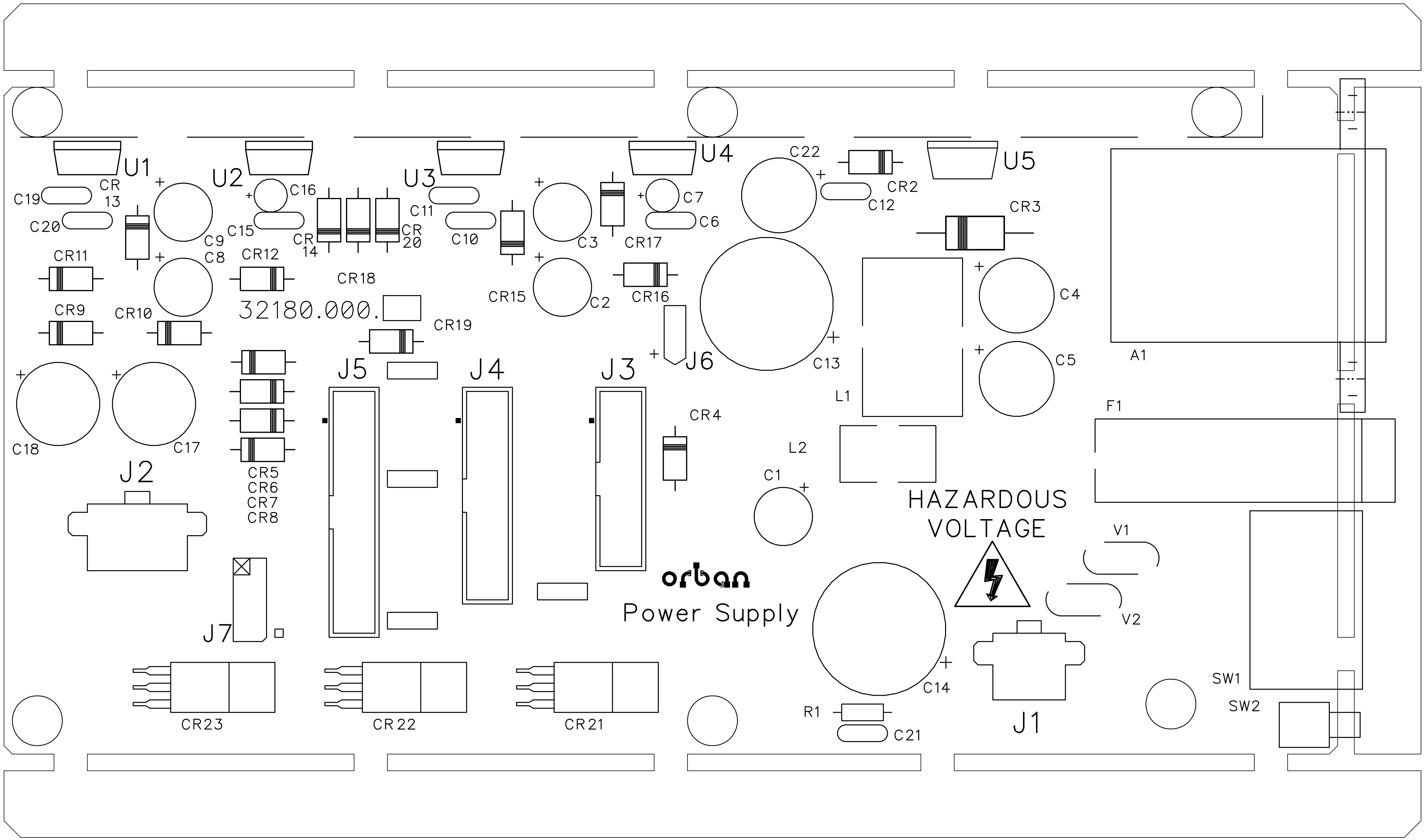
REVISION HISTORY					
REV	ECO	DATE	DESCRIPTION	DRW	CHK
01	3124	01/06/04	Release to Prod.	WRS	
02	3179	11/02/04	Change Sockets, etc.	WRS	

RS232 Board Parts Locator Drawing
(for schematic 62250.000.02)

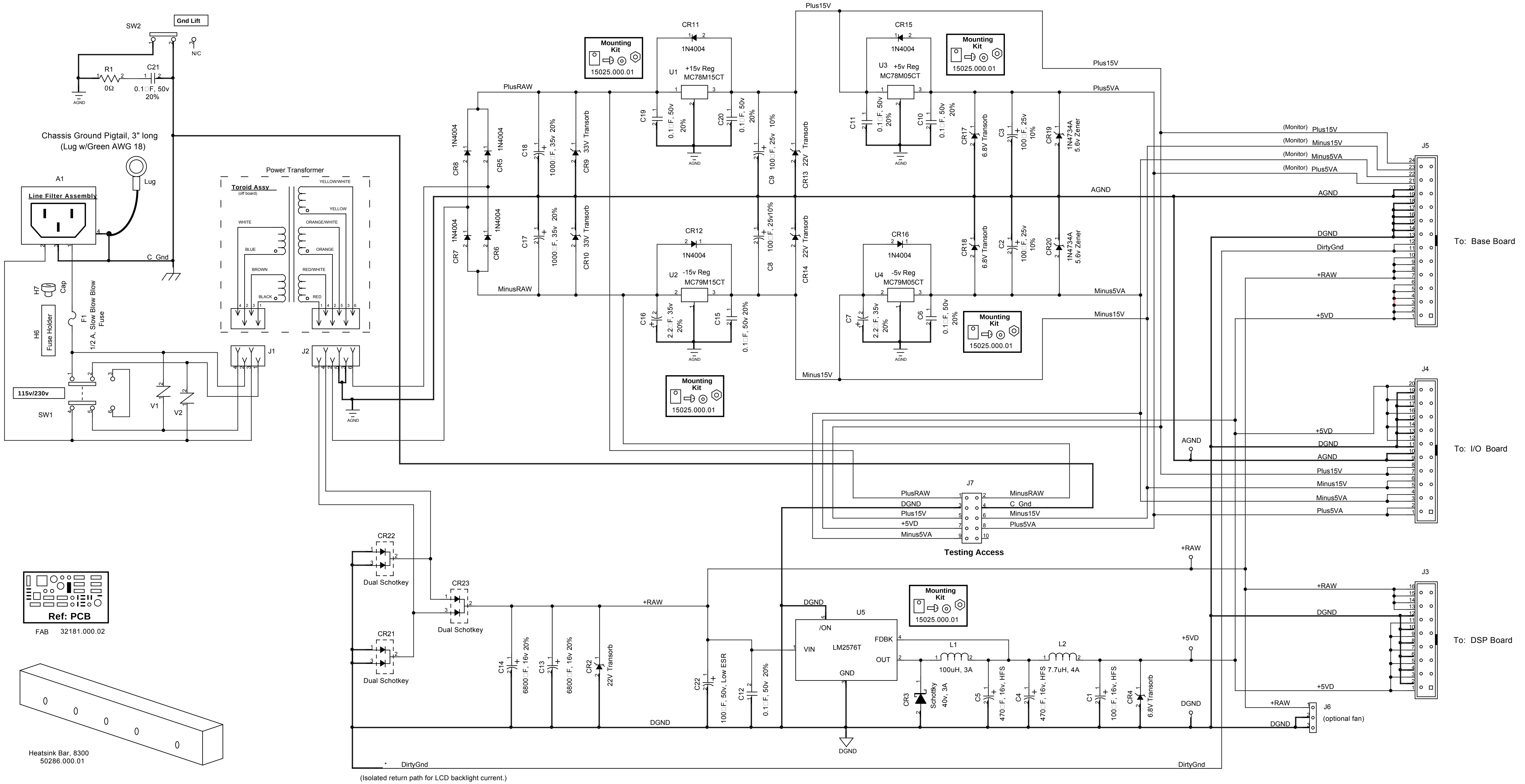
Revision History:				62250.000.02	
ECO#	DATE	REV	DESCRIPTION	DONE	CHECKED
3124	12/15/03	01	Created for 8500 project.	WRS	---
3179	11/02/04	02	Changed sockets; bridged R11, 15, 19; C16 becomes R20.	WRS	



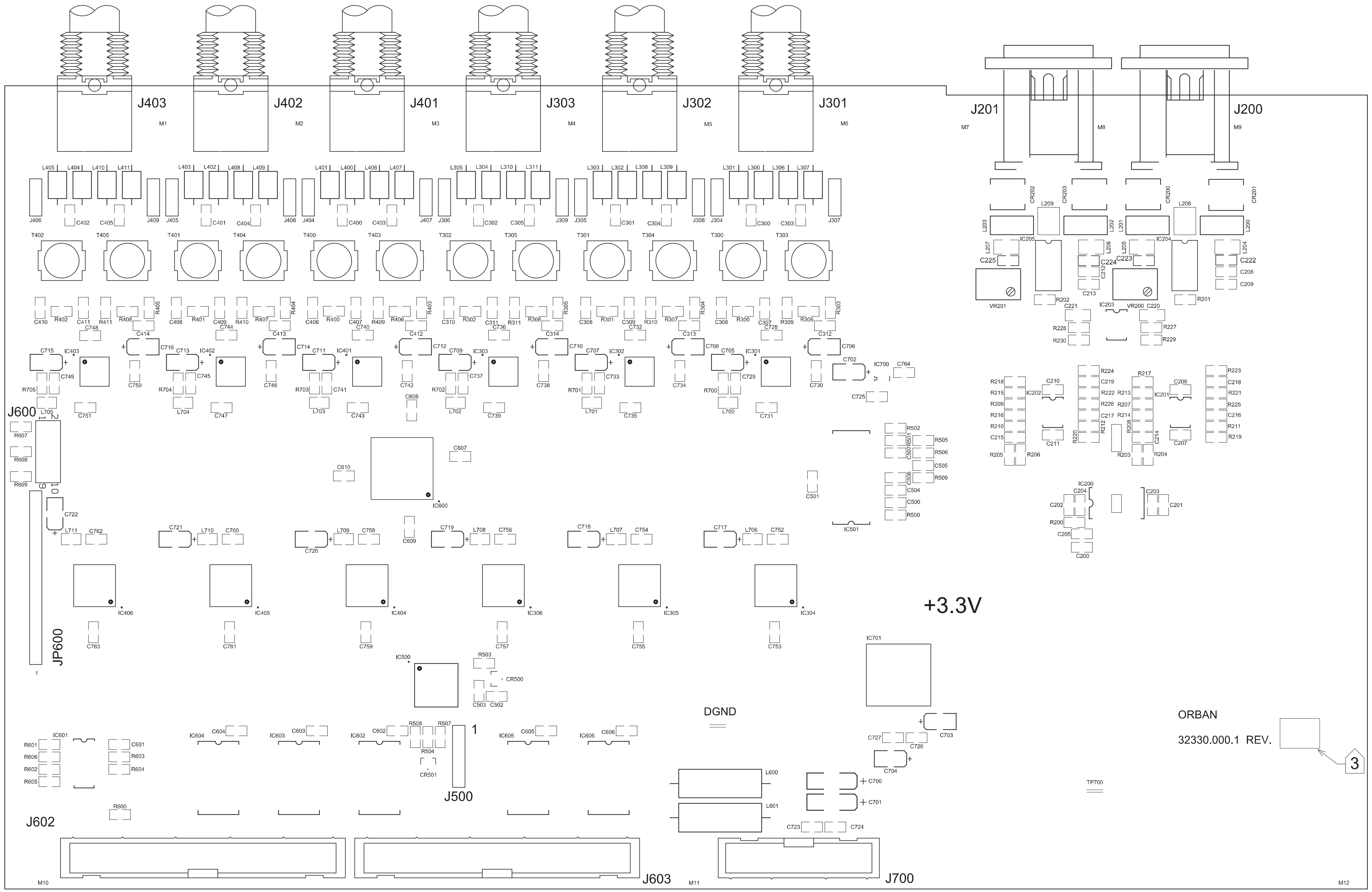
RS232 Board Schematic Drawing



8300 POWER SUPPLY PARTS LOCATOR



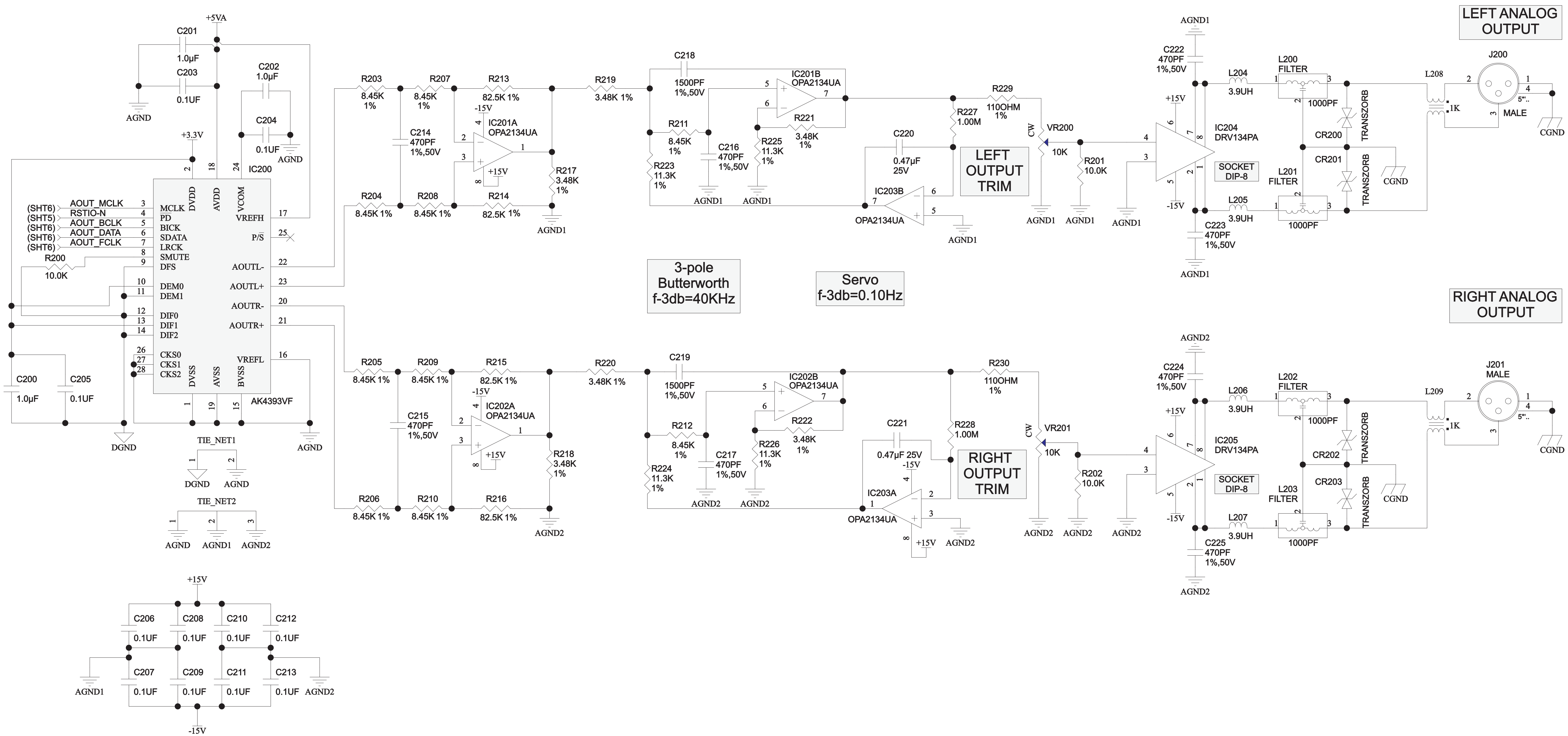
POWER SUPPLY



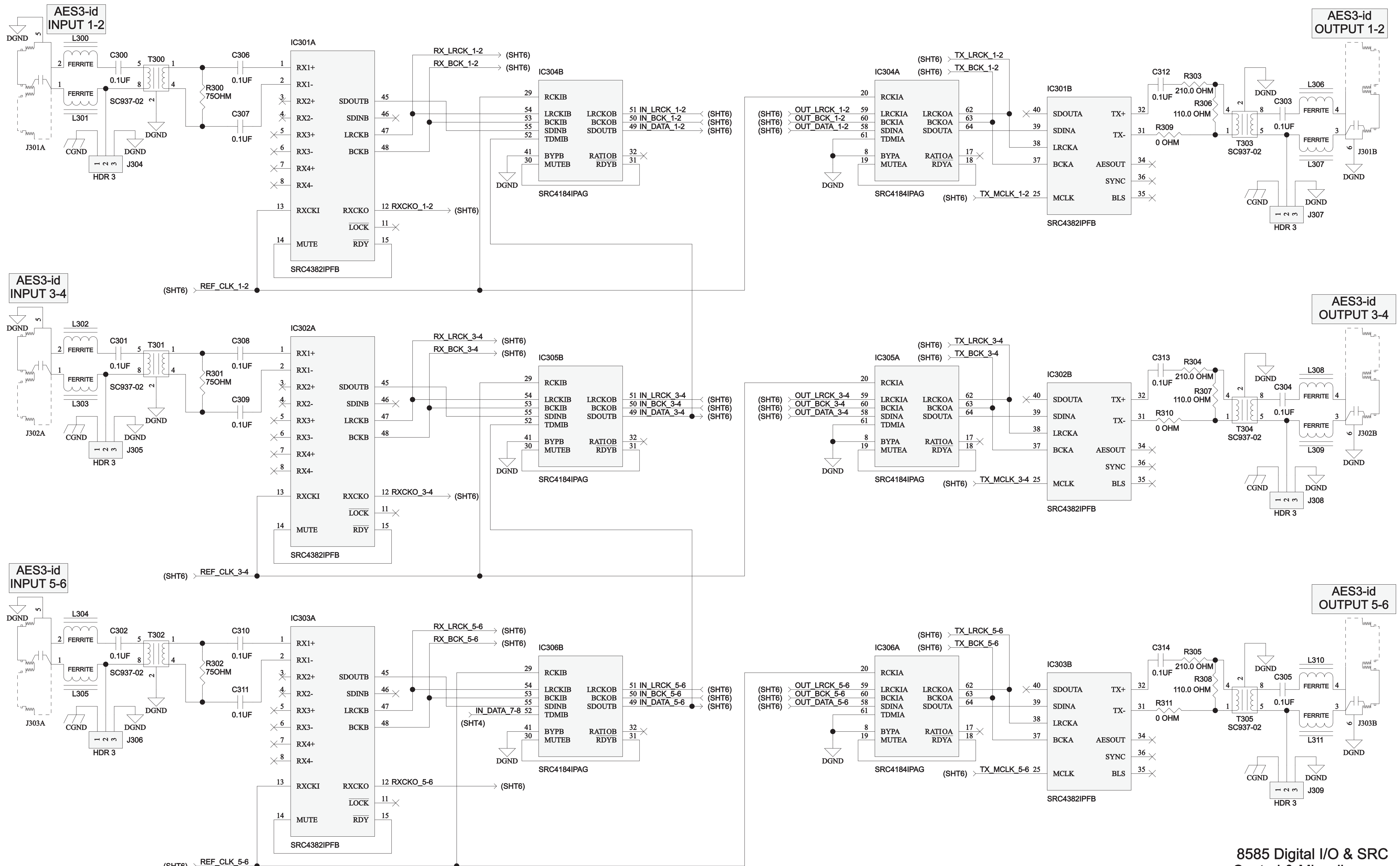
NOTE: UNLESS OTHERWISE SPECIFIED.

1. PRINTED CIRCUIT BOARD SHALL BE ASSEMBLED PER THE MOST RECENT REVISION OF IPC-A-610, CLASS2.
2. REFERENCE SCHEMATIC DRAWING NO. 62330.000.1.
3. MARK ASSEMBLY REVISION NUMBER IN SPACE PROVIDED.
4. FINISHED ASSEMBLY SHALL BE RoHS COMPLIANT AND MARKED PB FREE AS STATED IN IPC-1066.

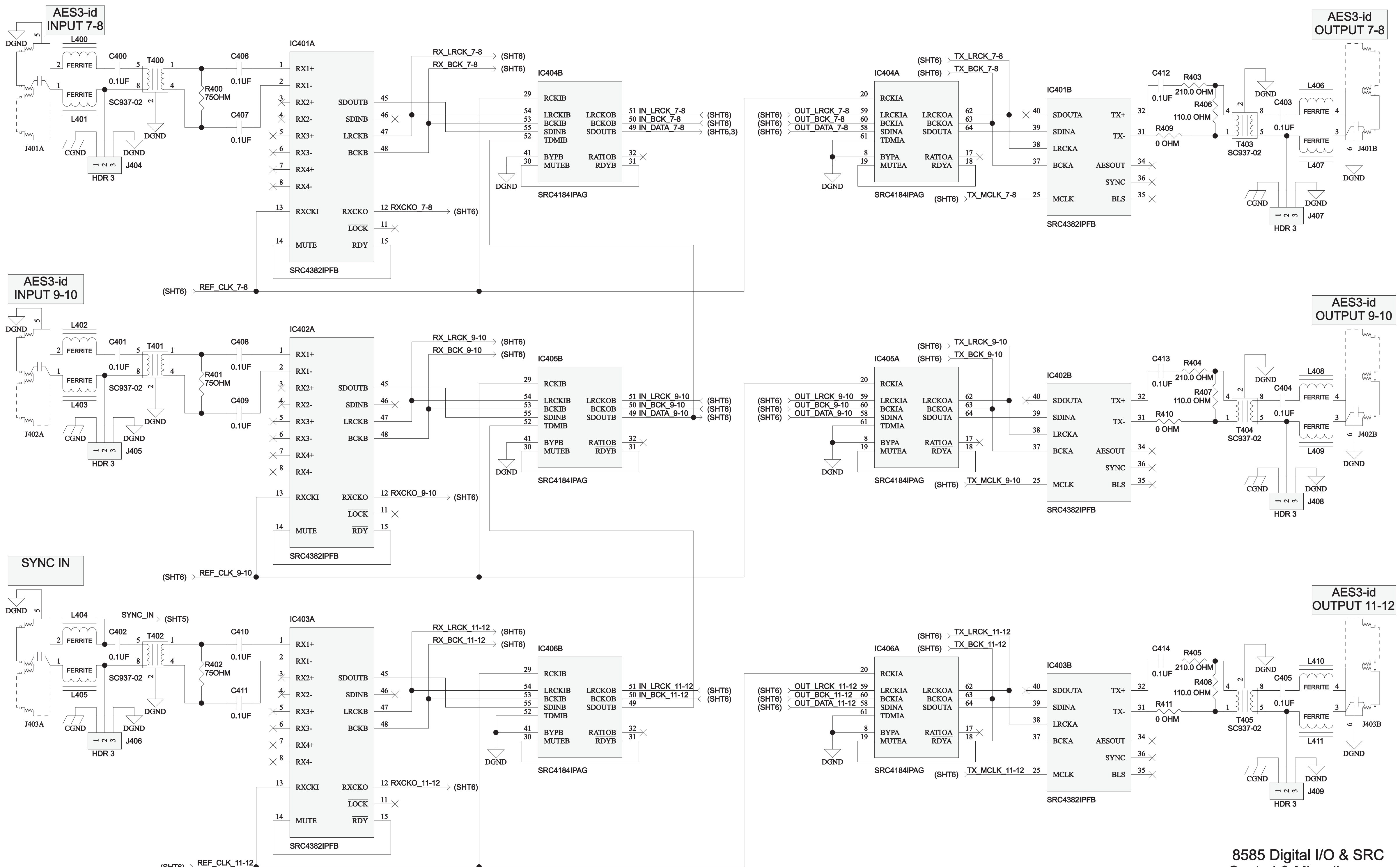
8585 Digital I/O & SRC
Control & Miscellaneous
Parts Locator
32330.000.02.1



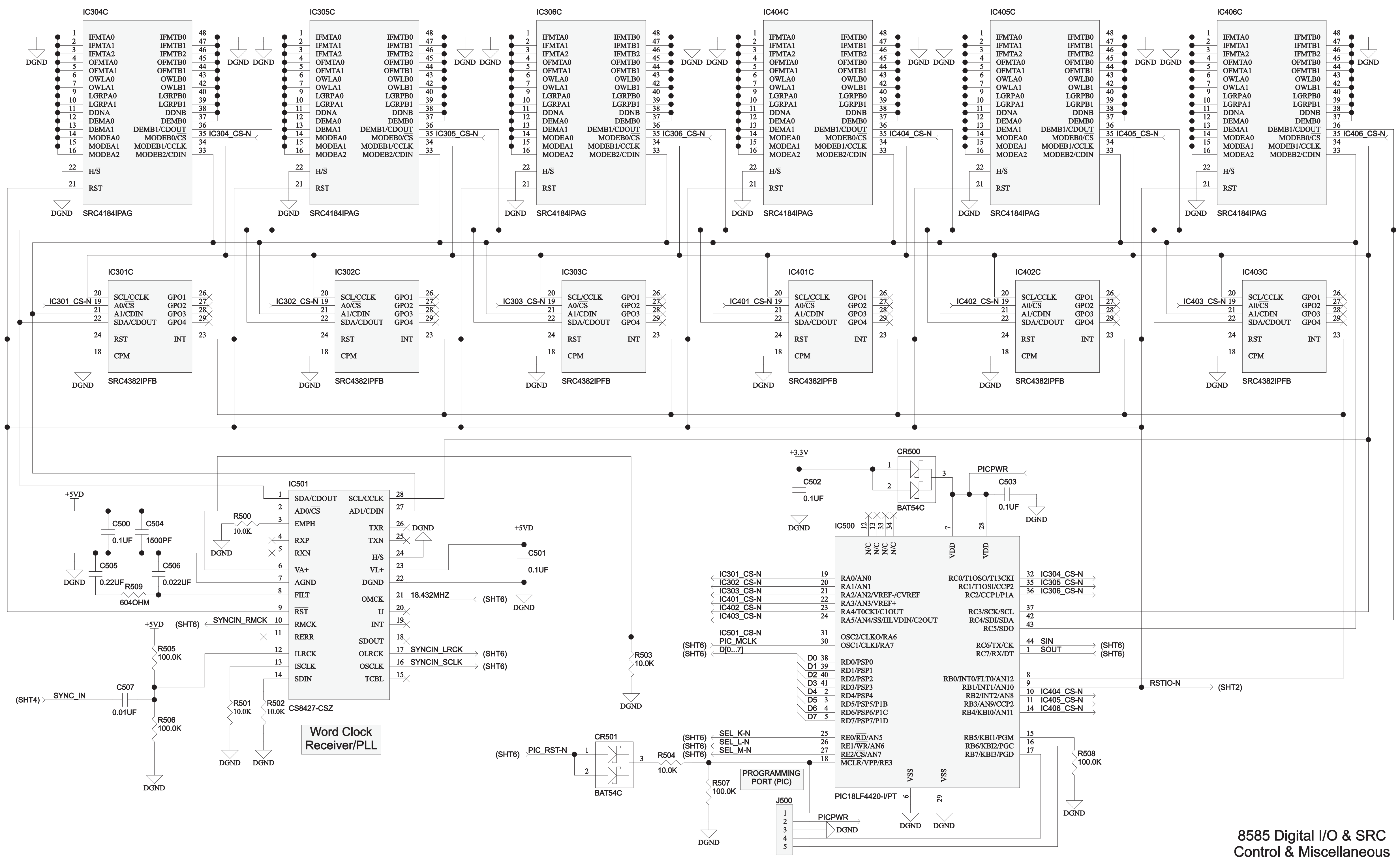
8585 Digital I/O & SRC
Control & Miscellaneous
62330.000.02.1 2 of 7



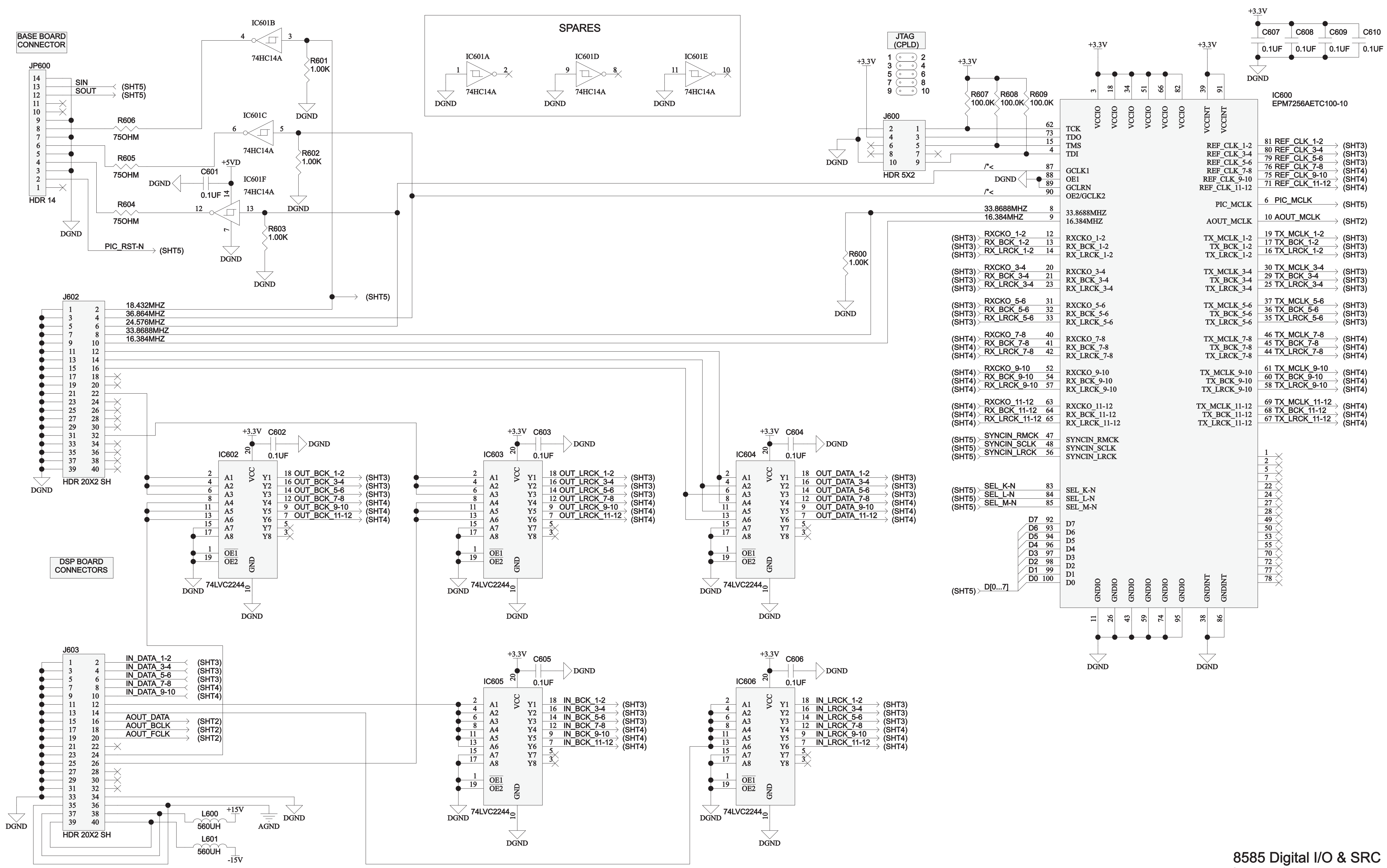
8585 Digital I/O & SRC
Control & Miscellaneous
62330.000.02.1 3 of 7



8585 Digital I/O & SRC
Control & Miscellaneous
62330.000.02.1 4 of 7

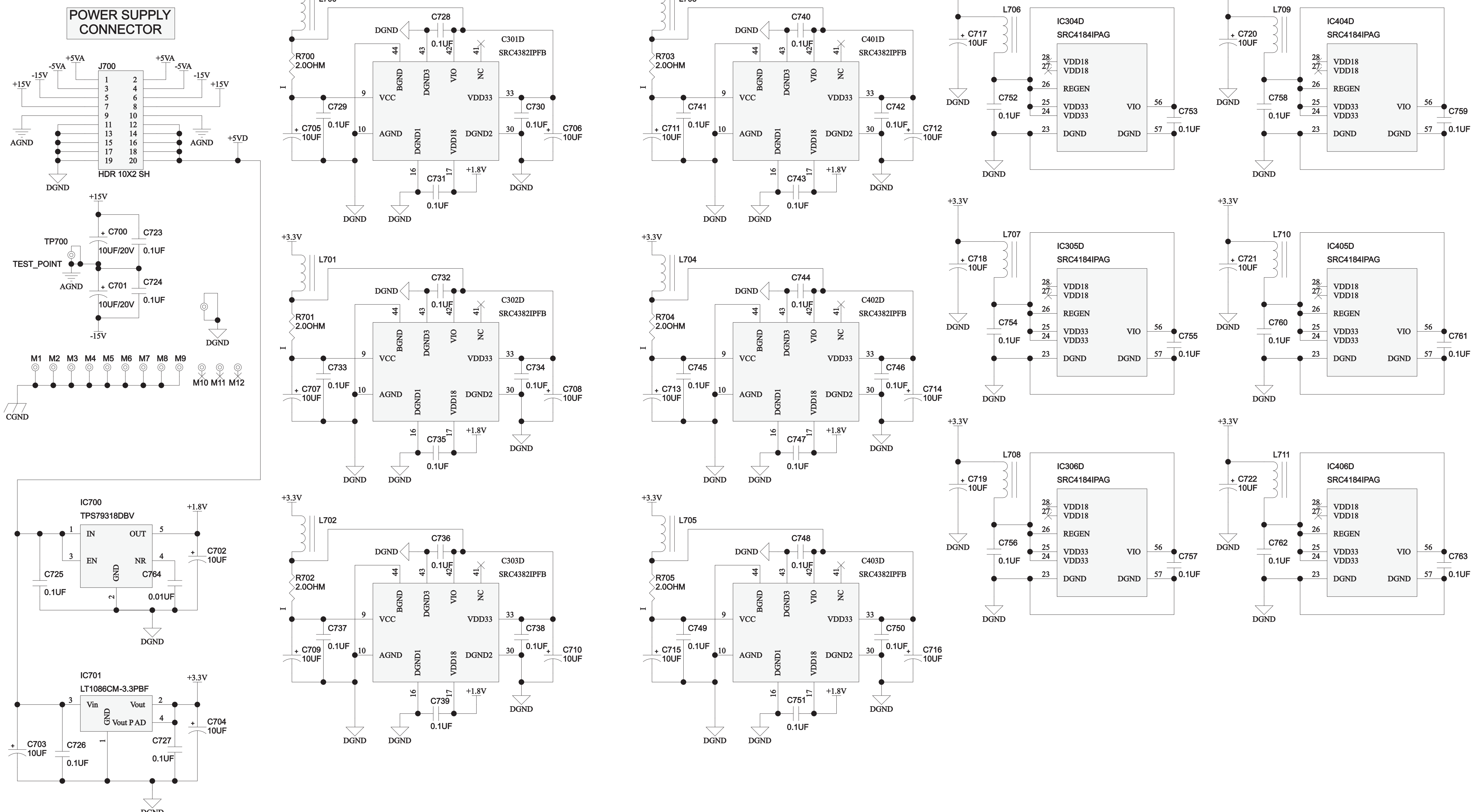


8585 Digital I/O & SRC
Control & Miscellaneous
62330.000.02.1 5 of 7

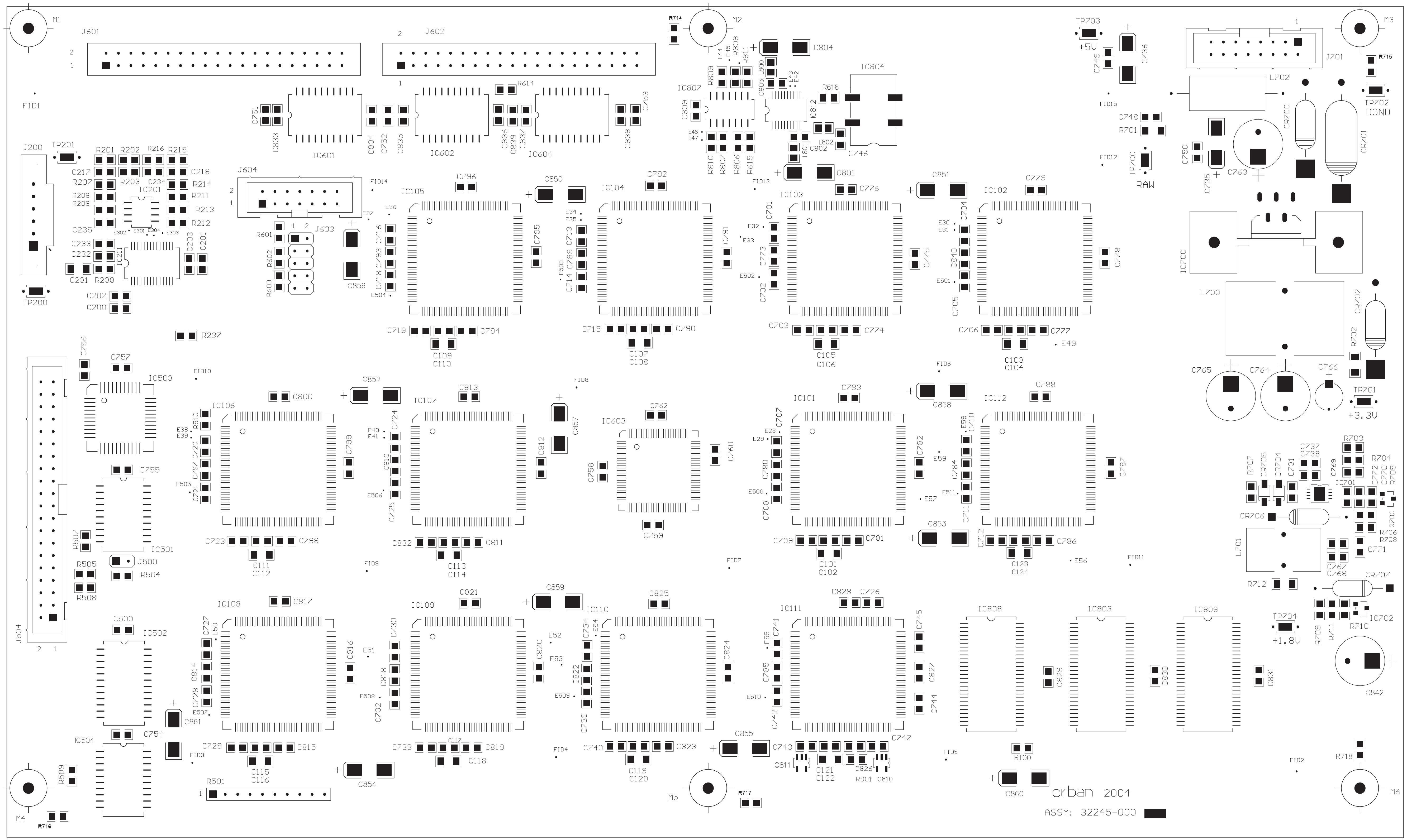


8585 Digital I/O & SRC
Control & Miscellaneous
62330.000.02.1 6 of 7

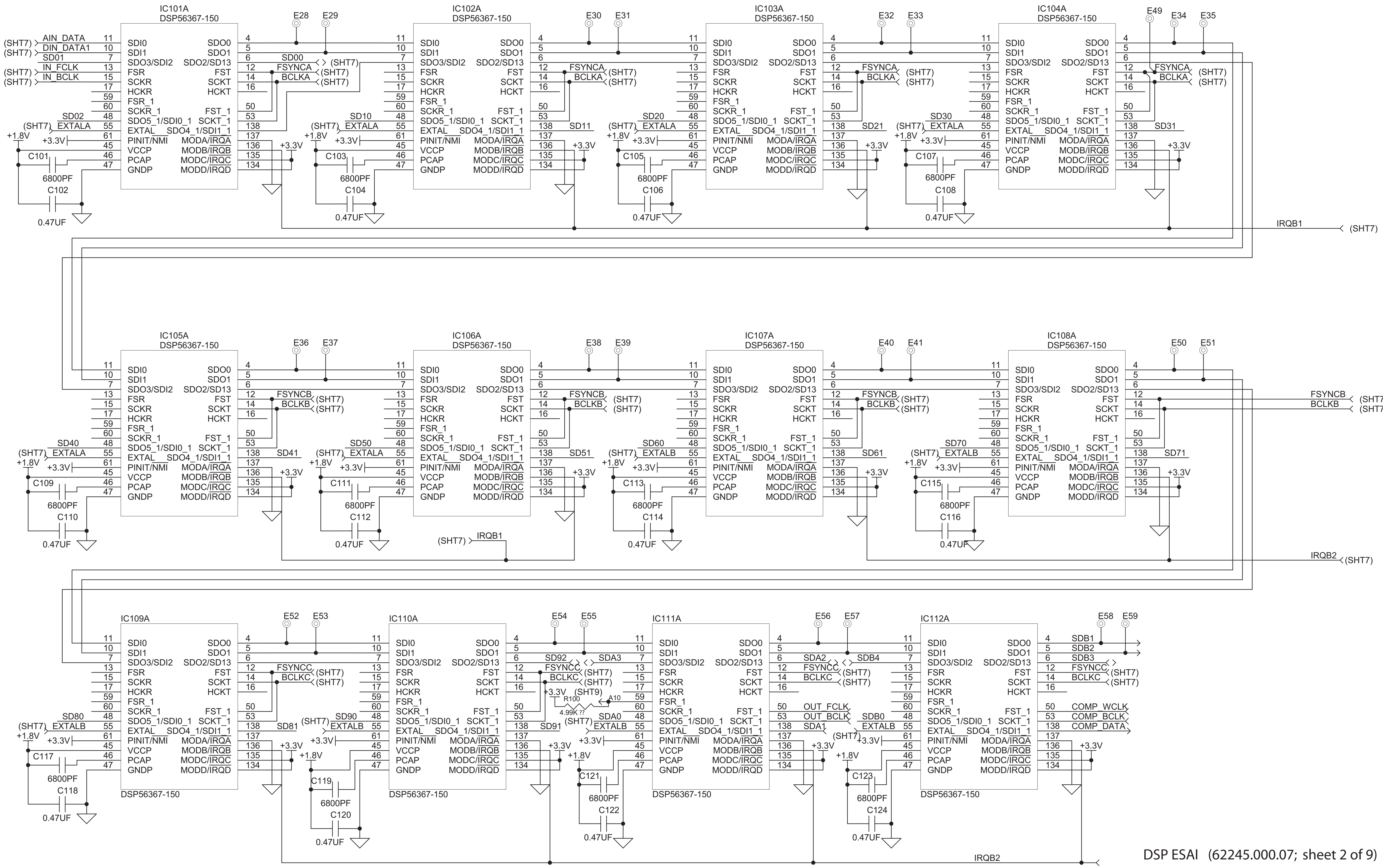
NOTE:
1. -5VA (J700 PINS 3,4) IS NOT USED ON THIS ASSEMBLY.



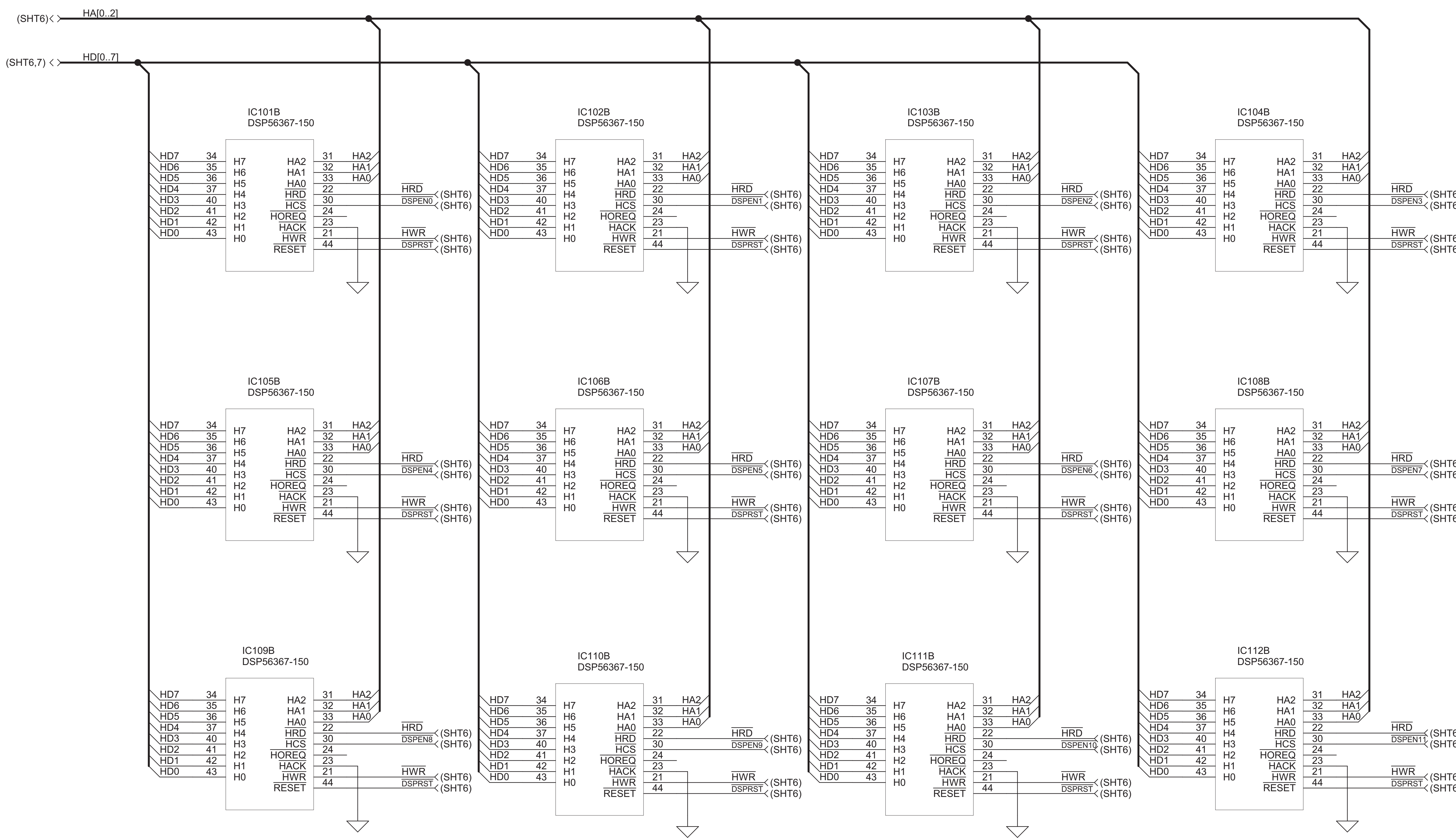
8585 Digital I/O & SRC
Control & Miscellaneous
62330.000.02.1 7 of 7



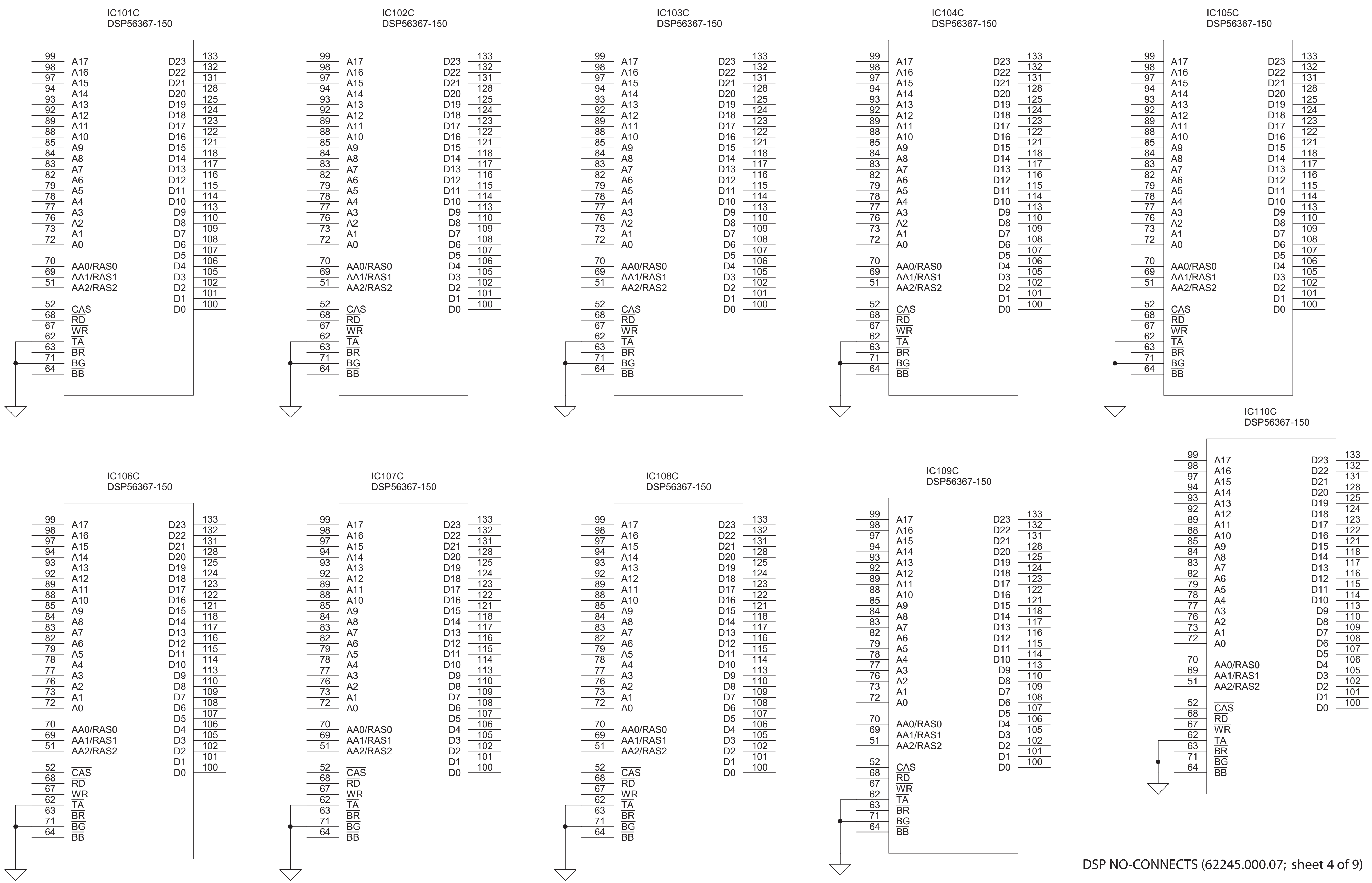
DSP Board Parts Locator Drawing
(for schematic 62245.000.07)



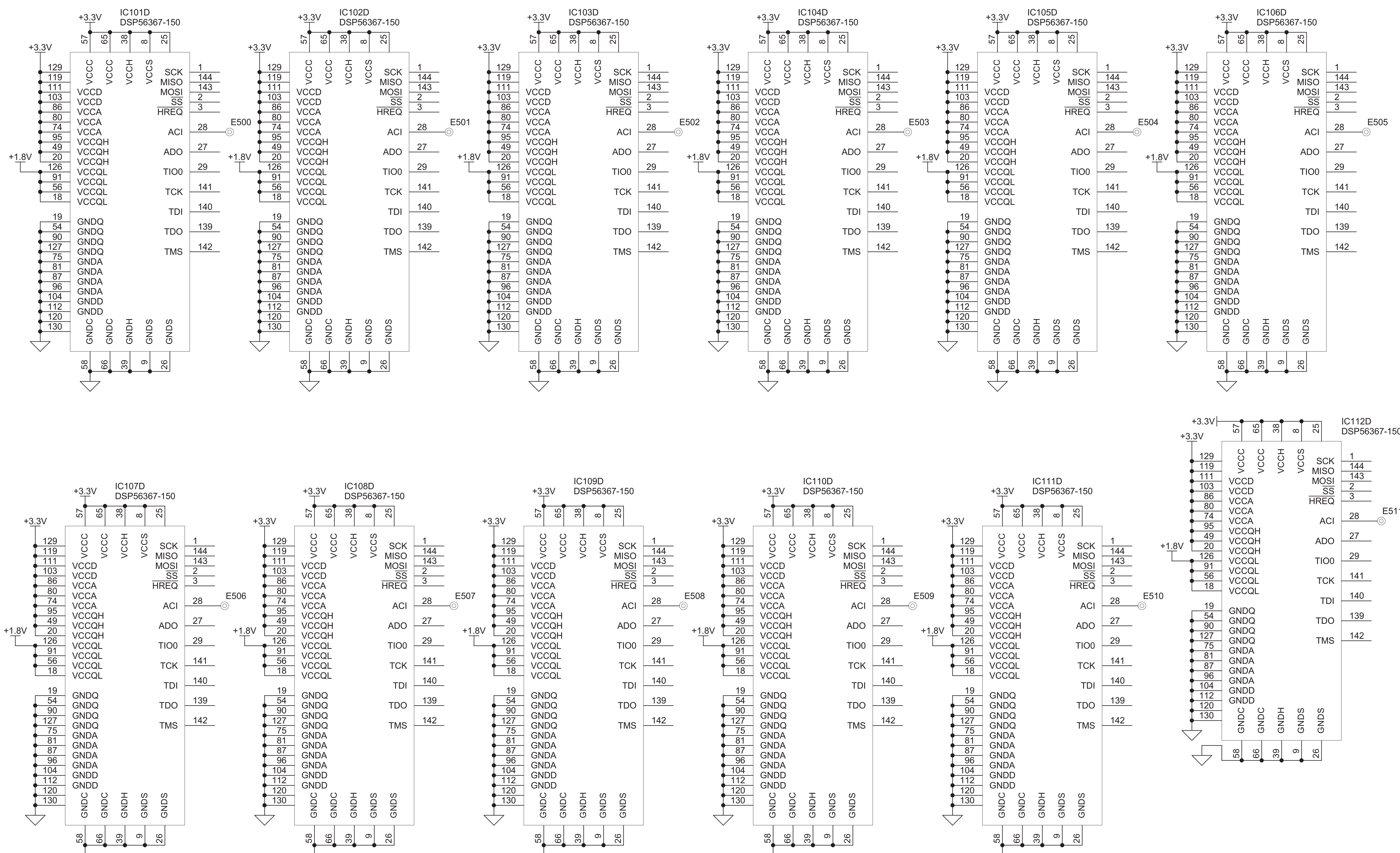
DSP ESAI (62245.000.07; sheet 2 of 9)



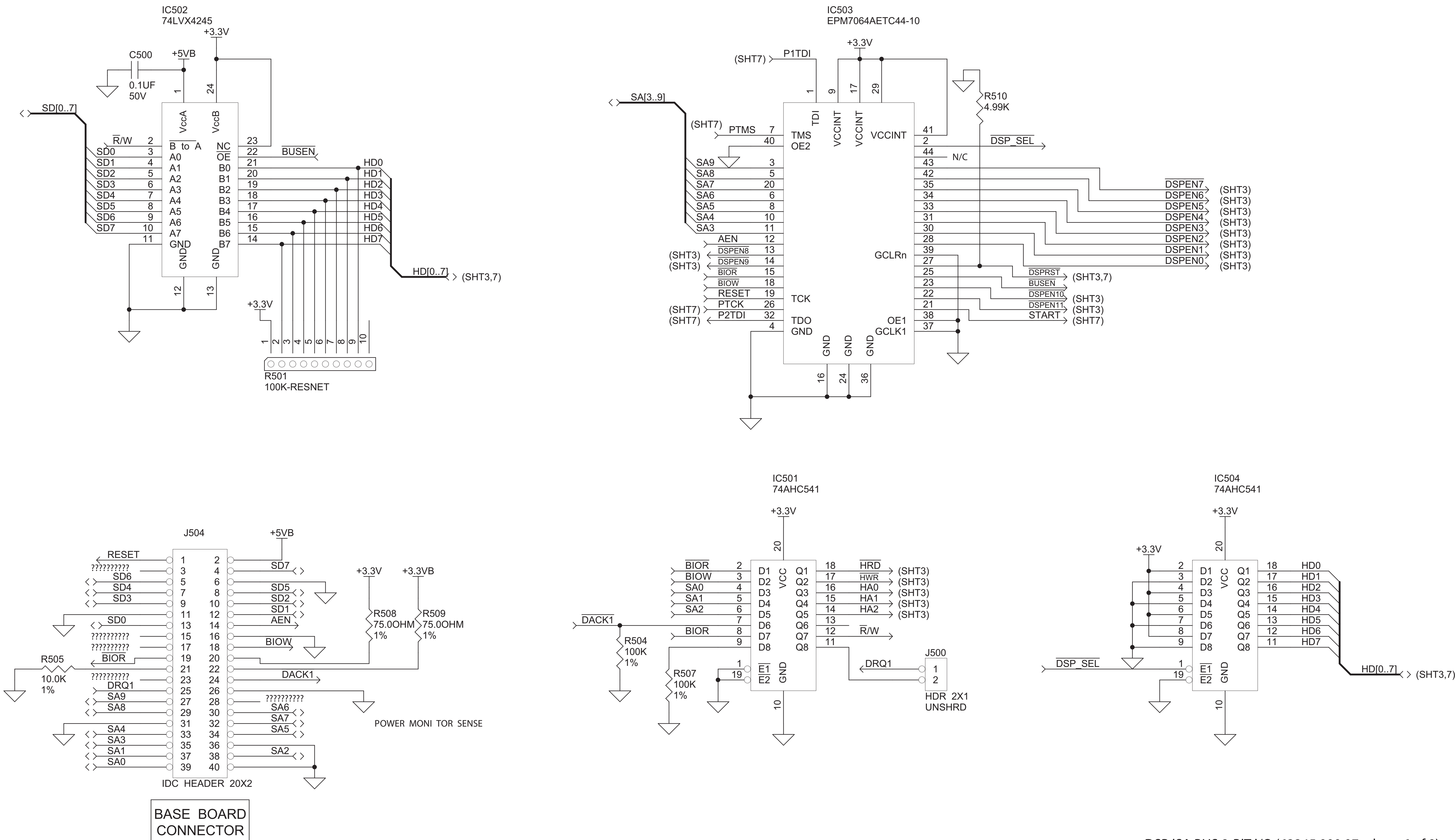
DSP HOST INTERFACE (62245.000.07; sheet 3 of 9)



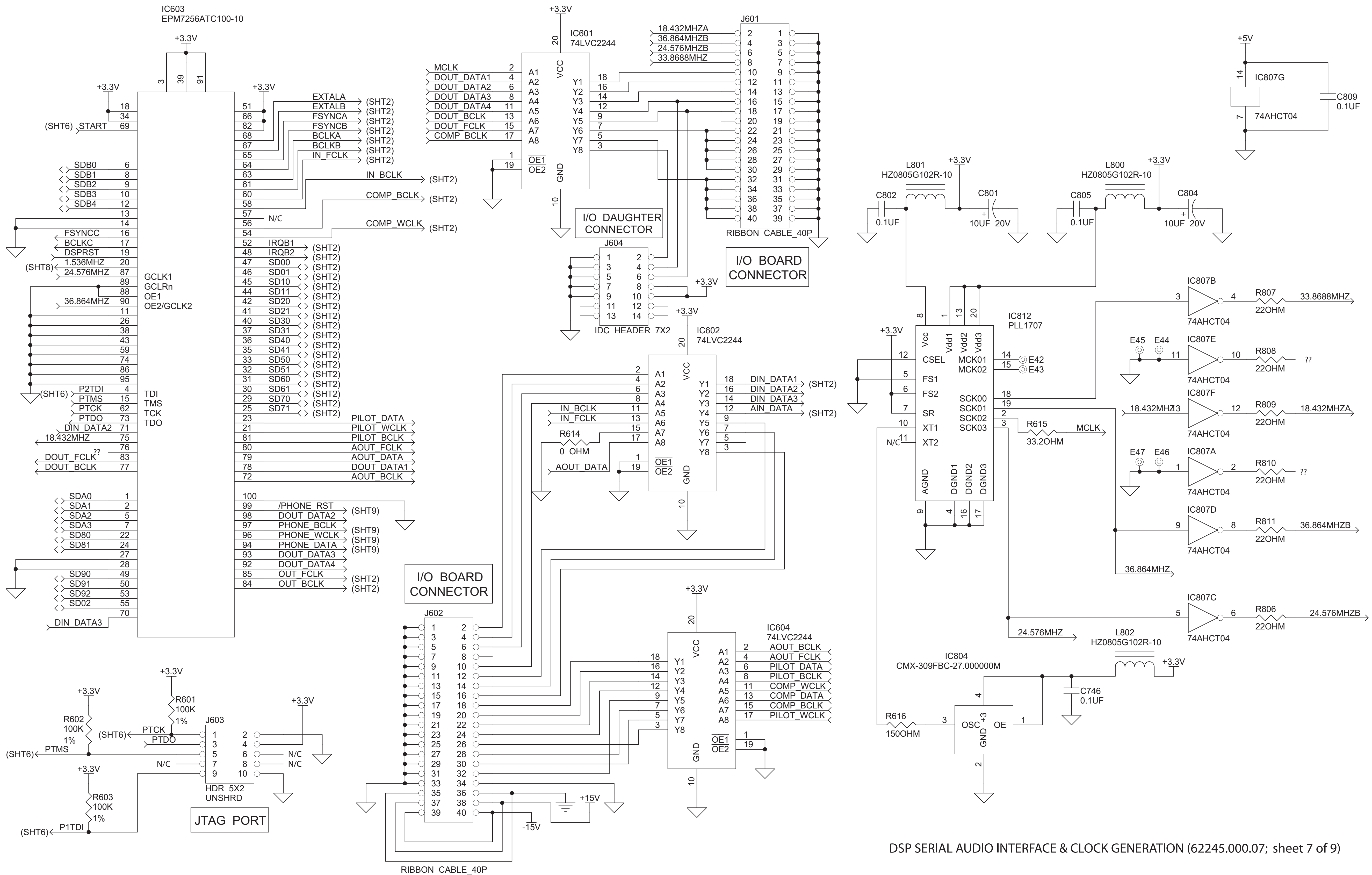
DSP NO-CONNECTS (62245.000.07; sheet 4 of 9)



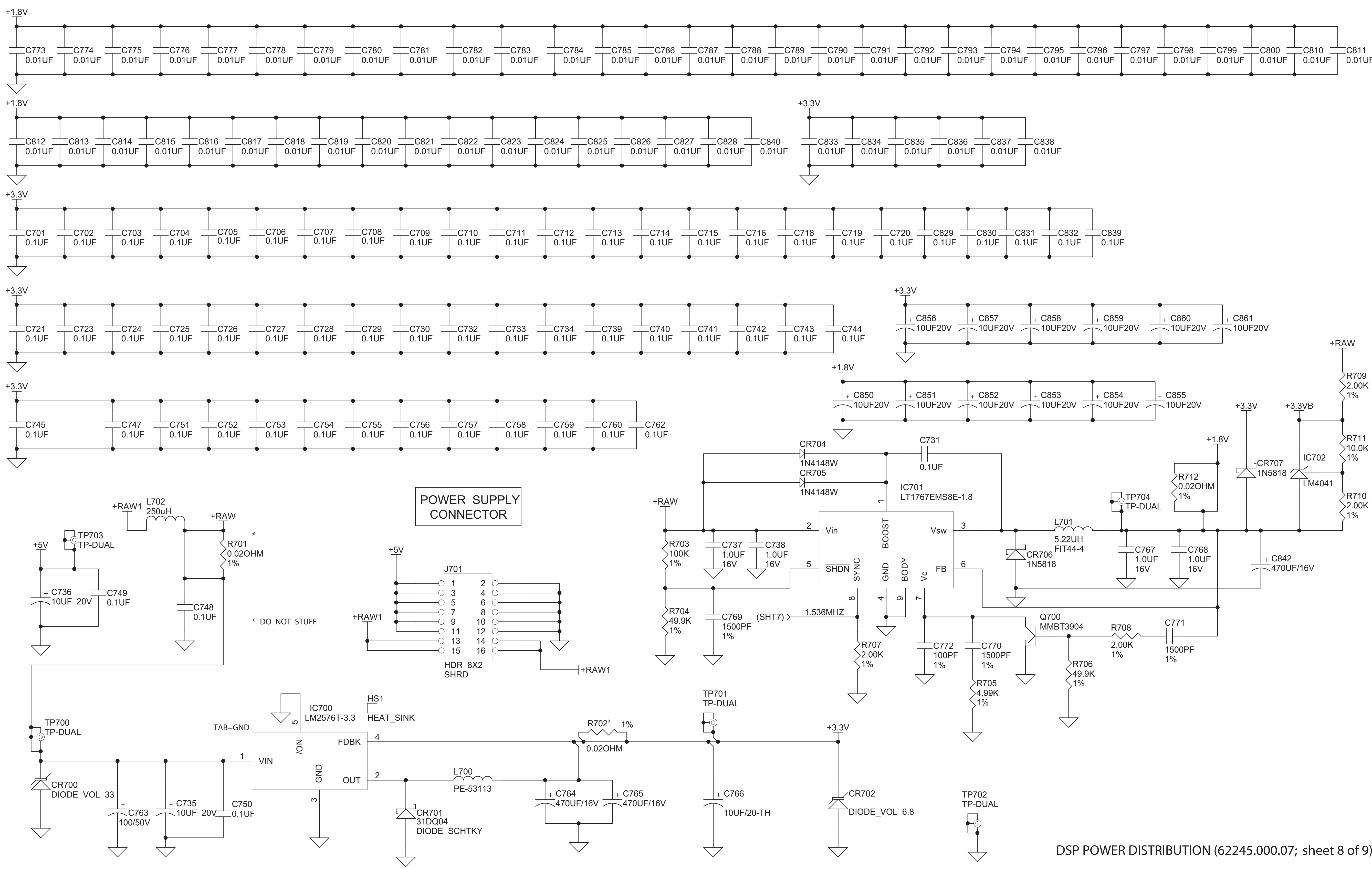
DSP POWER AND GROUND (62245.000.07; sheet 5 of 9)



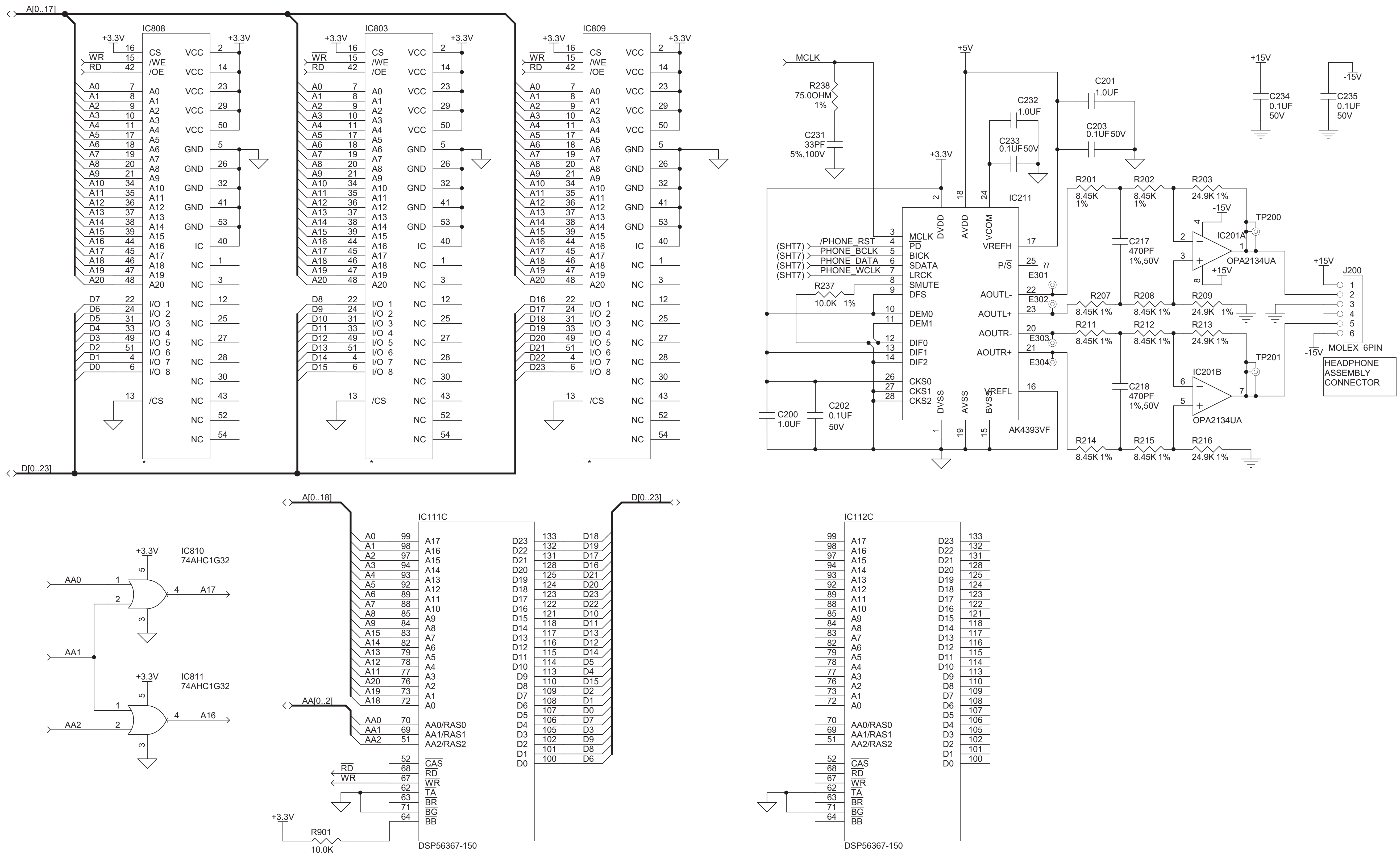
DSP ISA BUS 8-BIT I/O (62245.000.07; sheet 6 of 9)



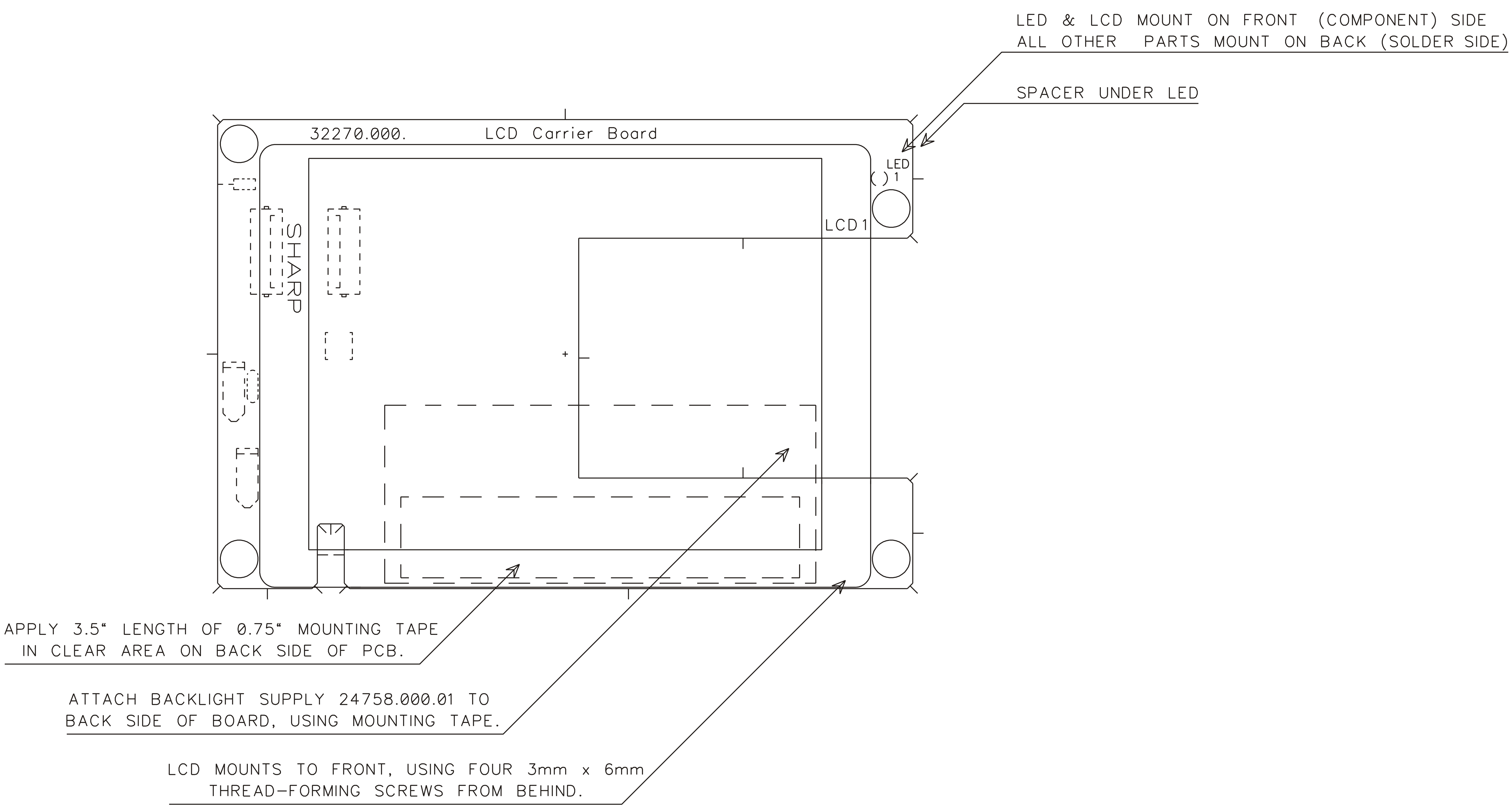
DSP SERIAL AUDIO INTERFACE & CLOCK GENERATION (62245.000.07; sheet 7 of 9)



DSP POWER DISTRIBUTION (62245.000.07; sheet 8 of 9)

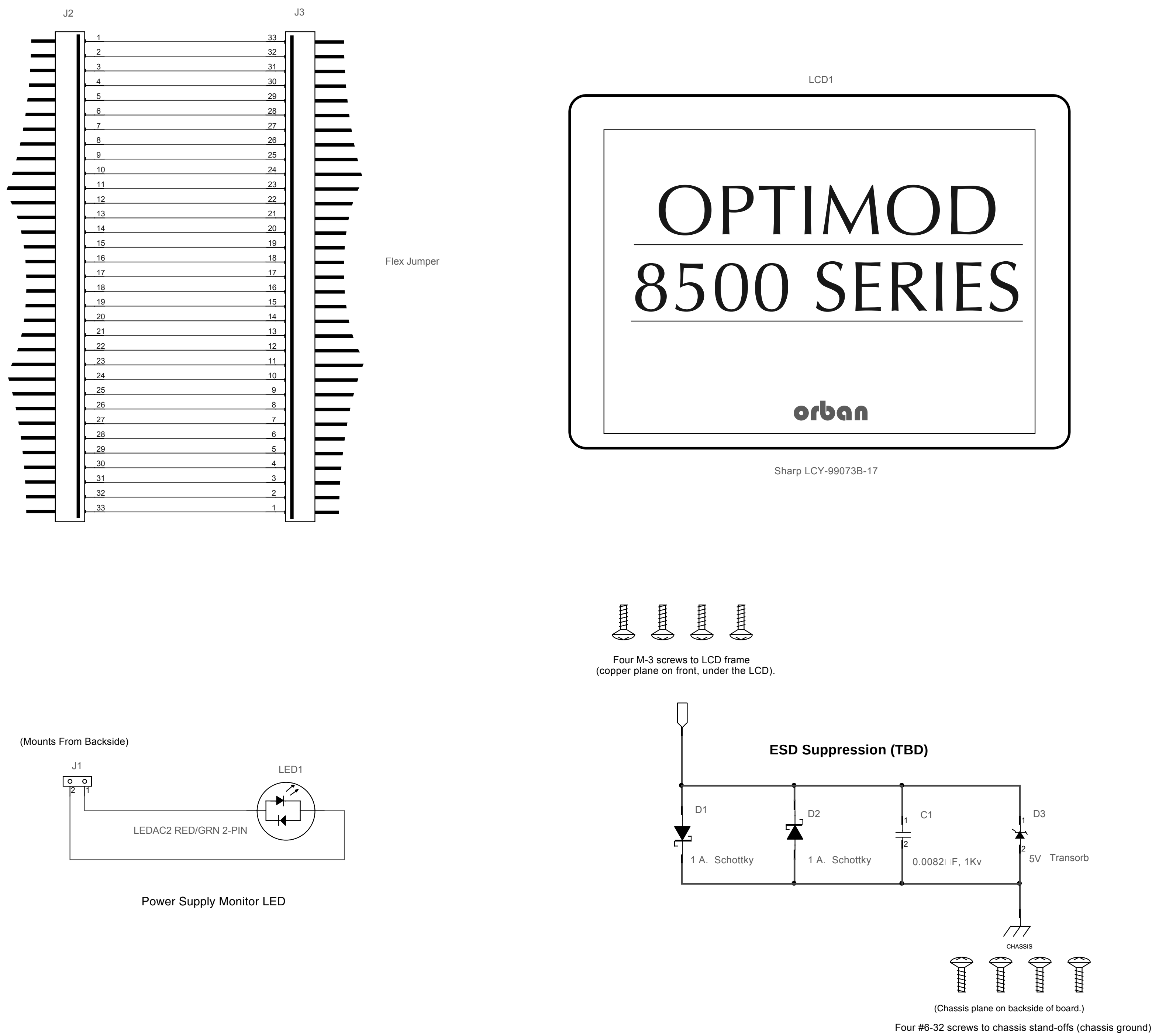


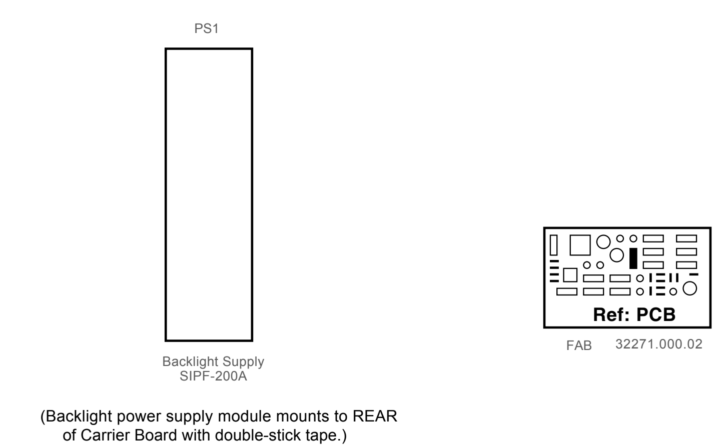
DSP MEMORY and HEADPHONE DISTRIBUTION AMPLIFIER (62245.000.07; sheet 9 of 9)



LCD CARRIER PARTS LOCATOR
32270.000

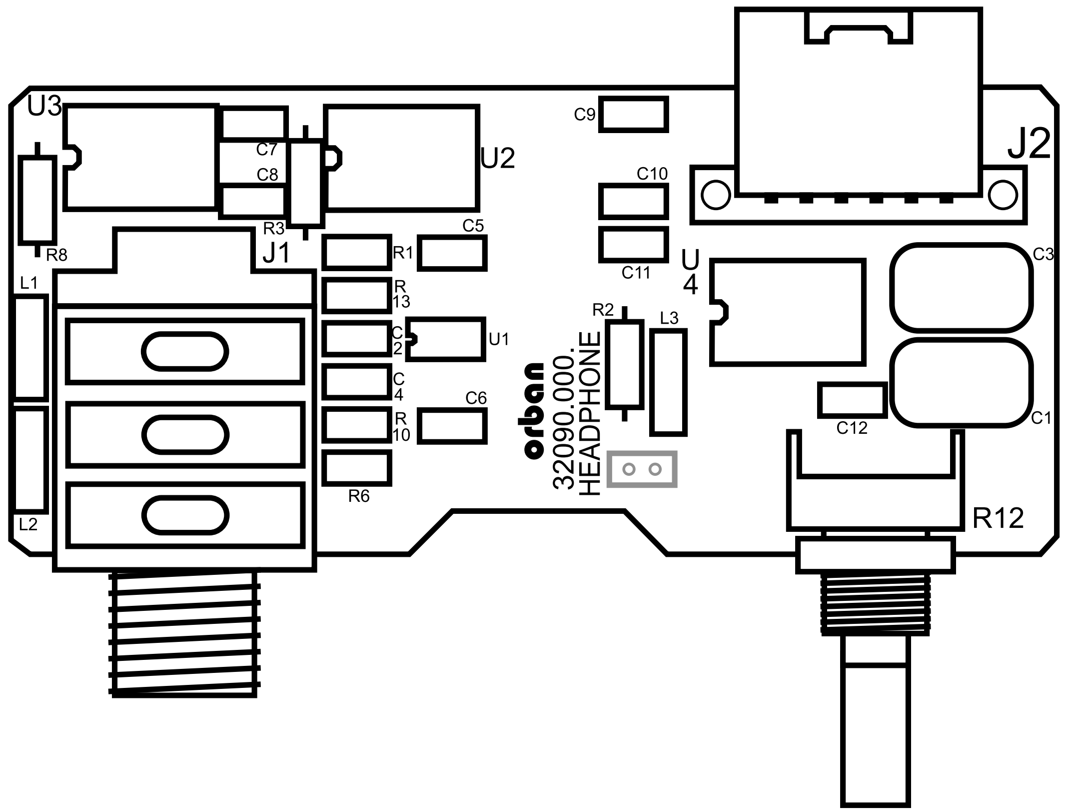
Revision History:				62270.000.02	
ECO#	DATE	REV	DESCRIPTION	DONE	CHECKED
3174	03/08/04	01	First Cut Released	WRS	
3200	08/27/04	02	LCD Rotation, add ZIFs, Move LED Connector	WRS	



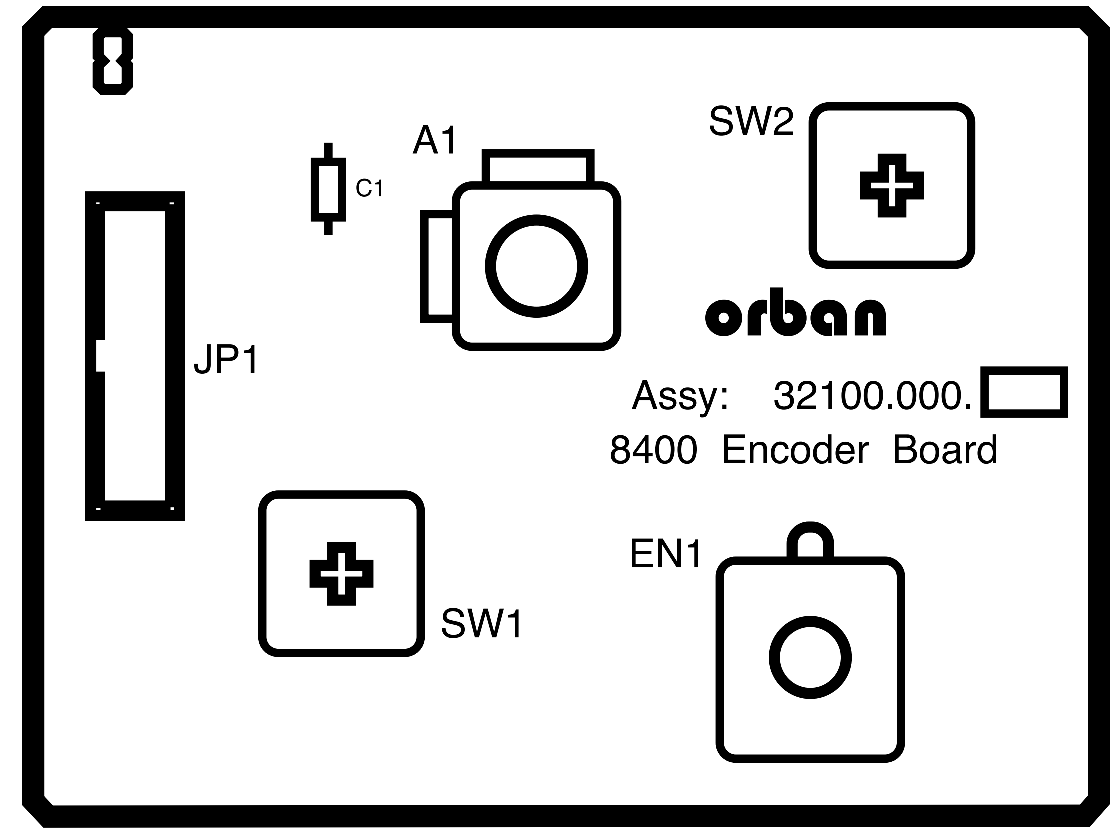


* NOTE: All Components Except LED & LCD Mount To Backside Of PCB.

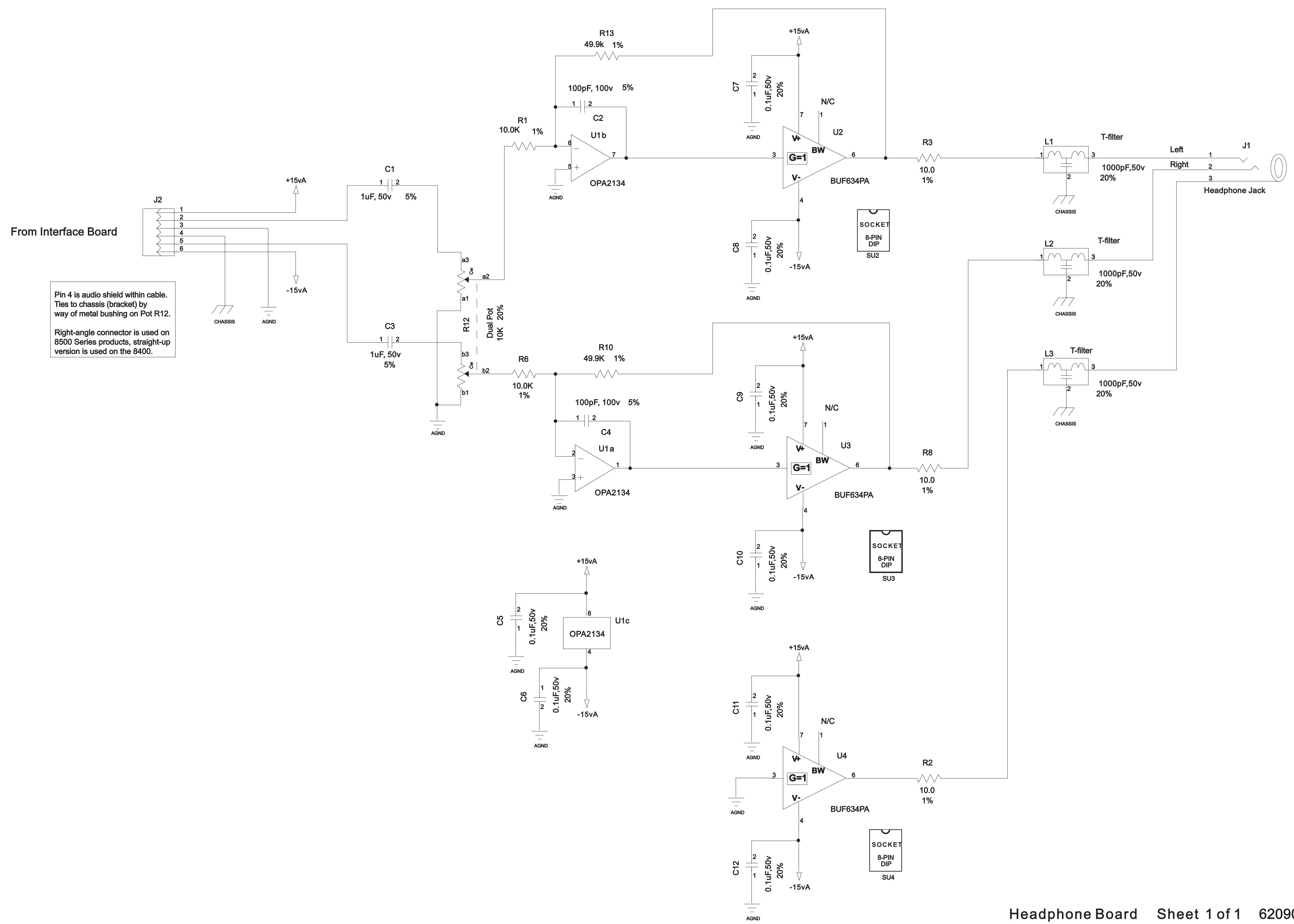
LCD CARRIER BOARD SCHEMATIC
1 of 1

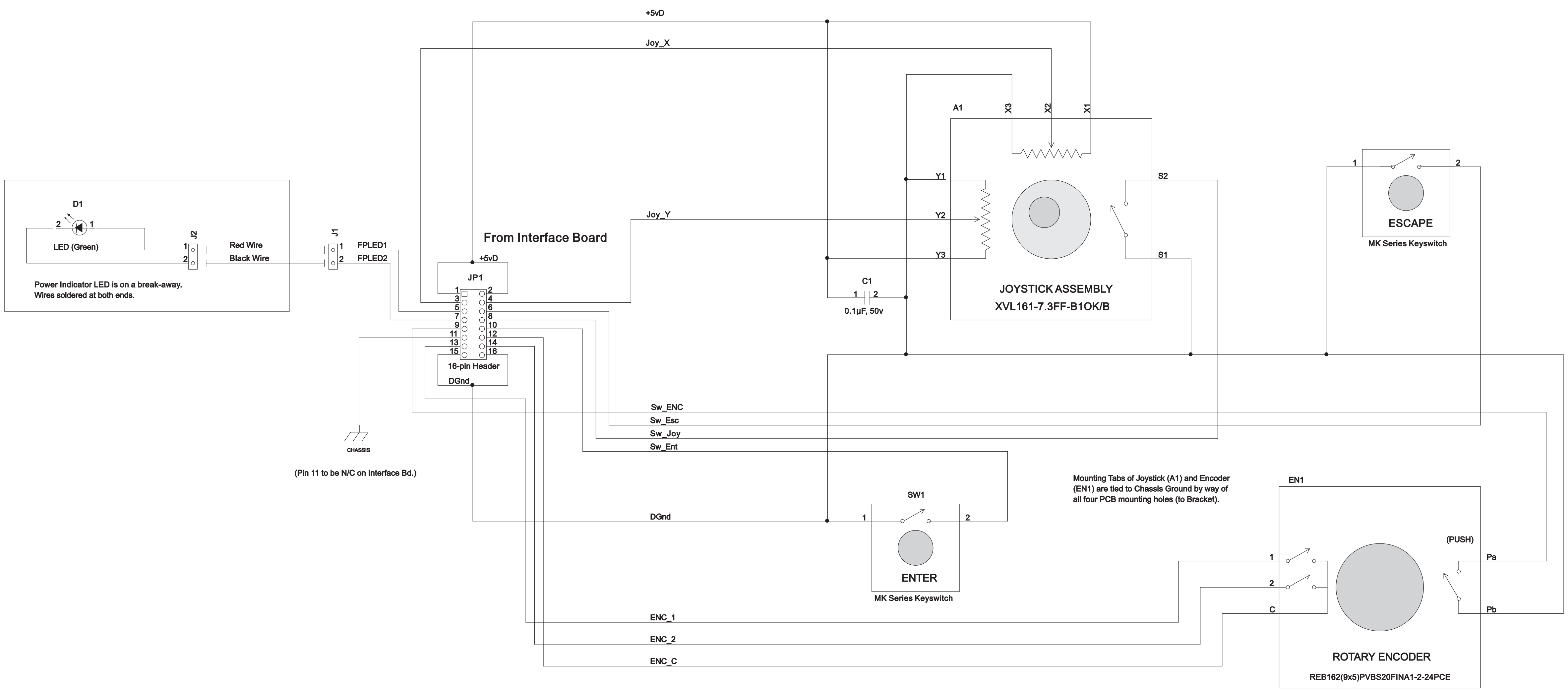


HEADPHONE BOARD PARTS LOCATOR



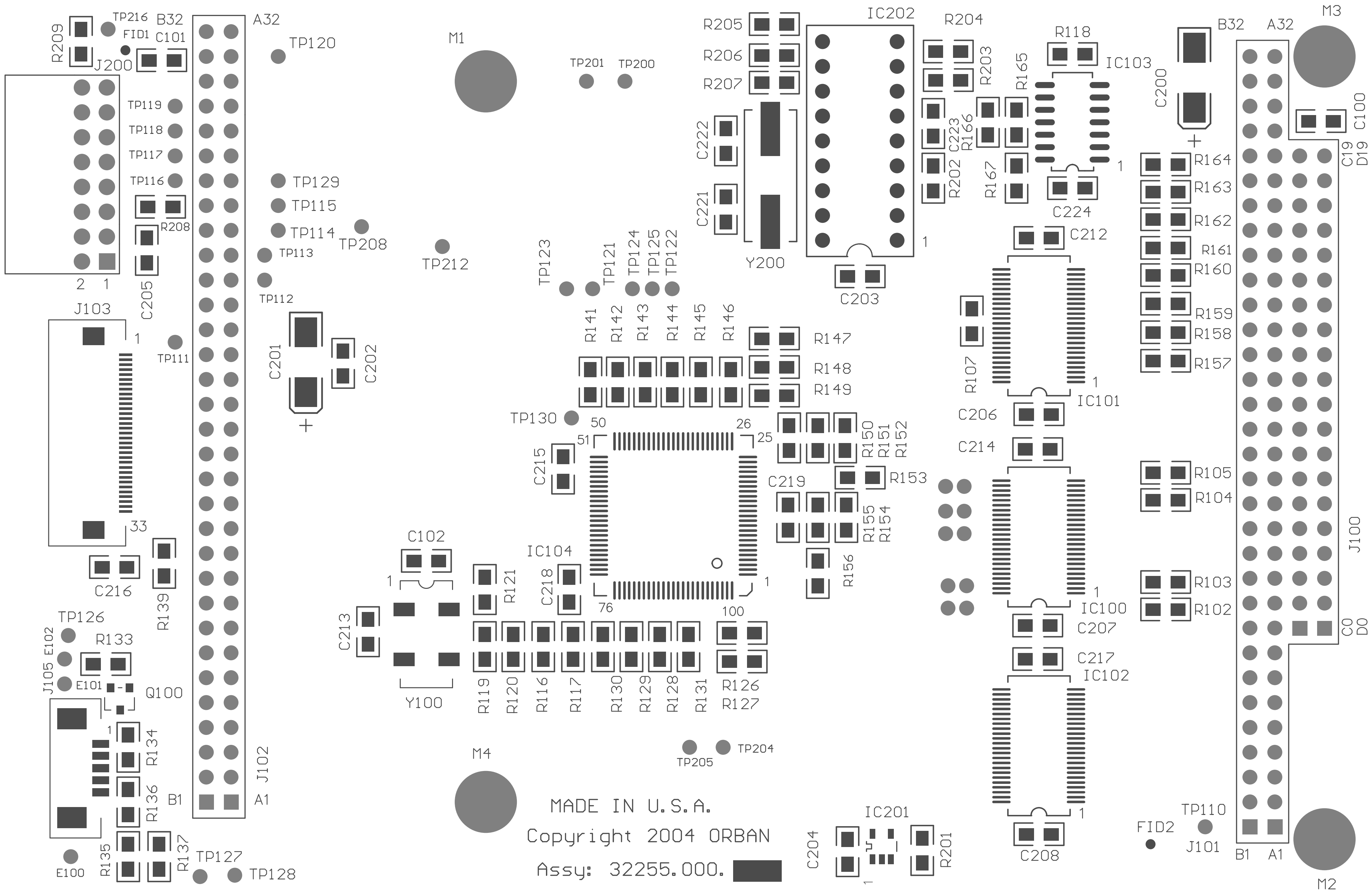
ENCODER BOARD PARTS LOCATOR


From Interface Board
J2
Pin 4 is audio shield within cable. Ties to chassis (bracket) by way of metal bushing on Pot R12.
Right-angle connector is used on 8500 Series products, straight-up version is used on the 8400.
+15vA
-15vA
CHASSIS
AGND
C1 1uF, 50v 5%
C3 1uF, 50v 5%
R12 Dual Pot 10K 20%
R1 10.0K 1%
R6 10.0K 1%
R13 49.9k 1%
R10 49.9K 1%
C2 100pF, 100v 5%
C4 100pF, 100v 5%
U1b OPA2134
U1a OPA2134
U1c OPA2134
C5 0.1uF,50v 20%
C6 0.1uF,50v 20%
C7 0.1uF,50v 20%
C8 0.1uF,50v 20%
C9 0.1uF,50v 20%
C10 0.1uF,50v 20%
C11 0.1uF,50v 20%
C12 0.1uF,50v 20%
U2 BUF634PA
U3 BUF634PA
U4 BUF634PA
N/C
V+
V-
BW
G=1
SOCKET 8-PIN DIP SU2
SOCKET 8-PIN DIP SU3
SOCKET 8-PIN DIP SU4
R3 10.0 1%
R8 10.0 1%
R2 10.0 1%
L1 T-filter 1000pF,50v 20%
L2 T-filter 1000pF,50v 20%
L3 T-filter 1000pF,50v 20%
J1
Left
Right
Headphone Jack

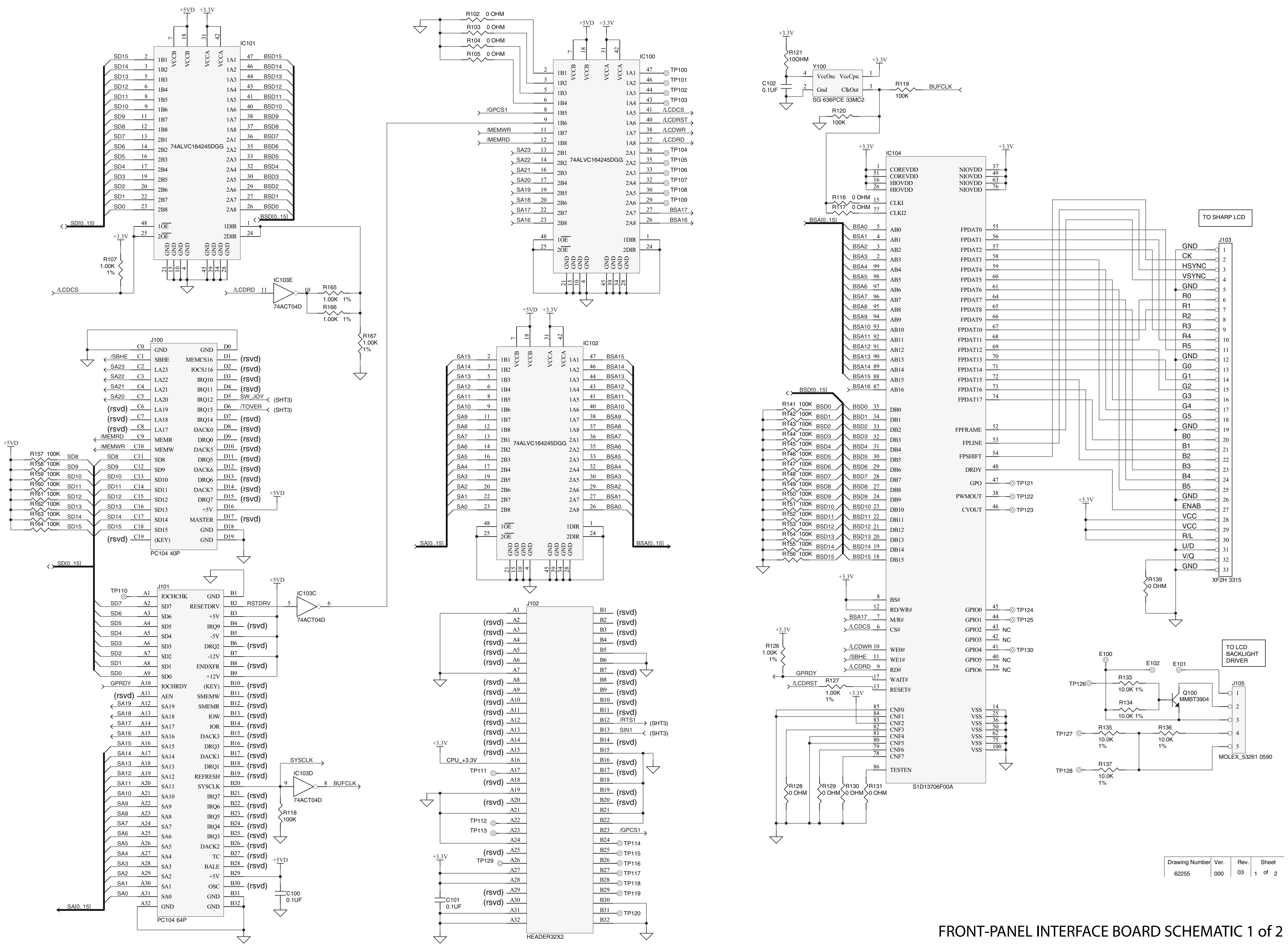

+5vD
Joy_X
A1
X3
X2
X1
Y1
Y2
Y3
S2
S1
JOYSTICK ASSEMBLY
XVL161-7.3FF-B1OK/B
Joy_Y
From Interface Board
+5vD
JP1
16-pin Header
DGnd
C1
0.1µF, 50v
D1
LED (Green)
J2
J1
Red Wire
Black Wire
FPLED1
FPLED2
Power Indicator LED is on a break-away.
Wires soldered at both ends.
CHASSIS
(Pin 11 to be N/C on Interface Bd.)
ESCAPE
MK Series Keyswitch
Sw_ENC
Sw_Esc
Sw_Joy
Sw_Ent
SW1
DGnd
ENTER
MK Series Keyswitch
Mounting Tabs of Joystick (A1) and Encoder
(EN1) are tied to Chassis Ground by way of
all four PCB mounting holes (to Bracket).
EN1
(PUSH)
Pa
Pb
ENC_1
ENC_2
ENC_C
ROTARY ENCODER
REB162(9x5)PVBS20FINA1-2-24PCE

3. MARK ASSEMBLY REVISION LEVEL IN SPACE PROVIDED.
2. REFERENCE SCHEMATIC DRAWING NO. 62255.000
1. SQUARE PADS INDICATE PIN 1 OF CONNECTORS, CATHODE OF DIODES, POS. SIDE OF CAPS. PIN 1 OF IC'S.
NOTES: (UNLESS OTHERWISE SPECIFIEC)

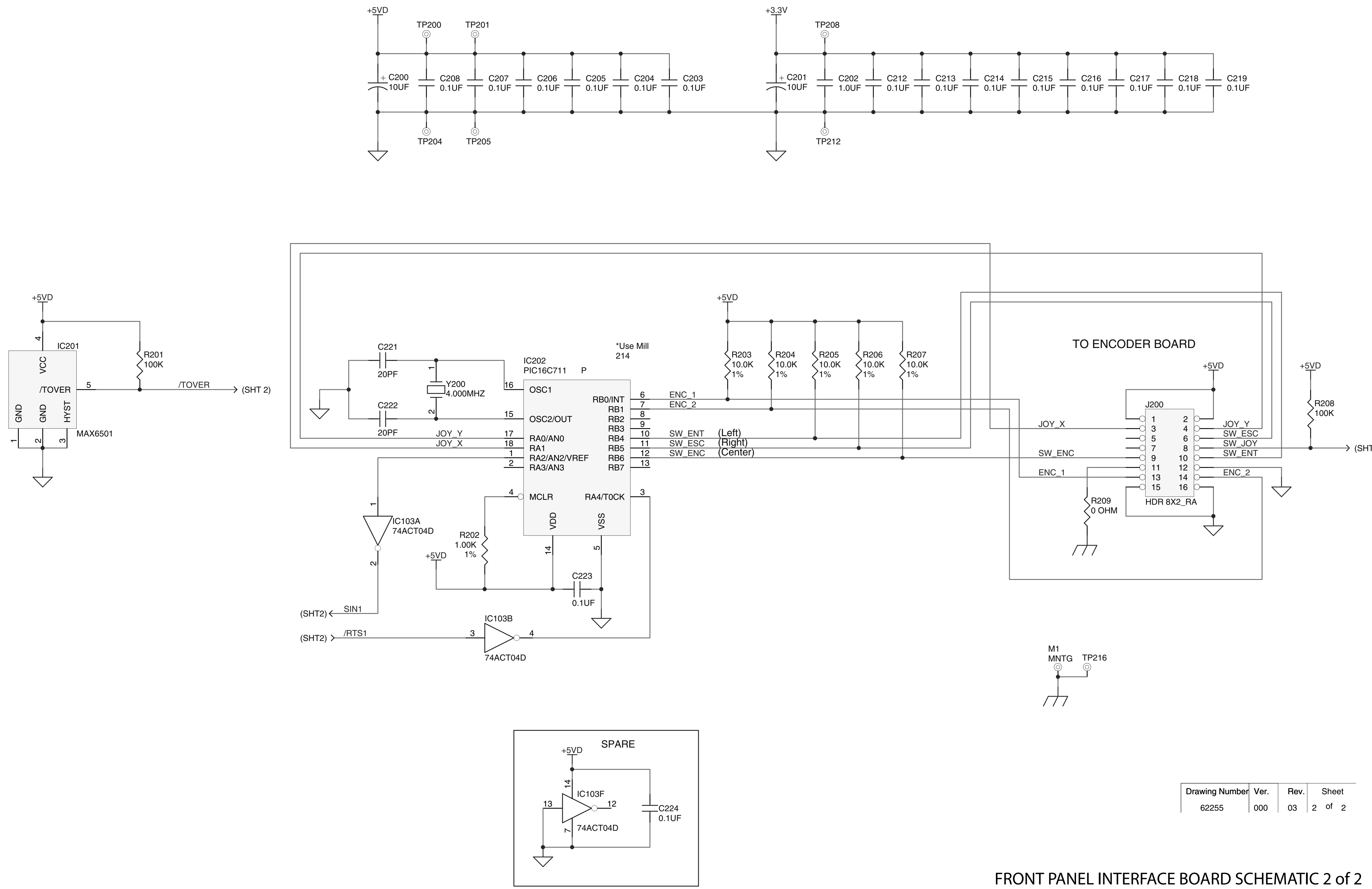
SIZE	DWG NO.	VER	REV	SHEET
C	32255	000	03	1 OF 1



FRONT-PANEL INTERFACE BOARD PARTS LOCATOR DRAWING

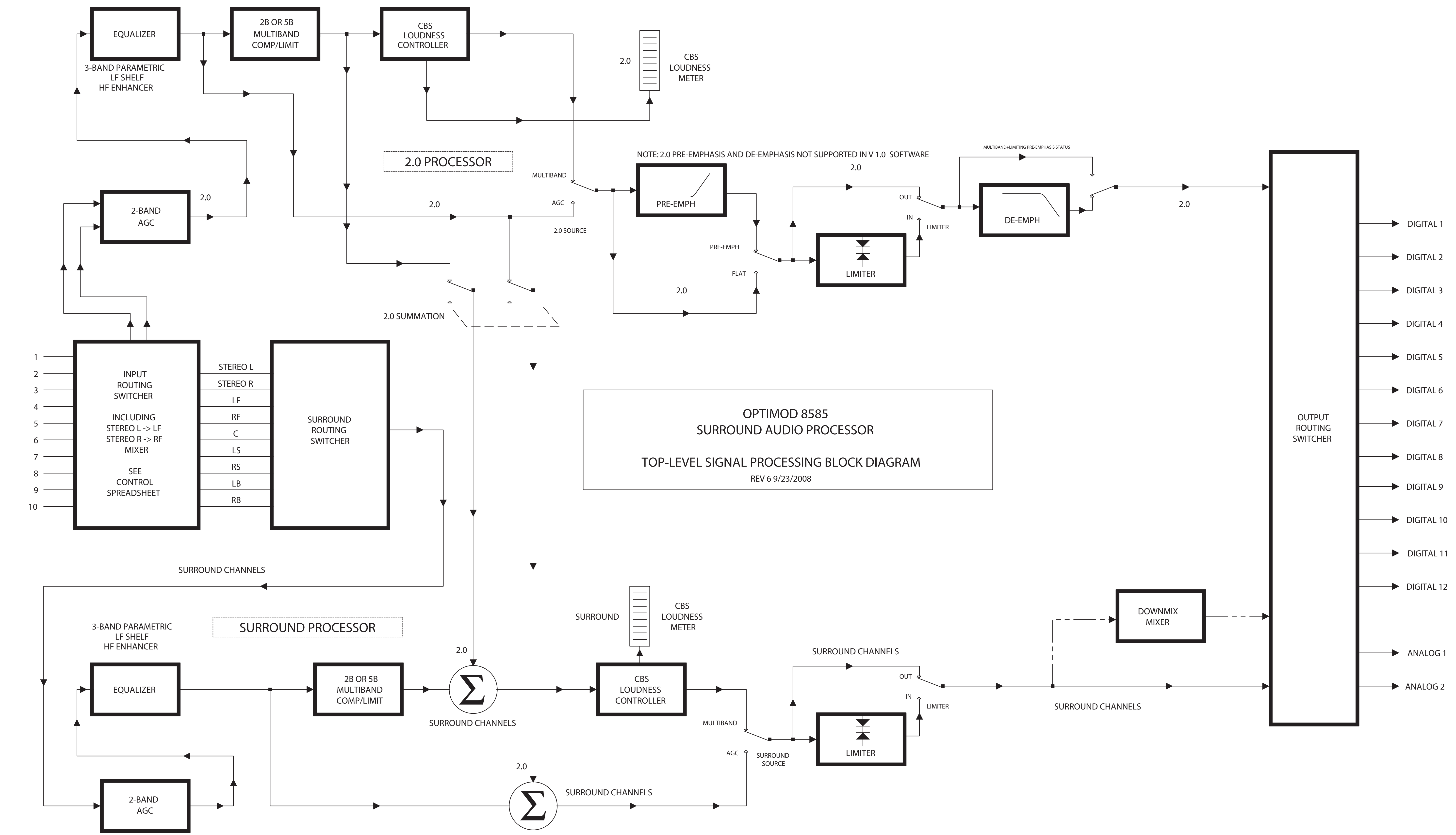


FRONT-PANEL INTERFACE BOARD SCHEMATIC 1 of 2



Drawing Number	Ver.	Rev.	Sheet
62255	000	03	2 of 2

FRONT PANEL INTERFACE BOARD SCHEMATIC 2 of 2


EQUALIZER
3-BAND PARAMETRIC
LF SHELF
HF ENHANCER
2B OR 5B
MULTIBAND
COMP/LIMIT
CBS
LOUDNESS
CONTROLLER
2.0
CBS
LOUDNESS
METER
2.0 PROCESSOR
NOTE: 2.0 PRE-EMPHASIS AND DE-EMPHASIS NOT SUPPORTED IN V 1.0 SOFTWARE
MULTIBAND+LIMITING PRE-EMPHASIS STATUS
2-BAND
AGC
MULTIBAND
AGC
2.0 SOURCE
PRE-EMPH
PRE-EMPH
FLAT
OUT
IN
LIMITER
LIMITER
DE-EMPH
2.0 SUMMATION
INPUT
ROUTING
SWITCHER
INCLUDING
STEREO L -> LF
STEREO R -> RF
MIXER
SEE
CONTROL
SPREADSHEET
1
2
3
4
5
6
7
8
9
10
STEREO L
STEREO R
LF
RF
C
LS
RS
LB
RB
SURROUND
ROUTING
SWITCHER
OPTIMOD 8585
SURROUND AUDIO PROCESSOR
TOP-LEVEL SIGNAL PROCESSING BLOCK DIAGRAM
REV 6 9/23/2008
OUTPUT
ROUTING
SWITCHER
DIGITAL 1
DIGITAL 2
DIGITAL 3
DIGITAL 4
DIGITAL 5
DIGITAL 6
DIGITAL 7
DIGITAL 8
DIGITAL 9
DIGITAL 10
DIGITAL 11
DIGITAL 12
ANALOG 1
ANALOG 2
SURROUND CHANNELS
SURROUND PROCESSOR
3-BAND PARAMETRIC
LF SHELF
HF ENHANCER
EQUALIZER
2B OR 5B
MULTIBAND
COMP/LIMIT
Σ
SURROUND CHANNELS
SURROUND
CBS
LOUDNESS
METER
CBS
LOUDNESS
CONTROLLER
DOWNMIX
MIXER
SURROUND CHANNELS
OUT
IN
LIMITER
LIMITER
MULTIBAND
AGC
SURROUND
SOURCE
SURROUND CHANNELS
2-BAND
AGC
Σ
SURROUND CHANNELS