TECHNICAL MANUAL

for Models

RTPR-1Y - PROGRAMMER

RDCR-1Y - DECODER

SPER-1F3 - EXCITER

THE TECHNICAL MATERIEL CORPORATION

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

IN 4105

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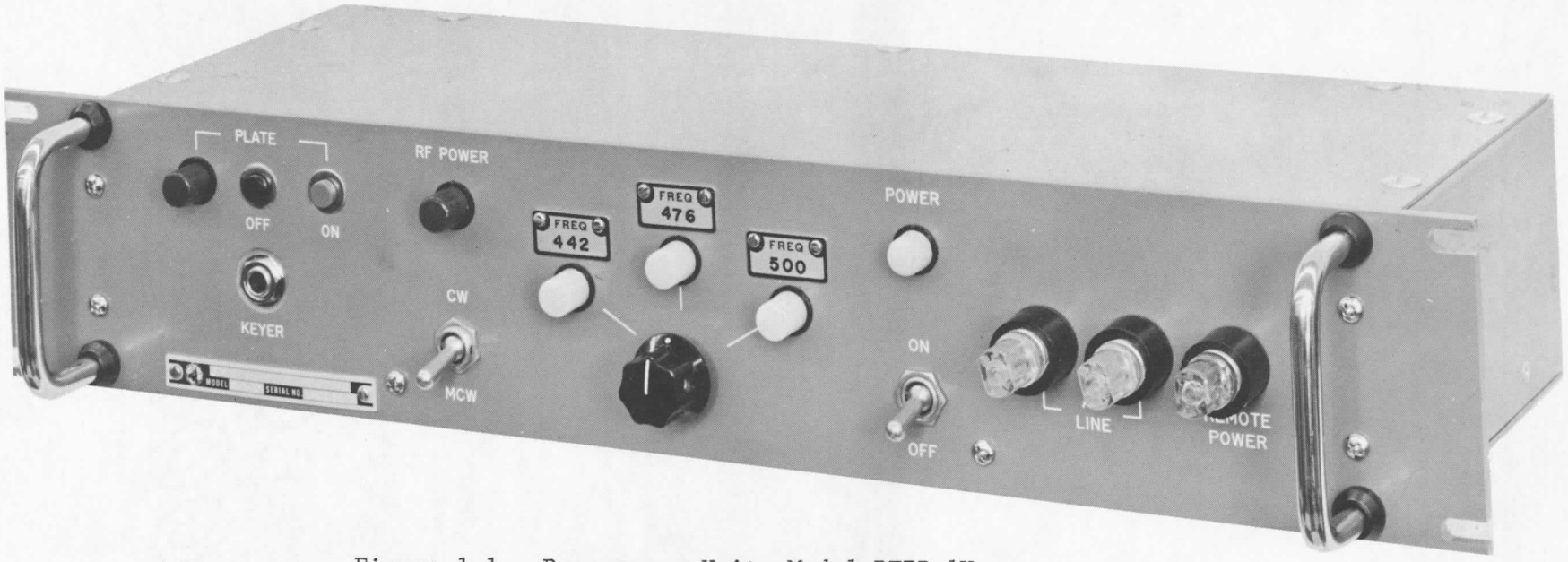

Figure 1-1. Programmer Unit, Model RTPR-1Y

Figure 1-2. Decoder Unit, Model RDCR-1Y.

SECTION 1

GENERAL INFORMATION

1-1. FUNCTIONAL SYSTEM DESCRIPTION (Refer to figure 1-4).

The following medium frequency transmitting system consisting of six interrelated units, is remote controlled and capable of operating on three frequencies; 442KC, 476KC, and 500KC. The transmitter portion of the system can provide 10 kilowatts of peak envelope power. The modes of operation are CW and MCW.

The system consists of the following units: the Broadcast Transmitter Model BCTR-10KYA, which is transmitter 1, the exciter unit, Model SPER-1F3, a customer furnished transmitter which is transmitter 2, the Antenna Tuner containing a pass reject filter network, the Decoder unit Model RDCR-1Y, and the Programmer unit Model RTPR-1Y.

A typical system configuration is shown in figure 1-4. The two transmitters and the Decoder are stationed at Amagansett, Long Island. The Programmer is stationed at Southampton, Long Island and is linked to the Decoder through several teletype loops.

When a frequency or mode selection, or any of the four control functions are sent out from the Programmer, they are coupled to the Decoder through the teletype links.

In the Decoder the command signals are translated and applied to the exciter unit, controlling the BCTR-10K transmitter. When transmitter 2 is operating on either 418KC, or 500KC, the Decoder applies a control voltage to the Antenna Tuner, pass reject circuit, to prevent the output from transmitter 2 from coupling to the output of transmitter 1. It also enables the operating frequency from the BCTR-10K to pass to the antenna. When both transmitters are on 500KC they are shut off.

The Decoder also transfers the readback signals to the Programmer indicating transmitter operation.

1-2. FUNCTIONAL DESCRIPTION OF PROGRAMMER

The Programming unit, Model RTPR-1Y is used for the purpose of remote controlling the BCTR-10KYA transmitter. The command signals are applied to the Decoder through several teletype loops.

The control functions are:

1. Selection of three channels - 442KC, 476KC, or 500KC.
2. Mode control CW or MCW.
3. Key input.
4. Plate ON-OFF.

Provision is made for readback of the following conditions:

1. Actual transmitter channel.
2. RF power/key indication.
3. Plate ON indication.

All control lines are brought to the rear of the programmer to a screw lock connector. The control loops for all controls and readback functions should be 20 ma with polarity as indicated by the interconnect diagram (figure 6-1).

1-3. FUNCTIONAL DESCRIPTION OF DECODER

The Decoder, Model RDCR-1Y translates the command, and feedback signals through a system of relays, it applies the command signals to the BCTR-10K, and applies the feedback signals to the Programmer.

All control inputs are made at the rear through four screw lock connectors. The Decoder is directly wired to the BCTR-10K, the Antenna Tuner, and the transmitter 2.

1-4. FUNCTIONAL DESCRIPTION OF THE EXCITER

The Exciter, Model SPER-1F3 provides approximately 3 volts of excitation to the BCTR-10K. The three crystal controlled operating frequencies are 442KC, 476KC, and 500KC. The unit is capable of either CW or MCW modes of operation. A test key is provided on the front panel for local test use. When the frequency switch is placed in the remote position, one of the three frequencies may be selected by the programmer, and either the CW or MCW mode used.

SOUTHAMPTON LONG ISLAND NY

AMAGANSETT, LONG ISLAND NY

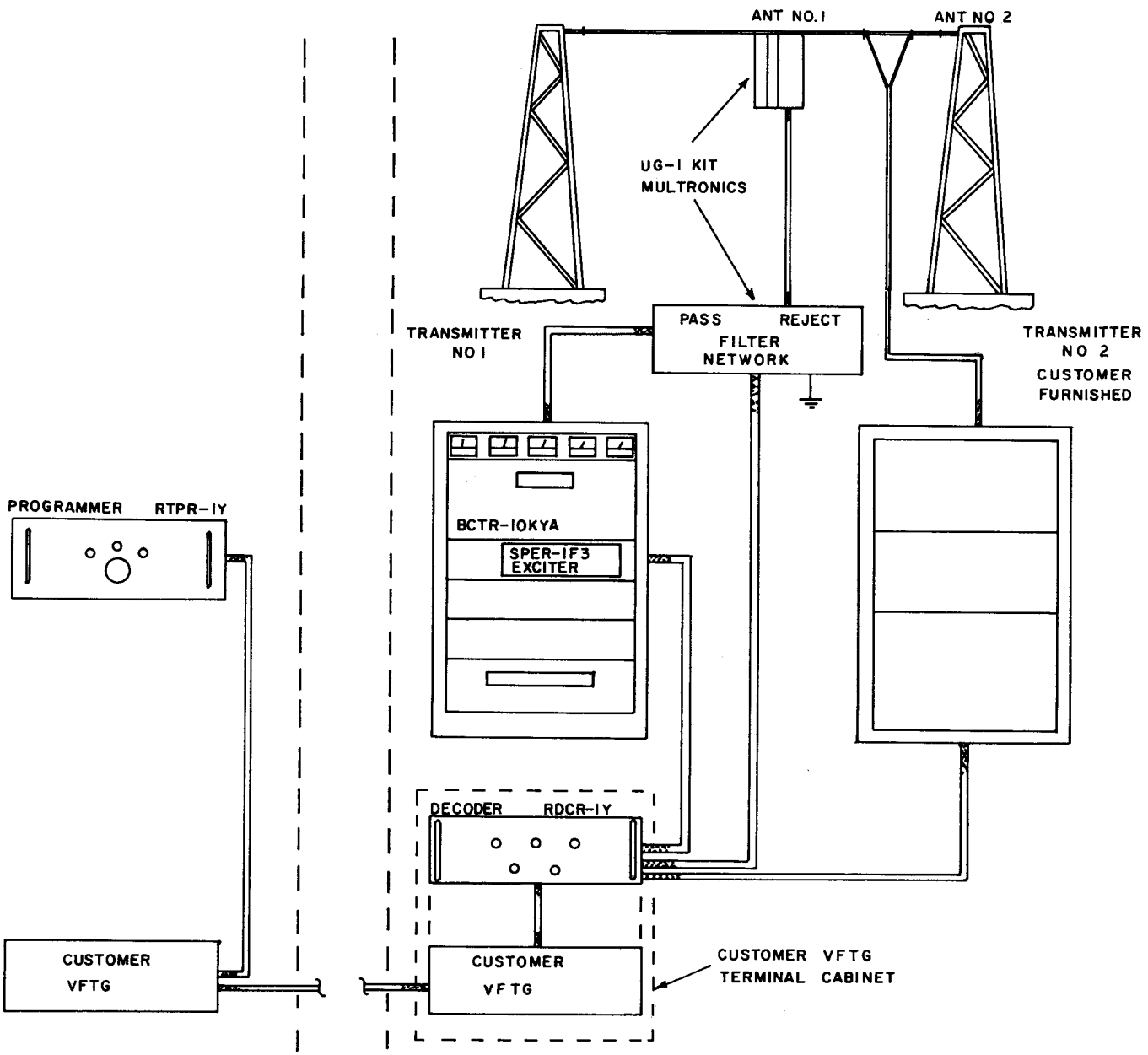

Figure I-4 Medium Frequency Transmitting System

SECTION 2

OPERATOR'S SECTION

2-1 GENERAL

The Exciter model SPER-IF3 contains a minimum of controls, therefore the operation of the unit is easily performed.

The Programmer and Decoder units will not require an operating procedure since there operation is self explanatory by following the front panel control markings.

2-2 PRELIMINARY SETUP PROCEDURE

STEP	OPERATION	INDICATION
1	Place EXCITER POWER OFF/ON switch to ON. (This control is located on the MAIN POWER PANEL of the BCTR-10K transmitter.	Power lamp should light.
2	Turn FREQUENCY SELECT control to each of the three frequencies 442KC, 476KC, and 500KC. Note the output on the FORWARD POWER METER of the BCTR-10K as each selection is made. If the three readings vary turn LEVEL adjust controls until all frequencies read the same as the LOWEST reading on FORWARD POWER meter. The LEVEL adjust controls should not be adjusted every time a frequency selection is made after the above procedure has been performed.	All readings on FORWARD POWER meter should be the same for each frequency.

NOTE

The Normal tuning procedure may now be performed.

2-3 LOCAL TUNING PROCEDURE

STEP	OPERATION	INDICATION
1	Place EXCITER POWER OFF/ON switch to ON.	POWER Lamp should light.
2	Turn Frequency select control to desired FREQUENCY.	The selected frequency indicator lamp should light.
3	Turn EMISSION switch to desired mode.	The selector mode indicator should light.

2-3 LOCAL TUNING PROCEDURE (cont.)

STEP	OPERATION	INDICATION
4	Adjust OUTPUT control as required.	Indication may be seen on FORWARD POWER METER of BCTR-10K transmitter.
5	Place TEST KEY to ON or MOMENTARY position.	

2-4 REMOTE OPERATION

1	For REMOTE operation place FREQUENCY SELECT control to the REMOTE position.	

NOTE

System will now be controlled by the Programmer.

SECTION 3

PRINCIPLES OF OPERATION

3-1. GENERAL

The following circuit description will first describe the operation of the exciter unit SPER-1F3 individually, in a local condition. The Programmer, the Decoder, and the BCTR-10K will then be described in a system configuration, with the SPER-1F3 in a remote condition.

3-2. CIRCUIT DESCRIPTION (Refer to figure 6-2).

a. CW OPERATION.- The exciter can be operated from a remote or local position. The unit is shown in the remote condition in Schematic Diagram figure 6-2.

To describe the circuit operation for local control, switch S1 will be shown in the 442KC position. This simultaneously places the transmitter in the test key position.

The unit will be described for the CW mode of operation first, therefore the emission switch will be placed at CW.

Primary Power is applied to the exciter by the on-off switch located on the exciter drawer. The on position allows 220 vac to be applied to the primary of input transformer T1, which energizes the 24 vdc bridge rectifier. The 24 vdc supply voltage then lights CW indicator lamp DS5. The supply voltage also energizes relay K1 and lights the 442KC indicator lamp DS1. The ground to complete the relay circuit is provided by switch S1. The closed contacts 9 and 11 of K1 route the 220 vac primary voltage through pin L of J1. The 24 vdc supply voltage flows through the closed contacts 1 and 3 of K1 and turns on gating transistor Q1 by biasing the base circuit. The 442KC crystal oscillator is now able to operate. The circuit consists of the following components. NPN transistor stage Q1, crystal Y1, capacitors C1 and C2, and FET oscillator stage Q4. Capacitors C1 and C2 are a voltage divider network that sets the gain of the stage.

The 442KC output signal generated by the oscillator is coupled to pin 3 of FET modulator stage Q5 through C12.

When the test key is depressed either to the on position or the momentary position, a ground is placed on the shaper stage Q11 making it operate. The shaper circuit Q11 refines the signal applied to pin 4 by delaying the keying pulses through the resistor capacitor network R40, C25 and R41, C26. When the ground is removed, Q11 deenergizes and the stored signal from the RC network is applied to pin 4 of the modulator, biasing the stage off for that instant, when the key is depressed to ground again Q11 builds up the charge in the RC network, this operation happens many times a second as keying is applied.

The CW output signal is then coupled to RF amplifier Q6 through coupling capacitor C16.

With K1 energized contacts 6 and 7 close, placing level adjust resistor R2 in the emitter circuit of Q6 providing a point where the RF signal level may be varied. The amplified output signal from Q6 is then directly coupled to the base of the emitter follower driver stage Q7. The output comes off the emitter of Q7 and is applied to the base of output amplifier stages Q8 and Q9 configured in a complementary symmetry circuit alternately biasing Q8 and Q9 into conduction. The output is then routed through RF output level adjust resistor R1 to output jack J2.

The output amplifiers Q8 and Q9 also conduct and cut-off in time with the keyer.

b. MCW OPERATION. - When the front panel emission switch is turned to the MCW position a ground is applied to the indicator lamp DS4, making it light, and a ground is also placed on the base emitter circuit of the 400 cps tone generator setting it into operation. The 400 cps tone is coupled to pin 2 of the modulator stage Q5 through modulation level adjust resistor R21. The mixing action of the modulator varies the 442KC carrier in relation to the 400 cps tone and therefore produces the modulated carrier signal from pin 1 of modulator stage Q5. The remaining circuit operation stays the same as in CW operation.

c. RELAY DRIVER STAGE.- The relay driver stage Q10 remains in a non-conductive state until a ground is applied by the keying circuit. The wiper of K4 is held in the normally closed position by the application of 24 vdc to the coil.

When relay K5 is used for remote keying, or the local test key S3 is used, a ground is applied to the base of Q10 making the transistor conduct and pull the wiper of K4 to the normally open relay coil. The wiper is held in this position until the last character is transmitted, and the keying circuit is opened.

When the wiper of K4 is in the normally open position the bias circuit is closed to the driver and PA tubes of the BCTR-10K, by the closing of the PTT relay K303 in the driver drawer, allowing the tubes to conduct.

When the wiper of K4 is in the normally closed position, the relay driver stage Q10 is non-conducting and bias is removed from the driver and PA tubes.

d. REMOTE OPERATION.- Switch S1 is shown in the remote position with the ground supplied for the operating relay K1 applied at a remote position through pin B of jack J1. Relay K1 is now able to operate and the 24 vdc supply voltage to operate the 442KC crystal oscillator is applied to Q1.

The remaining circuit operations are the same as described in the local condition. The only exception occurs in the area of keying. A keying voltage is now applied to pins 7 and 8 from a remote position to operate keying relay K5.

e. LOCAL CONTROL OF PLATE VOLTAGE (Refer to figure 6-2). - The plate voltage of the BCTR-10K may be controlled from the front panel of the Exciter, by turning switch S1 to the local position. In the remote position plate voltage is controlled from the programmer. When S1 is in the local position, wafer B closes the 28 vdc supply circuit to the HV contactor K301 in the BCTR-10K providing plate voltage to the transmitter.

3-3. SYSTEM CIRCUIT DESCRIPTION.

a. FREQUENCY SELECTION (Refer to figure 3-1). - The Schematic Diagrams figures 6-3 and 6-4 show the system set up for an operating frequency of 442KC, in the CW

mode. The system will be described for 442KC operation but switch S3 on the Programmer will be placed in the MCW mode.

When switch S4 on the Programmer is in the 442KC position (as shown on figure 6-3) a 20 ma teletype loop between relay K8 in the Decoder and switch S4 is closed. Relay K8 is then energized.

The frequency selection switch S1A in the exciter places a ground on the common lead passing through pin A of jack J1. The ground is extended to the Decoder, where it goes through the closed contacts of de-energized relay K7 and the closed contacts of energized relay K8. It is then routed back into the exciter through pin B, providing a ground for the 442KC relay K1 to make it energize.

b. MODE SELECTION (Refer to Figure 3-2). - To enable MCW operation switch S3 on the Programmer is turned to the MCW position closing the teletype loop between relay K9 in the decoder and switch S3. Relay K9 is then energized. This extends the ground on switch S1C through pin F of J1 in the exciter to the closed contacts of relay K9. The ground is then routed back to the exciter through pin E of J1 to activate the tone generator producing the modulating tone for MCW operation when keying is applied.

c. REMOTE KEYING OPERATION (Refer to Figure 3-3). - A keying unit is provided for on the Programmer front panel by jack J1. When an external keying unit is plugged into jack J1 a 20 ma circuit extends from the Programmer to the teletype terminal equipment through the Decoder to key relay K5 in the exciter.

d. READBACK INDICATION CIRCUIT OPERATION (Refer to Figure 3-4). - When an operating frequency such as 442KC has been selected by the Programmer, the command signal is applied to the BCTR-10K making it tune to the selected frequency.

When the BCTR-10K is tuned to 442KC a -28 vdc supply voltage is applied to relay K3 in the Decoder. One set of contacts on K3 close a 24 vac supply circuit from transformer T1. The 24 vac flows through the 442KC indicator DS1, to the closed contacts of relay K3, through the contacts of de-energized relay K5 to the ground side of T1, lighting the 442KC indicator on the Decoder front panel.

The other set of closed contacts of K3 close the teletype loop between relay K2 in the Programmer and relay K3 in the Decoder. When relay K2 is energized the 12 vac supply voltage from the Programmer power supply is routed through the 442KC indicator to the closed contacts of K2, to the closed contacts of de-energized relay K1 grounding the circuit and lighting the 442KC indicator on the Programmer front panel.

e. PLATE ON READBACK INDICATION (Refer to Figure 3-5). - When high voltage is applied to the plate of the BCTR-10K transmitter the plate on indicator lamp on the front panel of the Programmer lights.

The -28 vdc supply voltage from the transmitter is applied to relay K6 in the Decoder. When K6 is energized, the closed contacts of the relay close the teletype loop between the Decoder and the Programmer and energize relay K3. The ac supply voltage from the Programmer Power Supply is applied to the plate on lamp through to the closed contact of relay K3, to the ground, causing the plate on lamp to light.

f. PLATE ON-OFF CONTROL (Refer to Figure 3-6). - To apply plate voltage to the BCTR-10K transmitter from a remote position, switch S2 must be depressed on the Programming unit.

When S2 is depressed relay K1 is energized in the Decoder, by the closing of the teletype loop between S2 and K1.

When K1 is energized the -28 vdc supply voltage from the transmitter passes through the closed relay contacts and is routed to the coil of the plate on-off relay closing the interlock circuit and allowing plate voltage to be applied to the transmitter.

When switch S1 is depressed on the programming unit relay K2 in the decoder is energized and the -28 vdc supply voltage is routed through the closed contacts of K2 to the coil of the plate on-off relay opening the contacts and removing plate voltage.

Switches S1 and S2 are momentary controls and must be held in while observing the plate on indicator.

g. RF OUTPUT INDICATION - (Refer figure 3-7). - When the contacts of relay K200 in the BCTR-10K transmitter close, the teletype loop is closed between the RF indicator transistor Q1 in the Programmer and the contacts of relay K200.

The RF indicator circuit in the Programmer operates in the following manner. When a negative voltage is applied to the base of Q1 the transistor will turn on and light the RF power indicator.

The same operation occurs when the transmitter is being keyed. In the key condition the RF power indicator reflects the actual keying.

h. PASS REJECT CIRCUIT OPERATION (Refer to figure 3-8A and B). - The Decoder is interconnected to the BCTR-10K transmitter, which is transmitter 1, a customer furnished transmitter, which is transmitter 2, and the Antenna Tuner.

When a desired operating frequency is to be transmitted through the BCTR-10K the Decoder circuitry is set into operation for that particular frequency.

The Decoder receives a -28 vdc feedback signal from the BCTR-10K, indicating whether the operating frequency is 442KC, 476KC, or 500KC by its application to a specific relay in the Decoder. If 442KC were the selected frequency relay K3 would become energized. If 476KC were the selected frequency relay K4 would become energized. If 500KC were the selected frequency relay K5 would become energized.

When transmitter 2 is operating on 418KC, relay K16 is energized in the Decoder. When K16 is energized one of the following three relays, involved between the Decoder and the Antenna Tuner is energized. If 442KC were the selected frequency, relay K10 would be energized. If 476KC were the selected frequency relay K12 would be energized. If 500KC were the selected frequency relay K14 would be energized.

When transmitter 2 is operating on 500KC, relay K16 in the Decoder is de-energized, and one of the following three relays involved between the Decoder and Antenna Tuner is energized. If 442KC were selected K11 would be energized. If

476KC were selected K13 would be energized. If 500KC were selected K15 would be energized.

In an energized condition the relay involved closes the circuit and allows the -28 vdc interlock circuit voltage from the BCTR-10K to pass into the antenna tuner where the interlock circuit is completed by a switch closure, this allows the BCTR to operate.

A 220 vac voltage also flows through the other set of closed contacts of the relay involved and is applied to the Antenna Tuner filter network where the 418KC or 500KC signal from transmitter 2 is impeded before it can couple to the output of transmitter 1. The 220 vac also conditions the filter network to pass the operating frequency to the antenna.

A typical circuit operation is as follows: When an output frequency of 442KC is desired from transmitter 1, a -28 vdc signal from the BCTR-10K energizes relay K3. When K3 is energized the following circuit operation takes place. A 24 vac signal is applied to one side of the 442KC indicator lamp DS1. The other side of the indicator lamp is grounded through the closed contacts of energized relay K3, and the closed contacts of de-energized relay K5 returning to the ground side of transformer T1.

Relay K16 is also energized at this time with the grounding circuit completed through the 418KC indicator circuit through to transmitter number 2.

When relay K16 is energized relay K10, becomes energized and K12 and K14 are de-energized.

When relay K10 is energized the Antenna Tuner is conditioned to pass the 442KC signal and reject the 418KC signal.

If 476KC had been selected as the operating frequency, relay K12 would have been energized and conditioned the antenna tuner to pass 476KC and reject the 418KC signal.

If 500KC had been selected as the operating frequency relay K14 would have been

energized and conditioned the Antenna Tuner to pass the 500KC and reject the 418KC signal from transmitter 2.

When relay K16 is de-energized either relay K11, or K13, is energized and pass either the 442KC or 476KC signal from the BCTR and reject the 500KC signal from transmitter 2.

Relay K15 may also be energized when K16 is de-energized. When K15 is energized the interlock circuit in transmitter 2 opens up and shuts transmitter 2 off, since both transmitters are on 500KC.

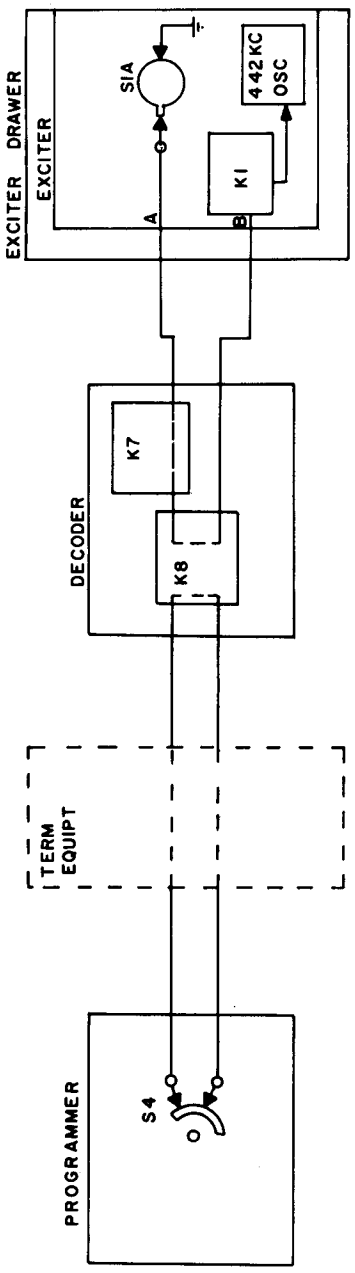

Figure 3-1. Remote Frequency Selection

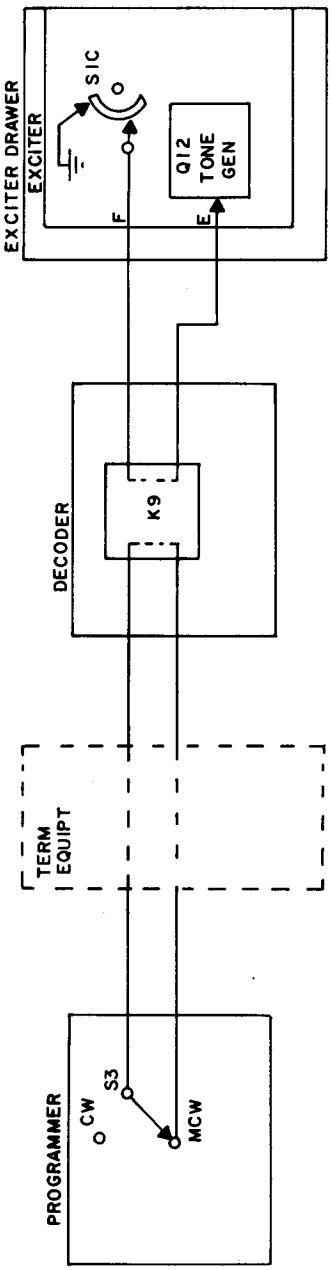

Figure 3-2. Mode Selection

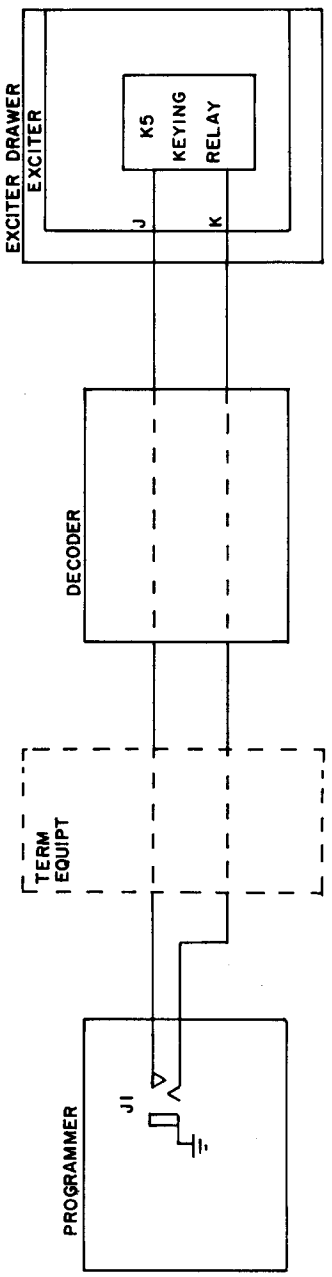

Figure 3-3. Keying Circuit

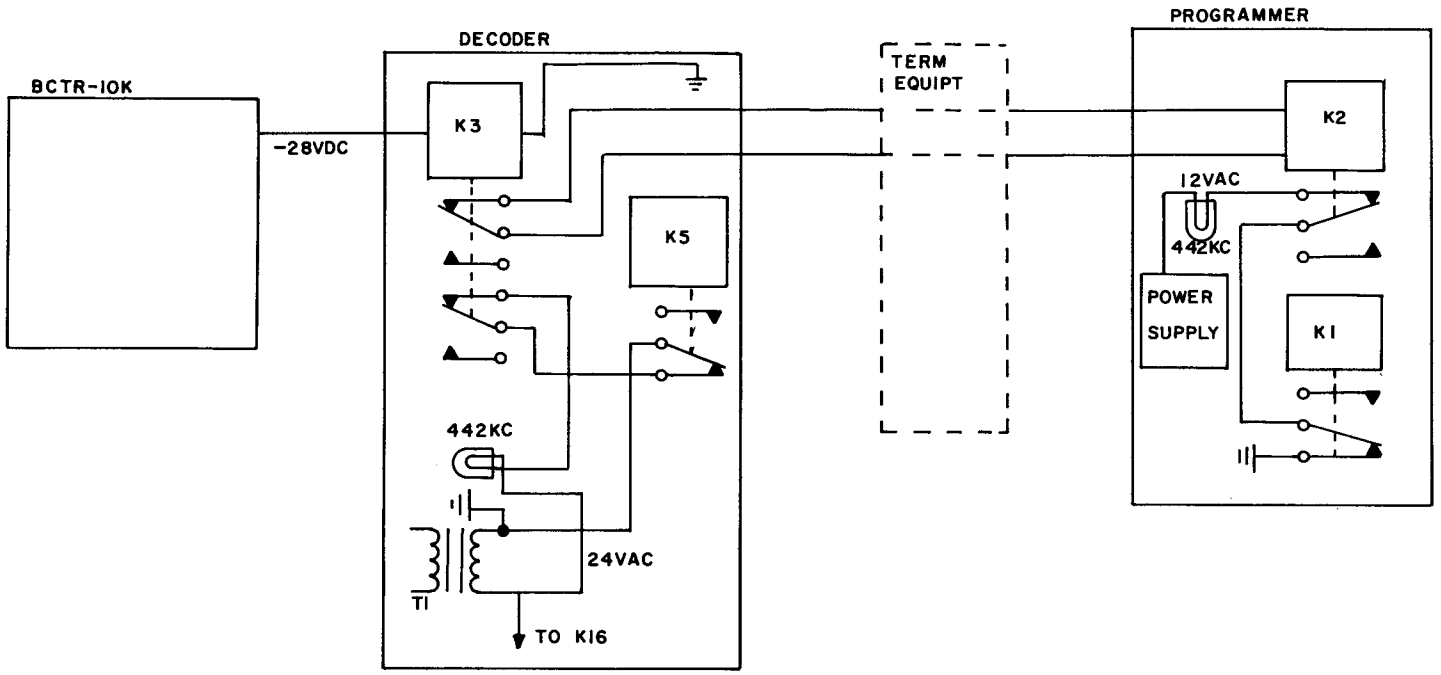

Figure 3-4 Freqency Readback Indication

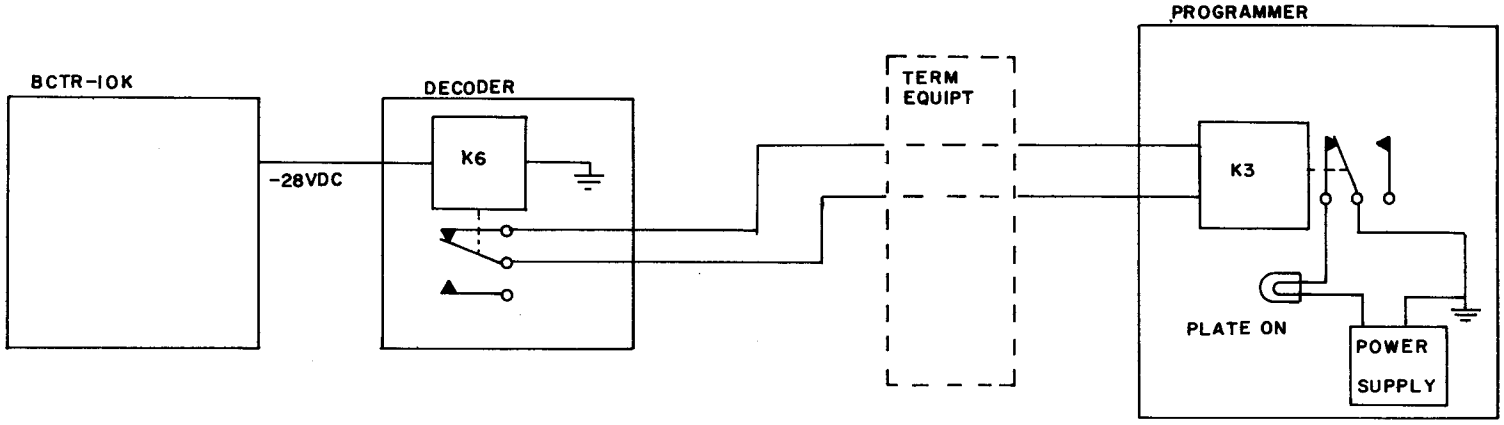

Figure 3-5 Plate ON Indication

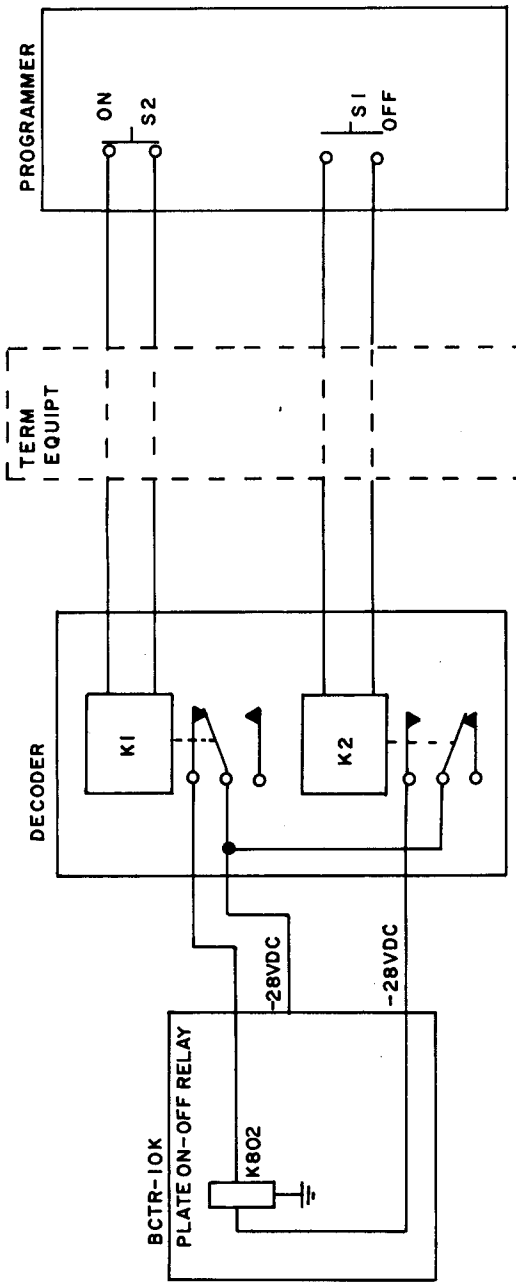

Figure 3-6 Plate ON-OFF Control

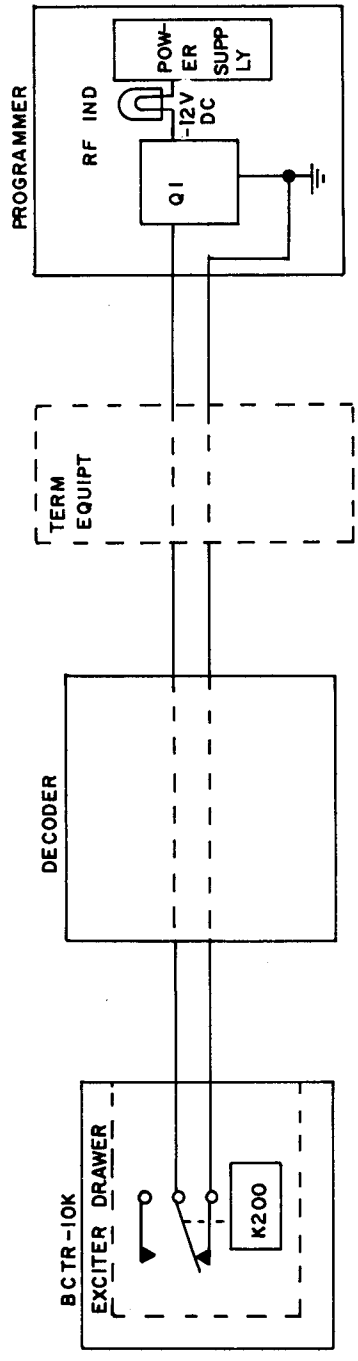

Figure 3-7 RF Output Indication

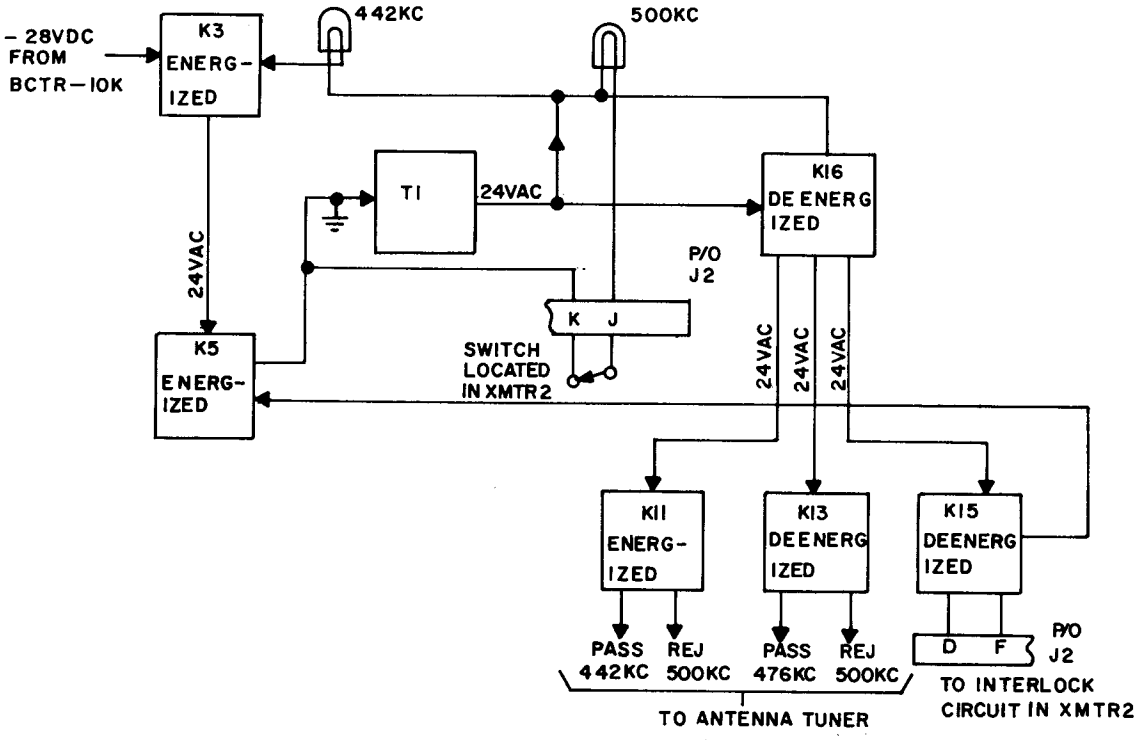

Figure 3-8A Pass Reject Diagram For 442 KC

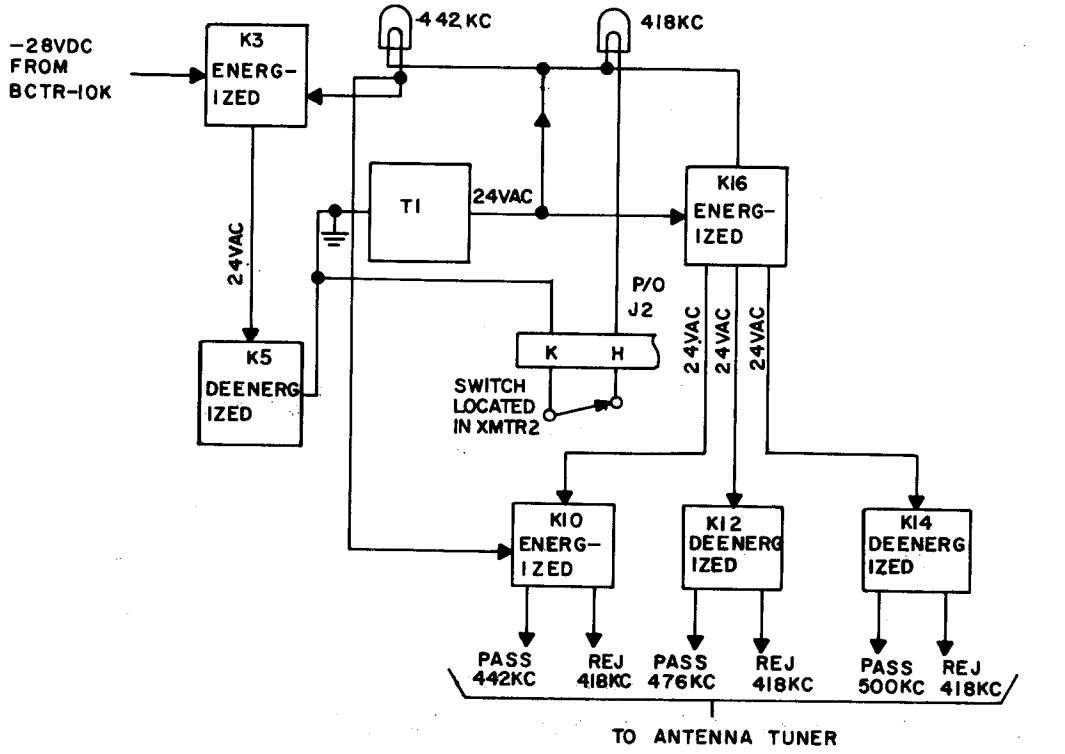

Figure 3-8B Pass Reject Diagram For 442KC

SECTION 4

MAINTENANCE

4-1. 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 removed from its mounting for 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. Trichlorethylene or methylchloroform may be used, providing the necessary precautions are observed.

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.

TABLE 4-1. TEST EQUIPMENT AND TOOLS

TEST EQUIPMENT	TYPE
Oscilloscope	Tetktronix Type 545A with Type L plug in unit or equivalent.
Electronic Counter	Hewlett Packard, HP5244L or equivalent.
Vacuum Tube Voltmeter	Hewlett Packard, HP410C, or equivalent.
T Connector	UG274A/U

TABLE 4-1. TEST EQUIPMENT AND TOOLS (CONT.)

TEST EQUIPMENT	TYPE
Dummy Load 47 ohm 1/2 W.	TMC Part No. DL100, or equivalent.
Connnector, 34 pin.	TMC Part No. JJ333-34S-RS.
Alignment Tool.	JFD. #5284, TMC Part No. TP119-1 or equivalent.
12V DC 20 ma source Power Supply or Battery.	

WARNING

Circuit checks and alignment procedures should be performed by qualified technical personnel. Voltages are present in the unit that can be harmful to life if handled carelessly.

4-2. DC VOLTAGE MEASUREMENTS.

When DC voltage measurements are made refer to table 4-2 Voltage Chart. The readings on the VTVM should be as they appear on the chart, with a ±15% tolerance.

Before performing the tests; set the controls as follows:

1) Turn RF Output control R1, to minimum (CCW).

2) Turn Frequency switch S1, to 442KC.

3) Turn Emission switch S2, to CW.

4) Place Test Key ON.

5) Turn Modulation Level adjust R21, to minimum (CCW).

6) Plug 34 pin connector into J1.

7) Plug power input cable into 220V, 60CPS. AC source.

8) Measure DC voltages with Vacuum Tube Volt Meter.

4-3. REMOTE SWITCHING FUNCTION TEST.

When testing the remote switching function set the controls as follows:

1) Set Frequency switch S1, to REMOTE. This disables switches S1 and S3.

2) Observe the following voltages and Indicator lights as pins are connected at J1.

CONNECT PINS	INDICATOR LIGHT ON		MEASURE 220 VAC BETWEEN PINS
A to B	DS1	442KC	S and L
A to C	DS2	476KC	S and M
A to C	DS3	500KC	
A to D	DS4	MCW	
F to E	PS5	CW	
(ALWAYS ON)	DS6	POWER	

3) Apply a +12V 20 ma Source (12V battery) positive to pin J negative to pin K and measure for continuity (approx. 0 ohms) between pin "A" and chassis at J1.

4-4. LOCAL SWITCHING TEST

When making a Local switch test, Set the controls as follows:

1) Turn frequency switch S1 to 442KC, to 472KC and 500KC. In turn, indicators DS1, DS2, and DS3 should light.

2) Turn Emmission switch S2 to the MCW and CW position. In turn Indicator DS4 and DS8 should light.

4-5. ALIGNMENT PROCEDURE.

To align Crystal Oscillators, Y1-Q4, Y2-Q4, and Y3-Q4, perform the following procedure:

1) Turn switch S1 to 442KC, and as required.

2) Turn switch S2 to CW.

3) Turn switch S3 to ON.

4) Turn R1 to minimum or as required to drive counter.

5) Turn R2, R3, R4 to maximum output (clockwise).

6) Turn R21 to mimimum (CCW).

7) Connect Oscilloscope to base of Q6 and ground.

8) Connect Electronic Counter to J2 output jack, through T Connector, and Dummy Load.

9) Tune Frequency Adjust Trimmer C1, for maximum crystal activity (maximum output) rather than precise frequency. This ensures good stability and quick starting. Frequency shall be 442KC ±42 cps. Use Alignment Tool.

10) Tune Level Adjust Trimmer C2 to maximum output. The output at the base of Q6 shall be 225 mv pp ±20%.

11) Set S1 to 476KC, adjust C3 and C4 as per items 9 and 10 above.

12) Set S1 to 500KC, adjust C5 and C6 as per items 9 and 10 above.

13) After the above steps have been performed; follow the procedure below to equalize the outputs of the three channels.

    1) Select the channel with the lowest output (at the base of Q6).

    2) Turn Switch S1 to the other applicable 2 channels and reduce their output levels to the same value by adjusting C2, C4 or C6. Thus delivering a constant level of carrier from channel to channel.

4-6. TONE GENERATOR ALIGNMENT.

To align the Tone Generator Q12 perform the following procedure:

1) Turn switch S1 to 442KC.

2) Turn switch S2 to MCW.

3) Turn R21 to maximum output (CW).

4) Turn R1, R2, R3, and R4 same as indicated in items 4 and 5 of crystal alignment procedure.

5) Connect Electronic Counter, thru 50 ohm cable with clip lead end connected to C27 on the arm side of R21. Connect the shielded lead of cable to ground.

6) Tune L5 to 400 cps.

7) Remove Counter and substitute oscilloscope. Output voltage should be approximately 3.0 vpp.

8) Reset R21 to mimimum.

4-7. MODULATION LEVEL ADJUSTMENT.

1) Set controls as per items (1), (2), (3), (4), (5), and (6) of paragraph 4-5.

2) Connect 47 ohm dummy load to J2 output jack.

3) Connect Oscilloscope through T Connector to output jack J2.

4) Turn R1 RF Output, to produce 4vpp on scope. Wave shape should be sign of excellent quality.

5) Set Emission Switch S2 to MCW.

6) Turn Modulation Level Adjust until Voltage on Oscilloscope equals 7.2vpp. (equivalent to 80% Modulation).

4-8. LEVEL CONTROL ADJUSTMENTS:

1) Set Controls as follows:

    1) Turn output control R1 to maximum output.

    2) Turn Frequency Switch S1 to 442KC.

    3) Turn Emission Switch S2 to CW.

    4) Turn Test Key S3 to ON.

2) Set R2 to produce 7.2vpp at output jack J2.

3) Set S1 to 476KC, adjust R3 to produce 7.2vpp at output jack J2.

4) Set S1 to 500KC, adjust R4 to produce 7.2vpp at output jack J2.

NOTE

R2, R3, and R4 provides capability of altering the relative level of a particular channel whether in the CW or MCW mode without affecting the percent of modulation in the MCW mode, thus providing more or less drive to a transmitter at a particular channel.

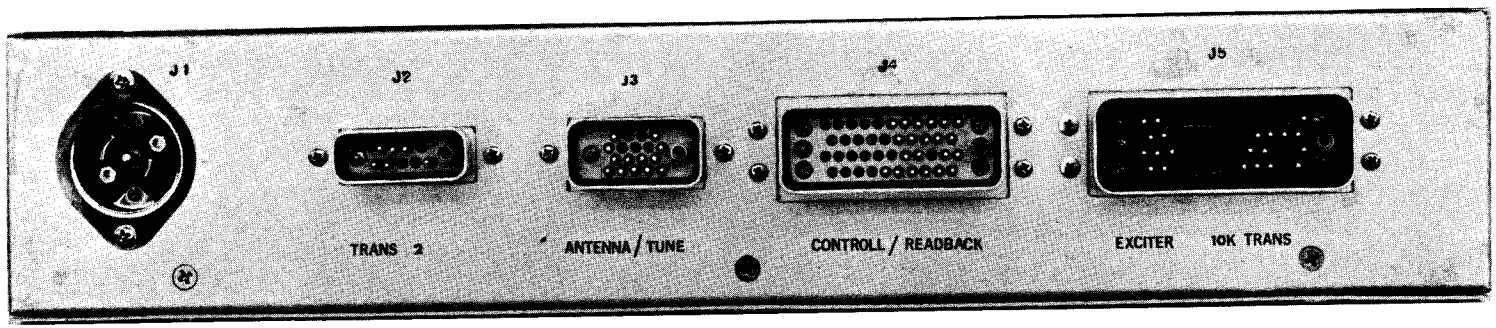

Figure 4-1 Rear View of Decoder Unit

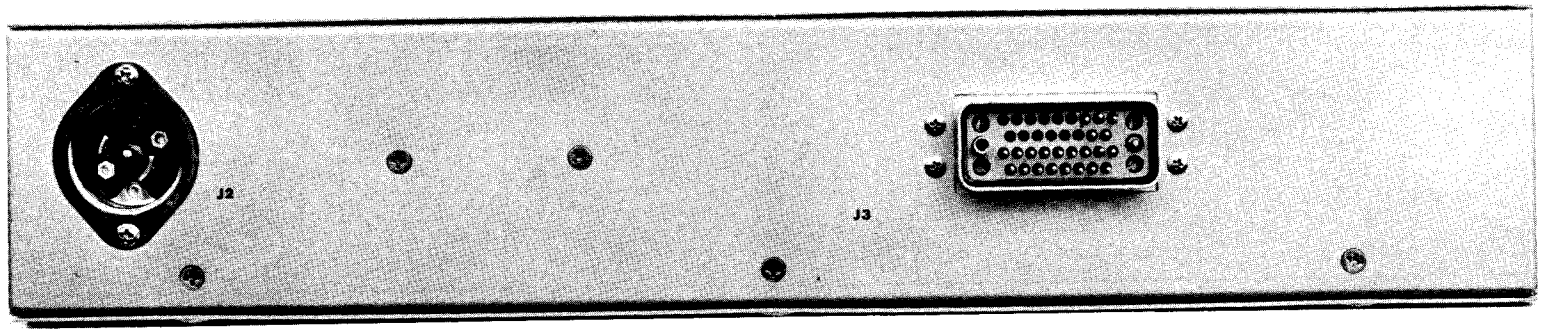

Figure 4-2 Rear View of Programmer Unit

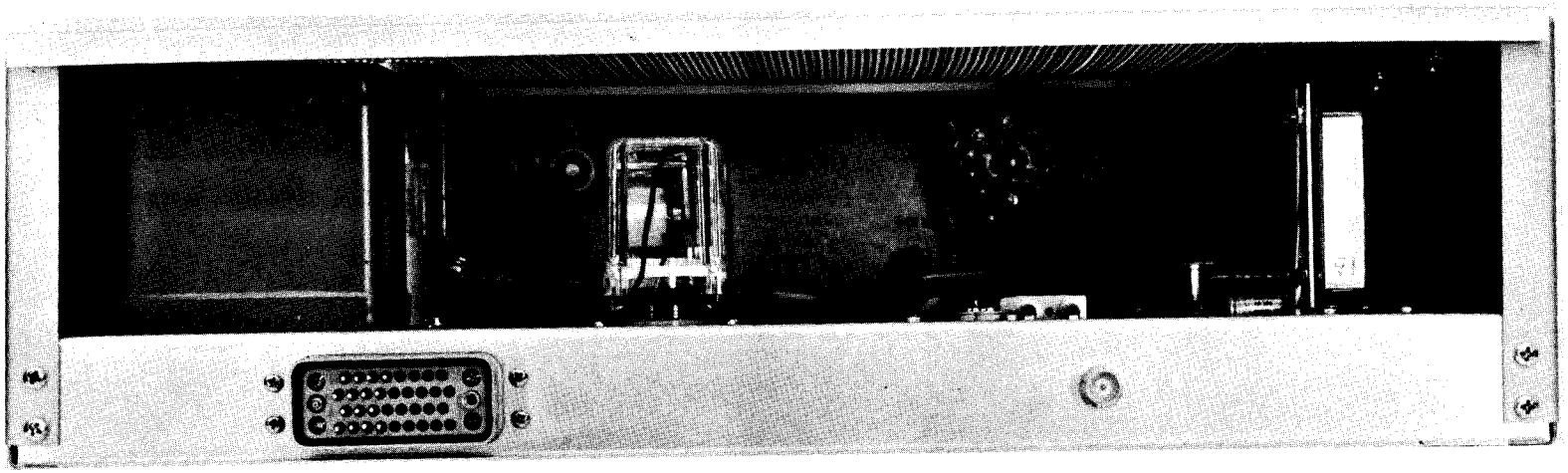

Figure 4-3 Rear View of Exciter Unit

Table 4-2. DC Voltage Chart

SYMB.	TYPE & FUNCTION	F E T				TRANSISTOR			CONDITIONS	
		PIN 1	PIN 2	PIN 3	PIN 4	EMITTER	BASE	COLLECTOR		
Q1	2N3646 GATE					+13.8V	+14.3V	+14V		S1 ON 442KC
Q2	2N3646 GATE					+13.8V +13.8V	+14.3V +14.3V	+14V +14V		S1 ON 476KC
Q3	2N3646 GATE					+13.8V	+14.3V	+14V		S1 ON 500KC
Q4	3N128 OSCILLATOR	+10.5V	+2V	0	+2V					
Q5	3N141 MODULATOR	+12V	0	0	+6.9V +0.17V					KEY OFF KEY ON
Q6	2N3646 RF AMPL.					+1.5V	+2.2V	+13.3V	NOTE 1	ZERO SIGNAL KEY ON
Q7	2N3646 DRIVER					0	+13.3V	+24V	NOTE 1	
Q8	2N3053 OUTPUT					+12.8V	+13.3V	+24V	NOTE 1	
Q9	2N1132 OUTPUT					+12.4V	+11.8V	0	NOTE 1	
Q10	2N3646 RELAY DRIVER					0 0	+0.68V +0.77	+21.5V +0.3V		KEY OFF KEY ON
Q11	2N3646 SHAPER					+6.9V +0.17V	+6.9V +0.88V	+6.9V +0.3V		KEY OFF KEY ON
Q12	2N3646 TONE GEN.					+2.3V	+2.6V	+12V		EMISSION MCW
Q13	2N1488 REGULATOR					+24V	+24V	+52V		

NOTE 1: MAY FIND IT NECESSARY TO REMOVE ONE OF THE CRYSTALS FOR ZERO SIGNAL IN ORDER TO OBTAIN VOLTAGES GIVEN.

SECTION 5

PARTS LIST

5-1. INTRODUCTION

The parts list presented in this section is a cross-reference list of parts identified by a reference designation and TMC part number. In most cases, parts appearing on schematic diagrams are assigned reference designations in accordance with MIL-STD-16. Wherever practicable, the reference designation is marked on the equipment, close to the part it identifies. In most cases, mechanical and electro-mechanical parts have TMC part numbers stamped on them.

To expedite delivery when ordering any part, specify the following:

a. Reference symbol.

b. Description as indicated in parts list.

c. TMC part number.

d. Model and serial numbers of the equipment containing the part being replaced; this can be obtained from the equipment nameplate.

For replacement parts not covered by warranty (refer to warranty sheet in front of manual), address all purchase orders to:

The Technical Materiel Corporation
Attention: Sales Department
700 Fenimore Road
Mamaroneck, New York

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
CR3	SEMICONDUCTOR, DEVICE, DIODE	IN4245
K1	RELAY, ARMATURE	RL156-14
K2	SAME AS K1	
K3	SAME AS K1	
R1	RESISTOR, FIXED, COMPOSITION	RC32GF222J
R2	SAME AS R1	
R3	SAME AS R1	
T1	TRANSFORMER, POWER, STEP DOWN	TF245
XK1	SOCKET, RELAY	TS171-1
XK2	SAME AS XK1	
XK3	SAME AS XK1	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
DS1	LAMP, INCANDESCENT	BI110-7
DS2	LAMP, INCANDESCENT	BI110-6
DS3	SAME AS DS1	
DS4	SAME AS DS1	
DS5	SAME AS DS1	
DS6	SAME AS DS1	
J1	CONNECTOR, RECEPTACLE	JJ033
S1	SWITCH, PUSH	SW296-2
S2	SWITCH, PUSH	SW296-1
S3	SWITCH, TOGGLE, DPST	ST22N
S4	SWITCH, ROTARY	SW510
S5	SWITCH, TOGGLE, DPST	ST22K
XDS1	LIGHT, INDICATOR	TS153-8
XDS2	LIGHT, INDICATOR	TS153-11
XDS3	LIGHT, INDICATOR	TS153-12
XDS4	SAME AS XDS3	
XDS5	SAME AS XDS4	
XF1	FUSEHOLDER, INDICATOR	FH104-3
XF2	SAME AS XF1	

CHAS. ASSY, WRP
BMA - 348

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1	CAPACITOR, FIXED, CERAMIC	CC100-37
C2	SAME AS C1	
J2	CONN, RECEPTACLE	JJ175
J3	CONN, RECEPTACLE	JJ333-34P-FS34

BD ASSY, PC
A4772

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1	CAPACITOR, FIXED, ELECTROLYTIC	CE105-50-25
CR1	SEMI-CONDUCTOR DEVICE, DIODE	IN4245
CR2	SAME AS CR1	
Q1	TRANSISTOR	2N3905
R1	RESISTOR, FIXED, COMPOSITION	RC07GF332J
R2	RESISTOR, FIXED, COMPOSITION	RC20GF561J
R3	RESISTOR, FIXED, COMPOSITION	RC32GF560J
R4	SAME AS R3	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
CR1	SEMICONDUCTOR, DEVICE, DIODE	IN4245
CR2 thru CR9	SAME AS CR1	
K1	RELAY, ARMATURE	RL156-14
K2	SAME AS K1	
K3	RELAY, ARMATURE	RL156-1
K4 thru K6	SAME AS K1	
K7 thru K9	SAME AS K1	
K10	RELAY, GENERAL PURPOSE	RL168-2C-10-24AC
K11 thru K15	SAME AS K10	
K16	RELAY, GENERAL, PURPOSE	RL168-3C-10-24AC
R1	RESISTOR, FIXED, WIRE WOUND	RW109-6
R2	RESISTOR, FIXED, COMPOSITION	RC32GF560J
R3	RESISTOR, FIXED, COMPOSITION	RC32GF222J
R4 thru R7	SAME AS R3	
T1	TRANSFORMER, POWER, STEP DOWN	TF245
XK1	SOCKET, RELAY	TS171-1
XK2 thru XK9	SAME AS XK1	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
XK10	SOCKET, ELECT. TUBE	TS100-3
XK11 thru XK15	SAME AS XK10	
XK16	SOCKET, ELECT, TUBE	TS100-5

CHAS. ASSY, WRP
BMA - 354

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
J1	CONN, RECEPTACLE	JJ175
J2	CONN, RECEPTACLE, EL	JJ333-9P-FS34-6
J3	CONN, RECEPTACLE, EL	JJ333-18P-FS34-13
J4	CONN, RECEPTACLE, EL	JJ333-42P-FS34-21
J5	CONN, RECEPTACLE, EL	JJ333-50P-FS34-21

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
DS1	LAMP, INCANDESCENT	BI110-7
DS2 thru DS6	SAME AS DS1	
XDS1	LIGHT, IND	TS153-5
XDS2	LIGHT, IND	TS153-12
XDS3 thru XDS6	SAME AS XDS2	
F1	FUSE, CTG	FU102-1
F2	SAME AS F1	
XF1	FUSEHOLDER, IND	FU104-3
XF2	SAME AS XF2	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C26	Same As C25	
C27	CAP., FXD, MTLZ	CN114-6R05J
C28	CAP., FXD, ELECT.	CE105-10-25
C29	Same As C27	
C30	CAP., FXD, MTLZ	CN114-R47-5J
C31	CAP., FXD, ELECT.	CE112-2
C32	CAP., FXD, ELECT.	CE107-1
C33	CAP., FXD, ELECT.	CE105-75-50
C34	CAP., FXD, ELECT.	CE105-50-25
C35	CAP., FXD, ELECT.	CE105-10-50
CR1	SCOND, DEV, DIO	IN456
CR2	Same As CR1	
CR3	SCOND, DEV, DIO	IN4245
CR4	Same As CR3	
CR5	SCOND, DEV, ZENER	IN759A
CR6	SCOND, DEV, DIO	IN1582R
CR7	Same As CR6	
CR8	SCOND, DEV, DIO	IN1582
CR9	Same As CR8	
CR10	SCOND, DEV, ZENER	VR10124S51
CR11	Same As CR3	
CR12	Same As CR3	
DS1	LAMP	BI110-7

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1	CAP., VAR, CER	CV112-9-C
C2	Same As C1	
C3	Same As C1	
C4	Same As C1	
C5	Same As C1	
C6	Same As C1	
C7	CAP., FXD, CER	CC100-16
C8	Same As C7	
C9	CAP., FXD, MICA	CM111F820G5S
C10	Same As C9	
C11	CAP., FXD, CER.	CC100-28
C12	CAP., FXD, MICA	CM111C200J5S
C13	Same As C11	
C14	CAP., FXD, MICA	CM111F103F1S
C15	CAP., FXD, CER	CC100-24
C16	Same As C7	
C17	CAP., FXD, MTLZ	CN114-1R05F
C18	Same As C11	
C19	Same As C17	
C20	Same As C15	
C21	Same As C15	
C22	CAP., FXD, CER	CC100-29
C23	Same As C11	
C24	Same As C15	
C25	CAP., FXD, ELECT.	CE105-1-25

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
DS2	SAME AS DS1	
DS3	SAME AS DS1	
DS4	SAME AS DS1	
DS5	SAME AS DS1	
DS6	SAME AS DS1	
J1	CONN, RECEP	JJ33034PFS34
J2	CONN, RECEP	UG625/U
K1	RELAY	RL168-3C10-24DC
K2	SAME AS K1	
K3	SAME AS K1	
K4	RELAY, MERC, WET	RL167-1
K5	RELAY, MERC, WET	(CLARE HG1004 supplied by customer)
L1	COIL, RF	CL275-121
L2	SAME AS L1	
L3	SAME AS L1	
L4	COIL, RF	CL275-102
L5		
L6	SAME AS L4	
Q1	TRANSISTOR	2N3646
Q2	SAME AS Q1	
Q3	SAME AS Q1	
Q4	TRANSISTOR	3N128

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
Q5	TRANSISTOR	3N141
Q6	SAME AS Q1	
Q7	SAME AS Q1	
Q8	TRANSISTOR	2N3053
Q9	TRANSISTOR	2N1132
Q10	SAME AS Q1	
Q11	SAME AS Q1	
Q12	SAME AS Q1	
Q13	TRANSISTOR	2N1488
R1	RES., VAR.	RV4LAYSA101A
R2	RES., VAR.	RV106UX10C103A
R3	SAME AS R2	
R4	SAME AS R2	
R5	RES., FXD, COMP	RC20GF471J
R6	RES., FXD, COMP	RC07GF823J
R7	RES., FXD, COMP	RC07GF154J
R8	RES., FXD, COMP	RC07GF124J
R9	SAME AS R8	
R10	SAME AS R6	
R11	SAME AS R7	
R12	SAME AS R8	
R13	SAME AS R6	
R14	SAME AS R7	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R15	SAME AS R8	
R16	RES., FXD, COMP	RC07GF105J
R17	RES., FXD, COMP	RC07GF333J
R18	RES., FXD, COMP	RC07GF183J
R19	RES., FXD, COMP	RC07GF274J
R20	RES., FXD, COMP	RC07GF102J
R21	RES., VAR	RV124-103K
R22	RES., FXD, COMP	RC07GF474J
R23	NOT USED	
R24		
R25	SAME AS R20	
R26	RES., FXD, COMP	RC07GF562J
R27	RES., FXD, COMP	RC07GF560J
R28	SAME AS R20	
R29	RES., FXD, COMP	RC07GF222J
R30	RES., FXD, COMP	RC07GF270J
R31	SAME AS R30	
R32	RES., FXD, COMP	RC07GF822J
R33	SAME AS R32	
R34	NOT USED	
R35	RES., FXD, COMP	RC20GF911J
R36	RES., FXD, COMP	RC20GF222J
R37	SAME AS R24	
R38	RES., FXD, COMP	RC07GF122J

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R39	RES., FXD, COMP	RC07GF680J
R40	SAME AS R24	
R41	RES., FXD, COMP	RC07GF682J
R42	SAME AS R29	
R43	NOT USED	
R44	SAME AS R22	
R45	SAME AS R17	
R46	SAME AS R24	
R47	RES., FXD, COMP	RE75G15R0
R48	SAME AS R47	
R49	RES., FXD, WW	RW107-18
R50	RES., FXD, COMP	RC42GF560K
S1	SWITCH	SW109
S2	SWITCH	SW287
S3	SWITCH	SW186-3
T1	XFMR, PWR	TF274
XDS1	SOCKET, LAMP	TS153-3
XDS2	SOCKET, LAMP	TS153-1
XDS3	SOCKET, LAMP	TS153-2
XDS4	SOCKET, LAMP	TS153-5
XDS5	SAME AS XDS3	
XDS6	SAME AS XDS4	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
XK1	SOCKET, ELECT., TUBE	TS100-5
XK2	SAME AS XK1	
XK3	SAME AS XK1	
XK4	NOT USED	
XK5	SOCKET, ELECT., TUBE	TS101P01
XQ13	SOCKET	TS166-1
XY1	SOCKET, XTAL	TS167-1
XY2	SAME AS XY1	
XY3	SAME AS XY1	
Y1	XTAL UNIT	CR46A/U442.000KC
Y2	XTAL UNIT	CR46A/U476.000KC
Y3	XTAL UNIT	CR46A/U500.000KC

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C1	CAP., VAR, CER	CV112-9-C
C2	Same As C1	
C3	Same As C1	
C4	Same As C1	
C5	Same As C1	
C6	Same As C1	
C7	CAP., FXD, CER	CC100-16
C8	Same As C7	
C9	CAP., FXD, MICA	CM111F820G5S
C10	Same As C9	
C11	CAP., FXD, CER.	CC100-28
C12	CAP., FXD, MICA	CM111C200J5S
C13	Same As C11	
C14	CAP., FXD, MICA	CM111F103F1S
C15	CAP., FXD, CER	CC100-24
C16	Same As C7	
C17	CAP., FXD, MTLZ	CN114-1R05F
C18	Same As C17	
C19	Same As C17	
C20	Same As C15	
C21	Same As C15	
C22	CAP., FXD, CER	CC100-29
C23	Same As C11	
C24	Same As C15	
C25	CAP., FXD, ELECT.	CE105-1-25

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
C26	Same As C25	
C27	CAP., FXD, MTLZ	CN114-6R05J
C28	CAP., FXD, ELECT.	CE105-10-25
C29	Same As C27	
C30	CAP., FXD, MTLZ	CN114-R47-5F
C31	CAP., FXD, ELECT.	CE112-2
C32	CAP., FXD, ELECT.	CE107-1
C33	CAP., FXD, ELECT.	CE105-75-50
C34	CAP., FXD, ELECT.	CE105-50-25
C35	CAP., FXD, ELECT.	CE105-10-50
CR1	SCOND, DEV, DIO	IN456
CR2	Same As CR1	
CR3	SCOND, DEV, DIO	IN4245
CR4	Same As CR3	
CR5	SCOND, DEV, ZENER	IN759A
CR6	SCOND, DEV, DIO	IN1582R
CR7	Same As CR6	
CR8	SCOND, DEV, DIO	IN1582
CR9	Same As CR8	
CR10	SCOND, DEV, ZENER	VR10124S51
CR11	Same As CR3	
CR12	Same As CR3	
DS1	LAMP	BI110-7

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
DS2	SAME AS DS1	
DS3	SAME AS DS1	
DS4	SAME AS DS1	
DS5	SAME AS DS1	
DS6	SAME AS DS1	
J1	CONN, RECEP	JJ33034PFS34
J2	CONN, RECEP	UG625/U
K1	RELAY	RL168-3C10-24DC
K2	SAME AS K1	
K3	SAME AS K1	
K4	RELAY, MERC, WET	RL167-1
K5	RELAY, MERC, WET	(CLARE HG1004 supplied by customer)
L1	COIL, RF	CL275-121
L2	SAME AS L1	
L3	SAME AS L1	
L4	COIL, RF	CL275-102
L5		
L6	SAME AS L4	
Q1	TRANSISTOR	2N3646
Q2	SAME AS Q1	
Q3	SAME AS Q1	
Q4	TRANSISTOR	3N128

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
Q5	TRANSISTOR	3N141
Q6	SAME AS Q1	
Q7	SAME AS Q1	
Q8	TRANSISTOR	2N3053
Q9	TRANSISTOR	2N1132
Q10	SAME AS Q1	
Q11	SAME AS Q1	
Q12	SAME AS Q1	
Q13	TRANSISTOR	2N1488
R1	RES., VAR.	RV4LAYSA101A
R2	RES., VAR.	RV106UX10C103A
R3	SAME AS R2	
R4	SAME AS R2	
R5	RES., FXD, COMP	RC20GF471J
R6	RES., FXD, COMP	RC07GF823J
R7	RES., FXD, COMP	RC07GF154J
R8	RES., FXD, COMP	RC07GF124J
R9	SAME AS R8	
R10	SAME AS R6	
R11	SAME AS R7	
R12	SAME AS R8	
R13	SAME AS R6	
R14	SAME AS R7	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R15	SAME AS R8	
R16	RES., FXD, COMP	RC07GF105J
R17	RES., FXD, COMP	RC07GF333J
R18	RES., FXD, COMP	RC07GF183J
R19	RES., FXD, COMP	RC07GF274J
R20	RES., FXD, COMP	RC07GF102J
R21	RES., VAR	RV124-103K
R22	RES., FXD, COMP	RC07GF474J
R23	NOT USED	
R24		
R25	SAME AS R20	
R26	RES., FXD, COMP	RC07GF562J
R27	RES., FXD, COMP	RC07GF560J
R28	SAME AS R20	
R29	RES., FXD, COMP	RC07GF222J
R30	RES., FXD, COMP	RC07GF270J
R31	SAME AS R30	
R32	RES., FXD, COMP	RC07GF822J
R33	SAME AS R32	
R34	NOT USED	
R35	RES., FXD, COMP	RC20GF911J
R36	RES., FXD, COMP	RC20GF222J
R37	SAME AS R24	
R38	RES., FXD, COMP	RC07GF122J

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
R39	RES., FXD, COMP	RC07GF680J
R40	SAME AS R24	
R41	RES., FXD, COMP	RC07GF682J
R42	SAME AS R29	
R43	NOT USED	
R44	SAME AS R22	
R45	SAME AS R17	
R46	SAME AS R24	
R47	RES., FXD, COMP	RE75G15R0
R48	SAME AS R47	
R49	RES., FXD, WW	RW107-18
R50	RES., FXD, COMP	RC42GF560K
S1	SWITCH	SW109
S2	SWITCH	SW287
S3	SWITCH	SW186-3
T1	XFMR, PWR	TF274
XDS1	SOCKET, LAMP	TS153-3
XDS2	SOCKET, LAMP	TS153-1
XDS3	SOCKET, LAMP	TS153-2
XDS4	SOCKET, LAMP	TS153-5
XDS5	SAME AS XDS3	
XDS6	SAME AS XDS4	

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
XK1	SOCKET, ELECT., TUBE	TS100-5
XK2	SAME AS XK1	
XK3	SAME AS XK1	
XK4	NOT USED	
XK5	SOCKET, ELECT., TUBE	TS101P01
XQ13	SOCKET	TS166-1
XY1	SOCKET, XTAL	TS167-1
XY2	SAME AS XY1	
XY3	SAME AS XY1	
Y1	XTAL UNIT	CR46A/U442.000KC
Y2	XTAL UNIT	CR46A/U476.000KC
Y3	XTAL UNIT	CR46A/U500.000KC

SECTION 6

SCHEMATIC DIAGRAMS

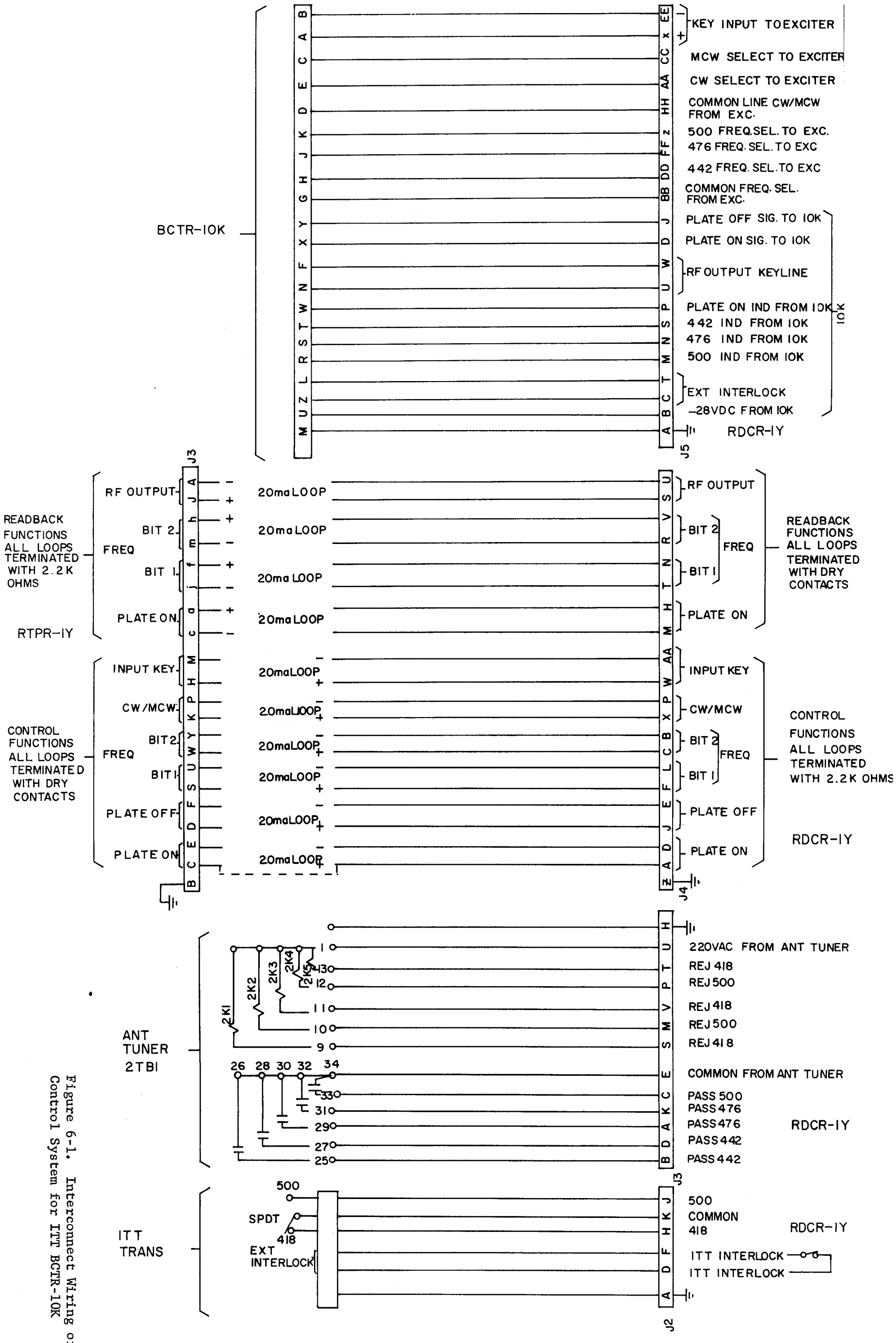

Figure 6-1. Interconnect Wiring of Remote Control System for ITT BCTR-10K

CK 1593

Figure 6-2. Schematic Diagram for Exciter

~~Figure 6-2~~

CR 1590

Figure 6-3 Schematic Diagram for RTPR-1Y PROGRAMMER

~~Figure 6-3~~

CK1591

Figure 6-4 Schematic Diagram for RDCR-1 Decoder

Figure 6-4

Figure 1-3. Front Angle View of the Exciter Unit, Model SPER-1F3.