TF830

FREQUENCY METER

SERVICE MANUAL

SINCLAIR

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FOR SERVICE MANUALS
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Manual Part No.48581-1060

GENERAL

Service Handling Precautions

Service work or calibration should only be carried out by skilled engineers. Please note the following points before commencing work.

The tracks on the printed circuit board are very fine and may lift if subjected to excessive heat. Use only a miniature temperature controlled soldering iron and remove all solder (on both sides of the joint) with solder wick or suction before attempting to remove a component.

Most of the integrated circuits are CMOS devices and care should be taken when handling to avoid damage by static discharge.

Dismantling the Instrument

WARNING!

Opening the instrument is likely to expose live parts. The instrument shall be disconnected from all voltage sources before it is opened for any adjustment, replacement, maintenance or repair. If, afterwards, any adjustment, maintenance or repair of the opened instrument under voltage is inevitable it shall be carried out only by a skilled person who is aware of the hazards involved.

1. Invert the instrument and remove the 4 screws next to the rubber feet.

2. Holding the case upper and lower together, turn the instrument the right way up and lift off the top, ensuring the front and rear panels stay with the lower half of the instrument.

3. The pcb is fixed to the front panel beneath the screen. To gain access remove the 4 screws holding the screen and remove the screen. Remove the 4 hex spacers and 1 screw retaining the pcb and lift the pcb away from the front panel.

   The TF830-RS232 has an additional pcb and screen, mounted on the outside of the main screen, which must be removed first. To do this, remove the two screws holding the second screen and lift off to reveal the RS232 pcb; the RS232 pcb can then be removed by disconnecting connector PJ3 and unscrewing the two screws and two hex spacers which secure it to its mounting pillars.

4. Reassemble in the reverse order.

SPECIFICATION

FUNCTIONS

Frequency
Input A

Frequency Range:	5Hz to 25MHz
L.S.D. Displayed:	.001mHz to 100Hz depending on measurement time and input frequency. At least 7 digits displayed per second of measurement time.

Input B

Frequency Range:	20MHz to 1.3GHz
L.S.D. Displayed:	1Hz to 10kHz depending on measurement time and input frequency. At least 7 digits displayed per second of measurement time.

Period
Input A

Frequency Range:	5Hz to 25MHz
L.S.D.Displayed:	10^{-7}ns to 1us depending on measurement time and input frequency. At least 7 digits displayed per second of measurement time.

Count
Input A

Counter Range:	1 to 268435456 (2^{28}): only the least significant 8 digits shown with overflow indication past 99999999 pulses
Frequency Range:	1Hz to at least 14MHz
Minimum Pulse Width:	20ns

Ratio A/B

Frequency Range:	A 5Hz to 25MHz B 20MHz to 1.3GHz
L.S.D. Displayed:	The answer is displayed with 8 significant digits irrespective of actual input frequencies and measurement time

Pulse Width
Input A

Mode:	Falling to rising edge or rising to falling edge
Pulse Width Range:	26s to 1us
Resolution:	100ns
Measurement Time:	0.1s and 1s ranges determine the inter-measurement time. 10s range will hold until reset

INPUTS

Input A

Input Impedance:	1MOhm//25pF
Frequency Range:	5Hz to 25MHz
Sensitivity:	Sinewave 15mVrms 10Hz to 20MHz; pulse 40mV pk-pk 0Hz to 14MHz
Trigger Level:	Continuously adjustable by front panel control

Maximum Permissible Input Voltage:	50Vdc; 50Vrms 50/60Hz with respect to ground, reducing to 1Vrms above 1MHz. Note, however, that the input circuit will not be damaged if subjected to an accidental short-term connection to a 50/60Hz line voltage not exceeding 250Vrms.
Low Pass Filter:	Switchable 50kHz low pass noise filter
Coupling:	AC

Input B

Input Impedance:	50 Ohm nominal
Frequency Range:	20MHz to 1.3GHz
Sensitivity:	10mVrms 20MHz to 700MHz, <50mVrms to 1.3GHz
Maximum Permissible Input Voltage:	50Vdc; 50Vrms 50/60Hz with respect to ground; 1Vrms 20MHz to 1.3GHz. Note, however, that the input circuit will not be damaged if subjected to an accidental short-term connection to a 50/60Hz line voltage not exceeding 250Vrms.
Coupling:	AC

External Standard

Input Frequency:	10MHz
External Standard Selection:	Front panel socket for external 10MHz standard input with automatic detection and change-over
Sensitivity:	TTL/CMOS compatible (typically 2V pk-pk), AC coupled
Maximum Permissible Input Voltage:	5Vrms, 50V dc

TIMEBASE

Crystal Oscillator Frequency:	10MHz
Initial Oscillator Adjustment Error:	+/-1ppm at 23°C
Oscillator Temperature Coefficient:	Typically less than +/-0.3ppm/°C 18°C to 28°C +/-10ppm -20°C to 70°C
Oscillator Ageing Rate:	<+/-5ppm/year

RS232 INTERFACE (TF830-RS232 ONLY)

Complies fully with the Thurlby-Thandar Addressable RS232 Chain (ARC) interface standard. All functions remote-controllable including trigger level and filter.

POWER REQUIREMENTS

Internal

Battery Type:	6'C' size disposable or rechargeable Set rear panel 'BATTERY TYPE' switch for correct type
Charge Current:	Typically 100mA from external AC input
Battery Life:	Typically 200 hours using 'C' size alkaline cells
Low Battery Indicator:	'Bat' shows in display when approximately 10% of battery life remains

AC Line

AC Input:	110/120 volts AC nominal or 220/240 volts AC nominal, adjustable internally. The instrument will operate safely and meet specification within normal AC supply variations. viz. 99-132 Volts AC and 198-264 Volts AC respectively
Power Consumption:	8VA max.

GENERAL

Environmental Operating Range:	+5°C to +40°C ,20% to 80% RH
Environmental Storage Range:	-20°C to +70°C
Size:	260(W) x 88(H) x 235(D) mm, excluding handle and feet
Weight:	1.4kg, excluding batteries

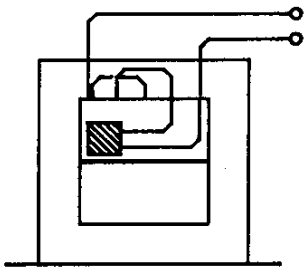
CIRCUIT DESCRIPTIONS

Power

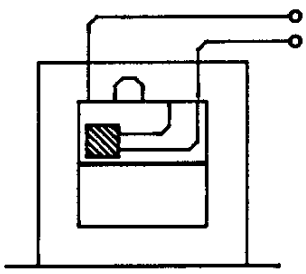
The TF830 may be powered from internal batteries or AC mains and is a safety class I instrument. Change-over from battery power is automatic when AC is applied. Only the battery and rectified transformer secondary are switched by the ON/OFF switch.

Power Supply - Mains Operating Voltage

Make sure that the operating voltage of the instrument shown on the rear panel is suitable for the local supply. Should it be necessary to change the operating voltage, dismantle the instrument and follow the appropriate diagram below.



110V - 120V



220V - 240V

WARNING!-THIS INSTRUMENT MUST BE EARTHED

Any interruption of the protective conductor inside or outside the instrument or disconnection of the protective earth terminal is likely to make the apparatus dangerous. Intentional interuption is prohibited.

Power Supply - DC Regulation

On the power pcb located under the battery box D1 and D2 fullwave rectify the transformer output and the DC is fed to the reservoir capacitor, C37, on the main pcb. D3 is a Schottky diode and provides automatic change-over between AC and battery.

IC19 on the main pcb is a 5V 3-terminal low drop out regulator which provides 5V +/-5% to the rest of the instrument.

R44 and R45 set the point at which the low battery indicator comes on, i.e. 6.4V to 6.8V. Current drain is less than 35mA dc with the A input selected and no input signal, rising to a maximum of 70 mA dc with the ratio function selected and no input signals.

Microcontroller Operation

The TF830 is controlled by a 4 bit microcontroller, IC13, which contains RAM, ROM, LCD driver, two 12-bit timer-counters, 28 I/O lines (mostly arranged in 4-bit ports) and various minor facilities. XLT2 provides the 4MHz clock which is used for all internal operations and C1/D1 provide the power-on reset.

The front panel keys are connected directly to the microcontroller at pins 12 to 15. Pressing the left and right function keys together will select a display test which will turn on all segments and annunciators until the keys are released.

IC13 pins 27 to 34 form an 8-bit data bus which is used to control the measurement functions via IC6 and IC12, to read the external counters via IC1 and IC4 and to communicate with the RS232 interface if fitted. Further control for these buffers and latches is provided by IC13 pins 35 to 42.

The maximum clock rate at which the internal 12-bit timer counters in IC13 (pins 20 and 22) will operate is about 60kHz so the external 8-bit binary counters, IC2 and IC3, are used to increase this to about 15MHz (60kHz x 256 = 15.36MHz). Each time one of these counters counts from FF hex to 0 the corresponding internal counter is incremented; if an internal counter overflows an interrupt is generated and an 8-bit, software generated, counter is incremented. This provides a total counter length of 28 bits which is used to obtain the resolution required in the measurements. If the 8-bit software counters overflow the ---OFL-- message is displayed and the current measurement is terminated. The external counters are read as required via IC1 and IC4. The counters are cleared by the **CLEAR** signal from IC6 pin 9.

The clock inputs to the external counters are each provided by similar gating circuits. IC1 and associated internal counters is the reference counter and is controlled by the reference gate comprising IC5-A and IC10-A. IC4 and associated internal counters is the input signal counter and is controlled by the count gate comprising IC5-B and IC10-B.

The count gate is closed, and no counter clocks are generated, when IC5-B pin 9 is high, and will stay closed as long as IC5-B pin 12, the control input, is held high. This is the **MEASURE bar** signal provided by the microcontroller. IC5-B pin 8 is inverted by IC10-C and applied to the control input of the reference gate which ensures that this gate is also closed.

To start a measurement the microcontroller sets **MEASURE bar** low. Then the first positive edge at IC5-B pin 11 resets the flip-flop and allows subsequent negative edges of the signal to pass through IC10-B to count the counter. Also IC5-B pin 8 going high allows the **REF** signal to open the reference gate and start the reference count. When the microcontroller requires the measurement to finish the **MEASURE bar** signal is set high and the next positive edge of the input signal now sets the flip-flop and stops the count and IC5-B pin 8 stops the reference count.

The time for which **MEASURE bar** is low is determined by the microcontroller from the selected measurement time.

When the A input is selected and the input frequency is above about 13MHz the **FA/2** signal, from IC15-B, is used in place of **FA**. This is transparent to the user and is decided by the microcontroller which performs a 38ms low resolution frequency measurement between actual measurements.

Measurement Functions

All measurement functions are selected and controlled by the microcontroller. Frequency A and Period A measurements are identical; the microcontroller performs the relevant calculation to give the required answer. **FA** or **FA/2** is selected by IC8-B and C to give **FIN** at IC9-D pin 13 and the **REF** signal is selected by IC8-A to give **FREF** at IC5-A pin 3. A timed measurement is then performed as specified by the selected measurement time.

Frequency B measurements are performed as above except that **FB** is selected by IC8 to generate **FIN**. The division by 256 in the B input stage is taken into account when the microcontroller performs the calculation.

Ratio measurements are also similar with **FA** or **FA/2** selected to become **FIN** and **FB** selected as **FREF**.

Count A uses **FA** selected as **FIN** and the count gate (IC5-B and IC10-B) is permanently open, by holding **MEASURE bar** low, to provide a continuous count which the microcontroller sends to the display at regular intervals.

In Pulse Width A measurements the **REF** signal is selected as **FREF** at the reference gate (IC5-A and IC10-A). The count gate remains closed because **MEASURE bar** is held high. The reference gate is opened by, and for the duration of, a positive going pulse at IC10-D pin 13. This pulse is derived from, and equal in length to, either a positive pulse on **FA** with **NEGPW** high or a negative pulse with **NEGPW** low. In this way the microcontroller gets a count of the **REF** signal for one pulse of the unknown input and can compute the width of the pulse.

Measurement Time

The measurement times are set by the microcontroller and are as follows: 116ms with 0.1s selected, 1s with 1s selected and 10s with 10s selected. The time between measurements is 40ms when the A input is selected and 1ms when the B input is selected.

A Input Amplifier

When input A is selected (in all measurement functions except Frequency B) Q6 is turned on by the microcontroller setting IC12 pin 6 low, thus applying power to the A input.

C28 is the dc blocking capacitor; R20, D3 and D4 provide input protection. Q2 is a high impedance amplifier with approximately unity gain at low frequencies. Q3 and Q4 form an emitter coupled amplifier with Q11 as a current source. Q5 is an emitter follower which drives the Schmitt trigger formed by IC7-D and IC7-C. VR4 sets the dc operating point of the amplifier and Schmitt trigger and is adjusted to give maximum sensitivity at 10MHz, see the Calibration section for details. The output of the Schmitt trigger is passed via IC8-B and IC15-B to the measurement system.

R31 and C40 form a low pass filter which is active when Q7 is turned on by the microcontroller setting IC12 pin 5 low, thus turning on Q8.

B Input

When input B is selected, in the Frequency B or Ratio functions, Q9 is turned on by the microcontroller setting IC12 pin 16 low, thus applying power to the B input.

C42 is the dc blocking capacitor; D6 and D7 provide input protection. IC16 is a divide-by-256 prescaler with an internal differential amplifier. The unused input is decoupled by C46; the internal amplifier biasing is adjusted by VR3 so that IC16 just stops self-oscillating without an input.

The output of IC16 is a TTL signal at 1/256 of the input signal. This is fed via IC8-A and B to the measurement system.

Timebase

Q1, XTL1 and associated components form a high stability 10MHz Colpitts crystal oscillator trimmed by VC1. IC14-B is biased as a linear amplifier and buffers the oscillator output which goes to IC7-B. IC14-A buffers the external clock input. If an external clock is applied, C11 is charged to a logic low, gating off the internal clock; change-over is therefore automatic. The selected clock at the output of IC7-C is connected via R28 to IC8-A and hence the measurement system.

RS232 Board (TF830-RS232 ONLY)

The RS232 pcb contains the serial interface device (IC5), interface buffers (IC6, Q2 and Q3), baud rate generator (IC1 and IC3) and address selector buffer (IC2).

The ARC address is read by the microcontroller at power up via IC1 which is connected to the DIP switch on the rear panel by PJ2.

The baud rates are generated by IC1 from the 4.9152MHz crystal XL1, selected by IC3 and sent to the transmit and receive clock inputs at pins 9 and 25 of IC5.

The serial interface is controlled by the microcontroller via PJ3. The RS232 interface is idle and ignored by the microcontroller until a byte is received. This causes pin 14 of IC5 to go high which interrupts the microcontroller via Q1. All bytes are received under interrupt. To send data the microcontroller polls the status register in IC5 for a ready signal for each byte.

The +5V power is supplied via PJ3. The -5V for the RS232 interface is generated by IC4.

CALIBRATION

Recalibration of the crystal oscillator may be carried out without dismantling the instrument. Access to the trimmer is through a hole in the front panel. Use a precision frequency standard or standard frequency receiver with a 1MHz or 10MHz output connected to the A input; select Frequency A.

VR4 is adjusted with the Trigger control VR1 set midway and a 10mV to 15mV, 10MHz signal on input A, with Frequency A selected. Adjust for the most stable reading.

VR2 is used only when in remote RS232 state and is adjusted in the same way as VR4 after the TF830 has received a TC remote command.

VR3 is adjusted to give zero count with no input on range B. Fine adjust from a position where it is self-oscillating until it just gives zero count; over-adjustment will reduce sensitivity.

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PARTS LISTS
PCB ASSY MAIN (44813-0120)

Part Number	Description	Position
22040-0901	BEAD FERRITE FX1115	FB1,2
22225-0220	SWITCH PUSH/PUSH SPPH11060A	SW1,2
22226-0140	KEYSWITCH DARK GREY	K1-4
22573-0041	HEADER 2 WAY STRAIGHT	TP1
22574-0119	SKT DIL 14 PIN	FOR IC2,5,7,9,10,11,13,14,15,17
22574-0120	SKT DIL 16 PIN	FOR IC8,18
22574-0141	SKT DIL 20 PIN	FOR IC1,4,6,12
22588-0004	BNC BULKHEAD SKT 50R	
23185-0150	RES 15RJ W25 CF RD25S B/R	R40
23185-0220	RES 22RJ W25 CF RD25S B/R	R27
23185-1100	RES 100RJ W25 CF RD25S B/R	R19,31
23185-1220	RES 220RJ W25 CF RD25S B/R	R43
23185-1470	RES 470RJ W25 CF RD25S B/R	R1,22
23185-2100	RES 1K0J W25 CF RD25S B/R	R6,30
23185-2220	RES 2K2J W25 CF RD25S B/R	R10
23185-2470	RES 4K7J W25 CF RD25S B/R	R33,34
23185-3100	RES 10KJ W25 CF RD25S B/R	R32,41,42
23185-3470	RES 47KJ W25 CF RD25S B/R	R2-5,36
23185-3560	RES 56KJ W25 CF RD25S B/R	R8,9
23185-4100	RES 100KJ W25 CF RD25S B/R	R7,16,17,20,29,35,46
23185-4150	RES 150KJ W25 CF RD25S B/R	R12
23185-5100	RES 1M0J W25 CF RD25S B/R	R18
23185-6100	RES 10MJ W25 CF RD25S B/R	R11,13
23187-1300	RES 300RJ W25 CF RD25S B/R	R14,15,24,28
23187-2300	RES 3K0J W25 CF RD25S B/R	R48
23202-1680	RES 680RF W25 MF 50PPM	R21,26
23202-2360	RES 3K60F W25 MF 50PPM	R39
23202-2620	RES 6K20F W25 MF 50PPM	R25,44
23202-2680	RES 6K80F W25 MF 50ppm	R23,37
23202-3180	RES 18K0F W25 MF 50PPM	R45
23301-0412	RES NETWK SIL 12K X 8	RP1,2
23347-0180	POT 10K LIN VB12L(7X10)N25KC	VR1
23378-2100	RES PS/V 1K0 CF 10MM	VR4
23378-3220	RES PS/V 22K CF 10MM	VR2
23378-4220	RES PS/V 220K CF 10MM	VR3
23427-0322	CAP 100PG 100V CER N150 P5	C5,6,41
23427-0323	CAP 22PG 100V CER NPO P5	C4
23427-0325	CAP 10NZ 63V CER HI K P5	C7-11,36,38,39,44
23427-0331	CAP 1N0K 63V CER	C43,46
23427-0333	CAP 33PG 100V CER N150 P5	C2,3
23427-0349	CAP 82PG 63V CER N150 P5	C32
23450-0036	CAP 47PK 500V NPO 7.5mm P5	C42
23450-0055	CAP 100PK 500V CER MED K P5	C29
23557-0647	CAP 10U 35V ELEC RE2 P2	C45
23557-0657	CAP 100U 10V ELEC RE2 P2	C27,30,35,48
23557-0661	CAP 470U 25V ELEC RE2 P5	C37
23557-0673	CAP 22U 35V ELEC RE2 P2	C50
23620-0246	CAP 100NK 63V P/E P5	C1, 12-26, 31,33,34,39, 47,49
23620-0251	CAP 33NK 63V P/E P5	C40
23621-0312	CAP 100NM 250V P/E 435/1 P7.5	C28
23984-9001	TRIMCAP 2-10P 7.5MM YELLOW	VC1
25021-0901	DIO 1N4148 B/R	C1,2,5,11

PCB ASSY MAIN (44813-0120) ...continued

Part Number	Description	Position
25030-0905	DIO BA482 B/R	D3,4,6,7
25061-0200	LED - T1 ROUND (3mm) - RED	LED1
25341-0214	TRAN PNP ZTX214L/BC559	Q6,8,9,10
25380-0229	TRAN NPN BC549	Q7,11,12
25380-0230	TRAN NPN MPS2369	Q1,4
25388-0220	TRAN NPN BF240	Q3,5
25601-9007	TRAN FET (NJ) J309	Q2
26100-0110	LCD 8 DIG TR-342 REV 2	DISP1
27160-0430	IC V/REG 5V 100MA LDO TO220	IC19
27230-0530	IC 74HC4053 16 PIN	IC8,18
27231-0000	IC 74HC00 14 PIN	IC7,17
27231-0020	IC 74HC02 14 PIN	IC10
27231-0040	IC 74HC04 14 PIN	IC14
27231-0740	IC 74HC74 14 PIN	IC5,11,15
27231-0860	IC 74HC86 14 PIN	IC9
27231-2440	IC 74HC244 20 PIN	IC1,4
27231-2730	IC 74HC273 20 PIN	IC6,12
27231-3930	IC 74HC393 14 PIN	IC2,3
27250-2010	IC MCU 4 BIT TMP47P421AF S/MNT	IC13
27251-0110	IC SP4740	IC16
28500-0110	XTAL - 10MHZ - FREQ STANDARD	XLT1
28502-0010	RESONATOR CER 4MHZ CSA4.00MG	XLT2
35358-0500	BRACKET BNC SUPPORT	
35555-1710	PCB - TF830	

PCB ASSY - RS232 (44813-0130)

Part Number	Description	Position
22040-0901	BEAD FERRITE FX1115	FB1,2
22574-0118	SKT DIL 8 PIN	FOR IC4
22574-0119	SKT DIL 14 PIN	FOR IC6
22574-0120	SKT DIL 16 PIN	FOR IC1,3
22574-0122	SKT DIL 28 PIN	FOR IC5
22574-0141	SKT DIL 20 PIN	FOR IC2
22575-0103	HEADER 16 WAY (2X8) STR SKELTN	PJ3
23185-2100	RES 1K0J W25 CF RD25S B/R	R5,11
23185-2220	RES 2K2J W25 CF RD25S B/R	R1
23185-3100	RES 10KJ W25 CF RD25S B/R	R4,6,7,8,9,10
23185-4100	RES 100KJ W25 CF RD25S B/R	R3
23185-5100	RES 1M0J W25 CF RD25S B/R	R2
23301-0445	RES NETWK SIL 100K X 8	RP1
23427-0324	CAP 56PG 100V CER N150 P5T	C7,8
23427-0331	CAP 1N0K 63V CER	C18,19,20,21
23557-0657	CAP 100U 10V ELEC RE2 P2	C1,2
23620-0246	CAP 100NK 63V P/E P5	C3-6,9-17,22
25380-0229	TRAN NPN BC549	Q1,2,3
27162-0010	IC SI7660CJ 8 PIN	IC4
27226-0510	IC 4051B 16 PIN	IC3
27230-0600	IC 74HC4060 16 PIN	IC1

PCB ASSY - RS232 (44813-0130) ...continued

Part Number	Description	Position
27231-2440	IC 74HC244 20 PIN	IC2
27250-0050	IC 14C88 14 pin	IC6
27250-0450	IC UPD71051C 28 PIN	IC5
28500-0800	XTAL - 4.9152MHZ - MICROPROCSR	XL1
35555-1790	PCB - RS232 - TF830	

PCB ASSY - POWER (44813-0140)

Part Number	Description	Position
22223-0060	SWITCH 8 WAY DIP PIANO TYPE	SW1 TF830-RS232 only
22572-9205	SKT 9 WAY D RT ANG INC BRACKT	PJ5 TF830-RS232 only
22575-0103	HEADER 16 WAY (2X8) STR SKELTN	PJ4 TF830-RS232 only
23284-0040	RES 27RJ 2W5 WW	R1
23620-9007	CAP 10NK 100V P/E P5	C1,2
25115-0700	DIO 11DQ03	D3
25115-0907	DIO 1N4002 B/R	D1,2
35515-1280	PCB - POWER - TF800	

CONN ASSY MAIN/RS232 (43171-1200)

Part Number	Description	Position
10148-0001	CABLE 16W IDC FLAT GREY AWG-28	
22575-0047	CONN TRANSITION 16W IDC	
22575-0060	SKT 16W IDC HIF3BA-16D-2.54R	

CONN ASSY POWER/RS232 (43171-1210)

Part Number	Description	Position
10148-0001	CABLE 16W IDC FLAT GREY AWG-28	
22575-0047	CONN TRANSITION 16W IDC	
22575-0060	SKT 16W IDC HIF3BA-16D-2.54R	

TF830 UNPACKED (58132-0501)
TF830-RS232 UNPACKED (58132-0531)

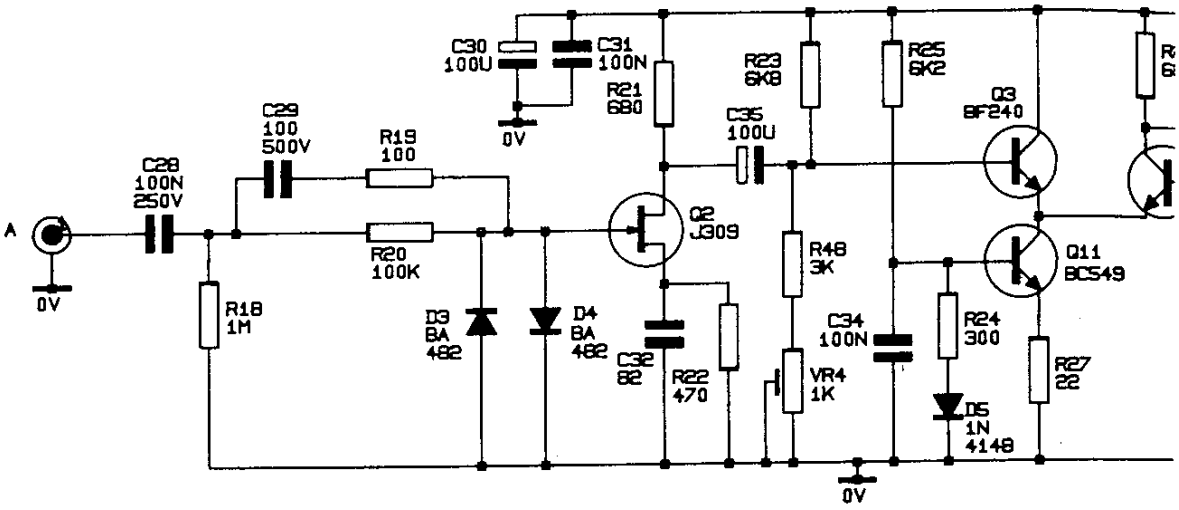
Part Number	Description	Position
10232-0305	SLEEVE H20 X 20MM	FOR TRANSFORMER (2)
10300-0316	FOAM P/E S/AD 40WX8THKX5M	
20030-0263	WASHER M3 ZPST	RECEP (2) TRANF (2) D SOCKET (2)
20030-0264	WASHER M2.5 ZPST	FOR FEET
20038-9501	WASHER M3 Spring	RECEP/2 TRANF/2 SCRNS/6 SPCRS/4 TRANF PL/4 PCBs/3 D SKT/
20065-0040	SCREW NO 4 X 5/16 PLAST PNHDPZ	FOR FEET
20073-9801	SCREW No.4x1/4" Plastite	TRANSFMR PLATE
20162-0010	SCREWLOCK D TYPE 4-40 UNC PAIR	
20210-0101	NUT M3 ZPST	RECEP (2) TRANF (2) PJ5 (2)
20234-0011	SCREW M3 X 10 PNHDPZ NPST	RECEP (2) TRANF (2) D SOCKET (2)

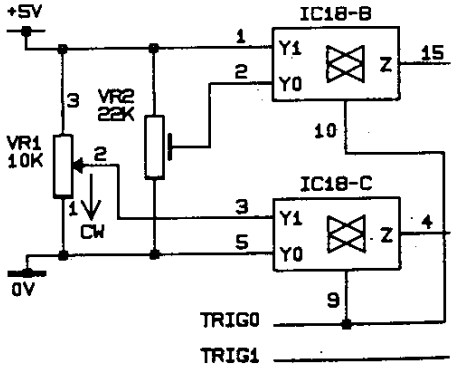
TF830 UNPACKED (58132-0501)
TF830-RS232 UNPACKED (58132-0531) ... continued

Part Number	Description	Position
20234-0017	SCREW M3 X 5 PNHDPZ ZPST	FOR SPACERS
20234-0038	SCREW M3 X 40 PNHDPZ ZPST	CASE UPPER/LOWER
20234-0045	SCREW M2 X 10 PNHDSL Nylon	FOR SL SWITCH
20653-0204	CABLE TIE	
20656-0011	BATT COMP 26-1 LUG TERMS 6XC	
20657-0080	KNOB 11MM TP111 006 GREY 99	
20657-0081	CAP C110 FOR 11MM KNOB GREY 99	
20661-0225	SPACER Hex M3 x 12 ZPST	RS232 PCB
20661-0249	SPACER Hex Stud M3 x 15 ZPST	RS232 SCREEN
20661-0254	SPACER Hex Stud M3 x 20 ZPST	MAIN SCREEN
20661-0261	SPACER Clr NO.2 X 4.76mm Nylon	FOR SL SWITCH
20662-0540	FOOT MOULDED GREY 543-248	
22115-0160	TRANSFORMER - TF810/820	
22218-0205	SWITCH SLIDE - KNITTER MFS201N	DISP/RECH
22443-0002	GROMMET - 3109A	FOR MAIN SCREEN
22451-0203	SOLDER TAG M3	FOR D SOCKET
22458-0004	SHROUD INSULATING (MS1 BOOT)	
22520-0150	AC MAINS RECEP 10AMP 0707-1	
31333-0080	PLATE TRANSFORMR MTG TF810/820	
31336-0250	HANDLE BENCH INST CASE (STD)	
31347-0070	SCREEN - RS232 BOARD - TF830	
31347-0080	SCREEN - MAIN BOARD - TF830	
31711-0090	BEZEL, LCD - TF830	
33331-1870	FRONT PANEL - TF830	
33331-1790	OVERLAY FRONT PANEL - TF830	
33536-0810	CASE UPPER BENCH INST (STD)	
33536-0820	CASE LOWER BENCH INST (STD)	
33536-0830	BATT BOX BENCH INST CASE (STD)	
33536-0840	LID, BATT BOX BENCH INST (STD)	
37113-0180	BUTTON, MID GREY ABS (TF810/20	FOR SW1,2
37522-0160	LABEL SER NO - THURLBY-THANDAR	
37541-0720	LABEL REAR PANEL TF830-RS232	
43187-0440	WIRE SET	

TF830 PACKED
TF830-RS232 PACKED

Part Number	Description	Position
10612-0204	AIRCAP T100 1500MM WIDTH	
22491-0010	MAINS LD 2M RA IEC SKT/STRPEND	
	OR	
22491-0020	MAINS LD 2M RA IEC SKT/EURO PL	
	OR	
22491-0040	MAINS LD 2M ST JEC/USA PL	
38113-0370	CARTON T3 (BENCH CASE)	
38181-0210	SLEEVE - PRINTED - T3	
48581-0230	GUARANTEE CARD THURLBY/THANDAR	
48581-1040	INSTRUCTION BOOK - TF830	
48581-1050	INSTRUCTION BOOK ARC R/C TF830	





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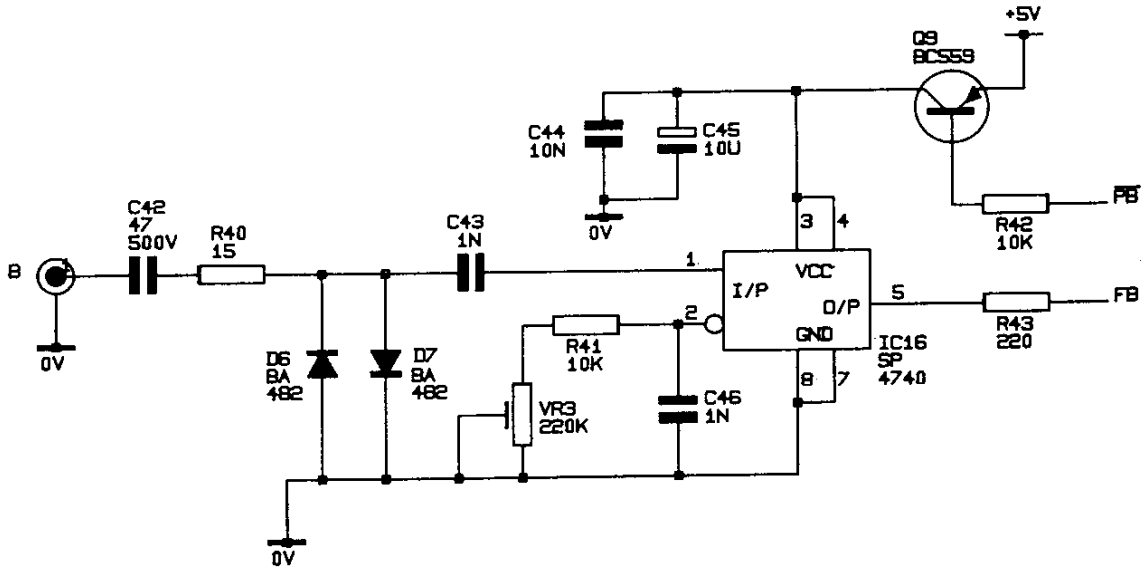
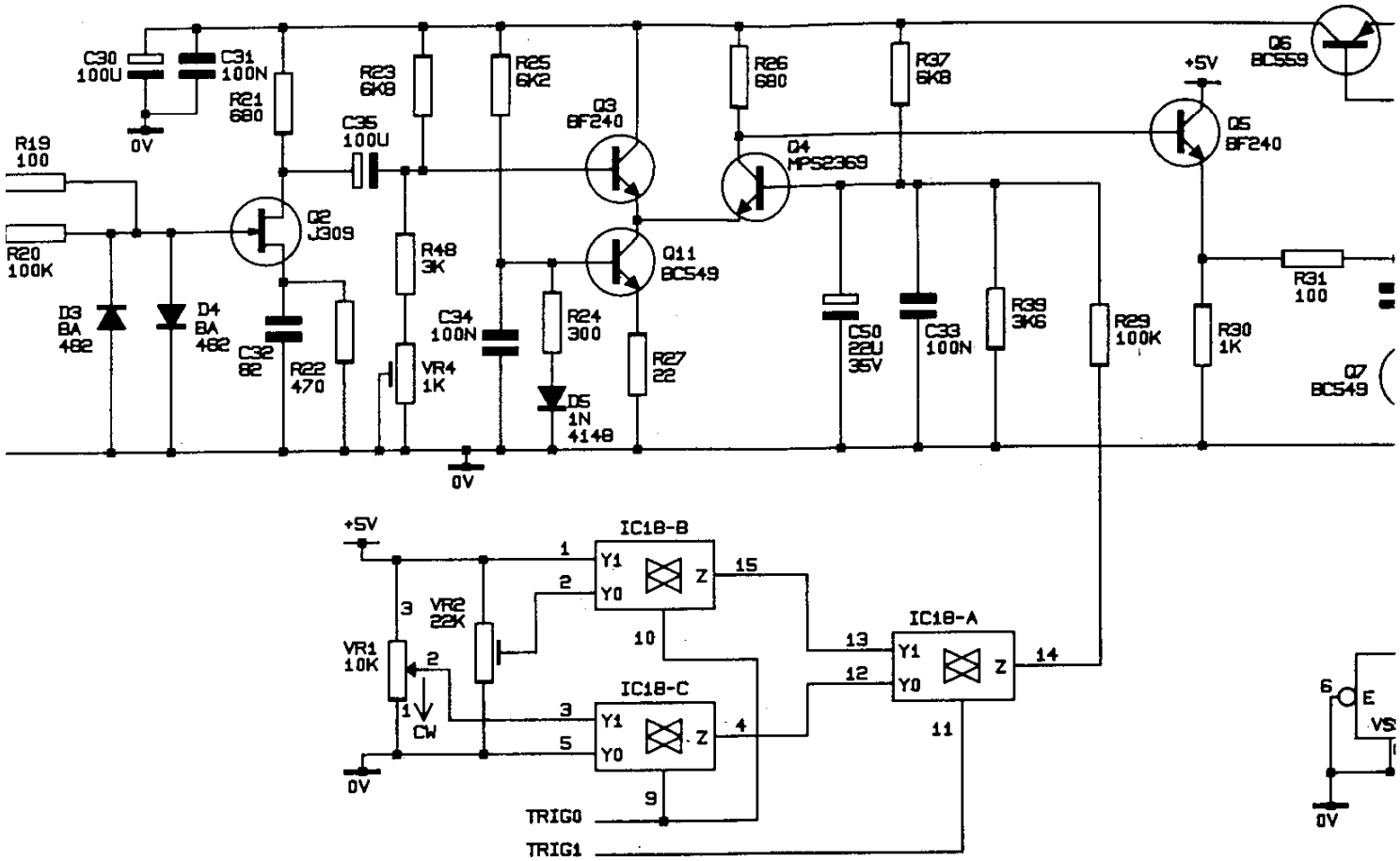
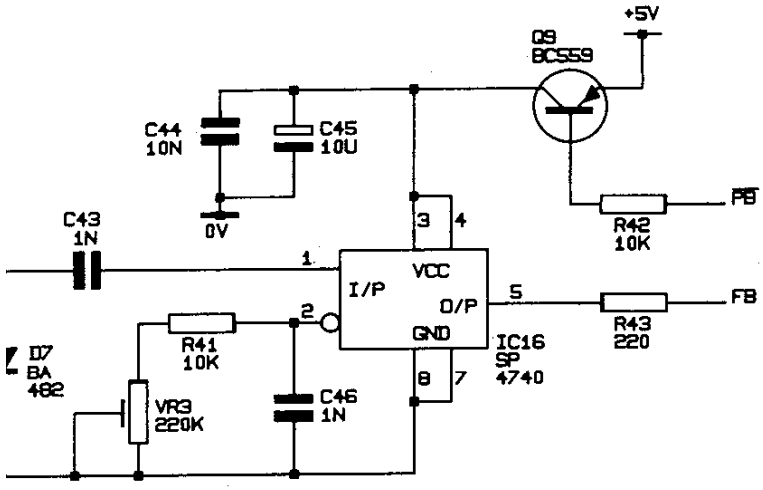
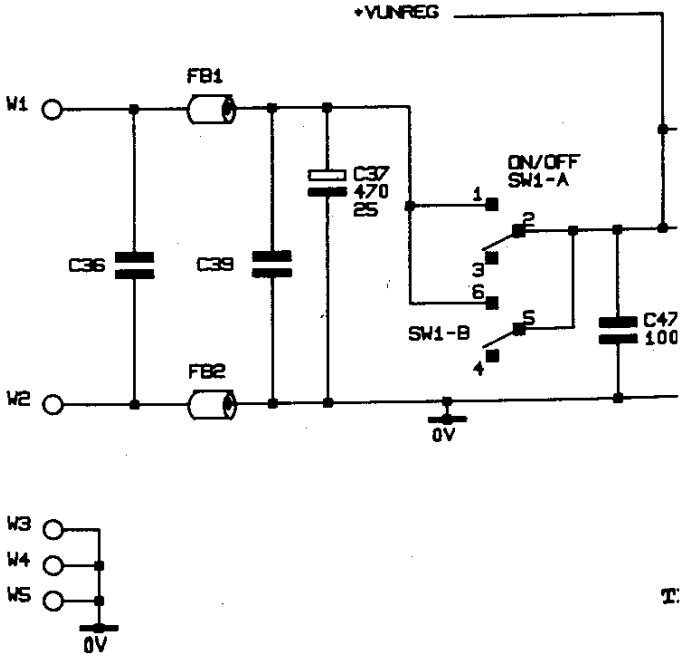
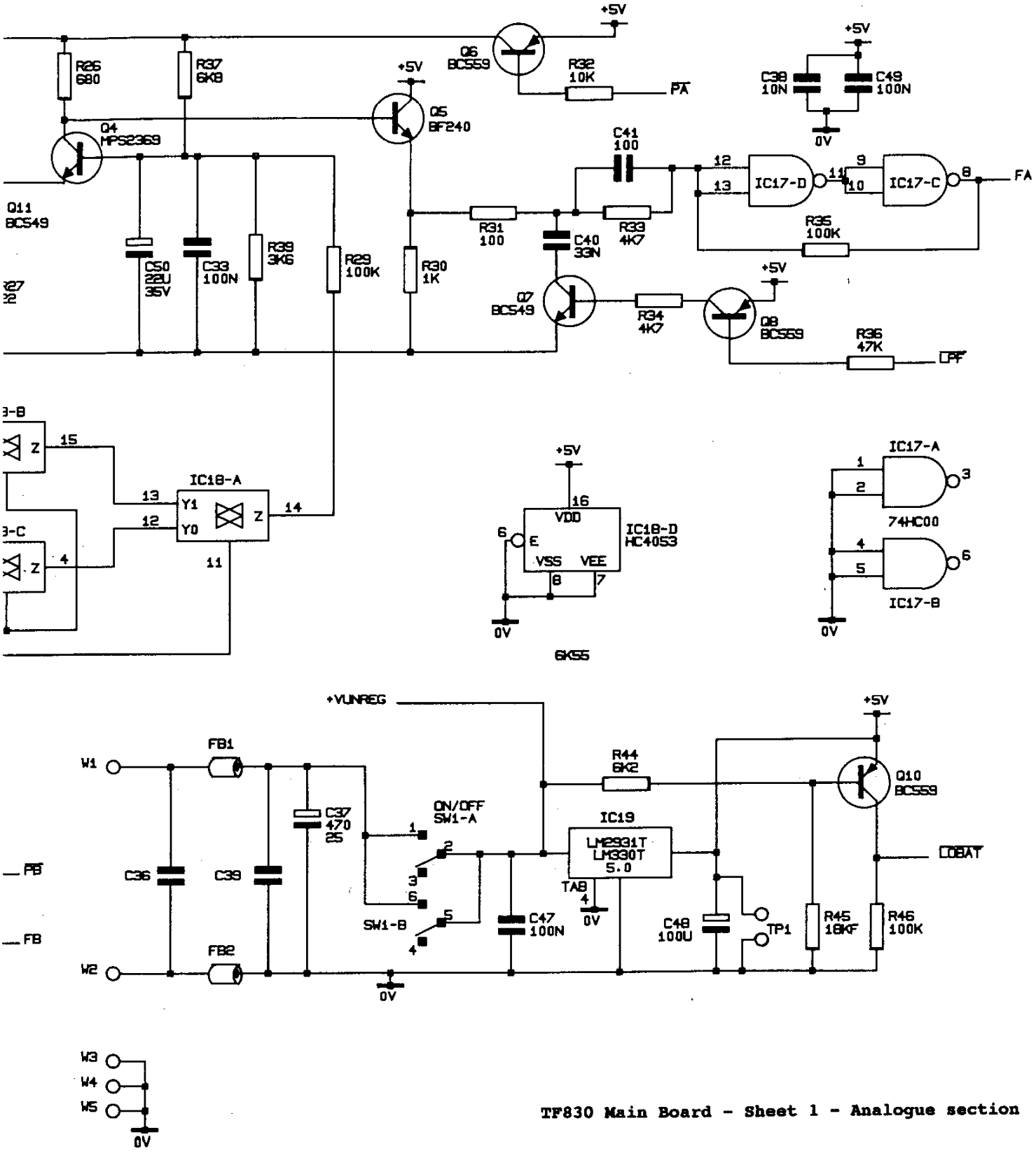


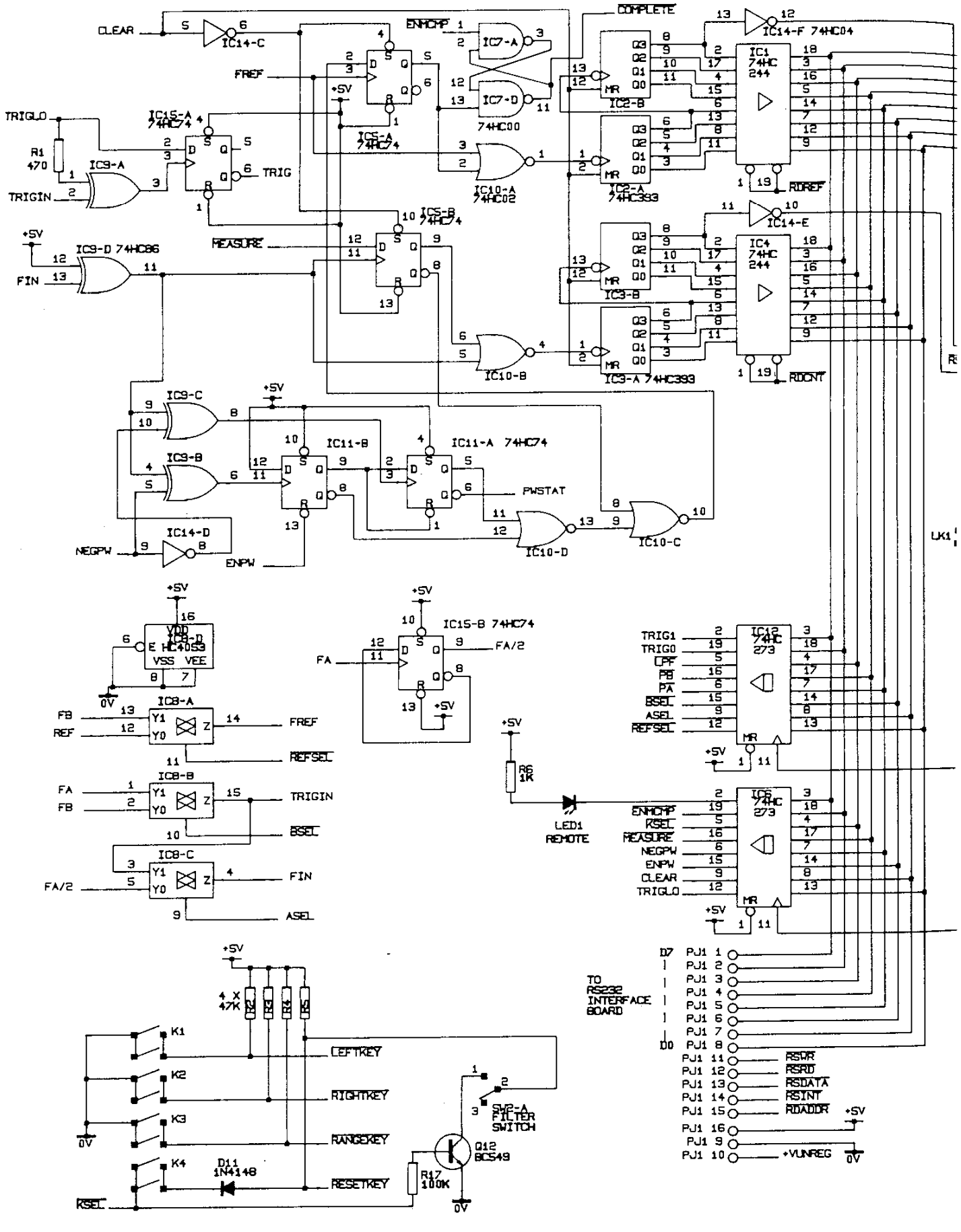

C30 100U
C31 100N
0V
R21 680
R23 6K8
C35 100U
R25 6K2
Q3 BF240
R26 680
R37 6K8
+5V
Q6 BC559
Q5 BF240
Q4 MPS2369
R19 100
R20 100K
Q2 J309
R48 3K
Q11 BC549
R31 100
D3 BA 482
D4 BA 482
C32 82
R22 470
C34 100N
R24 300
R27 22
VR4 1K
D5 1N 4148
C50 22U 35V
C33 100N
R39 3K6
R29 100K
R30 1K
Q7 BC549
+5V
IC18-B
VR2 22K
VR1 10K
CW
IC18-C
IC18-A
TRIG0
TRIG1
0V

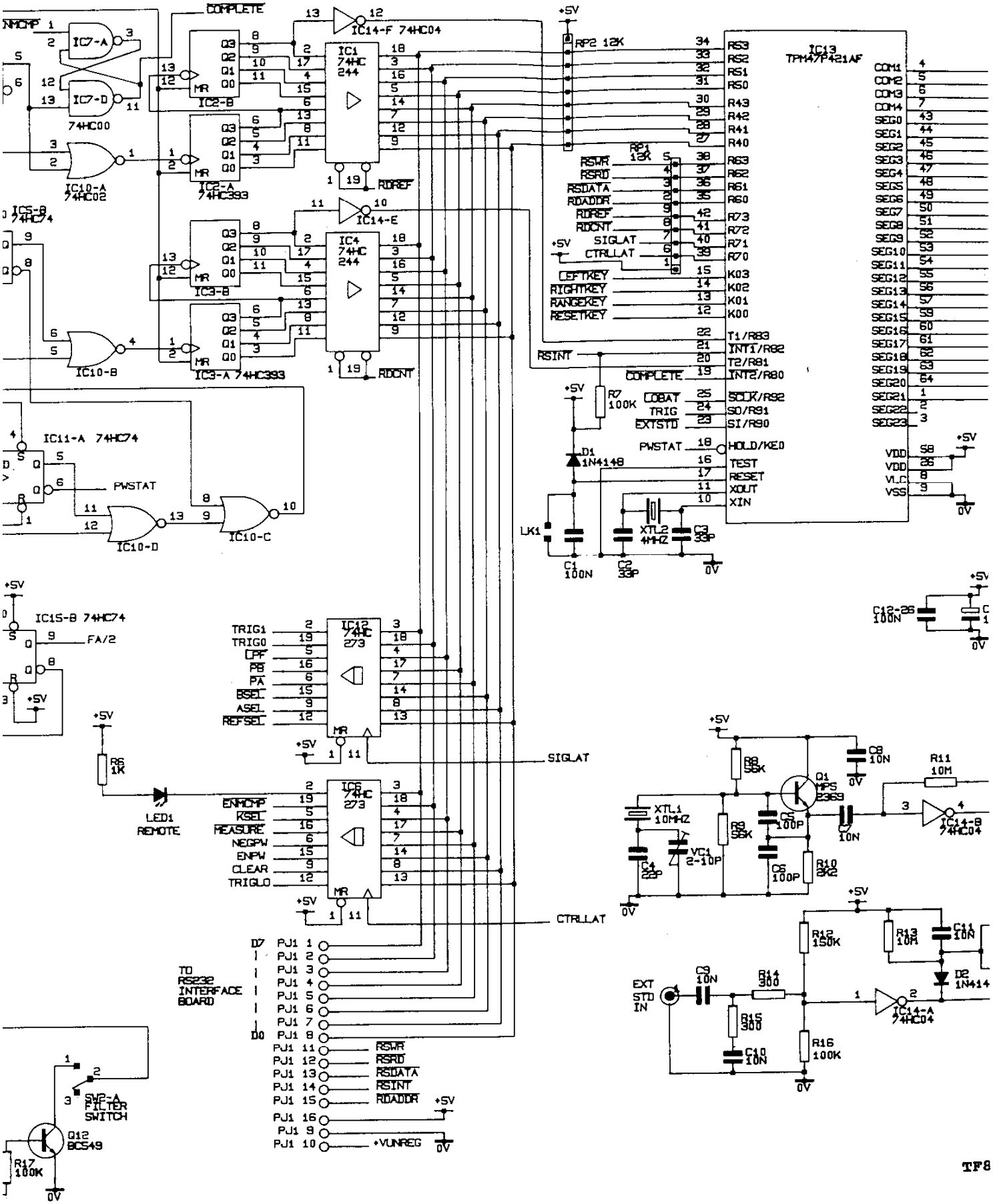

+5V
Q9 BC559
C44 10N
C45 10U
0V
C43 1N
R42 10K
FB
VCC
I/P
O/P
GND
IC16 SP 4740
R43 220
FB
R41 10K
D7 BA 482
VR3 220K
C46 1N


+VUNREG
W1
FB1
C36
C39
C37 470 25
ON/OFF SW1-A
SW1-B
C47 100
FB2
W2
0V
W3
W4
W5
0V

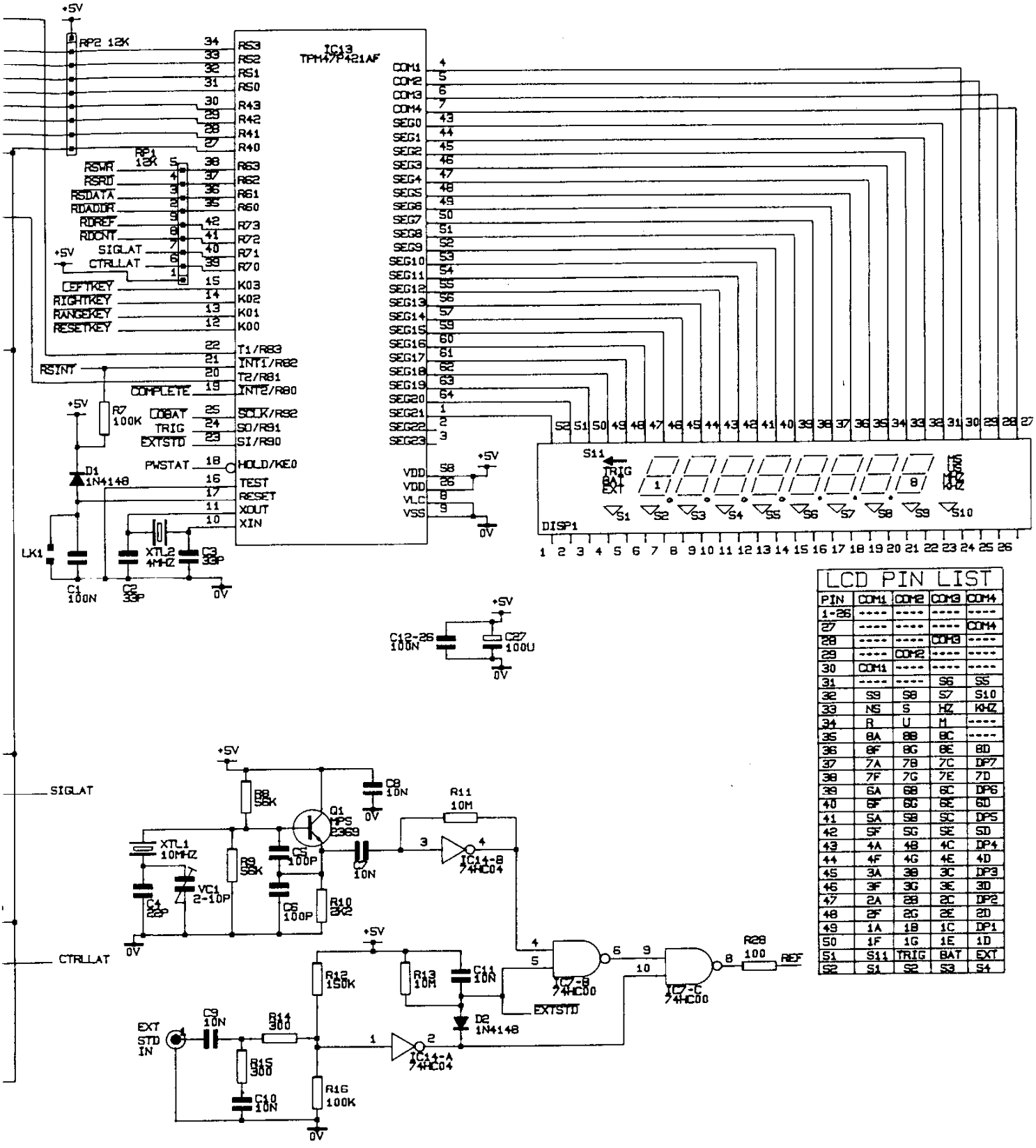


TF830 Main Board - Sheet 1 - Analogue section


CLEAR
IC14-C
ENHCMP
IC7-A
IC7-D
74HC00
FREF
IC5-A 74HC74
COMPLETE
IC2-B
IC2-A 74HC393
IC14-F 74HC04
IC1 74HC 244
RDREF
TRIGLO
IC15-A 74HC74
R1 470
IC9-A
TRIGIN
TRIG
IC10-A 74HC02
IC5-B 74HC74
MEASURE
IC9-D 74HC86
FIN
IC3-B
IC3-A 74HC393
IC14-E
IC4 74HC 244
RDCNT
IC9-C
IC9-B
IC11-B
IC11-A 74HC74
PWSTAT
IC14-D
NEGPW
ENPW
IC10-B
IC10-D
IC10-C
+5V
0V
IC8-D E HC4053 VDD VSS VEE
IC8-A
IC8-B
IC8-C
FB
REF
FREFSEL
FA
TRIGIN
BSEL
FA/2
ASEL
IC15-B 74HC74
FA/2
R6 1K
LED1 REMOTE
IC12 74HC 273
TRIG1
TRIG0
CPF
PB
PA
BSEL
ASEL
REFSEL
IC6 74HC 273
ENHCMP
RSEL
MEASURE
NEGPW
ENPW
CLEAR
TRIGLO
4 X 47K
R2
R3
R4
R5
K1
K2
K3
K4
LEFTKEY
RIGHTKEY
RANGEKEY
RESETKEY
D11 1N4148
SW2-A FILTER SWITCH
Q12 BC549
R17 100K
TO RS232 INTERFACE BOARD
D7
D0
PJ1 1
PJ1 2
PJ1 3
PJ1 4
PJ1 5
PJ1 6
PJ1 7
PJ1 8
PJ1 11 RSWR
PJ1 12 RSRD
PJ1 13 RSDATA
PJ1 14 RSINT
PJ1 15 RDADDR
PJ1 16
PJ1 9
PJ1 10 +VUNREG
LK1


COMPLETE
IC7-A
IC7-D
74HC00
IC10-A 74HC02
IC2-B
IC2-A 74HC393
IC14-F 74HC04
IC1 74HC 244
RDREF
IC5-B 74HC74
IC3-B
IC10-B
IC3-A 74HC393
IC14-E
IC4 74HC 244
RDCNT
IC11-A 74HC74
PWSTAT
IC10-D
IC10-C
+5V
RP2 12K
RP1 12K
RSWR
RSRD
RSDATA
RDADDR
RDREF
RDCNT
SIGLAT
CTRLLAT
LEFTKEY
RIGHTKEY
RANGEKEY
RESETKEY
RSINT
IC13 TPM47P421AF
COM1
COM2
COM3
COM4
SEG0
SEG1
SEG2
SEG3
SEG4
SEG5
SEG6
SEG7
SEG8
SEG9
SEG10
SEG11
SEG12
SEG13
SEG14
SEG15
SEG16
SEG17
SEG18
SEG19
SEG20
SEG21
SEG22
SEG23
R7 100K
COBAT
TRIG
EXTSTD
D1 1N4148
LK1
C1 100N
XTL2 4MHZ
C3 33P
C2 33P
0V
VDD
VLC
VSS
C12-26 100N
IC15-B 74HC74
FA/2
R6 1K
LED1 REMOTE
TRIG1
TRIG0
CPF
PB
PA
BSEL
ASEL
REFSEL
IC12 74HC 273
SIGLAT
ENHCMP
RSEL
MEASURE
NEGPW
ENPW
CLEAR
TRIGLO
IC6 74HC 273
CTRLLAT
TO RS232 INTERFACE BOARD
D7
D0
PJ1 1
PJ1 2
PJ1 3
PJ1 4
PJ1 5
PJ1 6
PJ1 7
PJ1 8
PJ1 11
PJ1 12
PJ1 13
PJ1 14
PJ1 15
PJ1 16
PJ1 9
PJ1 10
RSWR
RSRD
RSDATA
RSINT
RDADDR
+VUNREG
SW2-A FILTER SWITCH
Q12 BC549
R17 100K
R8 56K
Q1 MPS 2369
C8 10N
R11 10M
XTL1 10MHZ
C4 22P
VC1 2-10P
R9 56K
C5 100P
C6 100P
R10 2K2
C7 10N
IC14-B 74HC04
R12 150K
R13 10M
C11 10N
D2 1N4148
EXT STD IN
C9 10N
R14 300
R15 300
C10 10N
R16 100K
IC14-A 74HC04

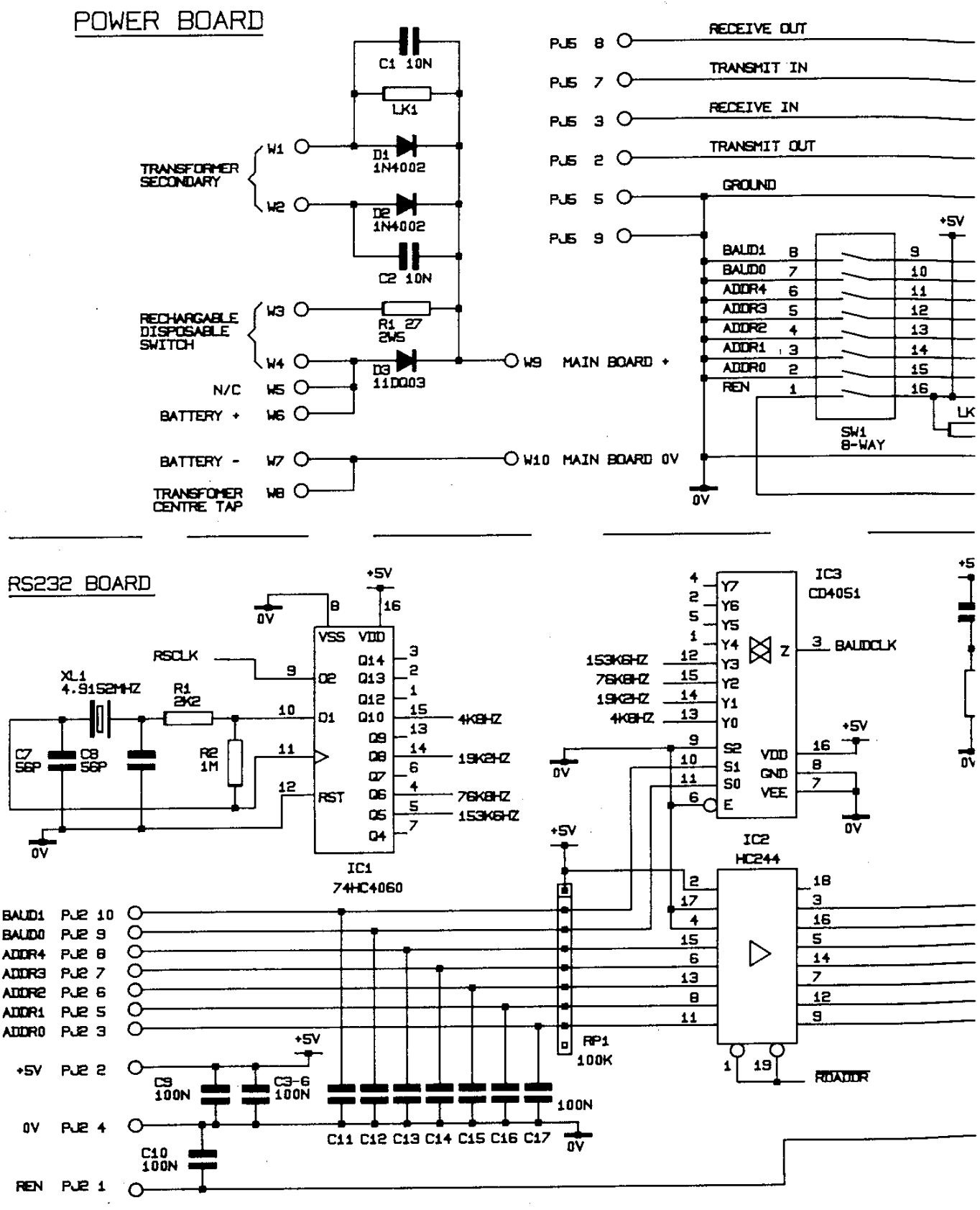
TF8

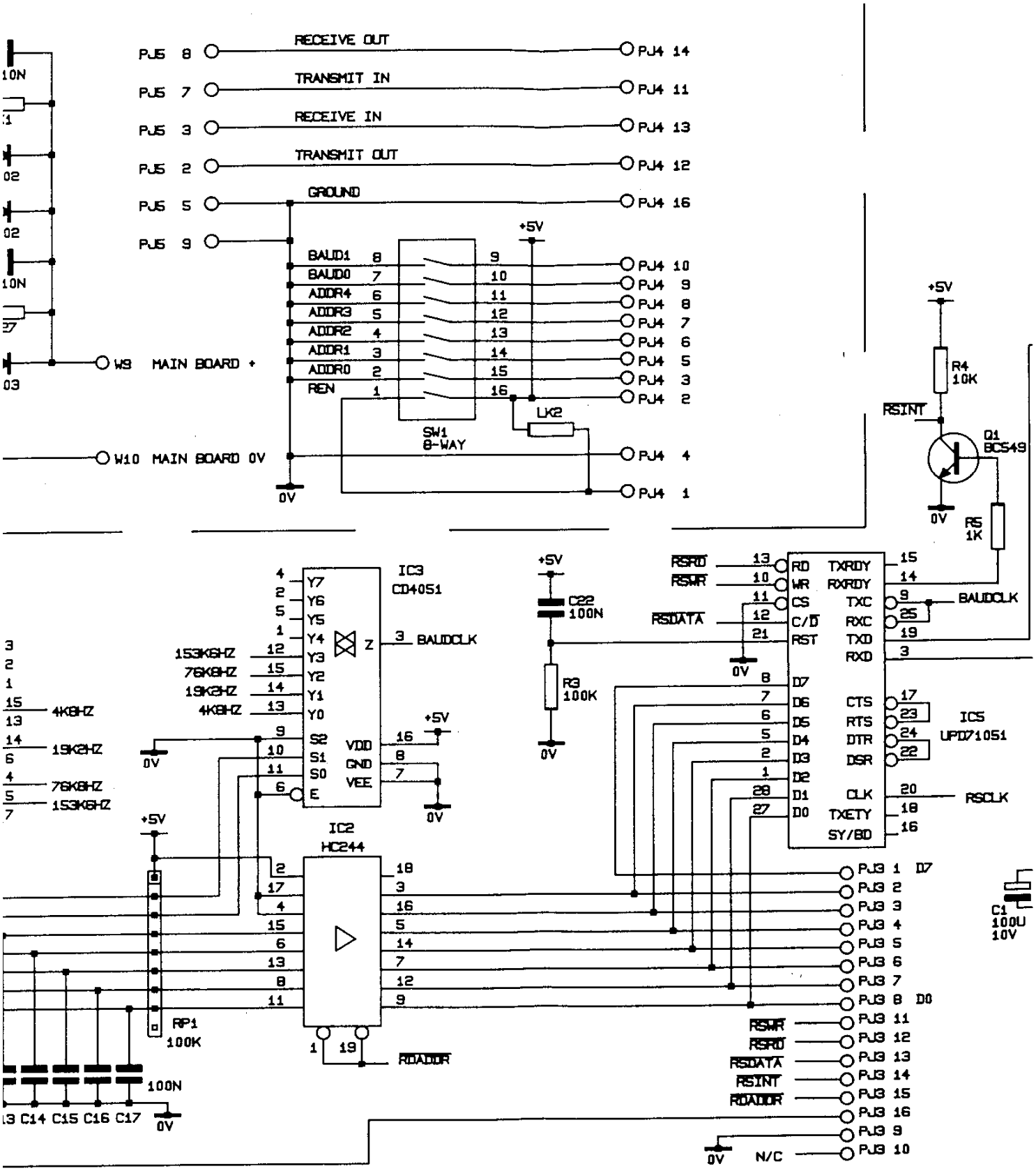


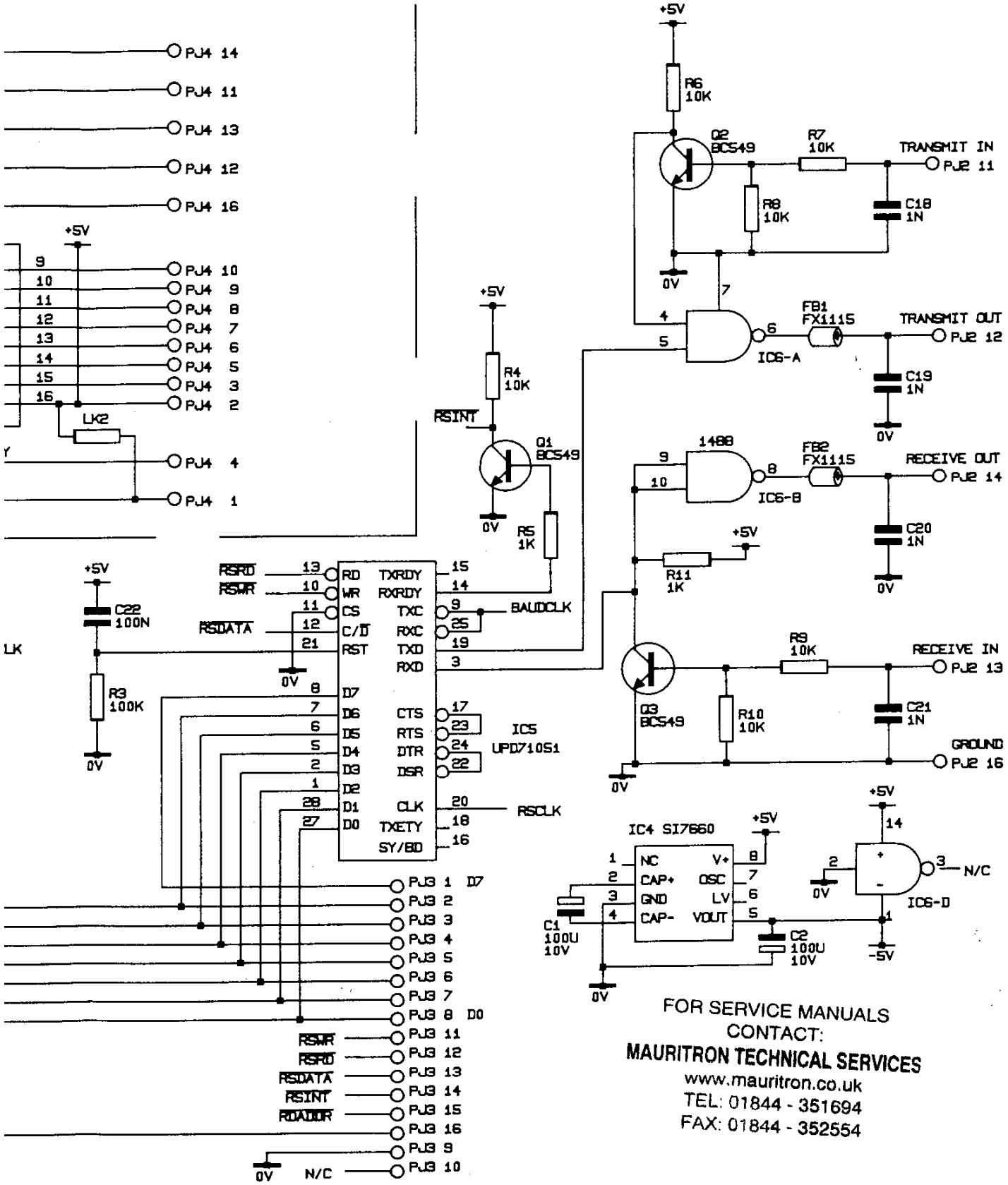
LCD PIN LIST

PIN	COM1	COM2	COM3	COM4
1-26	----	----	----	----
27	----	----	----	COM4
28	----	----	COM3	----
29	----	COM2	----	----
30	COM1	----	----	----
31	----	----	S6	S5
32	S9	S8	S7	S10
33	MS	S	HZ	KHZ
34	R	U	M	----
35	8A	8B	8C	----
36	8F	8G	8E	8D
37	7A	7B	7C	DP7
38	7F	7G	7E	7D
39	6A	6B	6C	DP6
40	6F	6G	6E	6D
41	5A	5B	5C	DP5
42	5F	5G	5E	5D
43	4A	4B	4C	DP4
44	4F	4G	4E	4D
45	3A	3B	3C	DP3
46	3F	3G	3E	3D
47	2A	2B	2C	DP2
48	2F	2G	2E	2D
49	1A	1B	1C	DP1
S0	1F	1G	1E	1D
S1	S11	TRIG	BAT	EXT
S2	S1	S2	S3	S4

TF830 Main Board - Sheet 2 - Digital section


POWER BOARD
C1 10N
LK1
W1
D1
1N4002
TRANSFORMER SECONDARY
W2
D2
1N4002
C2 10N
W3
R1 27
2W5
RECHARGABLE DISPOSABLE SWITCH
W4
D3
11DQ03
W9 MAIN BOARD +
N/C W5
BATTERY + W6
BATTERY - W7
W10 MAIN BOARD 0V
TRANSFOMER CENTRE TAP W8
PJ5 8 RECEIVE OUT
PJ5 7 TRANSMIT IN
PJ5 3 RECEIVE IN
PJ5 2 TRANSMIT OUT
PJ5 5 GROUND
PJ5 9
+5V
BAUD1 8
BAUD0 7
ADDR4 6
ADDR3 5
ADDR2 4
ADDR1 3
ADDR0 2
REN 1
9
10
11
12
13
14
15
16
LK
SW1
8-WAY
0V
RS232 BOARD
+5V
0V
VSS VDD
RSCLK
XL1
4.9152MHZ
R1
2K2
C7
56P
C8
56P
R2
1M
O2 Q14 Q13 Q12 Q10 Q9 Q8 Q7 Q6 Q5 Q4
RST
4KBHZ
19K2HZ
76KBHZ
153KBHZ
IC1
74HC4060
IC3
CD4051
153KBHZ
76KBHZ
19K2HZ
4KBHZ
Y7 Y6 Y5 Y4 Y3 Y2 Y1 Y0
Z
BAUDCLK
S2 S1 S0 E
VDD GND VEE
IC2
HC244
BAUD1 PJ2 10
BAUD0 PJ2 9
ADDR4 PJ2 8
ADDR3 PJ2 7
ADDR2 PJ2 6
ADDR1 PJ2 5
ADDR0 PJ2 3
+5V PJ2 2
0V PJ2 4
REN PJ2 1
C9
100N
C3-6
100N
C10
100N
C11 C12 C13 C14 C15 C16 C17
100N
RP1
100K
RDADDR


PJ5 8
RECEIVE OUT
PJ4 14
PJ5 7
TRANSMIT IN
PJ4 11
PJ5 3
RECEIVE IN
PJ4 13
PJ5 2
TRANSMIT OUT
PJ4 12
PJ5 5
GROUND
PJ4 16
PJ5 9
+5V
BAUD1 8
BAUD0 7
ADDR4 6
ADDR3 5
ADDR2 4
ADDR1 3
ADDR0 2
REN 1
9
10
11
12
13
14
15
16
PJ4 10
PJ4 9
PJ4 8
PJ4 7
PJ4 6
PJ4 5
PJ4 3
PJ4 2
LK2
SW1
8-WAY
W9 MAIN BOARD +
W10 MAIN BOARD 0V
0V
PJ4 4
PJ4 1
+5V
R4
10K
RSINT
Q1
BC549
0V
R5
1K
IC3
CD4051
Y7
Y6
Y5
Y4
Y3
Y2
Y1
Y0
S2
S1
S0
E
Z
VDD
GND
VEE
3 BAUDCLK
153K6HZ
76K8HZ
19K2HZ
4K8HZ
+5V
0V
C22
100N
R3
100K
RSRD
RSWR
RSDATA
RD
WR
CS
C/D
RST
TXRDY
RXRDY
TXC
RXC
TXD
RXD
BAUDCLK
IC5
UPD71051
D7
D6
D5
D4
D3
D2
D1
D0
CTS
RTS
DTR
DSR
CLK
TXETY
SY/BD
RSCLK
IC2
HC244
RP1
100K
100N
C13 C14 C15 C16 C17
RDADDR
PJ3 1 D7
PJ3 2
PJ3 3
PJ3 4
PJ3 5
PJ3 6
PJ3 7
PJ3 8 D0
PJ3 11
PJ3 12
PJ3 13
PJ3 14
PJ3 15
PJ3 16
PJ3 9
PJ3 10
N/C
C1
100U
10V



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TF830 Power Board and RS232 Board (TF830-RS232 only)