TECHNICAL MANUAL

for

FREQUENCY STANDARD DISTRIBUTION SYSTEM

THE TECHNICAL MATERIEL CORPORATION
MAMARONECK, N.Y. OTTAWA, CANADA

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IN-2124

INSERT

FIGURE 1-1	PUB DRAWING
2-1	CK1841
3-1	LD2418
4-1	LINE DRAWING FUNCTIONAL BLOCK DIAGRAM (PUB DRAWING)

UNCLASSIFIED

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MAMARONECK, N.Y. **OTTAWA, CANADA**

THE TECHNICAL MATERIEL CORPORATION
COMMUNICATIONS ENGINEERS
700 FENIMORE ROAD MAMARONECK, N. Y.

Warranty

The Technical Materiel Corporation, hereinafter referred to as TMC, warrants the equipment (except electron tubes,* fuses, lamps, batteries and articles made of glass or other fragile or other expendable materials) purchased hereunder to be free from defect in materials and workmanship under normal use and service, when used for the purposes for which the same is designed, for a period of one year from the date of delivery F.O.B. factory. TMC further warrants that the equipment will perform in a manner equal to or better than published technical specifications as amended by any additions or corrections thereto accompanying the formal equipment offer.

TMC will replace or repair any such defective items, F.O.B. factory, which may fail within the stated warranty period, PROVIDED:

1. That any claim of defect under this warranty is made within sixty (60) days after discovery thereof and that inspection by TMC, if required, indicates the validity of such claim to TMC's satisfaction.
2. That the defect is not the result of damage incurred in shipment from or to the factory.
3. That the equipment has not been altered in any way either as to design or use whether by replacement parts not supplied or approved by TMC, or otherwise.
4. That any equipment or accessories furnished but not manufactured by TMC, or not of TMC design shall be subject only to such adjustments as TMC may obtain from the supplier thereof.

Electron tubes *furnished by TMC, but manufactured by others, bear only the warranty given by such other manufacturers. Electron tube warranty claims should be made directly to the manufacturer of such tubes.

TMC's obligation under this warranty is limited to the repair or replacement of defective parts with the exceptions noted above.

At TMC's option any defective part or equipment which fails within the warranty period shall be returned to TMC's factory for inspection, properly packed with shipping charges prepaid. No parts or equipment shall be returned to TMC, unless a return authorization is issued by TMC.

No warranties, express or implied, other than those specifically set forth herein shall be applicable to any equipment manufactured or furnished by TMC and the foregoing warranty shall constitute the Buyers sole right and remedy. In no event does TMC assume any liability for consequential damages, or for loss, damage or expense directly or indirectly arising from the use of TMC Products, or any inability to use them either separately or in combination with other equipment or materials or from any other cause.

*Electron tubes also include semi-conductor devices.

RECORD OF CORRECTIONS MADE

Change No.	Date of Change	Date Entered	Entered By

SECTION 1

GENERAL INFORMATION

1-1. FUNCTIONAL DESCRIPTION

The Frequency Standard Distribution System (figure 1-1) hereafter referred to as Frequency Standard or System, consists of ten major units listed in table 1-1 as they appear in figure 1-1. The Frequency Standard System is used as a master 1 MHz frequency source for all units employing a synthesizer either for transmitters or receivers.

Two 24 vdc battery operated power supplies are incorporated within the system to provide an emergency source of power to each of the two frequency standard units in the event of primary voltage failure. The battery operated power supply receives a trickle charge as long as primary voltage is applied to the CSS-2. When the primary voltage is removed from the CSS-2, it automatically receives 24 vdc from the battery operated power supply.

Patching jacks mounted on the System's front panel provides these 1 MHz frequency outputs to transmitters and/or receivers.

TABLE 1-1. MAJOR COMPONENTS

	UNIT	MODEL	QUANTITY
1st	Frequency Standard	CSS-2	2 each
2nd	Antenna Multicoupler	AMC-32	2 each
3rd	Patch Panel	SPP-4046	1 each
4th	Patch Panel	SPP-20Y	3 each
5th	Battery Power Supply	BPSA-1	2 each

1-2. PHYSICAL DESCRIPTION

As shown in figure 1-1, the Frequency Distribution System consists of

a single equipment cabinet, RAK-9 (71-1/2 inches high by 20-5/8 inches wide by 22-1/2 inches deep) which houses all of the components within the System. The System consists of two Frequency Standard CSS-2 units, two Antenna Multicoupler AMC-32 units, two Battery Power Supply BPSA-1 units, three RF Patch Panel SPP-20Y units, and an RF Patch Panel SPP-4046. Primary power and external input connections to the System are made through either of two access holes in the lower rear and side of the equipment cabinet. Power for the CSS-2 and AMC-32 units is provided via Power Strip AX675, mounted within the equipment cabinet. All units of the System are bolted to the equipment cabinet except the Frequency Standard CSS-2 and Multicoupler AMC-32, which are slide mounted to the equipment cabinet for easy access.

1-3. REFERENCE DATA

TABLE 1-2.

Frequency Stability	Short term: 1 part in 10^9, or better per day with a stable voltage and ambient temperature. Long term: ageing rate, less than 5 parts in 10^8 per month.
Frequency Standard Outputs	1 MHZ, 10 MHz and 100 KHz.
Outputs to Transmitter Frequency Standards	32 outputs per AMC-32 unit (8 mw minimum into 50 ohms).
Power Input	220/380 vac approximately 180 watts, 50 Hz ±5%.

SECTION 2

INSTALLATION

2-1. INITIAL UNPACKING AND INSPECTION

The Frequency Standard System was assembled, calibrated and tested at the factory before shipment. Inspect all packages for possible damage during transit. With respect to damage to the equipment for which the carrier is liable, The Technical Materiel Corporation will assist in describing methods of repair and furnishing of replacement parts. Carefully unpack each crate as indicated by the packing list provided with the transmitter shipment. Inspect all packing materials for parts that may have been shipped as loose items (cabinet hardware, connectors, technical manuals, etc.).

2-2. POWER REQUIREMENTS

The system requires a single phase source of 220/380 vac, 50 Hz ±5% approximately 100 watts.

2-3. INSTALLATION (Refer to figure 2-1)

A minimum number of assemblies, subassemblies, components and hardware have been disassembled from the equipment and separately packaged, thus reducing the possibility of equipment damage in transit. The method of disassembly and separate packaging also permits realistic equipment handling.

Cables, wires, and other miscellaneous items that are disconnected during equipment disassembly are tagged and taped to the equipment. The information on a given tag indicates the designated terminal on a component to which the tagged item must be connected. Make sure all cables and wires have been connected as designated on tags and that all packing material, tags and tape have been removed before sealing-up the cabinet or section of the cabinet with a front panel drawer.

Refer to the technical manual for Model CSS-2, AMC-32 and BPSA for detailed procedural steps required to install components in the equipment cabinet. Install the CSS-2 and AMC-32 in the equipment cabinet and fasten the front panel to the rack with four screws and four washers (supplied). Connect the CSS-2 and AMC-32 using appropriate cables (supplied). Refer to figure 2-1 for electrical interconnection of all system components. With the unit fully assembled, install the cabinet in the desired location leaving a minimum two foot clearance on the top, front and back for maintenance and installation purposes.

2-4. PRE-OPERATIONAL CHECK

Although the system has been aligned and thoroughly checked against the manufacturer's specifications prior to shipment, it is necessary to ensure correct installation and proper operation by referring to the applicable technical manual to perform the initial checkout of the CSS-2, AMC-32 and BPSA.

SECTION 3

OPERATORS SECTION

3-1. GENERAL

The operating controls on the Frequency Standard System consist of simply setting the units POWER and/or AMPLIFIER switches to their ON positions to apply power to the units. With the POWER and AMPLIFIER switches on, the respective POWER indicators will light indicating ac power and B+ voltage is applied to the units.

Refer to figure 3-1 and make the required patches using patch panels (SPP-4046 and SPP-20Y).

SECTION 4

PRINCIPALS OF OPERATION

4-1. OVERALL BLOCK DIAGRAM ANALYSIS

Figure 4-1 is an overall block diagram of the Frequency Distribution System which consists of two CSS-2 Frequency Standards, AMC-32 Antenna Multicoupler, BPSA-1 Battery Power Supply, and Patch Panels SPP-20Y and SPP-4046.

The BPSA-1 battery supply provides 24 vdc to operate the CSS-2 Frequency Standard Unit when primary ac is not available or not desired. To enable the battery supplied 24 vdc to the CSS-2, the BATT switch (located on the rear apron of the CSS-2) must be set to the IN position. Functionally, the CSS-2 provides three outputs, 1 MHz, 10 MHz and 100 KHz. The highly stable 1 MHz output of the CSS-2 (1 part in 10^9) is routed to the multicoupler input jack, and the 10 MHz and 100 KHz outputs are terminated. The 1 MHz input to the AMC-32 Multicoupler is routed through the Multicoupler to 32 output jacks located on the rear of the Multicoupler. The Multicoupler's output jacks are interconnected to the patch field inputs.

The Patch Panels SPP-4046 and SPP-20Y provide interchangeability of the 1 MHz standards for synthesized transmitters and receivers. The Frequency Standard System contains two CSS-2 Frequency Standards and two AMC-32 Multicouplers, thereby providing the capability of 64 frequency standard inputs to the transmitters or receivers.

SECTION 5

MAINTENANCE AND TROUBLESHOOTING

5-1. INTRODUCTION

The Frequency Distribution System is designed for long term, trouble-free operation. When it becomes necessary to perform alignment and/or adjustments to the equipment, it is recommended that technicians perform the necessary operations outlined in the associated technical manuals. The following maintenance aids are provided for troubleshooting and replacement of parts.

a. Overall block diagram (Section 4, figure 4-1)

b. Interconnection diagram (figure 2-1)

5-2. TEST EQUIPMENT REQUIRED

Table 5-1 lists the test equipment required for maintaining and troubleshooting the system. Refer to the technical manuals for additional equipment required to maintain and troubleshoot associated components within the equipment rack.

TABLE 5-1. TEST EQUIPMENT REQUIRED

EQUIPMENT	TYPE
Frequency Comparator	TMC PFCB-1 or equivalent
Variac	General Radio, W-10MT-3W, or equivalent
Oscilloscope	Tektronix, Model 545, or equivalent

5-3. OPERATORS MAINTENANCE PROCEDURE

a. Refer to operating procedure and applicable technical manual.

b. Refer to troubleshooting (paragraph 5-5).

c. Refer to maintenance procedures described in the applicable technical manuals.

5-4. PREVENTIVE MAINTENANCE

In order to prevent equipment failure due to dust, dirt or other destructive elements, it is suggested that a schedule of preventive maintenance be set up and adhered to. At periodic intervals, the equipment should be pulled out on its slides for internal cleaning and inspection. The wiring and all components should be inspected for dirt, dust, corrosion, grease or other harmful conditions. Remove dust with a soft brush or vacuum cleaner. Remove dirt or grease with any suitable cleaning solvent. Use of carbon tetrachloride should be avoided due to its highly toxic effects. Trichlorethylene or Methyl Chloroform may be used, providing the necessary precautions are observed. For detailed preventive maintenance procedures, refer to the applicable technical manuals.

WARNING

WHEN USING TOXIC SOLVENTS, MAKE CERTAIN THAT ADEQUATE VENTILATION EXISTS. AVOID PROLONGED OR REPEATED BREATHING OF THE VAPOR. AVOID PROLONGED OR REPEATED CONTACT WITH SKIN. FLAMMABLE SOLVENTS SHALL NOT BE USED ON ENERGIZED EQUIPMENT OR NEAR ANY EQUIPMENT FROM WHICH A SPARK MAY BE RECEIVED. SMOKING, "HOT-WORK", ETC. IS PROHIBITED IN THE IMMEDIATE AREA.

CAUTION

When using trichlorethylene, avoid contact with painted surfaces, due to its paint-removing effects.

5-5. TROUBLESHOOTING

Troubleshooting the system consists of isolating faults to either the CSS-2 Frequency Standard or the AMC-32 Multicoupler. Refer to the associated technical manuals for detailed troubleshooting procedures of the CSS-2, BPSA and AMC-32. Refer to checkout procedure for normal indications.

5-6. MAINTENANCE CHECKOUT PROCEDURE

A. Mechanical Inspection

1. Inspect the distribution rack to assure:

   a. All cables are harnessed and routed to preclude pinching, cutting or chafing when a chassis is withdrawn on its slides and tilted for inspection or maintenance.

   b. Chassis tilting and locking facilities lock the chassis on the servicing position.

B. Electrical Inspection

1. Inspect the distribution rack to assure:

   a. Proper installation of and application of AC Power.

   b. Correct termination of all interconnecting cables and plugs.

   c. Adequate protection of all cables from damage.

C. Operational Tests

1. Set the BAT switch (S904) on the CSS-2 Frequency Standards to the IN position. The red BATTERY lamp (DS902) should light.

2. Set the METER SWITCH (S1001) on the BSPA-1 units to the CONDITION position and record the battery condition.

3. Set the CSS-2 AMPLIFIER switch to the ON position.

4. Set the CSS-2 METER FUNCTION switch to the 24 v position and record the BSPA-1 voltage.

5. Set the METER SWITCH (on the BPSA-1) to the DISCHARGE position and record the discharge rate.

6. Calculate the dc voltage for steps 4 and 5 above.

7. Connect power strip to AC Strip AX673. The green POWER lamp (DS901) on the CSS-2 should light and the red BATTERY lamp will go out.

(NOTE: Allow the CSS-2 to warm up for fourteen (14) days before proceeding)

8. Connect the oscilloscope probe to the 100 KHz output jack of standard No. 1 (without releasing the switch) a 100 KHz sine-wave of at least 2.8 volt peak to peak should be observed.

9. Connect the oscilloscope probe to the 100 KHz output jack of standard No. 1 (without releasing the switch) a 10 MHz sinewave of at least 2.8 volt peak to peak should be observed.

10. Connect the oscilloscope probe to the 100 KHz output jack of standard No. 2 (without releasing the switch) a 100 KHz sinewave of at least 2.8 volt peak to peak should be observed.

11. Connect the oscilloscope probe to the 100 KHz output jack of standard No. 2 (without releasing the switch) a 10 MHz sinewave of at least 2.8 volt peak to peak should be observed.

12. Connect the oscilloscope probe to multicoupler No. 1 output jack No. 1 and observe an open circuit. Release the switch and observe a 1 MHz sinewave output.

13. Repeat step 12 for output No. 2 thru No. 32.

14. Repeat steps (12) and (13) for multicoupler No. 2 outputs.

15. Connect the oscilloscope probe to multicoupler No. 2 jacks 1 to 8 and 13 to 16 and observe a 1 MHz output sinewave.

16. Connect the metered variac between the power strip and CA-1068-1-12 of CSS-2 No. 1 and record the AC power.

17. Repeat step 16 for CSS-2 No. 2.

18. Connect the 1 MHz output of CSS-2 No. 1 to the test input of the frequency comparator. Connect the 1 MHz output of the house standard to the reference input. Set the Frequency Comparator for ± 1 part in 10^9 and record the Frequency error for a 24 hour period.

19. Repeat step 18 for CSS-2 No. 2.