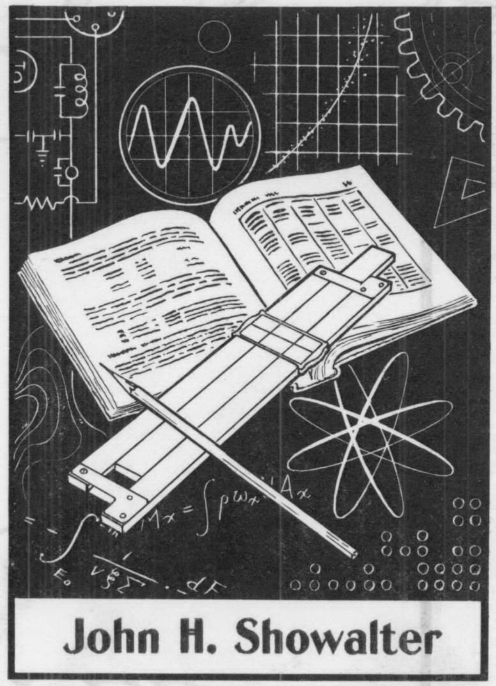
John Showalter

TECHNICAL MANUAL
for
MULTICOUPLER MODEL ATMC-1

TELE COMMUNICATIONS

THE TECHNICAL MATERIEL CORPORATION

MAMARONECK, N. Y. OTTAWA, CANADA



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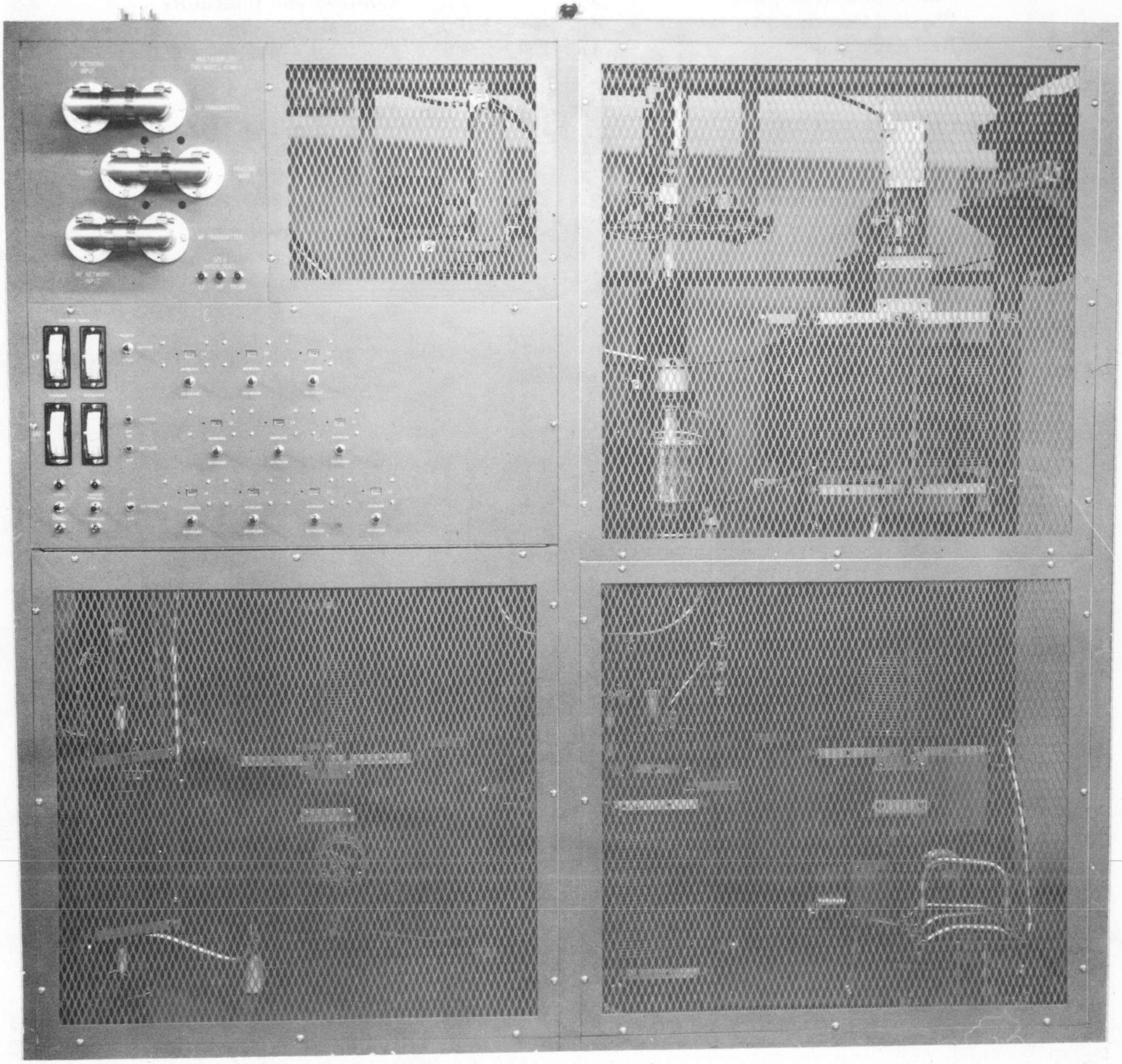


Figure 1-1. Model ATMC-1 Multicoupler

SECTION I
GENERAL INFORMATION

1.1 General Description

The ATMC-1 Multicoupler system consists of THREE units: the MULTICOUPLER CABINET, REMOTE READOUT PANEL and REMOTE STATUS PANEL. The Remote Units are standard relay rack type mountings.

Figure 1-1 is a front view of the Multicoupler Cabinet.

Figure 1-2 is a front view of the Remote Readout Panel.

Figure 1-3 is a front view of the Remote Status Panel.

A. Located on the Multicoupler Cabinet:

(1) The Local Control Panel, with all controls and indicators required for the operation of the system (including tuning indication meters).

(2) A six port Patch Panel Rosette (with fault indicators) for making the R.F. connections required for the various Modes of Operation of the system.

(3) Lift-off (expanded mesh) front doors which are secured by Camloc quick-disconnect fasteners.

(4) 1 5/8" EIA (50 ohm) Input connections for the L.F. and M.F. transmitters and the Trunk line.

(5) 1 5/8" By-Pass line for direct power feed to the Trailing Wire Antenna.

(6) Silver-Plated Copper Tubing lead for connection to the Trailing Wire Antenna.

B. Located on the Remote Readout Panel.

(1) Ten readout counters for remote indication of the position of all variable components of the filtering and impedance matching networks.

C. Located on the Remote Status Panel

(1) Tuning indication meters (forward and reflected power) for L.F. and M.F.

(2) Indicator lights for R.F. Contactor (K1 and K2) positions: (Normal /Patch) and (Series/Parallel-Parallel).

(3) Indicator lights for open interlock condition of L.F. and M.F. transmitters and Trunk line.

(4) Engraved representation of Multicoupler Patch Panel Rosette with indicator lights depicting the patch plug connections.

1.2 FUNCTIONAL DESCRIPTION

The ATMC-1 multicoupler is designed for use with a Trailing Wire Antenna.

The system provides for the operation of a single transmitter (L.F., M.F. or H.F.) directly into the antenna through the use of its Patch Panel Rosette and the By-Pass line.

The system provides for the operation of a single transmitter (L.F. or M.F.) through the Trunk line to a Dummy Load.

The system provides for simultaneous operation of the L.F. (95-500 KHz) and the M.F. (500-2000 KHz) transmitters into the common antenna through the use of the Patch Panel Rosette and the various Filtering and Impedance Matching networks.

For single transmitter operation, the trailing wire is adjusted to give a load with a SWR of less than 2:1.

If the trailing wire cannot be adjusted to give a SWR of less than 2:1, then the system can be TUNED FOR DUAL TRANSMITTER OPERATION BUT USED FOR SINGLE TRANSMITTER OPERATION by removing R.F. power from one of the two transmitters. The Filters must be properly tuned for dual transmitter operation. This arrangement allows the single transmitter to make use of the

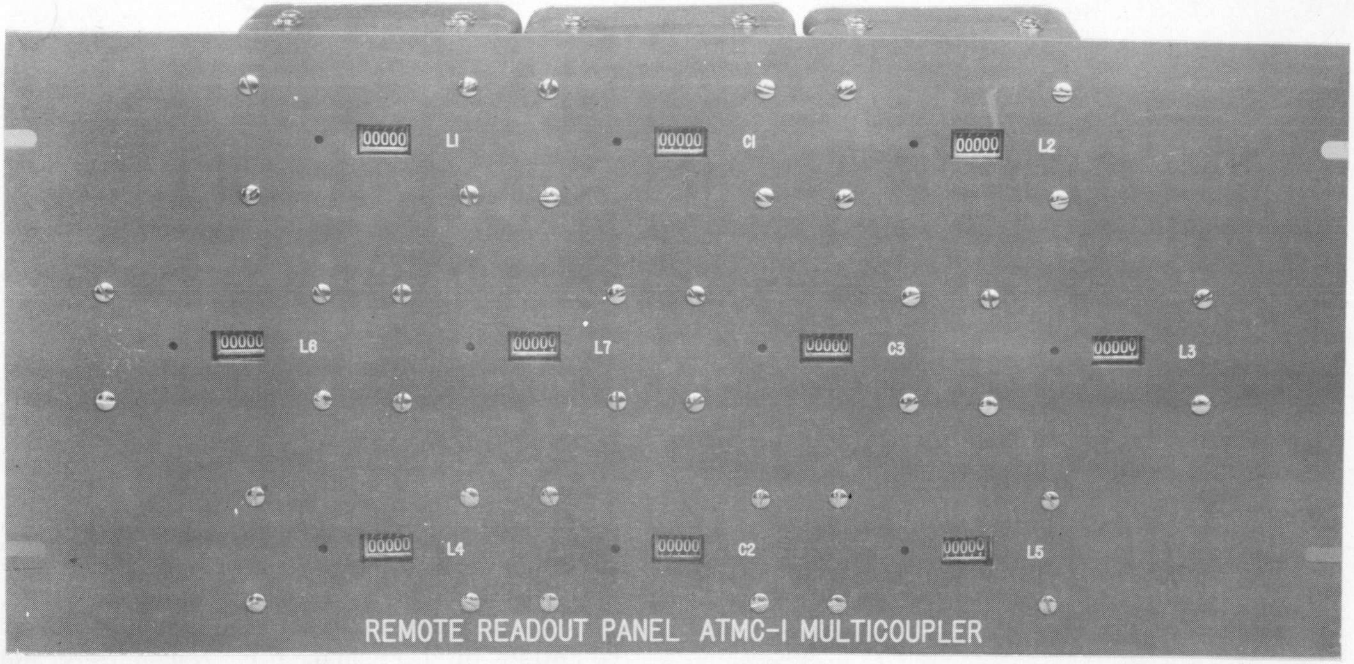


Figure 1-2. Remote Readout Panel for ATMC-1 Multicoupler

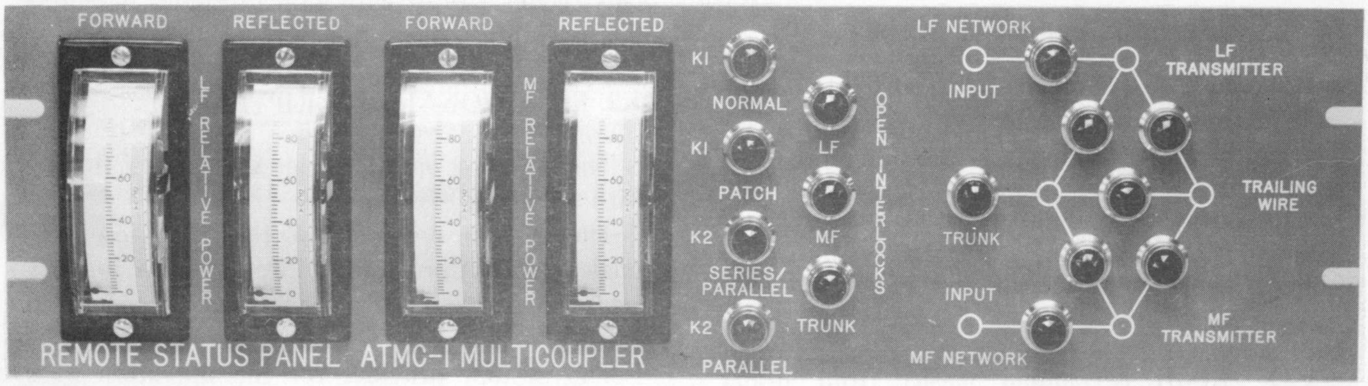


Figure 1-3. Remote Status Panel for ATMC-1 Multicoupler

M.F./ L.F. Resonator and the L.F. network or M.F. network (as appropriate) for improved impedance matching.

For dual transmitter operation, the trailing wire is adjusted to give a relatively non-reactive load (at L.F.) with a SWR of less than 3:1.

Impedance matching at M.F. (providing a SWR of less than 2:1) is accomplished through the use of the MF/LF Resonator component and the M.F. Pi-Matching network.

M.F. and L.F. Filter networks are adjusted to provide R.F. isolation of at least 20 db between transmitters.

1.3 PHYSICAL DESCRIPTION

The ATMC-1 Multicoupler consists of:

(1) The Multicoupler Cabinet (aluminum enclosure; 72" high x 78" wide x 28" deep) painted Grey Vinyl Coritex.

(2) The Remote Readout Panel (8 3/4" high x 8" deep)

(3) The Remote Status Panel (5 1/4" high x 5" deep)

Both remote units are standard 19" relay rack type mountings.

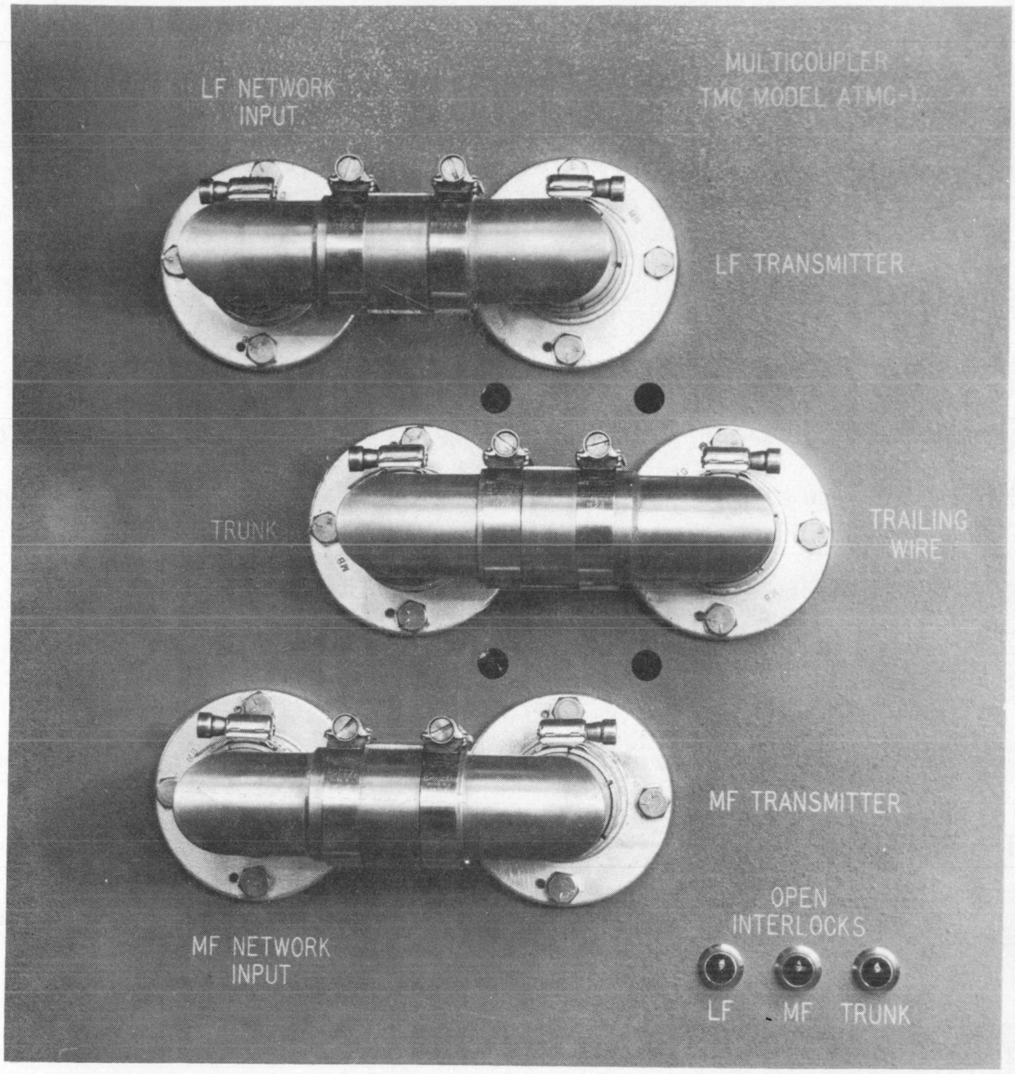


Figure 1-4. Patch Panel for ATMC-1 Multicoupler (closed ports)

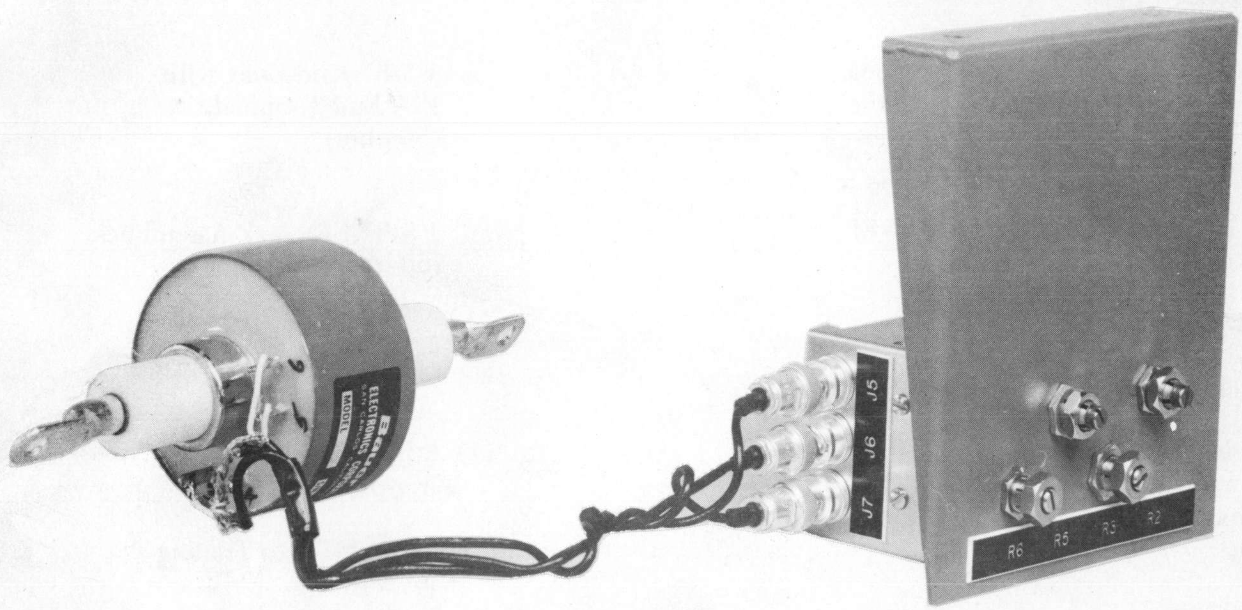


Figure 1-5.. L.F. Bi-Directional Coupler for ATMC-1 Multicoupler

1-4 TECHNICAL SPECIFICATIONS OF THE ATMC-1 MULTICOUPLER.

1. FREQUENCY RANGES:

(L.F.) Low Frequency Operation	95-500 KHz
(M.F.) Medium Frequency Operation	500-2000 KHz

2. POWER RATING:

(L.F.) Low Frequency Operation	5 KW Average, 10 KW PEP
(M.F.) Medium Frequency Operation	10 KW Average, (with 100% modulation)
(L.F.) plus (M.F.), Simultaneous Operation	40 KW PEP

3. INPUTS:

L. F. Transmitter	1 5/8" EIA End Terminal (50 ohm)
M. F. Transmitter	1 5/8" EIA Flange (50 ohm)
Trunk Line	1 5/8" EIA Flange (50 ohm)

4. OUTPUT:

Trailing Wire Antenna	Silver plated copper tubing termination.

5. BY-PASS LINE:

Connects the Trailing Wire Antenna (through R.F. Contactor K1) to the Trailing Wire port of the Multi-coupler Patch Panel.	1 5/8" rigid Coax with EIA End Terminal. (50 ohm)

6. SIX (6) PORT R.F. PATCH PANEL (Rosette)	1 5/8" EIA Jack Assemblies (50 ohm)

7. MODES OF OPERATION

(Patch Panel Connection Patterns)

A. Single transmitter Operation: (with R.F. Contactor K1 in PATCH position)	(1) L.F. XMTR to Trailing Wire Antenna. (2) M.F. XMTR to Trailing Wire Antenna. (3) Trunk XMTR to Trailing Wire Antenna.

(4) L.F. XMTR to Trunk Port to Dummy Load.

(5) M.F. XMTR to Trunk Port to dummy Load.

B. Dual Transmitter (Multicoupler) Operation:

(with R.F. Contactor K1 in NORMAL position)

(1) L.F. XMTR to L.F. Network Input.

(2) M.F. XMTR to M.F. Network Input.

(Now the above simultaneous LF/MF power will flow through the impedance matching, filtering and resonating networks to R.F. Contactor K1 and the Trailing Wire Antenna)

8. R. F. Isolation

20 DB minimum between transmitter throughout the entire frequency range.

9. FREQUENCY SEPARATION

60 KHz minimum between transmitters.

10. IMPEDANCE MATCHING CAPABILITY

Tuning of the LF Network (L1), MF Filter (C1/L2) and MF/LF Resonator (L3) provides a VSWR of less than 2:1 for the L.F. Transmitter when the Trailing Wire Antenna is adjusted to the optimum L.F. length for the operating L.F. frequency.

Tuning of the MF Network (C2/L4/L5) and LF Filter (L6/L7/C3/C4) provides a VSWR of less than 2:1 for the operating M.F. frequency.

11. CONTROL AND INDICATORS

A. LOCAL

Motor-driven reactive components (inductors and capacitors: L1,L2,L3,L4,L5 L6,L7,C1,C2, and C3) with front panel lever switch control and readout counter indication.

Front panel toggle switches for emergency LF Plate and MF Plate cutoff control.

Front panel toggle switch (with 15 amp circuit breaker) for A.C. Power (on/off) control.

Front panel tuning indication Meters (M1, M2, M3, M4) for relative forward and reflected power for L.F. and M.F.

Front panel lever switch for controlling Local versus Remote reading of tuning meters.

Front panel indicator light assemblies for Patch Panel mode connection malfunction (open interlocks for L.F., M.F. or Trunk) indentification.

Six Port Patch Panel (with coaxial U-Bend assemblies) for control of modes of operation.

B. REMOTE

Remote Readout Panel with counters for position indication of all motor-driven reactive components.

Remote Status Panel with:

1. Engraved representation of Patch Panel rosette; and indicator lights to identify port interconnections.

2. Indicator light assemblies for open Interlock (L.F., M.F. and Trunk) identification.

3. Indicator Light assemblies for position indication for R.F. Contactors (K1 and K2)

4. Tuning indication Meters (M5, M6, M7 and M8) for relative forward and reflected power for L.F. and M.F.

12. A. C. POWER REQUIREMENTS

115 VAC (± 10%) 60 Hz single phase 15 amperes maximum.

13. MULTICOUPLER CABINET:

Size	72" high x 78" wide x 28" deep
Weight	700 pounds
Paint	Grey Vinyl Coritex per TMC Specification S-521

14. REMOTE READOUT PANEL

Size	Standard 19" Relay Rack Panel 8-3/4" high x 8" deep
Weight	30 pounds
Paint	Smooth Epoxy Baked Enamel Semi-Gloss Grey per TMC Specification S-115.

15. REMOTE STATUS PANEL

Size	5 1/4" high x 5" deep
Weight	5 pounds
Paint	Smooth Epoxy Baked Enamel Semi-Gloss Grey per TMC specification S-115

SECTION 2
INSTALLATION

INSTALLATION

2-1 INITIAL INSPECTION

The ATMC-1 Multicoupler is a ruggedly constructed system with the basic shock and vibration resistant features of airborne electronic equipment. It has been given a thorough mechanical and electrical check-out by the manufacturer prior to shipment. Upon arrival at the operating site, inspect the packing cases and their contents immediately for any possible equipment damage. Inspect the packing cases to determine that you have received all items of the system (see Section 6 · Parts List). (Normally the only items that are now shipped as "installed" parts will be the Variable Vacuum Capacitors C1, C2, C3, and Fixed Vacuum Capacitor C4.

Although the carrier is liable for any damage to the equipment caused during shipment the Technical Materiel Corporation will assist in describing and providing for repair or replacement of damaged items.

2-2 CONNECTIONS

The mechanical and electrical connections required for the ATMC-1 are to be made after the Multicoupler Cabinet has been permanently positioned.

The connections should be made in accordance with the instructions of the following paragraphs.

2-3 MECHANICAL INSTALLATION

a. CABINET INSTALLATION—The Multicoupler (See Figure 7-4) should be secured to the surface on which it is to be mounted by drilling and bolting through the aluminum extrusions which form the perimeter of the cabinet base.

b. CONNECTIONS TO MULTICOUPLER INPUTS

(1) L.F. Transmitter:

The 1 5/8" EIA Flange of the transmitter output must be connected to the EIA Flange of the Multicoupler's 1 5/8" End Terminal (ETI) which is located on the left side at the upper rear area.

(2) M.F. Transmitter:

The 1 5/8" EIA Flange (of the transmission line which feeds power from the transmitter) must be connected to the EIA Flange (MF) located on the Multicoupler roof at the left front area.

(3) Trunk Line:

The 1 5/8" EIA Flange (of the transmission line which feeds power from the unit 7 Patch Panel) must be connected to the EIA Flange (TR) located on the Multicoupler roof at the left front area.

(4) By-Pass Line:

This 1 5/8" line is permanently installed across the back of the Multicoupler. The input end terminates at the Trailing Wire port of the Multicoupler Patch Panel; while the output end (End Terminal ET5) terminates at R.F. Contactor K1.

c. CONNECTIONS TO THE MULTICOUPLER OUTPUT

Trailing Wire:

Connection to the Trailing Wire winch assembly is made by means of a silver plated copper tubing conductor which is attached to R.F. Contactor (K1) at the right side (near the floor) of the cabinet.

d. GROUNDING OF THE MULTICOUPLER CABINET—The Cabinet has an aluminum ground strap "pigtail" which must be bonded (welded) to general ground of the system with which the ATMC-1 is to be used. Proper grounding is essential to the performance of the equipment and to the protection of operating personnel against dangerous RF voltages.

e. INSTALLATION OF R.F. COMPONENTS—All Components, except the Vacuum Capacitors (C1, C2, C3 and C4) are shipped as "installed" items.

Prior to shipment the Variable Vacuum Capacitors (C1, C2 and C3) have been tested against their peak voltage breakdown rating of (15 KV) with an ITT Jennings Model JHP-70A Hipot Tester. If a JHP-70A (no other tester) is available on site, these Capacitors should be tested once again. These components are critical to the proper performance of the ATMC-1. Fixed Vacuum Capacitor (C4) should be tested in the same manner for its 10 KV peak voltage breakdown rating.

To install the Variable Vacuum Capacitors proceed as follows:

(1) Remove the Upper Flange mounts (item 35, Figure 6-3) and Melamine Insulation plates (item 4, Figure 6-3 and item 10, Figure 6-2, and tubing connections.

(2) Before installing a capacitor turn its shaft to its full counterclockwise travel postion (it will now be loose). Next, turn the shaft clockwise until the first sign of tightening. STOP! The Capacitor now has its plates fully meshed; it is set at minimum reactance (maximum capacity).

(3) Adjust C1, C2, and C3 readout counters to 00000

(4) Place Upper Flange Mount over the variable end of the capacitor. The "flange" of the Flange Mount should be positioned away from the glass part of the capacitor.

(5) Place Capacitor C2 into its Lower Flange Mount (item 32, Figure 6-3).

(6) Raise the Teflon coupling (item 12, Figure 6-4) so that the capacitor shaft may be inserted into the Teflon coupling down over the capacitor shaft.

(7) Adjust the Capacitor for optimum mechanical alignment.

(8) Secure each end of the Teflon Coupling with the cotter pins that are provided.

(9) Install Capacitor C3 in the same manner as outlined above.

(10) Install Melamine Insulation Plate (item 4, Figure 6-3).

(11) Install Capacitor C2 in the same manner as outlined above.

(12) Install Melamine Insulation Plate (item 10, Figure 6-2).

(13) Re-attach the silver plated copper tubing connections to the upper Flange Mounts.

(14) To set the Limit Switches (item 34, Figure 6-2) of the Capacitors, lift the knife-edge angle slightly at one end and rotate the lower nylon gear until it actuates (click) the lower microswitch. This action establishes the DECREASE POSITION, limit of travel, for the Capacitor. Next, rotate the upper nylon gear until its upper surface is approximately 1 13/16" from the closest surface of the upper nylon post. At 32 turns per inch for the 3/8-32 threaded shaft, you will have 58 turns as the upper limit of travel of the capacitor (its full INCREASE POSITION). Now, insert the knife-edge angle into the gear teeth.

(15) Check the overall alignment of the Capacitor/Right Angle/Limit Switch assembly.

(16) When the a.c. circuitry of the multicoupler has been connected (see Wire Chart, Figure 7-4), you may put the Local/Remote switch in the Local position and hold the Capacitor's front panel lever switch in the INCREASE position until the counter reads 00580 (which is 58.0 turns). The upper nylon gear should have actuated the upper microswitch which takes a.c.

power off the capacitor's motor. If it does not, then adjust the gear until it does actuate the microswitch.

(17) The variable R.F. Inductors (L1, L2, L3, L4, L5, L6, and L7) are permanently installed. Their Limit Switches have been adjusted and coupled with the Local Readout units to provide zero counter setting when they are in their fully DECREASED position (minimum reactance).

If it should ever become necessary to adjust the limits of travel of these inductors, adjustment can be made in the same basic manner as outlined in (14) and (15) for the setting of the capacitors.

The main differences for adjustment of the various inductors are as follows:

(a) FOR INDUCTOR L1

The nylon gear at the lower end of the Limit Switch should be in the MICROSWITCH ACTUATING POSITION when the roller wheel is at the upper extremity of its travel along the winding of the inductor. The front panel readout counter should be set to zero to indicate the fully DECREASED (minimum reactance) condition of the inductor.

The OPPOSITE nylon gear can now be rotated until its surface is approximately 1/2" from the closest surface of the nylon post. Now, hold the front panel lever switch for the inductor in its INCREASE position until the roller wheel travels to the opposite extreme of the winding.

Next, rotate this nylon gear until it actuates its microswitch to establish the inductor's full INCREASE position (maximum reactance). This should be approximately 00180 (which is 18.0 turns) on the front panel readout counter.

(b) FOR INDUCTORS L3, L6 and L7

The nylon gear at the flexible cable end of their Limit Switches should be in the MICROSWITCH ACTUATING POSITION when the roller wheel is at the LOWER extremity of its travel along the winding of the inductor. The front panel readout counter should be set to zero to indicate the fully decreased (minimum reactance) condition of the inductor.

The OPPOSITE nylon gear can now be rotated until its surface is approximately 1/2" from the closest surface of the nylon post. Now, hold the front panel lever switch for the inductor in its INCREASE position until the roller wheel travels to the opposite extreme of the winding. Next, rotate this nylon gear until it actuates its microswitch to establish the inductor's full INCREASE position (maximum reactance). This should be approximately 00180 (which is 18.0 turns) on the front panel readout counter.

(c) FOR INDUCTORS L2, L4 AND L5

The nylon gear at the flexible cable end of their Limit Switches should be in the MICROSWITCH ACTUATING POSITION when the roller wheel is at the UPPER extremity of its travel along the winding of the inductor. The front panel readout counter should be set to zero to indicate the fully DECREASED (minimum reactance) condition of the inductor.

The OPPOSITE nylon gear can now be rotated until its surface is approximately 1/2" from the closest surface of the nylon post. Now, hold the front panel lever switch for the inductor in its INCREASE position until the roller wheel travels to the opposite extreme of the winding. Next, rotate this nylon gear until it actuates its microswitch to establish the inductor's full INCREASE position (maximum reactance). This should be approximately 00180 (which is 18.0 turns) on the front panel readout counter.

IMPORTANT MECHANICAL FEATURE RELATING TO ALL THE INDUCTORS.

It should be noted that when the roller wheel of the inductor is at either extreme of its travel it causes the microswitch of the Limit Switch to OPEN; thereby taking a.c. power off the motor. You may now reverse the direction of travel of the roller wheel by actuating the front panel lever switch in the appropriate direction, but you must allow travel in that new direction for approximately 1 turn BEFORE YOU CAN REVERSE DIRECTION ONCE AGAIN. This is necessary to allow the microswitch to CLOSE so that the motor can change its direction of travel.

This is the normal operation of the unit, and should not be mistaken as a malfunction.

(18) TO INSTALL FIXED VACUUM CAPACITOR C4

This unit should be secured to the insulation plates (item 17, Figure 6-3) ; and the silver-plated copper tubing leads should be connected to it in accordance with that same figure.

2-4 ELECTRICAL INSTALLATION

A.C wiring harnesses are required for interconnections between the ATMC-1 Multicoupler and:

(1) The Remote Readout Panel (see Wire Chart, Figure 7-4). Connection is made in the Multicoupler to the a.c. connector located behind the Local Control panel at its lower right corner (item 31, Figure 6-3).Connection is made at the Remote Readout Panel to the a.c. connector located at the left rear lower corner of this unit (item 11, Figure 6-7).

(2) The Remote Status Panel (see Wire Chart, Figure 7-4). Connections are made in the Multicoupler to terminal board (1TB1) which is located at the right front corner (item 31, Figure 6-3). Connection is made at the Remote Status Panel to terminal board (2TB1) which is located at the rear of the unit (item 26, Figure 6-6).

These interconnections relate to the following circuitry of the Multicoupler system:

a. Tuning indication Meters (M1 through M8)

b. Transmitter Interlocks (L.F., M.F. and Trunk)

c. R. F. Contactors

K1 (for Modes of Operation; Normal versus Patch)

K2 (for L.F. Filter network; Series Pass/Parallel Reject versus Parallel Reject

d. Patch Panel Connections (microswitch and indicator light circuits)

2-5 INITIAL ADJUSTMENT

No special initial adjustments are required if the mechanical and electrical installation procedures have been carefully followed. If pressurized transmission line is used, its pressurization should be checked in accordance with the manufacturers instructions.

SECTION 3

OPERATORS SECTION

3-1 GENERAL

The Model ATMC-1 Multicoupler has been designed for rapid Local tuning (with local and remote status indication) through the use of front panel controlled, motor-driven inductors and capacitors for the filtering and impedance matching networks of the system.

Electrically operated R.F. contactors, in conjunction with a six port Patch Panel Rosette, provide for efficient mode of operation switching.

Relative (forward and reflected) Power Meters for both LF and MF serve as the basic tuning indicators of the system.

The ATMC-1 Multicoupler is a high power R.F. system operating at two frequencies (L.F. and M.F.) simultaneously into a common antenna (Trailing Wire).

Since high R.F. currents and voltages are existant, it is imperative that Safety measures, commensurate with the operation of high power electronic equipment, be carefully followed.

3-2 CONTROLS AND INDICATORS

The primary controls and indicators used to operate the Model ATMC-1 Multicoupler are located on the Local Control Panel at the Multicoupler Cabinet. Remote operation is accomplished through the Remote Readout Panel and the Remote Status Panel.

To assist the technician in the operation of the Multicoupler, the Controls and Indicators located on the Local Control Panel are shown in Figure 3-1 and referenced to Table 3-1. Figures 3-2 and 3-3 locate the Remote Controls and Indicators listed in Tables 3-2 and 3-3.

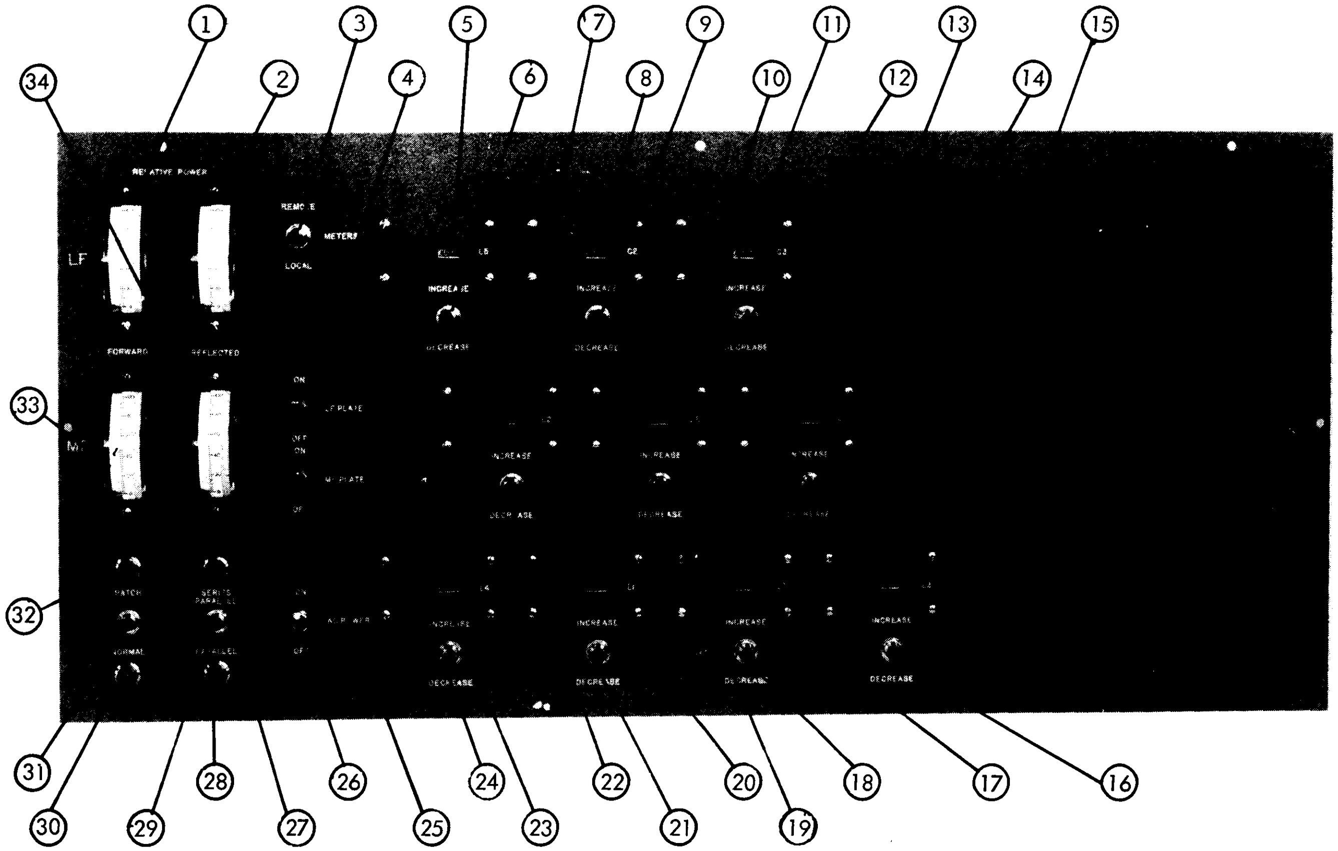


Figure 3-1. LOCAL Controls and Indicators

TABLE 3-1.

ITEM NO.	REF. SYM.	NOMENCLATURE	MFR. CODE	MFR. PART NO.
1	M1	Meter 0-100 Microamp DC (For Local: LF Forward Power)	B	1145VB
2	M2	Meter 0-100 Microamp DC (For Local: LF Reflected Power)	B	1145VB
3	1S21	Lever Switch (Local/Remote	F	160024
4	1S4	Toggle Switch (LF Plate)	G	7500K14
5	LR1	Local: Counter Selsyn Readout (For L5)	A	C0214
6	1S19	Lever Switch (For L5)	F	16038
7	LR4	Local: Counter/Selsyn Readout (For L2)	A	C0214
8	LR2	Local: Counter/Selsyn Readout (For C2)	A	C0214
9	1S13	Lever Switch (For C2)	F	16038
10	LR5	Local: Counter/Selsyn Readout (For L6)	A	C0214
11	LR3	Local: Counter/Selsyn Rcadout (For C3)	A	C0214
12	1S17	Lever Switch (For C3)	F	16038
13	LR6	Local: Counter/Selsyn Readout (For C1)	A	C0214

Table 3-1 (continued)

ITEM NO.	REF. SYM.	NOMENCLATURE	MFR. CODE	MFR. PART NO.
14	1S15	Lever Switch (For C1)	F	16038
15	LR10	Local: Counter/Selsyn Readout (For L3)	A	C0214
16	1S11	Lever Switch (For L3)	F	16038
17	LR9	Local: Counter/Selsyn Readout (For L7)	A	C0214
18	1S16	Lever Switch (For L7)	F	16038
19	1S20	Lever Switch (For L6)	F	16038
20	LR8	Local: Counter/Selsyn Readout (For L1)	A	C0214
21	1S14	Lever Switch (For L1)	F	16038
22	1S12	Lever Switch (For L2)	F	16038
23	LR7	Local: Counter/Selsyn Readout (For L4)	A	C0214
24	1S18	Lever Switch (For L4)	F	16038
25	1S3	Toggle Switch (MF Plate)	G	7500K14
26	1S10	Toggle Switch/Circuit Breaker (A.C.Power-On/Off)	I	112-215-101
27	1I3	Indicator Light Assembly (Series-Parallel)	J	5100-182-110 Blue
28	1I4	Indicator Light Assembly (Parallel)	J	5100-182-110 Amber
29	1S2	Lever Switch (Series Parallel-Parallel)	F	16038
30	1I1	Indicator Light Assembly (Normal)	J	5100-182-110 Amber
31	1S1	Lever Switch (Normal/Patch)	F	16038
32	1I2	Indicator Light Assembly (Match)	J	5100-182-110 Blue
33	M3	Meter 0-100 Microamp DC (For Local: MF Forward Power)	B	1145VB
34	M4	Meter 0-100 Microamp DC (For Local: MF Reflected Power)	B	1145VB

TABLE 3-2 REMOTE READOUT PANEL INDICATORS

ITEM NO.	REF. SYM.	NOMENCLATURE	MFR. CODE	MFR. PART NO.
1	RR5	Remote: Counter/Selsyn Readout (For L6)	A	C0219
2	RR8	Same as Item 1 (For L1)		
3	RR9	Same As Item 1 (For L7)		
4	RR6	Same Item 1 (For C1)		
5	RR3	Same as Item 1 (For C3)		
6	RR4	Same as Item 1 (For L2)		

Table 3-2 (continued)

ITEM NO.	REF. SYM.	NOMENCLATURE	MFR. CODE	MFR. PART NO.
7	RR10	Same as Item 1 (For L3)		
8	RR1	Same as Item 1 (For L5)		
9	RR2	Same as Item 1 (For C2)		
10	RR7	Same as Item 1 (For L4)		

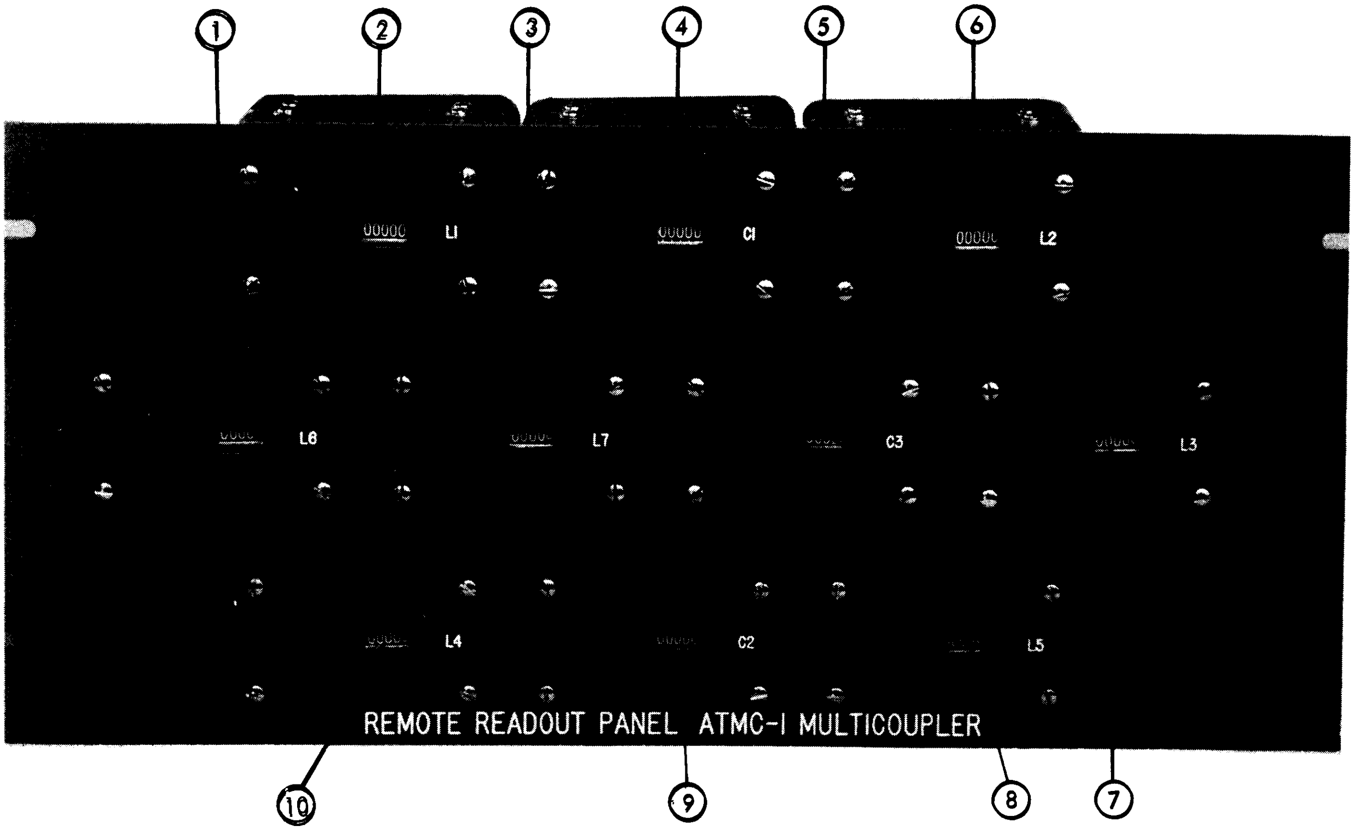


Figure 3-2. Remote Readout Panel-Controls and Indicators

TABLE 3-3 REMOTE STATUS PANEL CONTROLS AND INDICATORS

ITEM NO.	REF SYM	NOMENCLATURE	MFR. CODE	MFR PART NO.
1	M8	Meter 0-100 Microamps DC (For Remote: LF Forward Power)	B	1145VB
2	M7	Same as Item 1 (For Remote: LF Reflected Power)		
3	M6	Same as Item 1 (For Remote: MF Forward Power)		
4	M5	Same as Item 1 (For Remote: MF Reflected Power)		
5	RI2	Indicator Light Assembly (Normal)	J	5100-182-110 Amber
6	R12	Indicator Light Assembly (Patch)	J	5100-182-110 Blue

Table 3-3 (continued)

ITEM NO.	REF. SYM.	NOMENCLATURE	MFR. CODE	MFR. PART NO.
7	R16	Indicator Light Assembly (LF, Open Interlock)	J	5100-182-110 Red
8	R15	Same as Item 7 (MF, Open Interlock)		
9	R18	Same As Item 6 (Trunk)		
10	R19	Same as Item 6 (LF XMTR to LF Network Input)		
11	R114	Same as Item 6 (LFXMTR to Trunk)		
12	RI11	Same as Item 6 (LF XMTR To Trailing Wire)		
13	RI12	Same as Item 6 (MF XMTR to Trailing Wire)		
14	RI13	Same as Item 6 (Trunk to Trailing Wire)		
15	RI15	Same as Item 6 (MF XMTR to Trunk)		
16	RI10	Same as Item 6 (MF XMTR to MF Network Input)		
17	RI7	Same as Item 7 (Trunk Open Interlock)		
18	R13	Same as Item 5 (Series-Parallel)		
19	R14	Same as Item 5 (Parallel)		

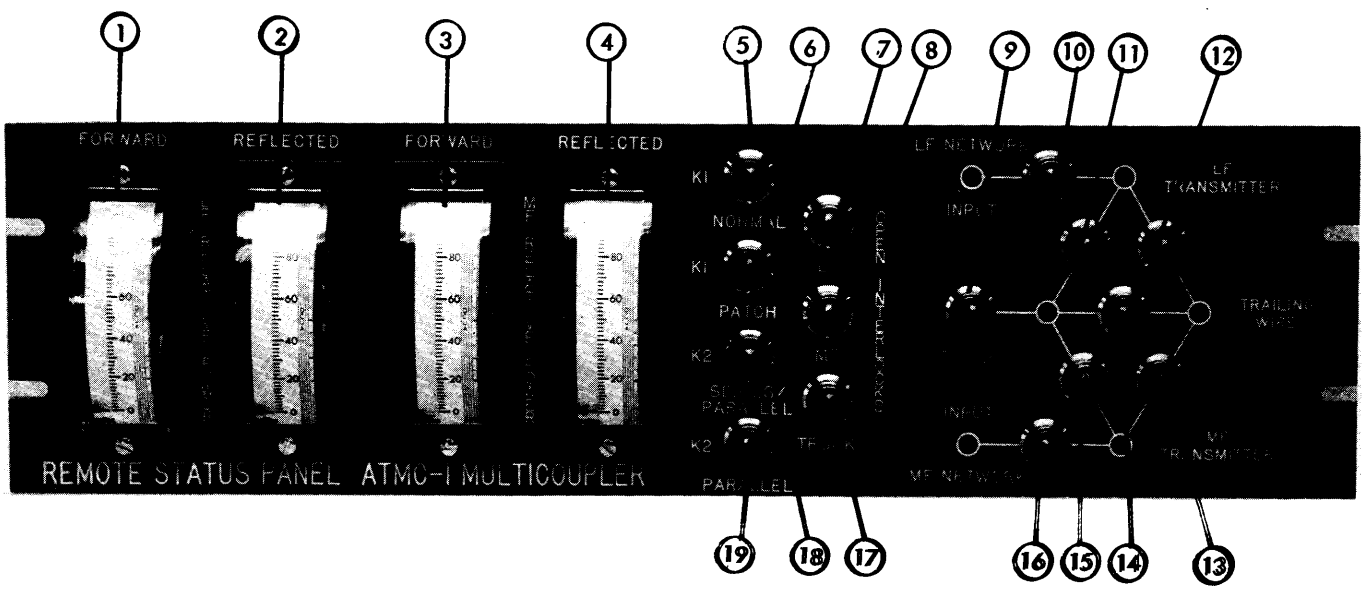


Figure 3-3. Remote Status Panel-Controls and Indicators

3-3. GENERAL PROCEDURE

Before operating the ATMC-1 Multicoupler, perform the following:

(1) Check to see that the cabinet's GROUND STRAP is properly secured (maximum surface contact) to the general ground system. The unit will not function correctly without an effective ground.

(2) Check to see that the interlocks for L.F. transmitter, M.F. transmitter, and the Trunk line are connected in accordance with the Wire Chart (Figure 7-4). Improper interlock connections will result in " hot switching" of R.F. Contactors K1 and K2, causing voltage flash over and serious damage to these components. A Time Delay Relay IK6 (item 15, Figure 6-2) provides a delay in reapplying R.F. power after the switch has been actuated to cause the R.F.Contactors to transfer. This time delay is capable of being set for a delay of from 2.0 -300 seconds. It is recommended that this unit be set (locking type, screw driver adjustment) to a minimum delay of 2.0 seconds.

(3) Check Wire Chart (Figure 7-4) for proper interconnections between the Multicoupler and its Remote Status Panel unit Figure 1-2.

(4) Connect the Remote Readout Panel Unit to the Multicoupler by means of the a c wiring harness and its connectors (Wire Chart, Figure 7-4).

(5) Check the input connections for the L.F. and M.F. transmitters and the Trunk line to be certain that they are mechanically secure.

(6) Check the diode elements of Bi-Directional Coupler BDC2 to be certain that they are properly oriented (direction of arrow) for forward and reflected power indication.

(7) Actuate the A.C. POWER switch to ON.

(8) Actuate the LOCAL/REMOTEswitch to LOCAL.

(9) Actuate the NORMAL/PATCH switch to PATCH.

(10) Actuate the L.F. PLATE and M.F. PLATE switches to ON.

(11) Adjust the balance and meter sensitivity controls of the Bi-Directional Coupler BDC1 as follows (once this has been done for a specific frequency, no subsequent adjustments should be needed for other frequencies):

CONTROLS

R2: Balance Control (reflected power)
R5: Balance Control (forward power)
R6: Meter Sensitivity Control (forward power)
R3: Meter Sensitivity Control (reflected power)

INDICATORS

M1: L.F. Meter (forward power)
M2: L.F. Meter (reflected power)

PROCEDURE

(a) Make the patch plug connection between the L.F. Transmitter port of the Multicoupler Patch Panel and the Trunk port.

(b) Connect Dummy Load (5 KW, 50 ohm) to the Trunk line at the Unit 7 Patch Panel.

(c) Select an operating frequency (95-500 KHz).

(d) Adjust R2, R3, and R6 to their full counterclockwise positions (minimum sensitivity).

(e) Adjust R5 to its full clockwise position, then turn it counterclockwise 1/8 turn.

(f) Apply very low transmitter power (approx. 250 watts) and adjust R6 clockwise for a 10% reading on the Forward power meter.

(g) Gradually increase to full power, but do not allow the Forward power meter to reach full scale. If necessary, adjust R6 to prevent a full scale reading.

(h) Now, adjust R2 clockwise until you observe a SUDDEN DIP on the Reflected power meter. If this does not happen, make a further counterclockwise adjustment of R5.

(i) Repeat the procedure of step h until the sudden dip indication is obtained.

(j) Adjust R6 for full scale reading on the Forward power meter.

(k) Finally, adjust R3 for 10% reading on the Reflected power meter.

(12) Check to see that the output (item 6, Figure 6-1)of the Multicoupler is securely attached to the Trailing Wire antenna.

Now, the system can be tuned and/or operated for a selected Mode of Operation at a specified frequency or frequencies.

TO OPERATE THE M.F. TRANSMITTER INTO THE DUMMY LOAD.

(1) Make the patch plug connection between the M.F. Transmitter port of the Multicoupler Patch Panel and the Trunk port.

(2) Connect Dummy Load (10KW, 50 ohm) to the Trunk line at the Unit 7 Patch Panel.

(3) Actuate the A.C. POWER switch to ON.

(4) Actuate the LOCAL/REMOTE switch to LOCAL.

(5) Actuate the NORMAL/PATCH switch to PATCH.

(6) Actuate the M.F. PLATE switch to ON.

(7) Apply RF power (gradually to full power) while observing the M.F. transmitter's SWR meter for an indication of matched impedances. Tune transmitter if necessary.

TO OPERATE THE L.F. TRANSMITTER INTO THE DUMMY LOAD

(1) Make the patch plug connection between the L.F. Transmitter port of the Multicoupler Patch Panel and the Trunk port.

(2) Connect Dummy Load (5KW, 50 ohm) to the Trunk line at the Unit 7 Patch Panel.

(3) Actuate the AC POWER switch to ON.

(4) Actuate the LOCAL/REMOTE switch to LOCAL.

(5) Actuate the NORMAL/PATCH switch to PATCH.

(6) Actuate the L.F. PLATE switch to ON.

(7) Apply RF power (gradually, to full power) while observing the L.F. transmitter's SWR meter for an indication of matched impedances. Tune transmitter, if necessary.

TO OPERATE THE M.F. TRANSMITTER INTO THE TRAILING WIRE ANTENNA (BY-PASSING THE MULTICOUPLER)

(1) Make the patch plug connection between the M.F. Transmitter port of the Multicoupler Patch Panel and the Trailing Wire port.

(2) Actuate the AC POWER switch to ON.

(3) Actuate the LOCAL/REMOTE switch to LOCAL.

(4) Actuate the NORMAL/PATCH switch to PATCH.

(5) Actuate the M.F. PLATE switch to ON.

(6) Adjust the length of the Trailing Wire Antenna in accordance with the following tabulation:

TABLE 3-4

FREQUENCY (KHz)	WIRE LENGTH ♦ (FEET)
500	
600	
700	
800	
900	
1000	
1100	
1200	
1300	
1400	
1500	
1600	
1700	
1800	
1900	
2000	

(7) Apply low power and observe the transmitter's SWR meter. If the SWR indication is less than 2:1, full power may gradually be applied; or the length of the trailing wire may be adjusted to obtain a better impedance match.

TO OPERATE THE L.F. TRANSMITTER INTO THE TRAILING WIRE ANTENNA (BY-PASSING THE MULTICOUPLER.

(1) Make the patch plug connection between the L.F.Transmitter port of the Multicoupler Patch Panel and the Trailing Wire port.

(2) Actuate the A.C. POWER switch to ON.

(3) Actuate the LOCAL/REMOTE switch to LOCAL.

(4) Actuate the NORMAL/PATCH switch to PATCH.

(5) Actuate the L.F. PLATE switch to ON.

(6) Adjust the length of the Trailing Wire Antenna in accordance with the following tabulation:

TABLE 3-5

FREQUENCY (KHz)	WIRE LENGTH ♦ (FEET)
95	
100	
150	
200	
250	
300	
350	
400	
450	
500	

(7) Apply low RF power and observe the transmitter's SWR meter. If the SWR indication is less than 2:1, full power may gradually be applied; or the length of the trailing wire may be adjusted to obtain a better impedance match.

TO OPERATE A TRANSMITTER (ORIGINATING AT THE UNIT 7 PATCH PANEL) INTO THE TRAILING WIRE ANTENNA (BY-PASSING THE MULTICOUPLER).

(1) Make the patch plug connection between the Trunk port of the Multicoupler Patch Panel and the Trailing Wire port.

(2) Actuate the A.C. POWER switch to ON.

(3) Actuate the LOCAL/REMOTE switch to LOCAL.

(4) Actuate the NORMAL/PATCH switch to PATCH.

(5) Actuate the M.F. PLATE switch to ON.

(6) Actuate the L.F. PLATE switch to ON.

(7) Adjust the length of the Trailing Wire Antenna in accordance with the appropriate tabulation for M.F. or L.F. and the following for H.F.:

TABLE 3-6

FREQUENCY (MHz)	WIRE LENGTH♦ (FEET)
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	

Apply low R.F. power and observe the transmitter's SWR meter. If the SWR indication is less than 2:1, full power may gradually be applied; or the length of the trailing wire may be adjusted to obtain a better impedance match.

TO OPERATE THE L.F. AND M.F. TRANSMITTERS SIMULTANEOUSLY INTO THE TRAILING WIRE ANTENNA

(1) Make the patch plug connection between the L.F. Transmitter port of the Multicoupler Patch Panel and the L.F. Network Input port.

(2) Make the patch plug connection between the M.F. Transmitter port of the Multicoupler Patch Panel and the M.F. Network Input port.

(3) Actuate the AC POWER switch to ON.

(4) Actuate the LOCAL/REMOTE switch to LOCAL.

(5) Actuate the NORMAL/PATCH switch to NORMAL.

(6) Actuate the L.F. PLATE switch to ON.

(7) Actuate the M.F. PLATE switch to ON.

(8) Actuate the SERIES/PARALLEL switch to PARALLEL (for 95-300KHz operation).

(9) Actuate the SERIES/PARALLEL switch to SERIES/PARALLEL (for 300-500 KHz L.F. operation)

(10) Adjust the length of the Trailing Wire Antenna in accordance with the tabulation of lengths FOR L.F. for the specific operating frequency.

(11) CLOSE positions J1 and J3; and OPEN position J2. This shorts out the M.F. Impedance Matching network which will be put back in the system later if SWR for M.F. is found to be greater than 2:1.

(12) Tune L1 and L3 to zero readout counter settings.

(13) Tune the M.F. Filter network to make C1 and L2, each approximately 100 ohms reactive AT M.F. in accordance with Table 3-7.

(14) If the operating L.F. is to be between 95 and 300 KHZ:

a. Actuate the SERIES/PARALLEL-PARALLEL switch to PARALLEL.

b. Tune the L.F. Filter to make C3/C4 and L6/L7, each approximately 100 ohms reactive at L.F. in accordance with Table 3-8.

(15) If the operating L.F. is to be between 300 and 500 KHz:

♦ Lengths developed operationally for the specific installation (Trailing Wire and Winch Assembly)

a. Actuate the SERIES/PARALLEL –PARALLEL switch to SERIES/PARALLEL.

b. Tune the L.F. Filter to make L6 approximately 100 ohms reactive at L.F.; and to make L7/C3 the required reactive values for the M.F. series pass network in in accordance with Table 3-9

(16) Apply low R.F. power (1KW) from the L.F. TRANSMITTER (the plates of the M.F. transmitter must be off) and observe the indication on the L.F. transmitter's SWR meter.

(17) Tune L1 to obtain maximum impedance matching improvement for L.F. (minimum reflected power indication on the Multicoupler's L.F. meters; in conjunction with minimum standing wave indication on the L.F. transmitter's SWR meter.

(18) Observe the Multicoupler's M.F. REFLECTED POWER meter. A reading on this meter indicates some leakage of L.F. into the M.F. transmitter.

a. If the operating frequency is 95-300 KHz, tune L6 for minimum indication on the M.F. reflected power meter.

b. If the operating frequency is 300-500 KHz, tune L7 for minimum indication on the M.F. reflected power meter.

(19) Apply low power (1KW) from the M.F. Transmitter and observe the indication on the M.F. transmitter's SWR meter.

If it is less than 2:1 (and the standing wave for the L.F. is also less than 2:1) no further impedance matching adjustment should be required for the system.

(20) Observe the Multicoupler's L.F. REFLECTED POWER meter. A reading on this meter indicates some leakage of M.F. into the L.F. transmitter. Tune L2 for minimum indication on the L.F. reflected power meter.

(21) To get a better SWR for M.F., you may tune L3 for minimum indication on the M.F. reflected power meter. This will also affect the SWR for L.F. so carefully observe the L.F. reflected power meter at the same time.

(22) To get further improvement of the SWR for M.F. (without affecting L.F.) you may OPEN position J1 and CLOSE position J2; thereby putting the Matching network into the system.

(23) Tune C2, L4 and L5 in accordance with Table 3-10 for 50 ohm to 50 ohm (non-reactive) adjustment. Then tune L4 for a minimum indication on the M.F. reflected power meter. Finally, tune C2 and L5 for additional minimum reflected power indication.

(24) Now, the L.F. transmitter may be gradually increased to full power followed by gradual increasing of the M.F. transmitter to full power.

3-4. OPERATOR'S MAINTENANCE

Maintenance by the operator primarily involves his observation of the metering and indicator circuitry as well as the general power handling performance of the equipment.

All observations should be recorded accurately so that technicians may be able to study the indicated symptoms and apply corrective actions.

TABLE 3-7

M.F. FILTER NETWORK (REJECT 500-2000 KHz)
READOUT COUNTER SETTINGS (WITH CAPACITY AND INDUCTANCE VALUES)
(00000 EQUALS 0000.0 TURNS)

L.F. REJECT FREQ (KHz)	CAPACITOR C1		INDUCTOR L2	
	P.F.	COUNTER	μh	COUNTER
500	3184	00230	31.84	00180
600	2653	00295	26.53	00178
700	2274	00345	22.74	00168
800	1990	00385	19.9	00150
900	1769	00410	17.69	00138
1000	1592	00435	15.92	00128
1100	1447	00455	14.47	00120
1200	1327	00470	13.27	00110
1300	1225	00480	12.25	00105
1400	1137	00495	11.37	00100
1500	1061	00505	10.61	00095
1600	995	00510	9.95	00092
1700	936	00518	9.36	00090
1800	884	00528	8.84	00085
1900	838	00530	8.38	00082
2000	796	00540	7.96	00080

These are the settings for C1 as a 100 ohm capacitor and L2 as a 100 ohm inductor.

TABLE 3-8
SERIES PASS/PARALLEL REJECT, L.F. FILTER NETWORKS
PASS 500–2000 KHz, REJECT 300–500 KHz
READOUT COUNTER SETTINGS (WITH CAPACITY AND INDUCTANCE VALUES)
(00000 EQUALS 0000.0 TURNS)

MF PASS FREQ (KHz)	LF REJECT FREQ (KHz)	INDUCTOR L6		CAPACITOR C3		INDUCTOR L7	
		μH	COUNTER	PF	COUNTER	μH	COUNTER
500	300	53	00095	3395	00205	30	00068
	350	45	00085	2324	00340	44	00085
	400	40	00080	1432	00455	70	00123
	450	35	00075	669	00555	152	00180
	500	—	—	—	—	—	—
600	300	53	00095	3979	00130	18	00050
	350	45	00085	2998	00255	23	00056
	400	40	00080	2210	00355	32	00070
	450	35	00075	1539	00445	46	00088
	500	32	00070	973	00515	72	00125

Table 3-8 (Continued)

MF PASS FREQ(KHz)	LF REJECT FREQ(KHz)	INDUCTOR L6		CAPACITOR C3		INDUCTOR L7	
		μH	COUNTER	PF	COUNTER	μH	COUNTER
700	300	53	00095	4331	00085	12	00040
	350	45	00085	3411	00205	15	00045
	400	40	00080	2679	00295	19	00052
	450	35	00075	2092	00370	25	00060
	500	32	00070	1559	00440	33	00072
800	300	53	00095	4559	00060	8.7	00032
	350	45	00085	3682	00170	11	00038
	400	40	00080	2984	00260	13	00042
	450	35	00075	2482	00320	16	00048
	500	32	00070	1939	00390	20	00054
900	300	53	00095	4716	00040	6.6	00026
	350	45	00085	3856	00150	8	00030
	400	40	00080	3193	00230	9.8	00035
	450	35	00075	2654	00300	12	00040
	500	32	00070	2201	00355	14	00044
1000	300	53	00095	4828	00025	5.2	00023
	350	45	00085	3996	00130	6	00025
	400	40	00080	3342	00215	7.6	00028
	450	35	00075	2818	00280	9	00032
	500	32	00070	2387	00330	11	00038
1100	300	53	00095	4911	00015	4.3	00022
	350	45	00085	4081	00125	5	00023
	400	40	00080	3453	00200	6.1	00025
	450	35	00075	2952	00265	7	00027
	500	32	00070	2525	00315	8.3	00031
1200	300	53	00095	4974	00000	3.5	00020
	350	45	00085	4167	00120	4	00021
	400	40	00080	3537	00190	5	00023
	450	35	00075	3039	00250	6	00025
	500	32	00070	2630	00305	6.7	00026
1300	300	53	00095	5023	00000	3	00017
	350	45	00085	4214	00115	3.6	00020
	400	40	00080	3602	00180	4.2	00021
	450	35	00075	3112	00245	4.8	00023
	500	32	00070	2712	00295	5.5	00024
1400	300	53	00095	5062	00000	2.6	00015
	350	45	00085	4264	00110	3	00017
	400	40	00080	3654	00175	3.5	00020
	450	35	00075	3172	00235	4.1	00021
	500	32	00070	2777	00280	4.7	00023
1500	300	53	00095	5093	00000	2.2	00013
	350	45	00085	4308	00105	2.6	00015
	400	40	00080	3696	00170	3	00017
	450	35	00075	3215	00230	3.5	00020
	500	32	00070	2829	00280	4	00021
1600	300	53	00095	5119	00000	1.9	00011
	350	45	00085	4328	00100	2.3	00013
	400	40	00080	3730	00167	2.7	00015
	450	35	00075	3264	00226	3	00017
	500	32	00070	2872	00278	3.4	00020

Table 3-8 (Continued)

MF PASS FREQ(KHz)	LF REJECT FREQ(KHz)	INDUCTOR L6		CAPACITOR C3		INDUCTOR L7	
		μH	COUNTER	PF	COUNTER	μH	COUNTER
1700	300	53	00095	5140	00000	1.7	00010
	350	45	00085	4352	00095	2	00012
	400	40	00080	3759	00164	2.3	00013
	450	35	00075	3295	00223	2.7	00015
	500	32	00070	2908	00274	3	00017
1800	300	53	00095	5158	00000	1.5	00009
	350	45	00085	4385	00090	1.8	00011
	400	40	00080	3782	00160	2.1	00012
	450	35	00075	3315	00220	2.4	00013
	500	32	00070	2937	00268	2.7	00015
1900	300	53	00095	5173	00000	1.4	00008
	350	45	00085	4400	00085	1.6	00009
	400	40	00080	3803	00155	1.8	00011
	450	35	00075	3335	00215	2.1	00012
	500	32	00070	2963	00265	2.4	00013
2000	300	53	00095	5186	00000	1.2	00006
	350	45	00085	4410	00080	1.4	00008
	400	40	00080	3820	00150	1.7	00010
	450	35	00075	3359	00210	1.9	00011
	500	32	00070	2984	00260	2.1	00012

These are the settings
for L6 as a 100 ohm inductor with C3 and L7 at their required values for Series Pass.

TABLE 3-9. PARALLEL REJECT FILTER NETWORK (REJECT 95–300 KHz)

READOUT COUNTER SETTINGS (WITH CAPACITY AND INDUCTANCE VALUES)

(00000 EQUALS 0000.0 TURNS)

LF REJECT (KHz)	CAPACITY (C3+ C4)		CAPACITOR C3		INDUCTANCE L6 + L7	INDUCTOR L6		INDUCTOR L7	
	P.F.	Xc	P.F.	COUNTER	μh	μh	COUNTER	μh	COUNTER
95	15000	112	5000	00000	188	94	00138	94	00139
100	15000	106	5000	00000	169	84	00128	85	00129
150	10450	102	450	00580	108	54	00098	54	00098
200	10450	76	450	00580	60	30	00068	30	00068
250	10450	61	450	00580	39	19	00051	20	00053
300	10450	51	450	00580	27	13	00043	14	00044

These are the settings for
C3 and L6 plus L7 as Capacitors and Inductors ranging in value between 50-100 ohms, approximate.

TABLE 3-10 M.F. IMPEDANCE MATCHING NETWORK (500-2000 KHz)

READOUT COUNTER SETTINGS (WITH CAPACITY AND INDUCTANCE VALUES)
(00000 EQUALS 0000.0 TURNS)

FREQ (KHz)	CAPACITOR C2		INDUCTORS L4 AND L5	
	P.F.	COUNTER	μh	COUNTER
500	6368	00000	15.92	00128
600	5306	00001	13.27	00110
700	4548	00060	11.37	00100
800	3980	00130	9.95	00092
900	3538	00193	8.85	00085
1000	3184	00230	7.96	00080
1100	2894	00270	7.24	00075
1200	2654	00300	6.64	00070
1300	2450	00320	6.13	00067
1400	2274	00350	5.69	00063
1500	2122	00368	5.31	00060
1600	1990	00385	4.98	00050
1700	1872	00400	4.68	00045
1800	1768	00410	4.42	00040
1900	1676	00430	4.19	00030
2000	1592	00435	3.98	00025

These are the settings for C2 as a 50 ohm Capacitor and L4 and L5 as 50 ohm Inductors.

SECTION 4
PRINCIPLES OF OPERATION

4.1 INTRODUCTION (MULTICOUPLER THEORY)

The Model ATMC-1 Multicoupler is shown schematically in Figure 7-1. A simplified R.F. schematic diagram is given in Figure 4-1.

4.2 R. F. CIRCUIT DESCRIPTION

The ATMC-1 Multicoupler has two basic modes of operation (Single Transmitter and Dual Transmitter).

1. FOR SINGLE M.F. TRANSMITTER OPERATION INTO THE TRAILING WIRE ANTENNA, power from the M.F. transmitter:

(1) Enters at the M.F. Input (Figure 4-1).
(2) Flows through Bi-Directional Coupler BDC2 (providing an R.F. energy sample which is rectified by its diodes for use by the d.c. microammeters M3 and M4).
(3) Flows to the M.F. Transmitter port of the Multicoupler Patch Panel which must have a patch plug connection to the Trailing Wire port. All other patch plugs, disconnected.
(4) Flows through the By-Pass line to R.F. Contactor K1, which must be in the Patch position. The Multicoupler's reactance networks are automatically grounded!
(5) Feeds the Trailing Wire Antenna whose impedance match is monitored at the transmitter's SWR meter and optimized by adjustment of the length of the trailing wire.

2. FOR SINGLE L.F. TRANSMITTER OPERATION INTO THE TRAILING WIRE ANTENNA, power from the L.F. transmitter:

(1) Enters at the L.F. Input (Figure 4-1)
(2) Flows through Bi-Directional Coupler BDC1 (providing an R.F. energy sample which is rectified by its diodes for use by the d.c. micorammeters M1 and M2).
(3) Flows to the L.F. Transmitter port of the Multicoupler Patch Panel which must have a patch plug connection to the Trailing Wire port. All other patch plugs, disconnected.
(4) Flows through the By-Pass line to R.F. Contactor K1, which must be in the Patch position. The multicoupler's reactance networks are automatically grounded.
(5) Feeds the Trailing Wire Antenna whose impedance match is monitored at the transmitter's SWR meter and optimized by adjustment of the length of the trailing wire.

3. FOR SINGLE TRANSMITTER OPERATION INTO THE TRAILING WIRE ANTENNA (of any transmitter whose source is at the Unit 7 Patch Panel), power:

(1) Enters at the Trunk Input (Figure 4-1).
(2) Flows to the Trunk port of the Multicoupler Patch Panel which must have a patch plug connection to the Trailing Wire port. All other patch plugs, disconnected.
(3) Flows through the By-Pass line to R.F. Contactor K1, which must be in the Patch position. The Multicoupler's reactance networks are automatically grounded.
(4) Feeds the Trailing Wire Antenna whose impedance match is monitored at the transmitter's SWR meter and optimized by adjustment of the length of the trailing wire.

4. FOR SINGLE M.F. TRANSMITTER OPERATION INTO A DUMMY LOAD at the Unit 7 patch panel, power from the M.F. transmitter:

(1) Enters the M.F. Input (Figure4-1).
(2) Flows through Bi-Directional coupler BDC2.
(3) Flows to the M.F. Transmitter port of the Multicoupler Patch Panel which must have a patch plug connection to the Trunk port. (All other patch plugs disconnected unless you want to simultaneously operate with the L.F. transmitter through the By-Pass line into the Trailing Wire. In this case, patch plug must also be connected between the L.F. Transmitter port and Trailing Wire port. R.F. Contactor K1 must be in the Patch position).
(4) Flows through the Trunk line to the Dummy Load at the Unit 7 Patch Panel.

5. FOR SINGLE L.F. TRANSMITTER OPERATION INTO A DUMMY LOAD at the Unit 7 Patch Panel, power from the L.F. transmitter:

(1) Enters the L.F. Input (Figure4-1)
(2) Flows through Bi-Directional coupler BDC1.
(3) Flows to the L.F. Transmitter port of the Multicoupler Patch Panel which must have a patch plug connection to the Trunk port. (All other patch plugs disconnected unless you want to simultaneously operate with the M.F. Tranmsitter through the By-Pass line into the Trailing Wire. In

this case, patch plug must also be connected between the M.F. Transmitter port and Trailing Wire port. R.F. Contactor K1 must be in the Patch position).

(4) Flows through the Trunk line to the Dummy Load at the Unit 7 Patch Panel.

6. FOR DUAL TRANSMITTER OPERATION INTO THE TRAILING WIRE ANTENNA, power from each transmitter flows as follows:

A. (FROM THE M.F. TRANSMITTER)

(1) Enters at M.F. Input (Figure 4-1).

(2) Flows through Bi-Directional Coupler BDC2.

(3) Flows to the Multicoupler Patch Panel which must have a patch plug connection to the M.F. Network Input port.

(4) Flows through the M.F. Matching Network (with position J1 OPEN and J2 CLOSED).

(5) Flows through R.F. Contactor K2 which should be in the Series/Parallel position for rejecting 300-500 KHz or in the Parallel position for rejecting 95-300 KHz.

(6) Flows through the L.F. Filter network (with position J3 CLOSED) into the MF/LF Resonator.

(7) Flows through R.F. Contactor K1 (which must be in the NORMAL position) to the Trailing Wire Antenna. The M.F. signal also has a path toward the L.F. Transmitter, but it encounters and is rejected by the high impedance presented to it by the M.F. Filter.

The choice can be made to by-pass the M.F. Matching Network by having the J1 position CLOSED and the J2 position OPEN. This would be done when the impedance of the Trailing Wire (and L.F. Filter) is acceptable to the M.F. Transmitter without the need for further impedance matching improvement.

B. (FROM THE L.F. TRANSMITTER)

(1) Enters the L.F. Input (Figure 4-1).

(2) Flows through the Bi-Directional Coupler BDC1

(3) Flows to the L.F. Tranmsitter port of the Multicoupler Patch Panel which must have a patch plug connection to the L.F. Network Input port.

(4) Flows through the L.F. Network component.

(5) Flows through the M.F. Filter network (low impedance for L.F.) into the MF/LF Resonator.

(6) Flows through R.F. Contactor K1 (which must be in the NORMAL position) to the Trailing Wire Antenna. The L.F. signal also has a path toward the M.F. transmitter, but it encounters and is rejected by the high impedance presented to it by the L.F. Filter.

7. BASIC CONVERSION EQUATIONS for (Inductance/Inductive Reactance) and (Capacitance/Capacitive Reactance).

Let A = the constant $\frac{1}{2\pi f}$

$$A = \frac{.1592}{\text{Freq.(in MHz)}} \qquad (1)$$

Freq.(KHz)	Constant "A"
95	1.6758
100	1.5920
150	1.0613
200	0.7960
250	0.6368
300	0.5307
350	0.4549
400	0.3980
450	0.3538
500	0.3184
600	0.2653
700	0.2274
800	0.1990
900	0.1769
1000	0.1592
1100	0.1447
1200	0.1327
1300	0.1225
1400	0.1137
1500	0.1061
1600	0.0995
1700	0.0936
1800	0.0884
1900	0.0838
2000	0.0796

Since;

L = Inductance (in μh) microhenries

C = Capacitance (in Mfd) microfarads

and;

X_L = Inductive Reactance (in Ohms)

$X_L = 2\pi fL$

and;

X_C = Capacitive Reactance (in Ohms)

$$X_C = \frac{1}{2\pi fC}$$

and;

Capacitance in picofarads (PF) = microfarads (Mfd) times 10^6

$$\text{Mfd} \times 10^6 = \text{PF} \qquad (2)$$

example: .003184 Mfd x 10^6 = 3184 PF

(decimal point moved 6 places to the right)

Therefore;

$$X_L = \frac{L\ (\text{in } \mu h)}{A} \qquad (3)$$

$$X_C = \frac{A}{C\ (\text{in Mfd})} \qquad (4)$$

$$L = X_L \times A \quad (\text{answer in } \mu h) \qquad (5)$$

$$C = \frac{A}{X_C} \quad (\text{answer in } \mu fd) \qquad (6)$$

(answer in microfarads; convert to picofarads by equation 2)

EXAMPLE FOR 1 MHz OPERATION

$$A = \frac{.1592}{1}$$

$$A = .1592$$

For Inductance of 1.592 μh

$$X_L = \frac{15.92}{.1592} = 100 \text{ ohms}$$

For Capacitance of .001592 Mfd

$$X_C = \frac{.1592}{.001592} = 100 \text{ ohms}$$

For Inductive Reactive of 100 ohms

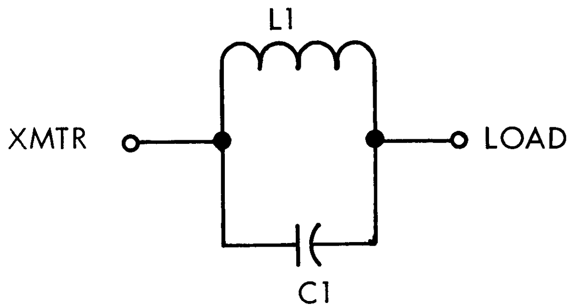
Inductance = 100 (.1592) = 15.92 μh

For Capacitive Reactance of 100 ohms

$$\text{Capacity} = \frac{.1592}{100} = .001592 \text{ Mfd}$$

.001592 Mfd x 10^6 = 1592 PF

8. BASIC PARALLEL REJECT FILTER



A. This filter consists of an inductance (L) and a capacitance (C) with the values of X_L and X_C chosen to be equal in magnitude (like 100 ohms each). They are opposite in sign (+j100 for the inductor versus -j100 for the capacitor). These values of X_L and X_C are chosen FOR THE FREQUENCY THAT IS TO BE REJECTED. Their equivalent values of L and C are calculated by using equations (1), (5), (6) and (2) for the specific reject frequency.

B. If the inductor and capacitor were "perfect" they would have no resistance and the total impedance (Z) of each unit would be equal to its reactance. The total impedance Z_T (at the reject frequency) of the inductor X_L and the capacitor X_C when they are connected in parallel is:

$$Z_T = \frac{X_L \times X_C}{X_L + X_C}$$

Therefore: for our perfect 100 ohm inductor and capacitor, we would have:

$$Z_T = \frac{(100)\,(100)}{(100) + (-100)} = \frac{10000}{0} = \text{infinity}$$

This infinite impedance at the reject frequency would not allow any of the reject frequency current to flow through the filter.

C. But the components are not perfect. All inductors have resistance; and from this resistance they derive a value called Q.

For an inductor $Q = \frac{X_L}{R}$

VALUE OF Q FOR MULTICOUPLER INDUCTORS

INDUCTORS L2, L4, and L5

Inductance Setting (μh)	Q at 1 Mhz
5	366
7	420
8	455
9	500
11	538
13	593
15	581
16	567
18	600
20	630
22	657
24	682
26	704

INDUCTORS L1, L3, L6 and L7

Inductance Setting (μh)	Q at 0.5 MHz
8	240
12	292
18	270
25	195
32	184
40	228
48	276
56	283
68	274
77	314
87	313
98	320
109	310
119	340
130	370
155	400

These values of Q can be used to approximate the Z of the Filters.

A good vacuum capacitor has very little resistance; and therefore, its Q is almost infinite. For a parallel circuit of an inductor and capacitor (when $X_L = X_C$), the total impedance is closely approximated by.

$$Z_T = QX_L$$

If the 100 ohm inductor had a resistance of 1 ohm its Q would be 100. The Z of the parallel circuit would be (100)(100) = 10,000. To approximate the Rejection Capability of the filter we need to know (at the reject frequency):

(1) The impedance of the filter, based upon the X_L and Q of the inductor.
(2) The impedance at the output (antenna side) of the filter.
(3) The voltage across the generator.

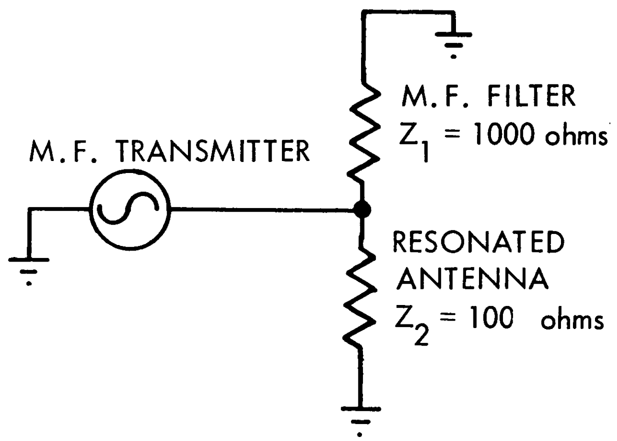
We assume the following conditions:
(1) $X_L = 100$, $Q = 100$, $Z_2 = 100$

Therefore, $Z1 = QX_L = 100\ (100) = 10{,}000$ ohm filter impedance.

(2) Z2 = 100 ohms (100j0 impedance at output of filter).
(3) Generator (XMTR): 10KW, 50ohms

Therefore: I = 14.14A E = 707V

(4) For approximation purposes we will assume an arbitrary (not actual) ground connection to the input (the pass frequency transmitter side of the filter), and the circuit will appear as shown below:



(5) For determining the approximate Rejection Capability of the filter, we know:

A. The voltage ratio $\frac{E_1}{E_2}$ is proportional to the $\sqrt{\frac{Z_1}{Z_2}}$ (letting Z_1 be the high impedance).

B. For our example the $\sqrt{\frac{Z_1}{Z_2}} = \sqrt{\frac{10000}{100}} = 10$

C. The equation for attenuation in decibels (db) is:

$$db = 20\log_{10}\frac{E_1}{E_2} \quad \text{or} \quad 20\log_{10}\sqrt{\frac{Z_1}{Z_2}}$$

Therefore, we have:

$$db = 20\ \log_{10}\ (10) = 10 \times 1 = 20db$$

(6) To determine the power that gets through the filter, we know:

A. $db = 10\ \log_{10}\ \frac{P_1}{P_2}$

Therefore:

$$\frac{db}{10} = \log_{10}\ \frac{P_1}{P_2}$$

For 20 db

$$\frac{20}{10} = \log_{10} \frac{P_1}{P_2} = 2$$

For $\frac{P_1}{P_2}$ to give a $\log_{10}$ of 2

$\frac{P_1}{P_2}$ must equal 100; (10^2)

For a 100:1 power ratio, the power that gets through the filter will be:

$$\frac{100}{1} = \frac{10000}{X} = 100 \text{ watts } (1\%)$$

D. EXAMPLE:

Filter to Reject 2000 KHz

Select $X_L = X_C$ = 100 ohms, for 2000 KHz

(1) At 2000 KHz Reject, the inductor for an X_L of 100 ohms is:

$$A = \frac{.1592}{2} = .0796 \text{ (equation 1)}$$

$L = X_L \times A = 100(.0796) = 7.96\ \mu h$ (equation 5)

(2) At 2000 KHz Reject, the capacitor for an X_C of 100 ohms is:

$$C = \frac{A}{X_C} = \frac{.0796}{100} = .000796 \text{ Mfd}$$

(equation 6)

$.000796 \times 10^6 = 796$ PF (equation 2)

(3) At 500 KHz Pass, the inductive reactance X_L for an inductor of 7.96 μh is:

$$A = \frac{.1592}{0.5} = .3184 \text{ (equation 1)}$$

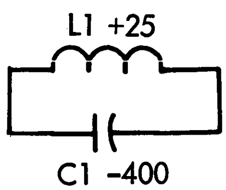
$$X_L = \frac{L \text{ (in } \mu h)}{A} = \frac{7.96}{.3184} = +25 \text{ (equation 3)}$$

(4) At 500 Khz Pass, the capacitive reactance (X_C) for a capacitor of .000796 μfd is:

$$X_C = \frac{A}{C \text{ (in } \mu fd)} = \frac{.3184}{.000796} = -400$$

(equation 4)

(5) Therefore, at 500 KHz Pass the filter looks like:



(6) The impedance for this Filter (at 500 KHz Pass) becomes:

$$Z_T = \frac{X_L \times X_C}{X_L + X_C}$$

$$Z_T = \frac{(+25)\ (-400)}{(+25) + (-400)}$$

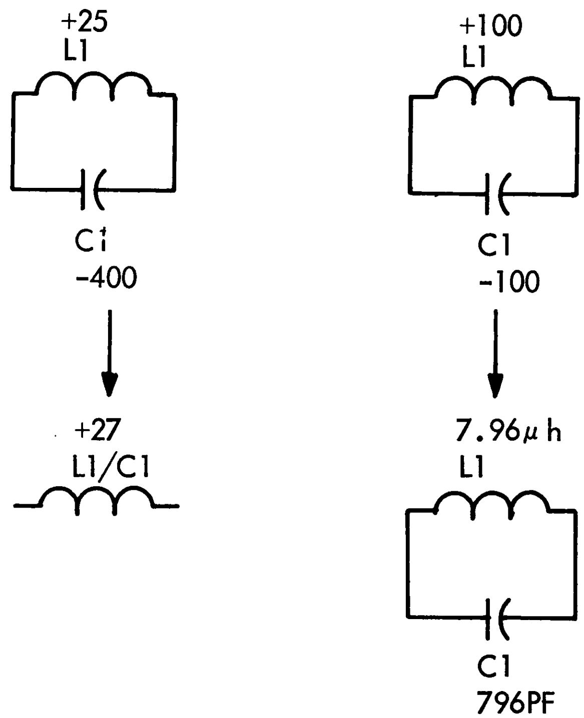
$$Z_T = \frac{(-10000)}{(-375)} = +27 \text{ ohms}$$

(7) At 500 KHz Pass, the inductance for an X_L of 27 ohms is

$L = X_L \times A = 27\ (.3184) = 8.6\ \mu h$ (equation 5)

(8) The Filter network now looks like this:

At 500 KHz Pass — At 2000 KHz Reject



(9) If we assume the conditions listed below, the following amperages and voltages will be present in the components:

A. 500KHz XMTR for 5KW, 50 ohms (Input)

Therefore: $I_1 = 10A$ $E_1 = 500V$

B. Antenna Impedance at 500 KHz of 25-j 100 (resonated to be 25j 0 at the output of the filter).

Therefore, $I_{11} = 14.14A$ $E_{11} = 354V$

C. 2000 KHz XMTR for 10KW, 50 ohms (Input)

Therefore: $I_2 = 14.14A$ $E_2 = 707V$

D. Antenna Impedance at 2000 KHz of 100-j 400 (resonated to be 100 j o at the output of the filter)

Therefore $I_{22} = 7.07A$ $E_{22} = 707V$

E. Resulting Voltage across L1/C1 at 500 KHz

382V (14.14A x 27 ohms)

F. Resulting current flowing through L1 at 500 KHz

15.3A $\left[\frac{382V}{25\ ohms}\right]$

G. Resulting current flowing through C1 at 500 KHz

0.96A $\left[\frac{382V}{400\ ohms}\right]$

H. Circulating current for L1 at 2000 Khz

7.07A $\left[\frac{707V}{100\ ohms}\right]$

I. Circulating current for C1 at 2000 KHz

7.07A $\left[\frac{707V}{100\ ohms}\right]$

J. Total current flowing through L1

16.85A (Square root of $(15.3)^2 + (7.07)^2$)

K. Total current flowing through C1

7.14A (square root of $(0.96)^2 + (7.07)^2$)

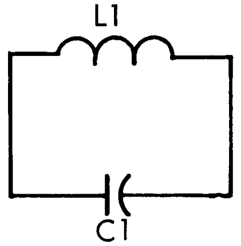
L. Resulting voltage across L1

707v at 2000 KHz
382v at 500 KHz
1089v total voltage across L1

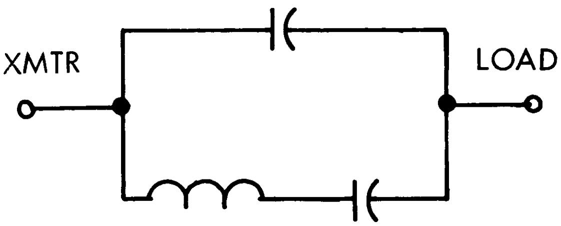
M. Resulting voltage across C1

707v at 2000 KHz
382v at 500 KHz
1089v total voltage across C1

N. Final Current/Voltage condition of the Filter.



(9) BASIC SERIES PASS/PARALLEL REJECT FILTER



This filter consists of an inductor (L1) in series with a capacitor (C1); and this series network is paralleled: (1) by a capacitor (C2) if we are passing a low frequency and rejecting a higher frequency, or (2) paralleled by an inductor (L2) if we are passing a high frequency and rejecting a lower frequency.

If we take an inductor and capacitor in series (with $X_L = X_C$) at a low frequency, and then calculate their new values of X_L and X_C for a higher frequency, we find that the plus value of the inductor becomes greater and the minus value of the capacitor becomes less resulting in a net value that is plus. At the higher frequency the series network now looks like an inductor; and therefore requires that we parallel a capacitor (C2) with it (making $X_C = X_L$) to obtain parallel resonance.

The opposite situation takes place if we go from a high frequency to a lower frequency; thereby requiring an inductor (L2) for parallel resonance.

To determine the required component values of the Filter, first select a desired value of $X_C = X_L$ for the Reject frequency.

EXAMPLE:

Filter to Pass 500 KHz and Reject 2000 Khz select $X_C = X_L = 100$ ohms, for 2000 KHz (-100 for X_C and + 100 for X_L) Immediately we know that the paralleling component will be a capacitor (C2) because we are passing high, rejecting low.

For -100 at 2000 KHz reject the capacitor required will be:

$$A = \frac{.1592}{2} = .0796 \text{ (equation 1)}$$

$$C = \frac{A}{X_C} = \frac{.0796}{100} = .000796 \text{ (equation 6)}$$

$$.000796 \times 10^6 = 796 \text{ PF (equation 2)}$$

Determine the required values for (L1) and (C1) as follows:

(1) At 500 Khz Pass, the inductance for an X_L of 100 ohms is:

$$A = \frac{.1592}{0.5} = .3184 \text{ (equation 1)}$$

$L = X_L \times A = 100\ (.3184) = 31.84\ \mu h$ (equation 5)

(2) At 500 KHz Pass, the Capacitor for an X_C of 100 ohms is:

$$C = \frac{A}{100} = \frac{.3184}{100} = .003184 \text{ Mfd (equation 6)}$$

$$.003184 \times 10^6 = 3184 \text{ PF (equation 2)}$$

(3) At 2000 KHz Reject, the inductive reactance (X_L) for an inductor of 31.84 μh (from the previous calculation) will be:

$$A = \frac{.1592}{2} = .0796 \text{ (equation 1)}$$

$$X_L = \frac{L(\text{in}\ \mu h)}{A} = \frac{31.84}{.0796} = +400 \text{(equation 3)}$$

(4) At 2000 Khz Reject, the capacitive reactance (X_C) for a capacitor of .003184 Mfd (from the previous calculation) will be:

$$X_C = \frac{A}{C\ (\text{in}\ \mu fd)} = \frac{.0796}{.003184} = -25 \text{ (equation 4)}$$

(5) The algebraic difference between (3) and (4) above is:

$$\begin{array}{r} 400 \\ -25 \\ \hline 375 \end{array}$$

(6) Select a new constant B which will be the value that was determined in (5) above divided by the value that was originally selected for $X_L = X_C$ at Reject (100 ohms)

$$B = \frac{375}{100} = 3.75$$

(7) The value of C1 for 500 KHz Series Pass is B times the capacity that was determined for the X_C of 100 ohms at 500 KHz Pass.

C1 = B(3184PF)

C1 = 3.75 (3184PF) = 11940 PF

For 500 KHz Pass, the capacitive reactance for 11940 PF is:

$$X_C = \frac{A}{C(\text{in}\ \mu fd)} = \frac{.3184}{.011940} = -27 \text{ (equation 4)}$$

(8) The value of L1 for 500 KHz Series Pass is B divided into the inductance that was determined for the X_L of 100 ohms at 500 KHz Pass.

$$L1 = \frac{31.84\ \mu h}{3.75} = 8.49\ \mu h$$

For 500 KHz Pass, the inductive reactance for 8.49μ h is:

$$X_L = \frac{L\ (\text{in}\ \mu\ h)}{A} = \frac{8.49}{.3184} = +27 \text{ (equation 3)}$$

(9) It can be seen that at 500 KHz Pass, the series network (C1 and L1) consists of a -27 ohm reactance added to a +27 ohm reactance; giving a total impedance of zero which represents a pass circuit for 500 KHz.

(10) The X_L value of L1 at 2000 KHz Reject is:

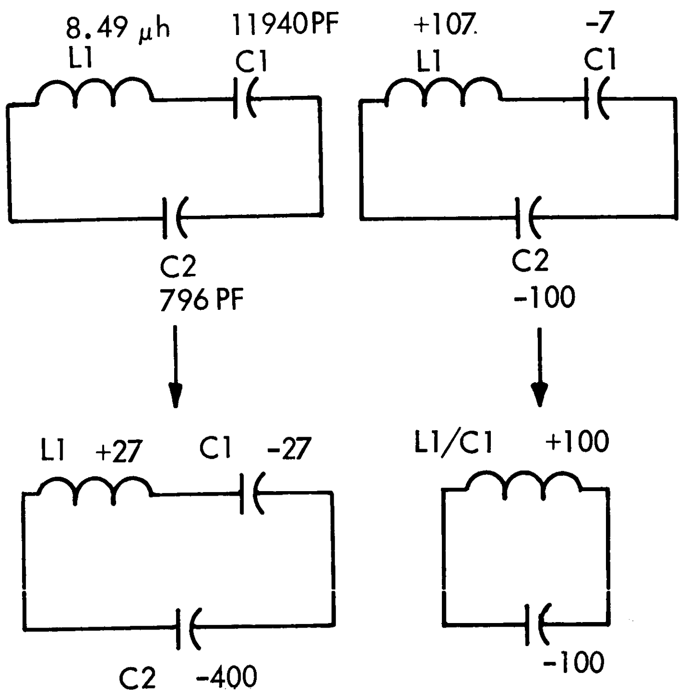
$$X_L = \frac{L(\text{ in}\ \mu\ h)}{A} = \frac{8.49}{.0796} = +107 \text{(equation 3)}$$

(11) The X_C value of C1 at 2000 Khz Reject is:

$$X_C = \frac{A}{C\ (\text{in}\ \mu fd)} = \frac{.0796}{.011940} = -7 \text{ (equation 4)}$$

(12) The Filter network now looks like this:

at 500 KHz Pass   at 2000 KHz Reject



(13) If we assume the conditions listed below, the following amperages and voltages will be present in the components:

A. 500 KHz XMTR for 5KW, 50 ohms (Input)

Therefore: $I_1 = 10A$ $E_1 = 500V$

B. Antenna Impedance at 500 KHz of 25-j100 (resonated to be 25j0 at the output of the filter).

Therefore: $I_{11} = 14.14A$ $E_{11} = 354V$

C. 2000KHz XMTR for 10KW, 50 ohms (Input)

Therefore: $I_2 = 14.14A$ $E_2 = 707V$

D. Antenna Impedance at 2000 KHz of 100-j400 (resonated to be 100j0 at the output of the filter).

Therefore: $I_{22} = 7.07A$ $E_{22} = 707V$

E. Resulting currents flowing through L1.

14.14A (highest series current for 500KHz)
7.07A (circulating current (due to the voltage present at the output of the filter at 2000 KHz)
15.81A Total current flowing through L1 (square root of $(14.14)^2 + (7.07)^2$.)

F. Resulting currents flowing through C1. The same as those for L1, because C1 and L1 are in series.

G. Resulting currents flowing through C2. No current at 500 KHz because L1 and C1 are a short circuit across C2 at 500 KHz

7.07A circulating current due to The 2000 KHz voltage (same situation as in L1)
7.07A total current flowing through C2.

H. Resulting voltage across L1

382v (14.14A x 27 ohms) for 500 KHz
756v (7.07A x 107 ohms) for 2000 KHz
1138v total voltage across L1

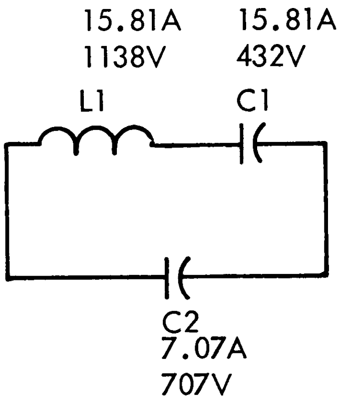
I. Resulting voltage across C1

382v (14.14A x 27 ohms) for 500 KHz
50v (7.07A x 7 ohms) for 2000 KHz
432v total voltage across C1

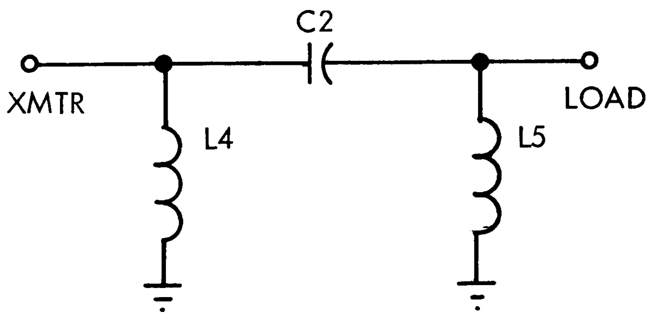
J. Resulting voltage across C2 no voltage at 500 KHz, because L1 and C1 are a short circuit across C2 at 500 KHz.

707v (7.07A x 100 ohms) for 2000 KHz
707v total voltage across C2.

K. Final current/voltage condition of the Filter.



10. BASIC IMPEDANCE MATCHING PI-NETWORK



For the Multicoupler this network consists of (1) a capacitor (C2) which is in series with the M.F. XMTR and the Load, (2) an inductor (L4) shunted to ground across the capacitor input and (3) an inductor (L5) shunted to ground across the capacitor output. Because the shunt elements are inductors, this is a "leading" (positive phase shift) network. For this type the easiest to calculate is one in which the phase shift +90°. The purpose of this network is to take the impedance of the Load (like 100 +j100) and transform it so that at the input of the network it looks like the impedance of the transmitter (50j0).

EXAMPLE:

(1) M.F. XMTR for 10KW, 50 ohms

Therefore I = 14.14A E = 707V

(2) M.F. Load at network output: 100+j100

Therefore: I = 10A E = IZ = 10(141.4) = 1414V

(Z = square root of $(100)^2 + (100)^2$)

(3) The desired input Resistance is 50 ohms (call it R1).

(4) The output Resistance is 100 ohms (call it R2)

(5) The output Reactance is +j100 ohms (call it X)

(6) The equations for the branches of the network are as follows (when using the preferred phase shift of +90 °):

A. X_C value for C2

$$X_C = -\sqrt{R1 \times R2}$$

B. X_L value for L5

$$X_L = +\sqrt{R1 \times R2}$$

C. X_L value for L4

$$X_L = \frac{-R1 \times R2}{-\sqrt{R1 \times R2} - (\pm j X)}$$

(7) If we select 2000 KHz as our operating frequency, the required component values would be as follows:

A. X_C (for C2) = $-\sqrt{50 \times 100}$ = -71 ohms

Capacitor for -71 ohms

$A = \frac{.1592}{2} = .0796$ (equation 1)

$C = \frac{A}{X_C} = \frac{.0796}{71} = .001121$ Mfd (equation 6)

.001121 Mfd x 10^6 = 1121 PF(equation 2)

B. X_L (for L5) = $+\sqrt{50 \times 100}$ = 71 ohms

Inductor for 71 ohms

$L = X_L \times A = 71\ (.0796) = 5.7\,\mu h$ (equation 5)

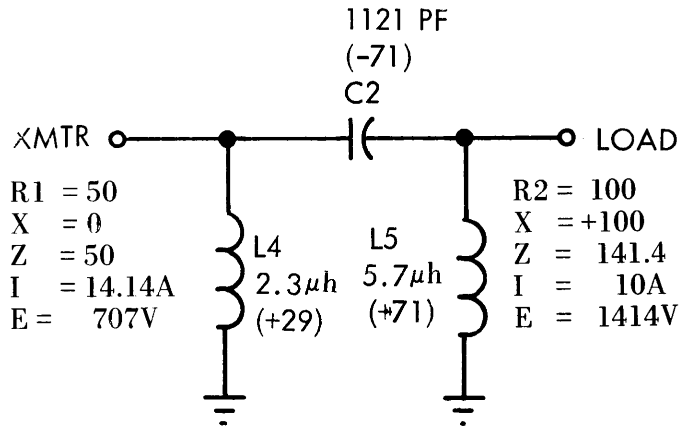
C. X_L (for L4)

$$\frac{-(50 \times 100)}{-\sqrt{50 \times 100} - (+100)} = \frac{(-5000)}{(-171)} = +29 \text{ ohms}$$

Inductor for 29 ohms

$L = X_L \times A = 29\ (.0796) = 2.3\,\mu h$(equation 5)

(8) Our 2000 KHz impedance matching network now looks like this:



(9) For the 10KW condition, the following amperages and voltages will be present in the components:

A. Voltage across L4 = XMTR voltage = 707V

B. Current flowing through L4

$$I = \frac{E}{Z} = \frac{707}{29} = 24.4A$$

C. voltage across L5 = Load Voltage = 1414V

D. Current flowing through L5

$$I = \frac{E}{Z} = \frac{1414}{71} = 20A$$

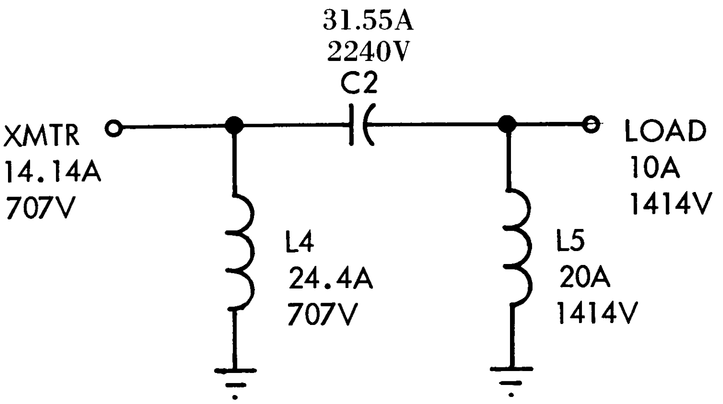
E. Current flowing through C2

31.55A (square root of $(B)^2 + (D)^2$)

F. Voltage across C2

E = IZ = 31.55 (71) = 2240V

(10) The current and voltage condition of the network looks like this:



4.3 A.C. SWITCHING CONTROL CIRCUITRY: MULTICOUPLER MODEL ATMC-1

(1) Theory of Operation-general: Operating a lever switch such as "Normal/Patch", 1S1, energizes a relay 1K1 which holds closed through its own contacts. Normally closed contacts on the same relay open (breaking the circuit to the interlock auxiliary relay 1K5) opening transmitter interlocks, and starting the time delay cycle At the end of the time delay, the time delay relay 1K6 applies power through the contacts of relay 1K1 (held closed) to the coils of the R.F. Contactor K1. When the contactor transfers, contactor microswitches energize an auxiliary relay 1K7 which breaks the electrical holding path (releasing the held relay 1K1) restoring the interlocks and returning the system to its standby state. In addition to the contactor control, each patch plug position of the Multicoupler Patch Panel is equipped with a microswitch actuated by the insertion of the patch plug. These microswitches actuate relays 1K12-1K18 and complete or interrupt the transmitter interlocks. Each transmitter interlock circuit (MF transmitter, LF transmitter, and Trunk) is equipped with an "interlock OPEN indicator."
(2) Lever Switch Functions:

One switch 1S1 selects "Normal" or "Patch" mode of operation by means of R.F. Contactor K1.

The other switch 1S2 transfers components in the LF Filter network from "Parallel" to "Series-Parallel".

"Normal" means LF XMTR feeding the L.F. network, MF XMTR feeding the MF network and their common output feeding the Trailing Wire through R.F. Contactor K1.

"Patch" means that the Multicoupler's R.F. circuitry is by-passed so that either the L.F. XMTR, M.F. XMTR or Trunk may be fed directly to the Trailing Wire through R.F. Contactor K1. "Patch" is also the required switch position when the mode of operation is to be for either transmitter (L.F. or M.F.) feeding the Trunk port of the Multicoupler Patch Panel, which in turn, feeds the unit 7, Main Patch Panel.

Switches 1S11 through 1S20 control the rotation and direction of the ten motor-driven reactive components, variable vacuum capacitors (C1 through C3) and variable R.F. inductors (L1 through L7). Associated with each switch is a readout counter/selsyn transmitting unit. As the variable component turns, a flexible cable turns the readout counter. The Local/Remote switch 1S21 transfers the tuning meter circuitry indication from the Local Control panel to the Remote Status panel.

Switches 1S3 and 1S4 interrupt the transmitter interlock circuits, for emergency cut-off.

The Patch Panel Rosette (Figure 4-2) has fault indicators which are controlled by the A.C. circuitry These indicators show that there is an open interlock (for the L.F. , M.F. or Trunk line transmitter) due to any improper connections of the Patch Panel U-Bend assemblies. Figure 4-3 shows proper and improper patching connections for the various modes of operation.

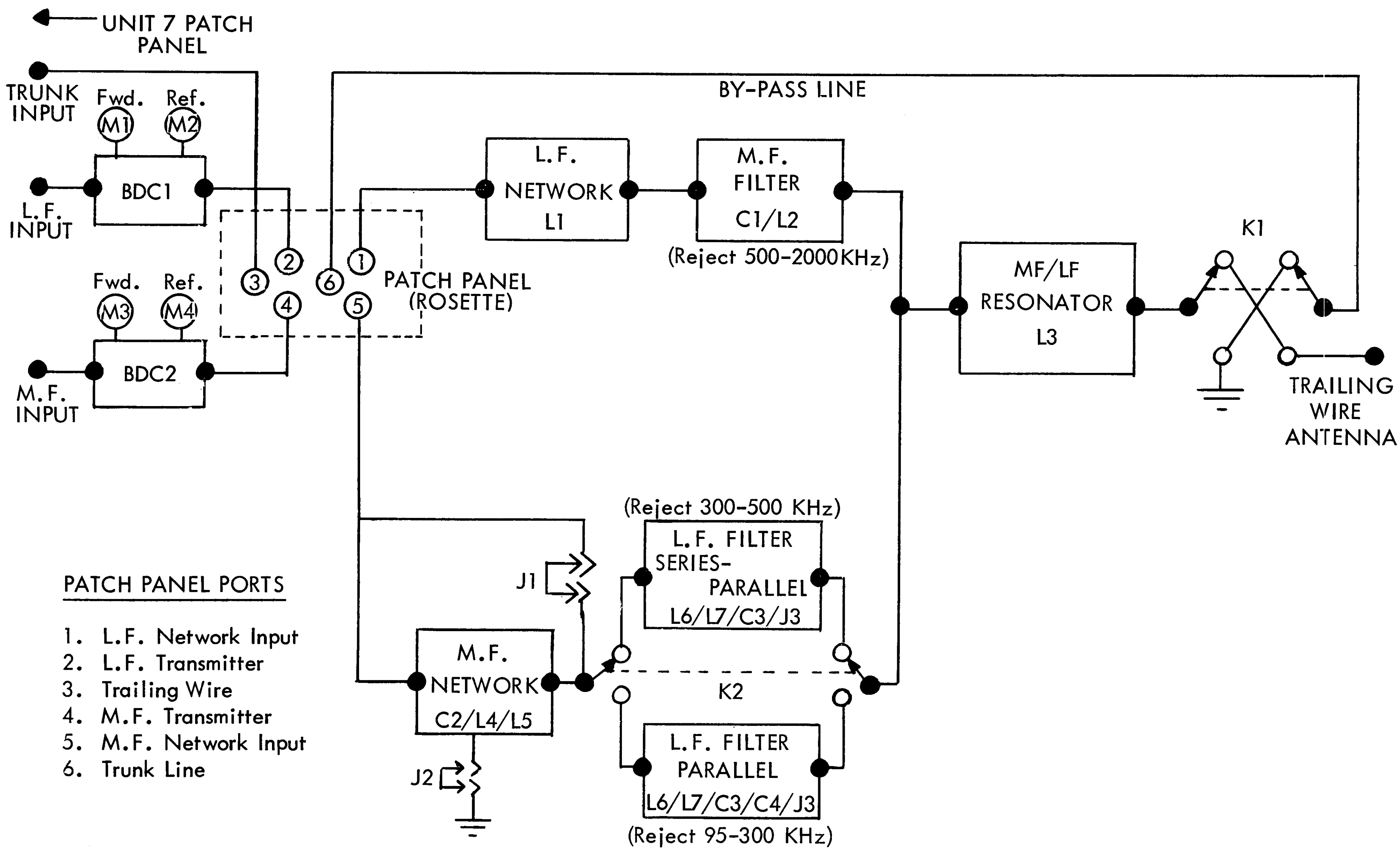


Figure 4-1. Model ATMC-1 Multicoupler, Simplified Schematic Diagram

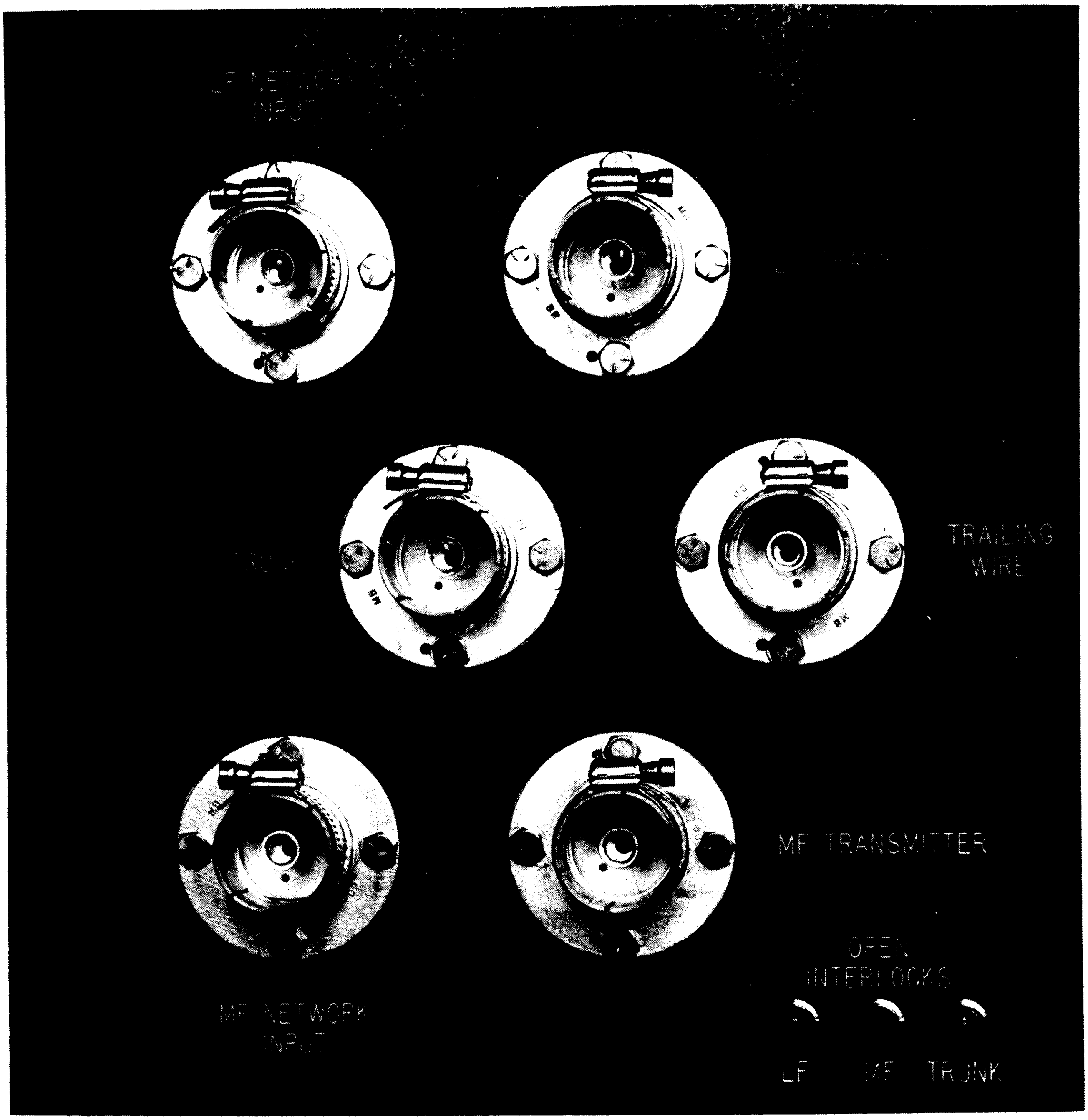


Figure 4-2 Rosette Patch Panel

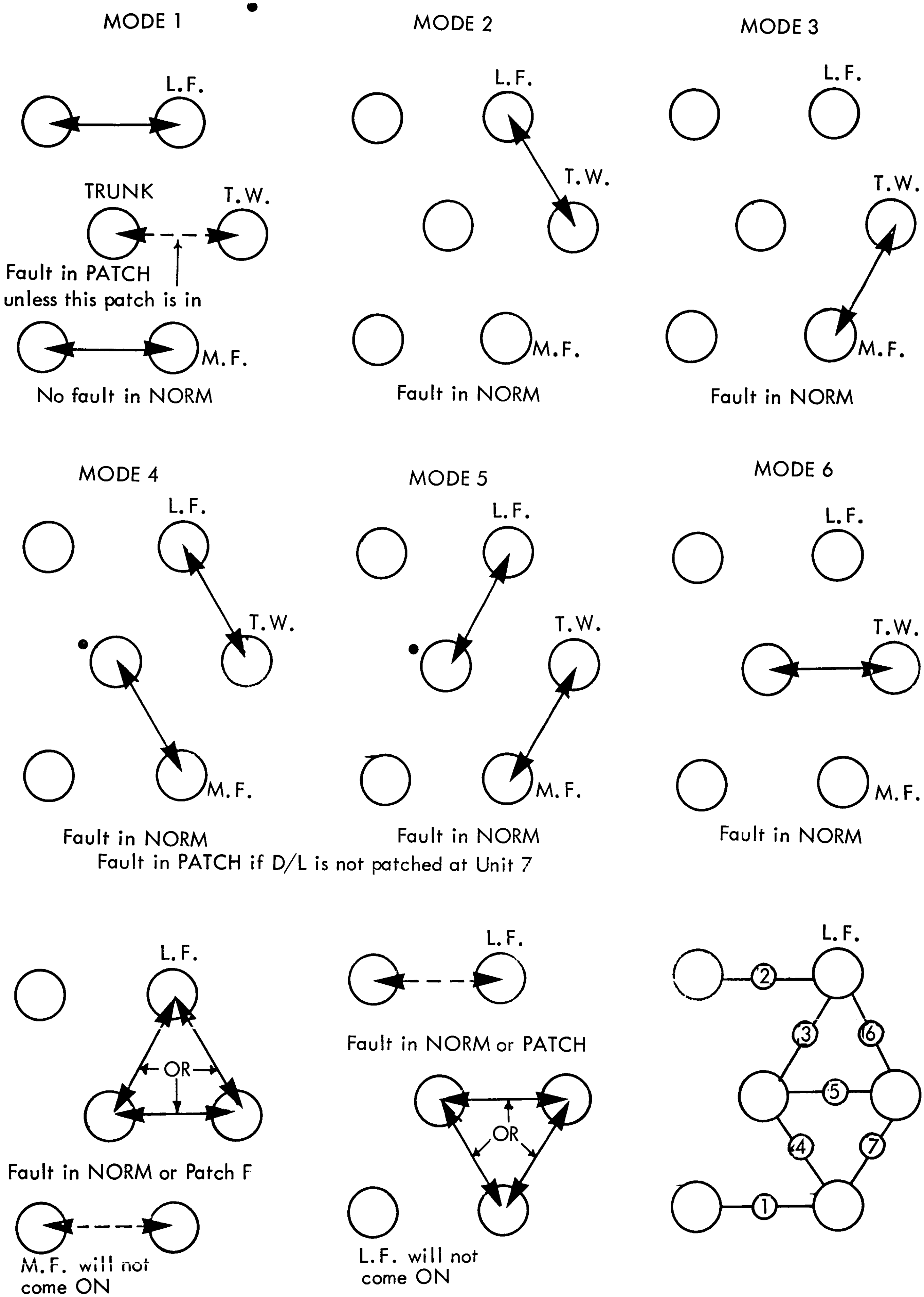


Figure 4-3 Rosette Patch Patterns

RELAY	OPER BY	OPERATES	FUNCTION
1K1	1S1	1K5 & 1K6 T/D & Cont. K1	Normal Mode Sel. Remains elec. Latched until rel. by K1 & 1K7
1K2	1S1	1K5 & 1K6 T/D & Cont. K1	Patch Mode sel. remains elec. Latched until rel. by K1 & 1K8
1K3	1S2	Cont. K2 & T/D 1K6 unless bypassed by 1K8	Switches L.F. Filter Comp. "Series-Par."-Remains elec. Latched until rel. by 1K9
1K4	1S2	Cont. K2 & 1K5 & TD 1K6 unless bypassed by 1K8	Switches L.F. Filter comp. "Parallel"-remains elec. Latched until rel. by 1K10

NOTE: 1K1 & 1K2, 1K3 & 1K4 are elec. interlocked to prevent operation of both Relays in each pair.

1K5	1K1, 1K2,1K3, 1K4 or Cabinet interlocks (releases)	1K6 T/D	Transmitter interlock & T/D Initiation. – FAIL SAFE.
1K6	1K5	K1 & K2 through 1K1, 1K2, 1K3 or 1K4	T/D on energization (normally De-energized by contacts of 1K5)
1K7, (1I1, RI1)	Cont. K1 Microswitch	Interlocks, releases 1K1	See Intlk Matrix.
1K8, (1I2, RI2)	Cont. K1 Microswitch	Interlocks, bypasses time delay, releases 1K2	See Intlk Matrix.
1K9(1I3 RI3	Cont K2 Microswitch	Releases 1K3	Holding path release relay
1K10 (1I4 RI4)	Cont. K2 Microswitch	Releases 1K4	Holding path release relay
1K11 (RI8)	When trunk is patched to dummy load for testing M.F. or L.F. transmitter	Contacts on trunk Bypass section of Interlock Matrix	Bypass "Normal" Interlock Pattern
1K12 (RI9)	Rosette Patch No.2 Microswitch	contacts on normal Interlock. (L.F.)	Completes "Normal" Interlock Pattern for L.F. Transmitter
1K13 (RI10)	Rosette Patch No.1 microswitch	contacts on normal Interlock (M.F.)	Completes "Normal" Interlock pattern for M.F. transmitter
1K14 (RI11	Rosette Patch No. 6 microswitch	Opens contacts on "Normal" M.F. interlock; closes contacts on L.F. "Patch to T.W. bypass"	Prevents M.F. "Normal" operation while L.F. transmitter is patched to T.W.
1K15 (RI12)	Rosette Patch No. 7 microswitch	Opens contacts on L.F. "Normal" interlock; closes contacts on M.F. "Patch to T.W. Bypass"	Prevents L.F. "Normal" operation while M.F. transmitter is patched to T.W.

1K16 (RI13)	Rosette Patch No.5 microswitch	Closes contacts on "Trunk interlock matrix	Allows transmitter selected at Unit 7 Patch to be patched to T.W.
1K17 (RI14)	Rosette Patch No.3 microswitch	Closes contacts on L.F. "Trunk Bypass interlock; Opens contacts on M.F. "Normal" interlock	Prevents L.F. "Normal" operation while M.F. transmitter is connected to the Trunk
1K18 (RI15)	Rosette Patch No.4 microswitch	Closes contacts on M.F. "Trunk Bypass" interlock; Opens contacts on L.F. "Normal" interlock	Prevents L.F. "Normal" operation while M.F. transmitter is connected to the Trunk
1K19	1K5 & M.F. Interlock Matrix	Opens contacts to 1I5 & RI5 and closes contacts in M.F. Plate interlock	Completes M.F. plate interlock and Extinguishes local and Remote M.F. Interlock lights.
1K20	1K5 & L.F. interlock matrix	Opens contacts to 1I6 and RI6 closes contacts in L.F. Plate interlock	Completes L.F. plate interlock and extinguishes local & remote L.F. Interl.
1K21	1K5 and Trunk interlock matrix	Opens contacts to 1I7 & RI7 closes contacts in Trunk interlock	Completes Trunk interlock and extuinguishes local and Remote Trunk Interlock lights.

SECTION 5

MAINTENANCE
&
TROUBLESHOOTING

5-1 INTRODUCTION

The basic areas of concern for troubleshooting and maintenance of the ATMC-1 Multicoupler are dictated by the fact that this is a High Power R.F. system operating at two frequencies (L.F. and M.F.) simultaneously into a common antenna (Trailing Wire).

Inherent in this type of system is the possibility of High R.F. Voltages (capable of causing corona discharge) and High R.F. Amperages, resulting from:

(1) Improper tuning of the Filter Networks for the given load impedance condition and (2) improper adjustment of the trailing wire antenna length (which will cause highly reactive load impedances, in conjunction with low resistances, that produce extremely difficult impedance matching situations).

Adjustments:

(1) The length of the trailing wire must be adjusted to give a good impedance for L.F. in conjunction with the best obtainable impedance for M.F.

(2) The components of the Filter Network must be tuned to give adequate rejection of the opposing frequency without causing high circulating currents and reactive voltages in those components.

5-2 TROUBLESHOOTING TECHNIQUES

If system failure occurs:

(1) Check Capacitors (C1, C2, C3 and C4) for possible voltage breakdown. A simple continuity check will not always prove that the capacitors are not shorted. It is advisable to use a Jennings JHP-70A Hipot Tester for this purpose.

(2) Check for possible breakdown of the input and output transmission lines ; end terminal connectors should also be checked.

(3) Check the Relative Power Meters (critical to the tuning of the system) they will not function if the diodes of the Bi-Directional Couplers have been damaged as the result of high standing waves due to improper impedance matching conditions. If a meter fails to read, it is probable that a diode has become defective. If the meter gives a reading when R.F. power is removed it is obvious that the meter has become defective.

5-3 PREVENTATIVE MAINTENANCE

The best preventative maintenance is to establish a periodic schedule of system checking for the ATMC-1 Multicoupler.

This should include:

(a) Cleaning and tightening of all R.F. and A.C. connectors.

(b) Checkout of a.c. circuitry to determine that it is functioning properly with respect to motor drives and transmitter interlocks.

(c) Voltage Breakdown testing of the Capacitors with a Jennings JHP-70A Hipot Tester.

(d) Lubrication of Capacitors (C1, C2, and C3) in accordance with Jennings Procedure No. 1006 which involves the following: Lubricant; vigorously agitated mixture of 250 grams of Dow-Corning No. 200 oil 50 CS, and 10 grams of Molykote, type Z, dry lubricant.

Apply the lubricant by:

(1) setting the capacitor to its maximum INCREASE position,

(2) inserting the lubricant through the "oil hole" provided in the side of the black turning head of the capacitor and

(3) simultaneously running the motor drive throughout its limits of travel.

The lubrication procedure should be performed every 2000 cycles or every six (6) months; whichever comes first.

The leadscrew of the capacitor can be lubricated with Lubriplate-aero grease.

5-4 CORRECTIVE MAINTENANCE

The multicoupler should never be serviced when it is operating under R.F. power. It should be serviced only by those with a thorough understanding and respect for High Power R.F. systems.

SECTION 6
PARTS LIST

This section has been included to assist the engineer and technician in locating and identifying components within the major units of the Model ATMC-1 Multicoupler

Reference Symbols have been assigned to identify all major component parts of the Multicoupler. They are used for marking the components and are included on all Schematic Diagrams and Parts Lists.

Item numbers have been listed on each component and referenced to the photograph of the equipment associated with the Table listing the part.

Following the parts lists and Figures, a List of Manufacturers and the code letter assigned to each can be found. The manufacturers' code is listed as an item in the parts listing.

TABLE 6-1

IIITEM NO..	REF. SYM.	NOMENCLATURE	MFR. CODE	MFR. PART NO.
1		Trunk Input		
2	L2	Bifilar Inductor (Variable) 25 μh, 40 Amps	A	M25VB
3	L6	Bifilar Inductor (Variable) 155 μh, 40 Amps	A	D0163
4		Local Control Panel		
5	L3	Same as L6		
6		Trailing Wire Output		
7	L7	Same as L6		
8	L1	Same asL6		
9	L5	Same as L2		
10	L4	Same as L2		
11	C4	Fixed Vacuum Capacitor 10,000 PF (10KV, 270 Amp)	C	CFSB 10000-10S
12	C2	Variable Vacuum Capacitor 100-5000 PF (15KV, 125 AMP)	C	VMMC 100-5000-15S
13		Patch Panel		
14		L.F . Input		
15		M.F. Input		

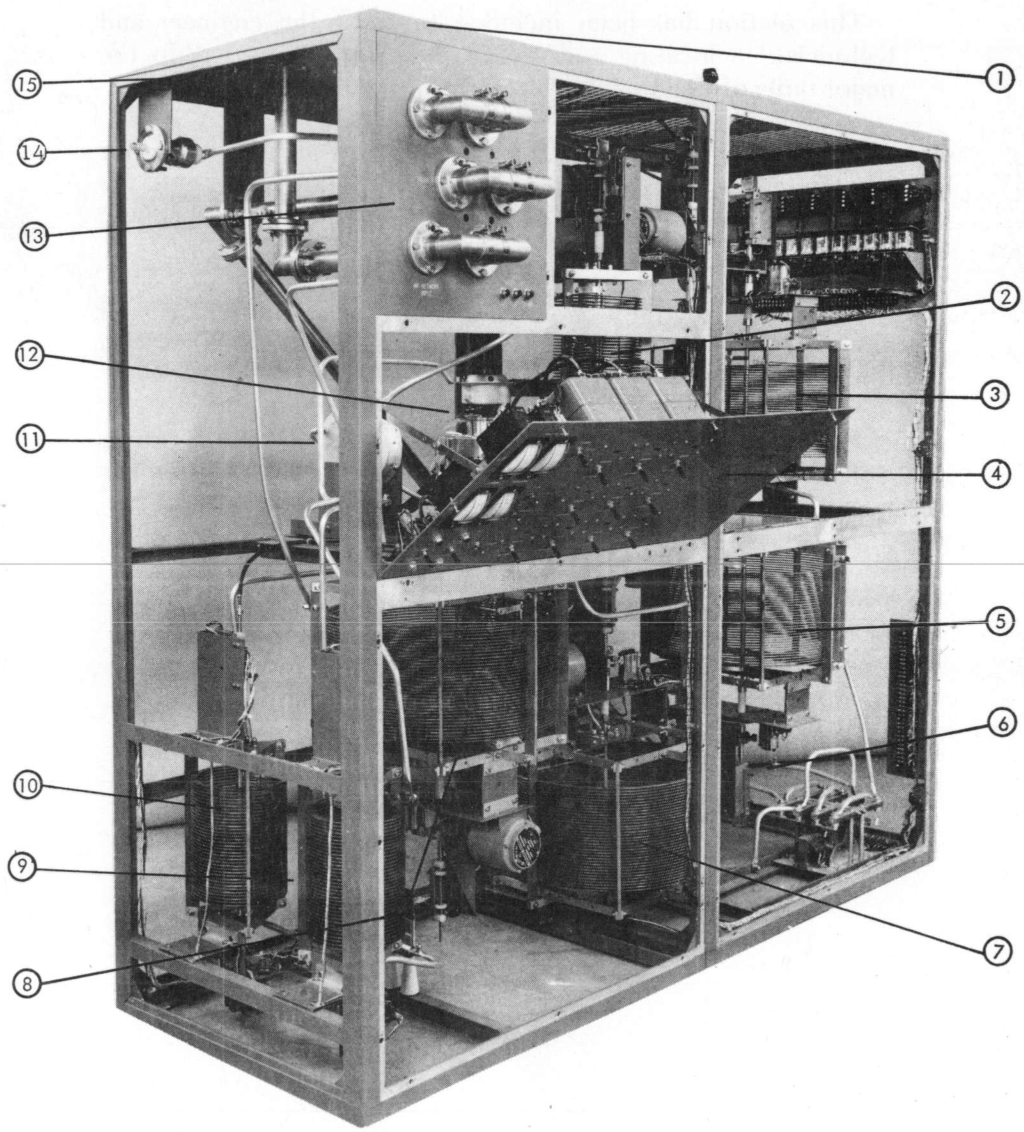


Figure 6-1 ATMC-1 Multicoupler, Overall View

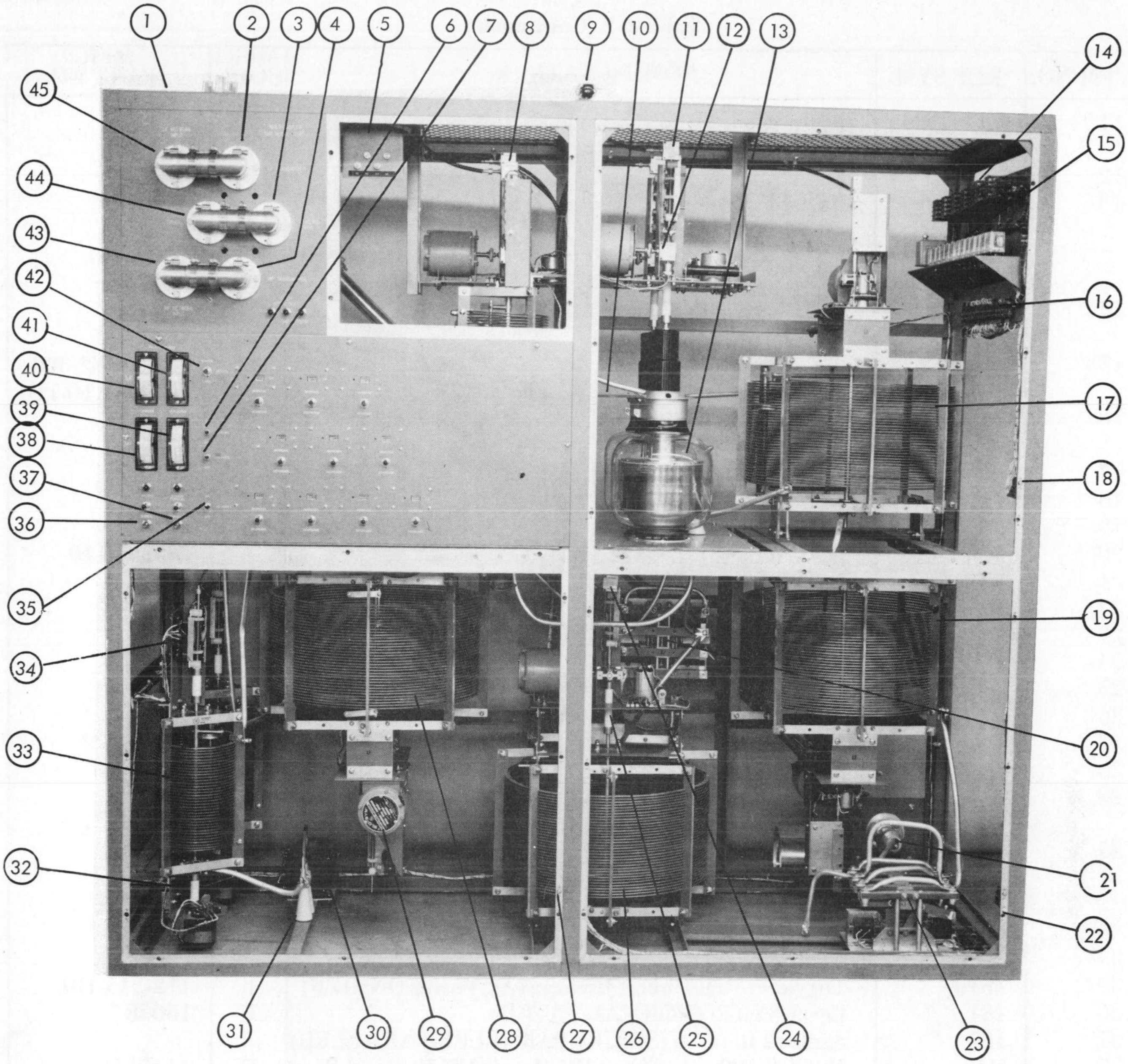


Figure 6-2 ATMC-1 Multicoupler, Front View (Doors Off)

Table 6-2

ITEM No.	REF. DESIG.	NOMENCLATURE	MFR. CODE	MFR. PART No.
1	DO182	Cabinet, Aluminum - 72" high x 78" wide 28" deep. Finish: TMC Grey Vinyl Coritex per specification S-521	A	DO182
2		1-5/8" EIA Jack Assembly	E	
3		Same as Item 2		
4		Same as Item 2		
5	BDC1	Bi-Directional Coupler(95-500KHz, 10KW PEP	A	DO180
6	1S4	Toggle Switch (LF Plate)	G	7500K14
7	1S3	Same as Item 6 (MF Plate)		
8		Right Angle Drive (Gear Limit Switch End)	Y	10012
9		Screwdriver	E	143-6
10		Melamine Insulation Plate (For upper flange mount of Vacuum Capacitor C1)	A	AO236

Table 6-2 (Continued)

ITEM NO.	REF. SYM.	NOMENCLATURE	MFR. CODE	MFR. PART NO.
11		Right Angle Drive (Gear Opposite Limit Switch End)	Y	10012
12		Same as Item 11		
13	C1	Variable Vacuum Capacitor 100–5000PF (15KV,125A)	C	VMMC-100-5000 15-S
14	1K1-1K4 1K7,1K8	A.C. Relay, 110VAC (Total 6)	K	E31-110
15	1K6 &	A.C.Time Delay Relay 110VAC	L	C21630E2-300
	1K9–1K21	A.C. Relay DPDT 110VAC (Total 12)	M	CAD11A10-110
16	1TB2	Terminal Boards (2) 30 Terminal, 4 Terminal	N	671-30 671-4
17	L6	Bifilar Inductor (Variable 155μH, 40 amp)	A	DO163
18	1S5	Door Interlock Switch	H	3AC5
19	L3	Same as Item 17		
20	K2	RF Contactor (DPDT) 110VAC	A	DO160-110
21	ET5	1-5/8" EIA End Terminal	E	270-25
22	1S6	Same as Item 18		
23	K1	Same as Item 20		
24		Same as Item 8		
25		Teflon Couplings (L1, L3, L6 & L7)	A	AO220-2
26	L7	Same as Item 17		
27	1S7	Same as Item 18		
28	L1	Same as Item 17		
29		Motors, 72 RPM-60cycle-110VAC(L1,L3,L6 and L7)	Q	SS150
30	1T1	Transformer	O	12004-B
31	J2	J-Plug Assembly (2-terminal)	A	CO203
32		Teflon Couplings (L2,L4 & L5)	A	AO220-1
33	L5	Bifilar Inductor, Variable (25μH, 40amps)	A	M25BV
34		Limit Switches (C1,C2,C3,L1,L2,L3,L4, L5,L6 &L7)	A	CO221
35	1S10	Toggle Switch/Circuit Breaker (AC Power ON/OFF)	I	112-215-101
36	1S1	Lever Switch (NORMAL/PATCH)	F	16038
37	1S2	Same as Item 36 (SERIES-PARALLEL/PARALLEL)		
38	M1	Meter 0-100 microamps DC (Local MF Forward Pwr)	B	1145VB
39	M2	Same as Item 38 (Local MF Reflected Power)		
40	M3	Same as Item 38 (Local LF Forward Power		
41	M4	Same as Item 38 (Local LF Reflected Power)		
42	1S21	Lever Switch (LOCAL/REMOTE)	F	160024
43		Same as Item 2		
44		Same as Item 2		
45		Same as Item 2		

TABLE 6-3

ITEM NO.	REF.SYM.	NOMENCLATURE	MFR. CODE	MFR.PART NO.
1		Motors(72 RPM,60 Cycle, 110 VAC) (For L1, L3, L6, L7)	Q	SS 150
2		Limit Switches (For C1,C2,C3,L2,L3,L4,L5,L6 and L7)		
3		Right Angle Drive (Second Gear, Opposite Drive end)	Y	10012
4		Melamine Insulation Plate (For Upper Flange Mount Of Variable Vacuum Capacitors C 2 and C3)	A	A0235
5		Same as Item 3		
6		Motors (72 RPM, 60 Cycle, 110 VAC) (For C1, C2, C3)	Q	SS 250
7		Same as Item 3		
8		Flexible Coupling ¼x⅜"	A	A0234-2
9		Same as Item 6		
10	ET2	1 5/8" EIA End Terminal	E	270-25
11	None	1 5/8 " EIA 90° Miter Elbow	E	270-18B
12	ET4	Same as Item 10		
13	ET1	Same as Item 10		
14		1 5/8" EIA 90° Unequal Miter Elbow	E	270-18A
15	ET3	Same as Item 10		
16	BDC2	Bi-Directional Coupler (500-2000 kHz, 10 KW AVG)	A	D0180
		Frequency Element for the BDC2 Bi-Directional Coupler (25 KW, 0.5-2 MC Relative FORWARD Power)	D	Special 25KW, 0.5-2MC
		Frequency Element for the BDC2 Bi-Directional Coupler (10KW,0.5-2 MC Relative REFLECTED Power)	D	Special 10KW, 0.5-2 MC
17	C4	Fixed Vacuum Capacitor 10000 PF (10KV, 270A)	C	CFSB 10000-10S
18	J1	J-Plug Assembly (2Term)	A	C0203
19	L4	Bifilar Inductor (Variable) (25 UH, 40 AMPS)	A	M25BV
20	IT1	Transformer	O	12004-B
21		Capacitor(1.25 MFD, 600VDC) (For Item 22)	R	480016
22		Motors (4 RPM, 60 Cycle, 110 VAC) (L2, L4, L5)	R	GA4
23		Melamine Insulation Plates (For Fixed Vacuum Capacitor C4)	A	A0237
24		Limit Switches (For C1, C2, C3, L1, L2, L3, L4 L5 and L6 & L7)	A	C0221
25		Flexing Cable (For Driving Local Readout Units)	X	1889LF
26	K2	R.F. Contactor (DPDT) 110 VAC	A	D0160-110
27		Right Angle Drive (Second Gear, –Drive End)	Y	10012
28		5" Aluminum, Ground Strap		

Table 6-3 (Continued)

ITEM NO.	REF. SYM.	NOMENCLATURE	CODE	MFR. PART NO.
29		Same as Item 11		
30		Same as Item 1		
31	1TB1	Terminal Board (30 Term) (At Right Hand Front Corner)	N	671-30
32		Lower Flange Mount (For Variable Vacuum Capacitors C1, C2, C3)	C	FM4
33		Same as Item 18		
34	C3	Variable Vacuum Capacitor 100-5000 PF (15KV, 125A)	C	VMMC 100-5000-15S
35		Upper Flange Mounts (For Variable Vacuum Capacitors C1, C2, C3)	C	FM4
36	1TB2	Terminal Board (30 Term) And Terminal Board (4 Term) (on A.C. Relay Chassis)	N N	671-30 671-4

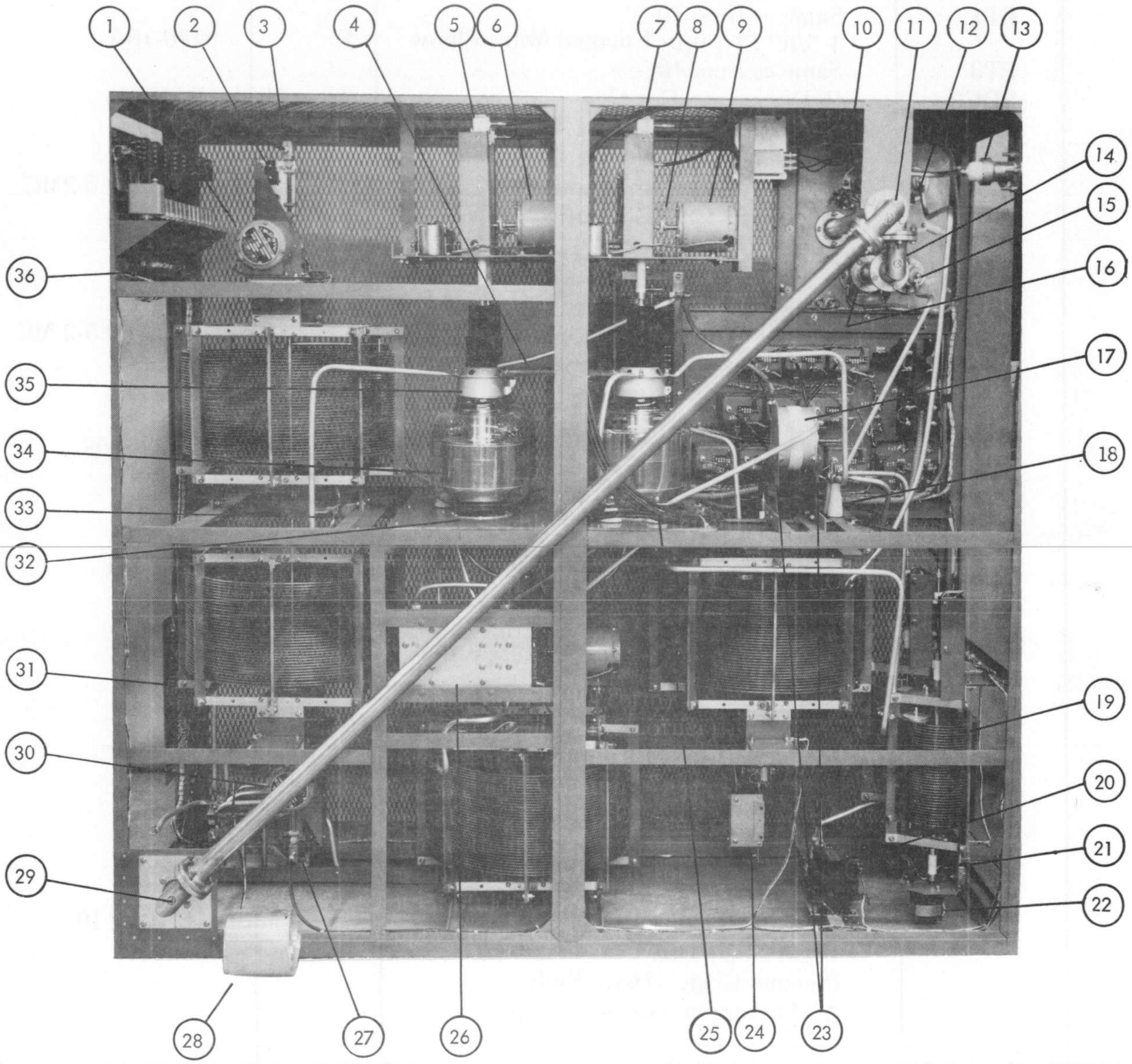


Figure 6-3 ATMC-1 Multicoupler Rear View

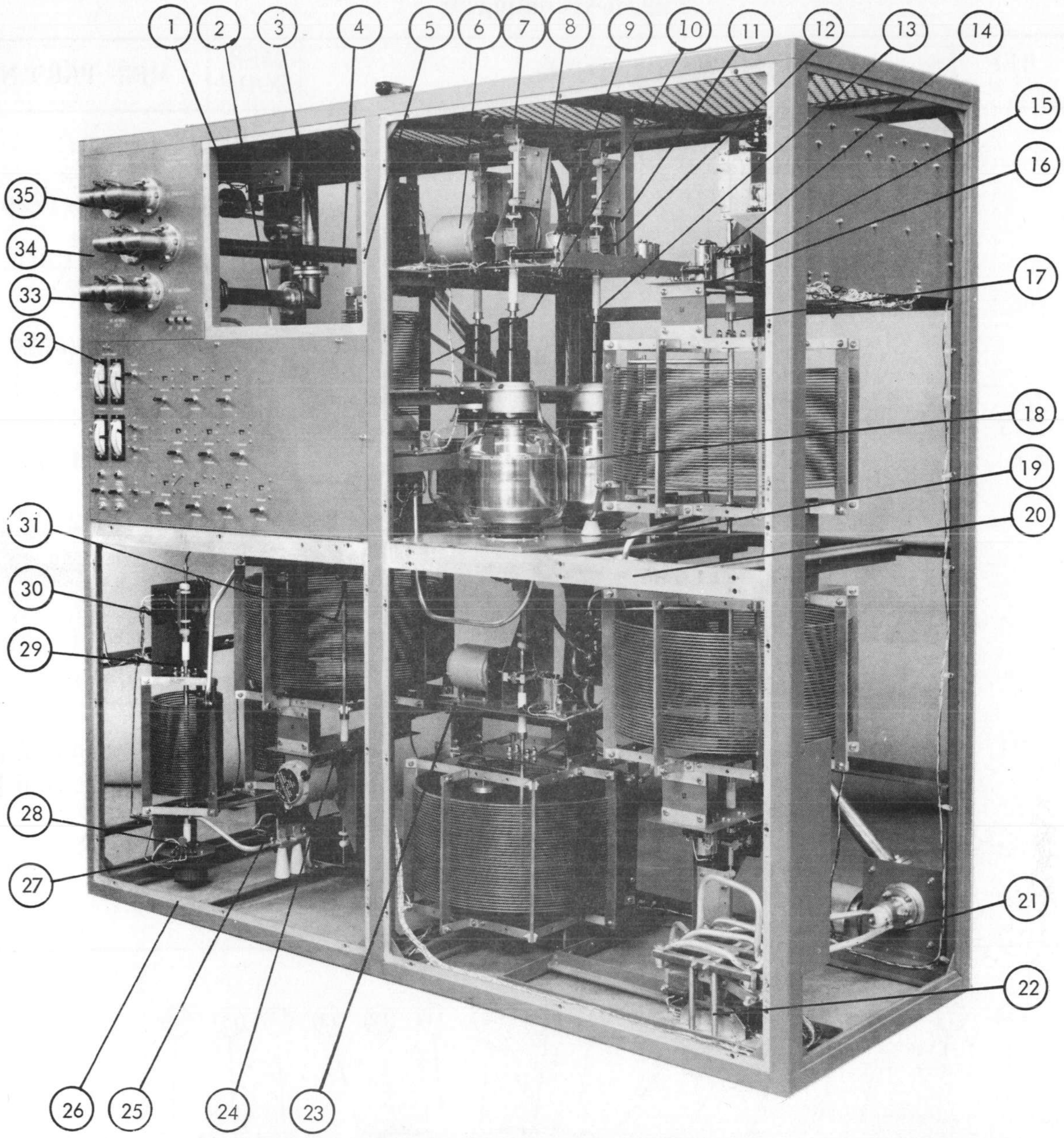


Figure 6-4 ATMC-1 Multicoupler, Right Front View.

Table 6-4

ITEM No.	REF. DESIG	NOMENCLATURE	CODE	PART No.
1		LF Current Sampler	S	380
2	D9	1-5/8" Rigid Line Section 9-13/16" Long	E	270-1
3	D12	Same as Item 2, 12-15/16" Long		
4	D27	Same as Item 2, 27-15/16" Long		
5	1S8	Door Interlock Switch-	H	3AC5
6		Motors, 72 RPM,60 cycle, 110VAC(C1,C2 & C3)	Q	SS250
7		Right Angle Drive (Gear opposite limit switch end)	Y	10012
8		Resistor 150 ohm,50W (for item 6)	Q	R-SS250/400
9		Capacitors 6.5MFD,330VAC (for item 6)	Q	C-SS250/400
10	L2	Bifilar Inductor Variable 25μH, 40 amp	A	M25BV
11		Limit Switches (C1, C2, C3, L1, L2, L3, L4, L5, and L6 & L7)	A	CO221

Table 6-4 (Continued)

ITEM NO.	REF. SYM.	NOMENCLATURE	MFR CODE	MFR PART NO.
12		Flexible Coupling ¼ x¼	A	AO234-1
13		Teflon Coupling	A	AO220-4
14		Capacitors 3.75MFD, 330VAC (for item 23)	Q	C-SS150/TS50
15		Worm Gear 16:1 ratio	A	AO233
16		Resistor 250 ohm, 25 watt (for item 23)	Q	R-SS50/150
17		Teflon Couplings (L1, L3, L6 & L7)	A	AO220-2
18	C1	Variable Vacuum Capacitor 100-5000PF,15KV,125A	C	VMMC-100-5000-15S
19		Feed through Insulator	A	AO238
20	J3	J-Plug Assembly (2-Terminals)	A	CO203
21	ET5	1-5/8" EIA End Terminal	E	270-25
22	K1	RF Contactor(DPDT) 110VAC	A	DO160-110
23		Motors, 72 RPM, 60 cycle,110VAC (L1, L3, L6 & L7)	Q	SS150 ′
24		Teflon Couplings (L1,L3, L6 & L7)	A	AO270-2
25		Same as Item 23		
26		Motors, 4RPM, 60 cycles, 110VAC (L2, L4 & L5)	R	GA4
27		Bypass Capacitors 0.1MFD, 500V	T	5GAP10
28		Teflon Couplings (L2, L4 & L5)	A	AO220-1
29		Same as Item 28		
30		Limit Switches (C1, C2, C3, L1, L2, L3, L4 , L5 & L6 and L7)	A	AO221
31	CN1	AC Connector (35 Contacts) Female Chassis Mount And AC Connector (35 Pins)	P	MS-3100A-36-15S MS-3106A-36-15P
32		Door Fastener Stud and Receptable	U	26S42-12 & 212-12N
33		1-5/8" U-Bend Assembly	E	
34		Same as Item 33		
35		Same as Item 33		

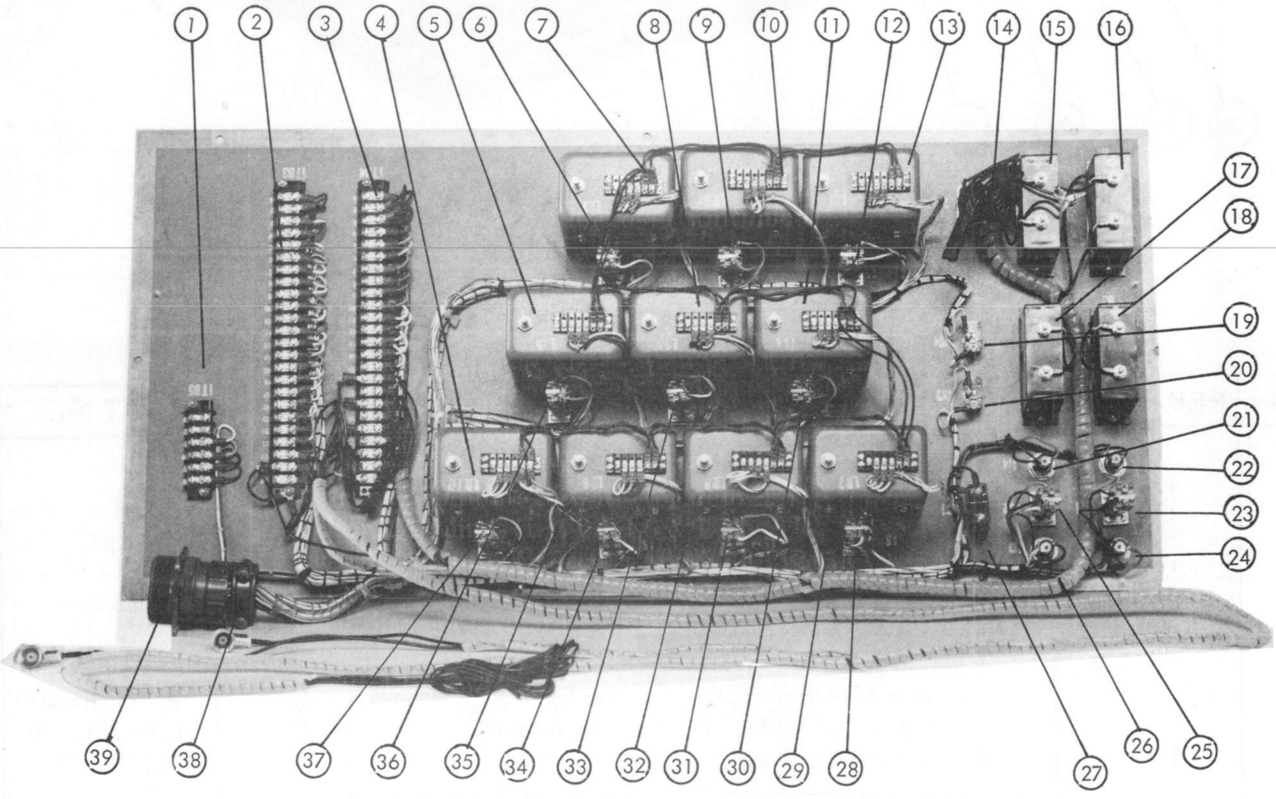


Figure 6-5 Local Control Panel for ATMC-1 Multicoupler (Rear View)

Table 6-5

ITEM NO.	REF DESIG	NOMENCLATURE	MFR. CODE	MFR. PART No.
1	1TB5	Terminal Board (6 Terminal)	N	671-6
2	1TB3	Same as Item 1 (24 Terminal)	N	671-24
3	1TB4	Same as Item 2		
4	LR10	Local: Counter Selsyn Readout (For L3)	A	CO214
5	LR6	Same as Item 4 (For C1)		
6	1S17	Lever Switch (For C3)	F	16038
7	LR3	Same as Item 4 (For C3)		
8	LR5	Same as Item 4 (For L6)		
9	1S13	Same as Item 6 (For C2)		
10	LR2	Same as Item 4 (For C2)		
11	LR4	Same as Item 4 (For L2)		
12	1S19	Same as Item 6 (For L5)		
13	LR1	Same as Item 4 (For L5)		
14	1S21	Lever Switch (LOCAL/REMOTE)	F	160024
15	M2	Meter, 0-100 microamps DC Local LF Reflected	B	1145VB
16	M1	Same as Item 15 Local LF Forward Power		
17	M4	Same as Item 15 Local MF Reflected Power		
18	M3	Same as Item 15 Local MF Forward Power		
19	1S4	Toggle Switch (LF Plate)	G	7500K14
20	1S3	Same as Item 19 (MF Plate)		
21	1I3	Indicator Light Assembly (Series/Parallel)(blue)	J	5100-182-110
22	1I2	Same as Item 21 (Patch)		
23	1S1	Same as Item 6 (Normal/Patch)		
24	1I1	Same as Item 21 (Normal)		
25	1S2	Same as Item 6 (Series/Parallel-Parallel)		
26	1I4	Same as Item 21 (Parallel)		
27	1S10	Toggle Switch/Circuit Breaker (AC Power ON/OFF)	I	112-215-101
28	1S18	Same as Item 6 (For L4)		
29	LR7	Same as Item 4 (For L4)		
30	1S12	Same as Item 6 (For L2)		
31	1S14	Same as Item 6 (For L1)		
32	LR8	Same as Item 4 (For L1)		
33	1S20	Same as Item 6 (For L6)		
34	1S16	Same as Item 6 (For L7)		
35	LR9	Same as Item 4 (For L7)		
36	1S15	Same as Item 6 (For C1)		
37	1S11	Same as Item 6 (For L3)		
38		AC Cable Clamp	P	AN3057-24
39	CN1	AC Connector (35 Contacts) Female Chassis Mounting Type	P	MS-3100A-36 -15S

TABLE 6-6

IDENT NO.	REF. SYM.	NOMENCLATURE	MFR. CODE	MFR. PART NO.
1	RI11	Indicator Light Assembly (Patch)(LF XMTR to Trailing Wire)	J	5100-182-110 Blue
2	RI13	Same as RI11 (Trunk to Trailing Wire)		
3	RI14	Same as RI11 (LF XMTR to Trunk)		
4	RI9	Same as RI11 (LF XMTR to LF Network Input)		

Table 6-6 (Continued)

ITEM NO.	REF SYM.	NOMENCLATURE	MFR. CODE	MFR. PART NO.
5	RI5	Indicator Light Assembly (MF, Open Interlock)	J	5100-182-110 Red
6	RI1	Indicator Light Assembly (Normal)	J	5100-182-110 Amber
7	RI2	Same as RI 11 (Patch)		
8	M5	Meter 0-100 Microamp DC (Remote MF Reflected Power)	B	1145VB
9	M6	Same as M5 (Remote MF Forward Power)		
10		Silicone Diode	J	IN251
11	M7	Same as M5 (Remote LF Reflected Power)		
12	M8	Same as M5 (Remote MF Forward Power)		
13		Silicone Diode		
14		By-Pass Capacitors (0.1 Mfd, 500V)	T	5GAP10
15		Silicone Diode		
16		Silicone Diode		
17		By-Pass Capacitors		
18		By- Pass Capacitors		
19		By-Pass Capacitors		
20	RI4	Same as RI1 (Parallel)		
21	R13	Same as RI1 (Series-Parallel)		
22	R17	Same as RI5 (Trunk, Open Interlock)		
23	R16	Same as RI5 (LF, Open Interlock)		
24	R18	Same as RI11 (Trunk)		
25	RI15	Same as RI11 (MF XMTR to Trunk)		
26	2TBI	Terminal Board (24 Term) (On Remote Status Panel Chassis)	N	671-24
27	RI12	Same as RI11 (MF XMTR to Trailing Wire)		

TABLE 6-7

ITEM NO.	REF SYM.	NOMENCLATURE	MFR. CODE	MFR. PART NO.
1	RR10	Remote: Counter/Selsyn Readout (For L3)	A	C0219
2	RR4	Same as RR10 (For L2)		
3	RR6	Same as RR10 (For C1)		
4	RR8	Same RR10 (For L1)		
5	RR5	Same as RR10 (For L6)		
6	RR7	Same as RR10 (For L4)		

Table 6-7 (Continued)

ITEM NO.	REF. SYM.	NOMENCLATURE	MFR. CODE	MFR. PART NO.
7	RR9	Same as RR10 (For L7)		
8	RR2	Same as RR10 (For C2)		
9	RR3	Same as RR10 (For C3)		
10	RR1	Same as RR 10 (For L5)		
11	CN2	A.C. Connector(35 contacts) (female, chassis mounting type: Located on Remote Readout Panel.	P	MS-3100A-36-155

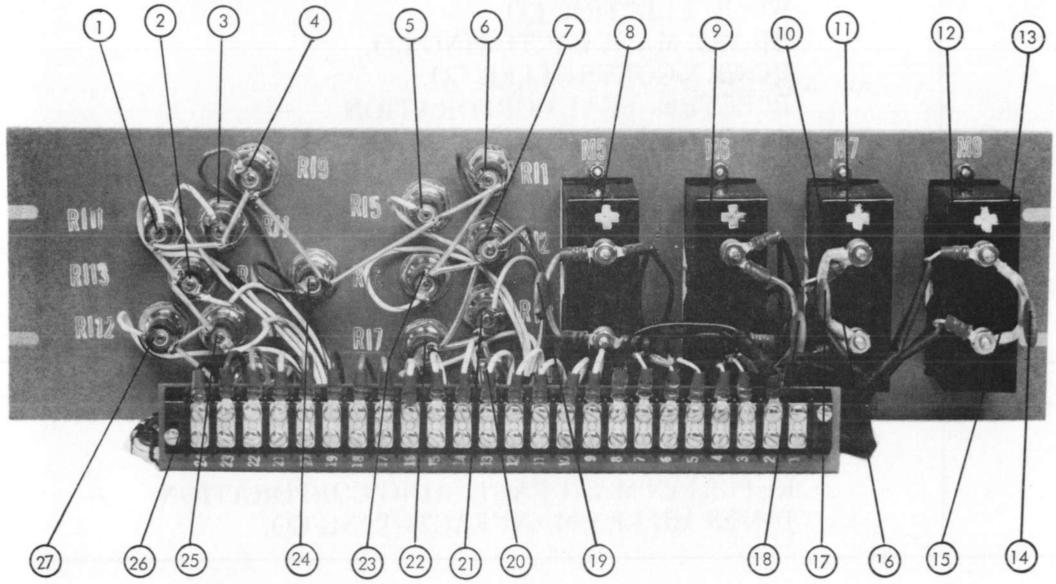


Figure 6-6 Remote Status Panel for ATMC-1 Multicoupler (Rear View)

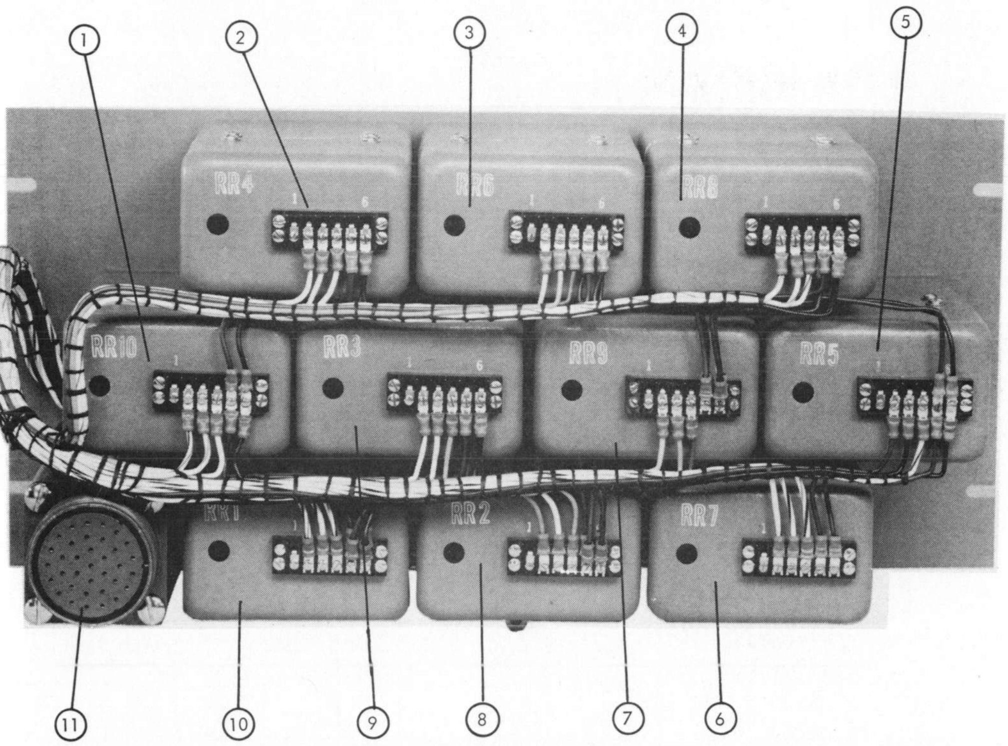


Figure 6-7 Remote Readout Panel for ATMC-1 Multicoupler (Rear View)

MANUFACTURER'S CODES FOR LISTS OF

REPLACEABLE PARTS

CODE	MANUFACTURER
A.	MULTRONICS, INC
B.	INTERNATIONAL INSTRUMENTS, INC.
C.	I. T. T. JENNINGS
D.	BIRD ELECTRONICS CORPORATION
E.	DIELECTRIC PRODUCTS
F.	SWITCHCRAFT INC.
G.	CUTLER–HAMMER, INC.
H.	MICROSWITCH DIVISION OF HONEYWELL
I.	WOOD ELECTRIC CO.
J.	DRAKE MANUFACTURING CO.
K.	ROWAN CONTROLLER CO.
L.	ELECTRO–SEAL CORPORATION
M.	SCHRACK ELECTRICAL SALES CORP.
N.	KULKA ELECTRIC CORPORATION
O.	TODD ELECTRIC CO.
P.	AMPHENOL
Q.	SUPERIOR ELECTRIC CO.
R.	HURST MANUFACTURING CO.
S.	GRANGER ASSOCIATES
T.	SPRAGUE ELECTRIC CO.
U.	CAMLOC FASTENER CORPORATION
V.	SYLVANIA
W.	ALPHA CORPORATION
X.	KUPERIAN MANUFACTURING CORPORATION
Y.	JAMES MILLEN MANUFACTURING CO.

SECTION 7

SCHEMATIC DIAGRAMS

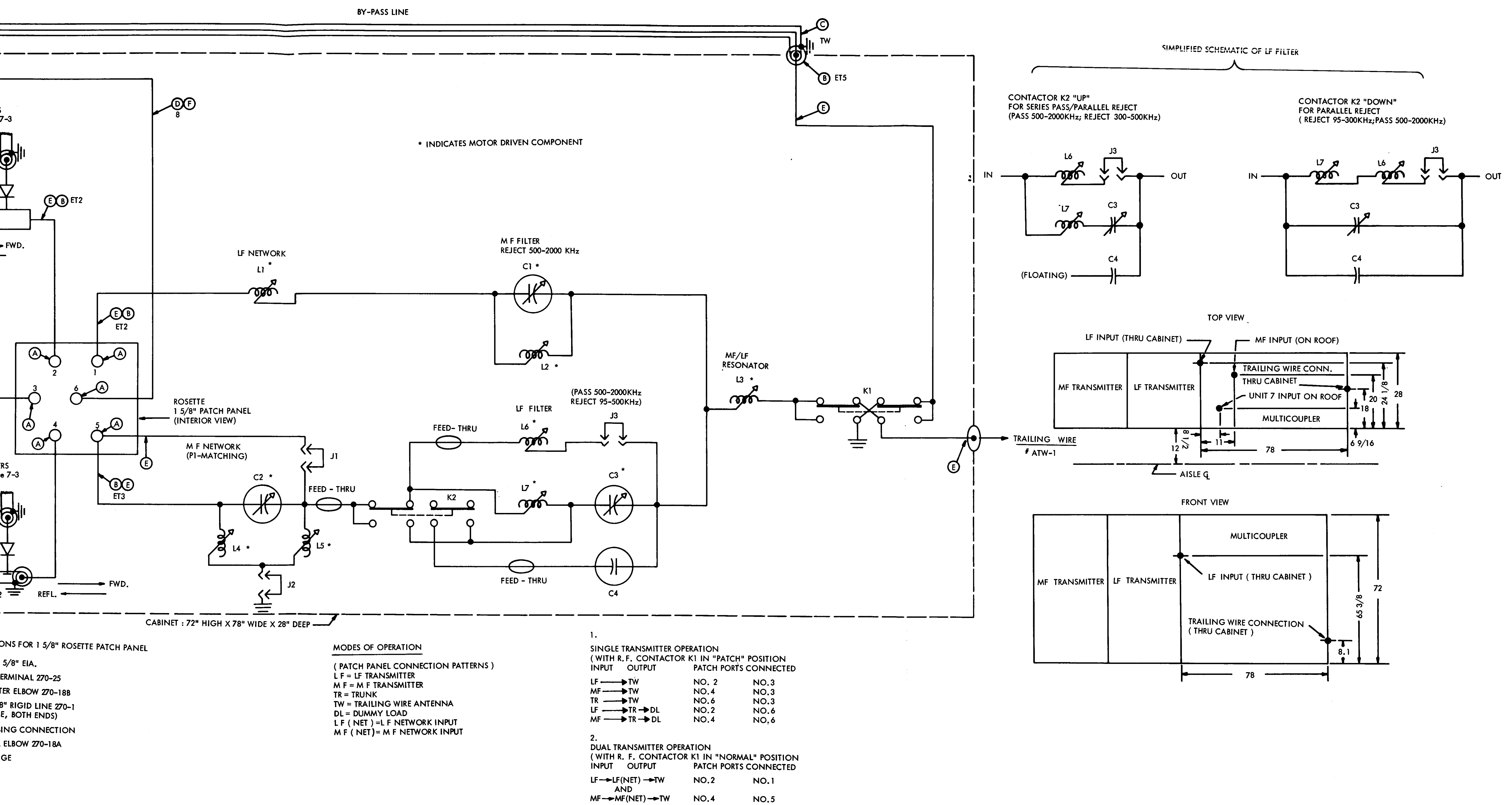
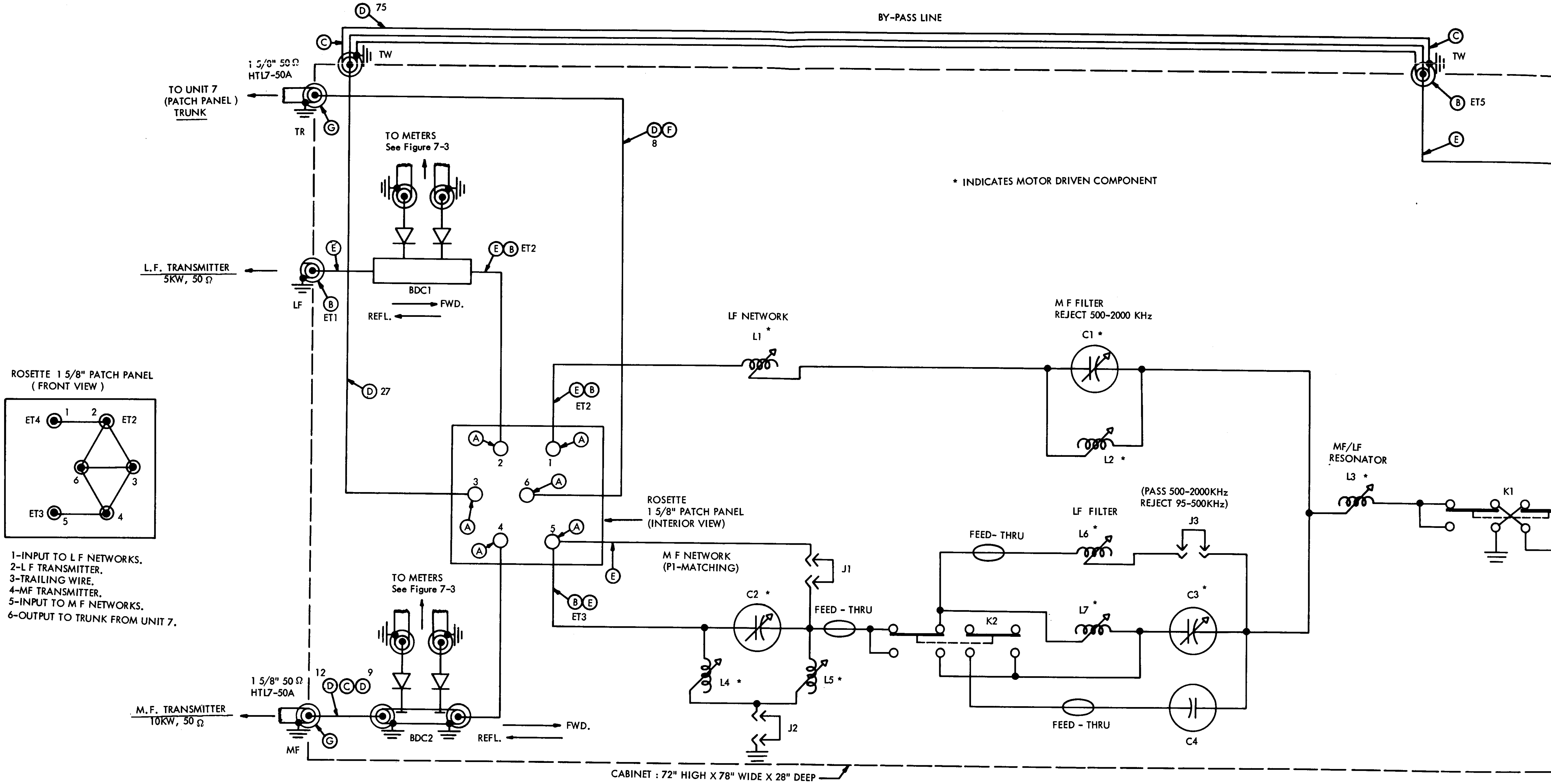


Figure 7-1. Schematic Diagram, Model ATMC-1 Multicoupler



CONTACTOR K1 SHOWN IN "NORMAL" POSITION FOR MULTICOUPLER INTO TRAILING WIRE (VERSUS "PATCH"; BY-PASS INTO TRAILING WIRE).

CONTACTOR K2 SHOWN IN " SERIES PASS/PARALLEL REJECT" POSITION (VERSUS "PARALLEL REJECT").

INSIDE CONNECTIONS FOR 1 5/8" ROSETTE PATCH PANEL

Ⓐ ROSETTE PORT 1 5/8" EIA.
Ⓑ 1 5/8" EIA END TERMINAL 270-25
Ⓒ 1 5/8" EIA 90 MITER ELBOW 270-18B
Ⓓ LENGTH OF 1 5/8" RIGID LINE 270-1 (WITH EIA FLANGE, BOTH ENDS)
Ⓔ 1/2" COPPER TUBING CONNECTION
Ⓕ 1 5/8" UNEQUAL ELBOW 270-18A
Ⓖ 1 5/8" EIA FLANGE

MODES OF OPERATION

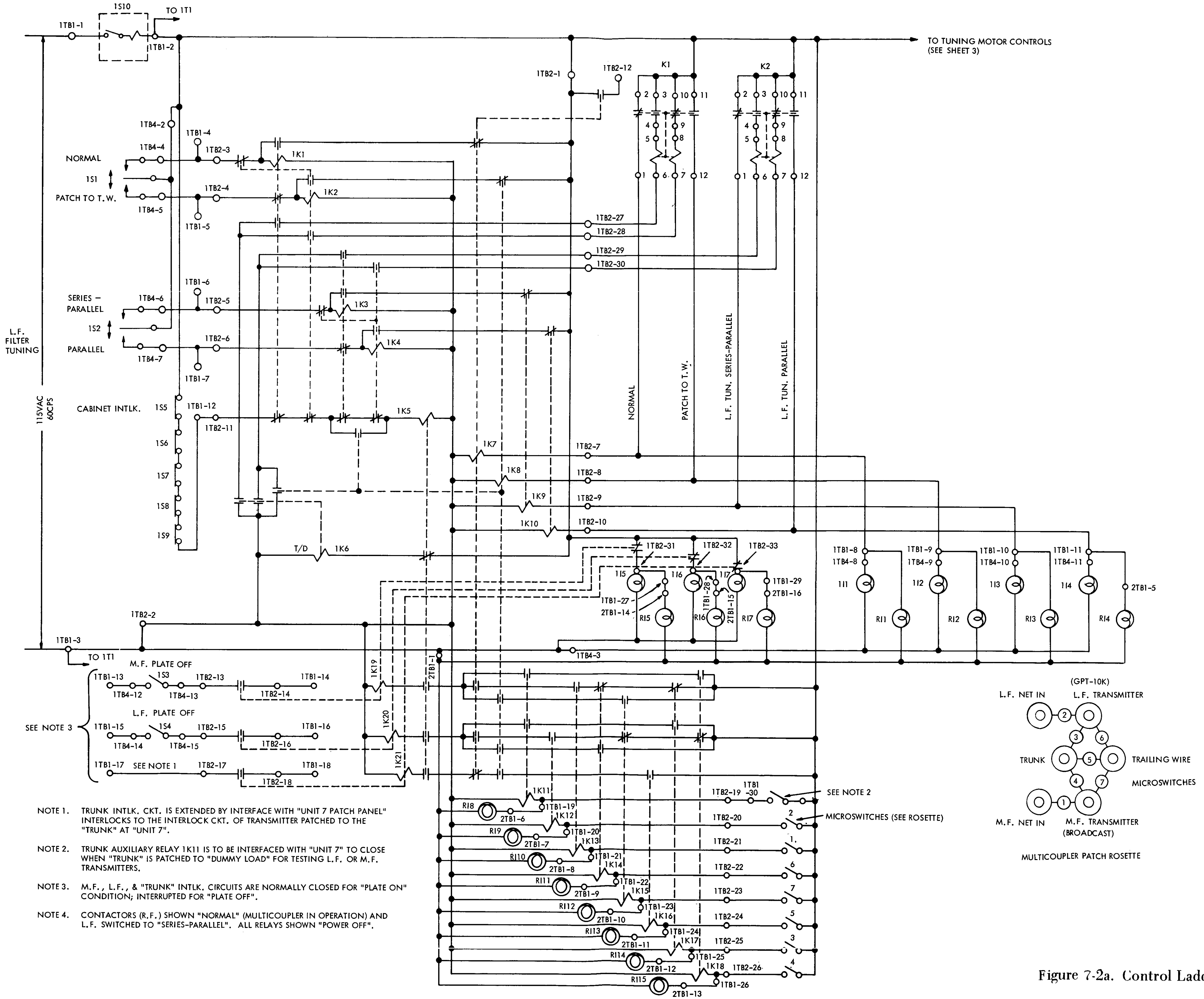
(PATCH PANEL CONNECTION PATTERNS)
L F = LF TRANSMITTER
M F = M F TRANSMITTER
TR = TRUNK
TW = TRAILING WIRE ANTENNA
DL = DUMMY LOAD
L F (NET) = L F NETWORK INPUT
M F (NET) = M F NETWORK INPUT

1.
SINGLE TRANSMITTER OPERATION
(WITH R.F. CONTACTOR K1 IN "PATCH" POSITION

INPUT	OUTPUT	PATCH PORTS CONNECTED	
LF ⟶	TW	NO. 2	NO.3
MF ⟶	TW	NO.4	NO.3
TR ⟶	TW	NO.6	NO.3
LF ⟶	TR ⟶ DL	NO.2	NO.6
MF ⟶	TR ⟶ DL	NO.4	NO.6

2.
DUAL TRANSMITTER OPERATION
(WITH R. F. CONTACTOR K1 IN "NORMAL" POSITION

INPUT	OUTPUT	PATCH PORTS CONNECTED	
LF ⟶	LF(NET) ⟶ TW	NO.2	NO.1
	AND		
MF ⟶	MF(NET) ⟶ TW	NO.4	NO.5



NOTE 1. TRUNK INTLK. CKT. IS EXTENDED BY INTERFACE WITH "UNIT 7 PATCH PANEL" INTERLOCKS TO THE INTERLOCK CKT. OF TRANSMITTER PATCHED TO THE "TRUNK" AT "UNIT 7".

NOTE 2. TRUNK AUXILIARY RELAY 1K11 IS TO BE INTERFACED WITH "UNIT 7" TO CLOSE WHEN "TRUNK" IS PATCHED TO "DUMMY LOAD" FOR TESTING L.F. OR M.F. TRANSMITTERS.

NOTE 3. M.F., L.F., & "TRUNK" INTLK. CIRCUITS ARE NORMALLY CLOSED FOR "PLATE ON" CONDITION; INTERRUPTED FOR "PLATE OFF".

NOTE 4. CONTACTORS (R.F.) SHOWN "NORMAL" (MULTICOUPLER IN OPERATION) AND L.F. SWITCHED TO "SERIES-PARALLEL". ALL RELAYS SHOWN "POWER OFF".

RELAYS AND CONTACTORS: ALL 115VAC COILS

K1, K2	MULTRONICS TYPE DO110
1K1, 1K2, 1K3, 1K4	ROWAN TYPE E22
1K5	ROWAN TYPE E31
1K6(ADJ. T/D SOLID STATE)	CLARE ELECTROSEAL TYPE C2163 E2 300
1K7	ROWAN TYPE E32
1K8	ROWAN TYPE E51
1K9 THROUGH 1K21	SCHRACK TYPE CAD11A10

Figure 7-2a. Control Ladder Schematic (Contactor/Patch Panel)

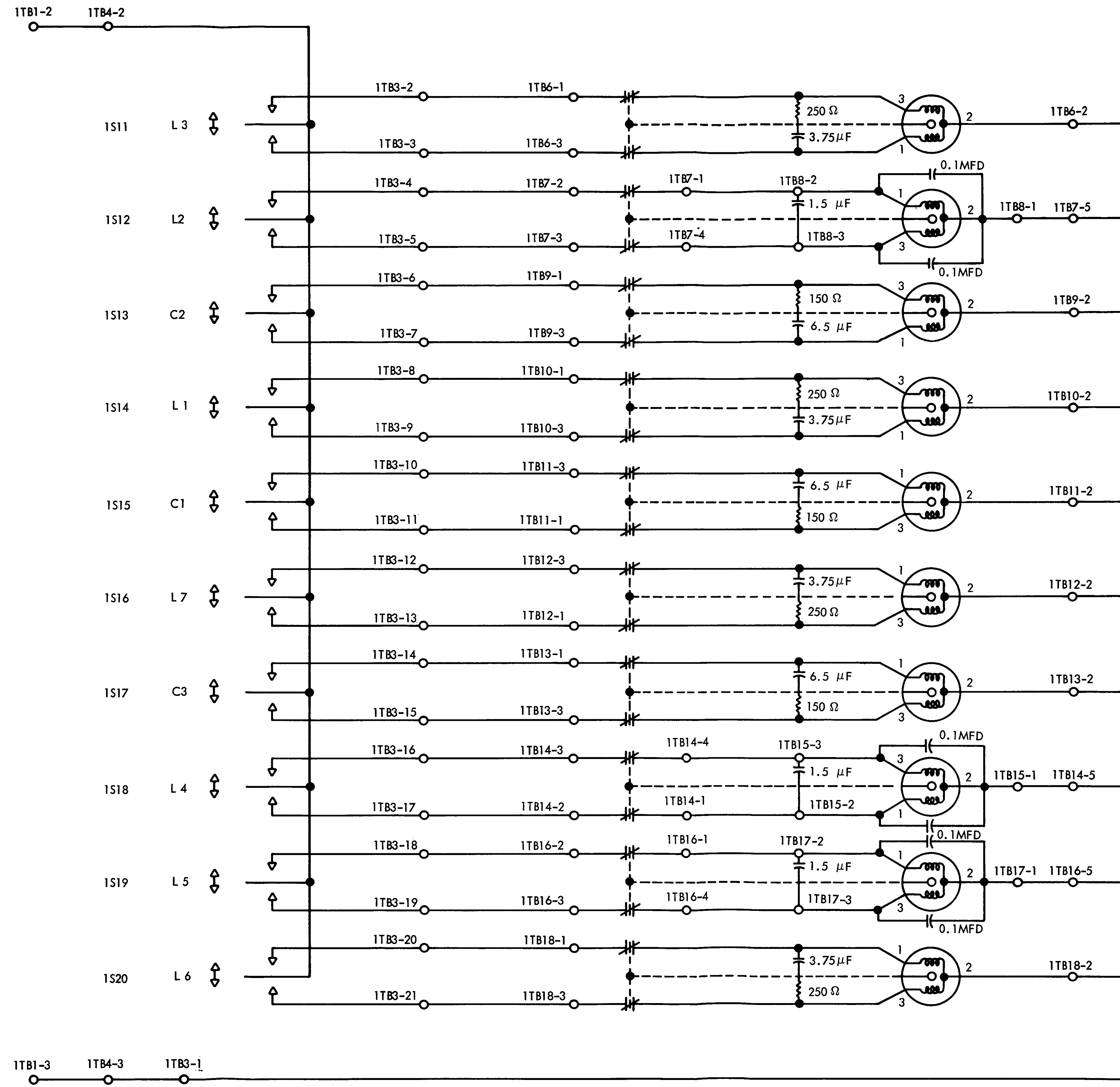
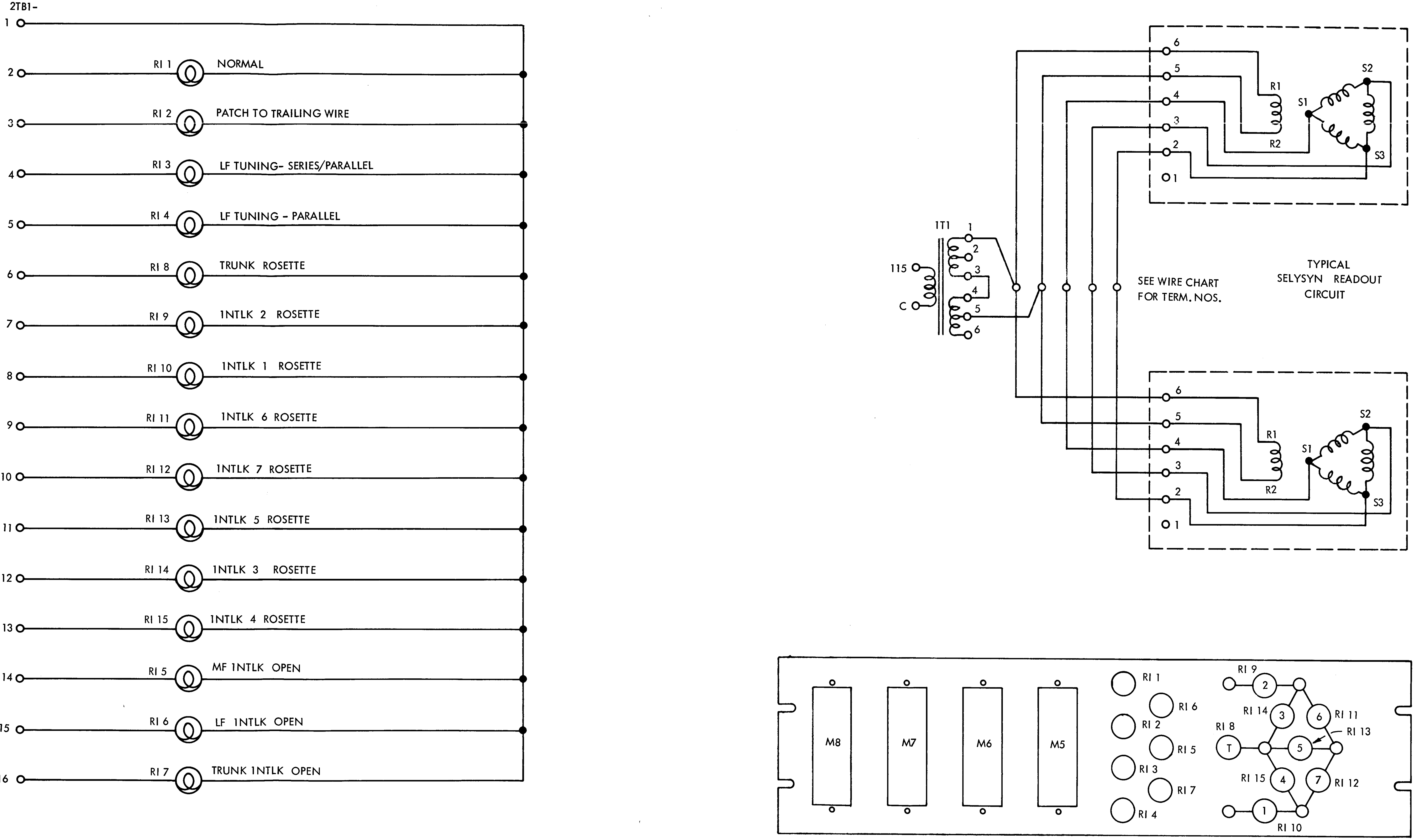
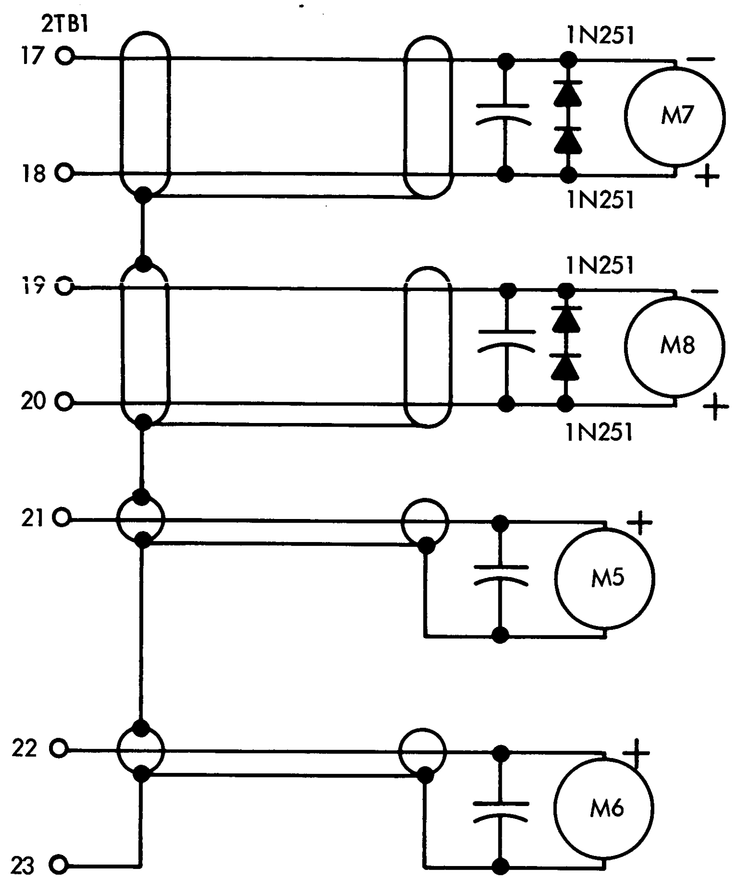


Figure 7-2b. Control Ladder Schematic (Tuning Motor Control)

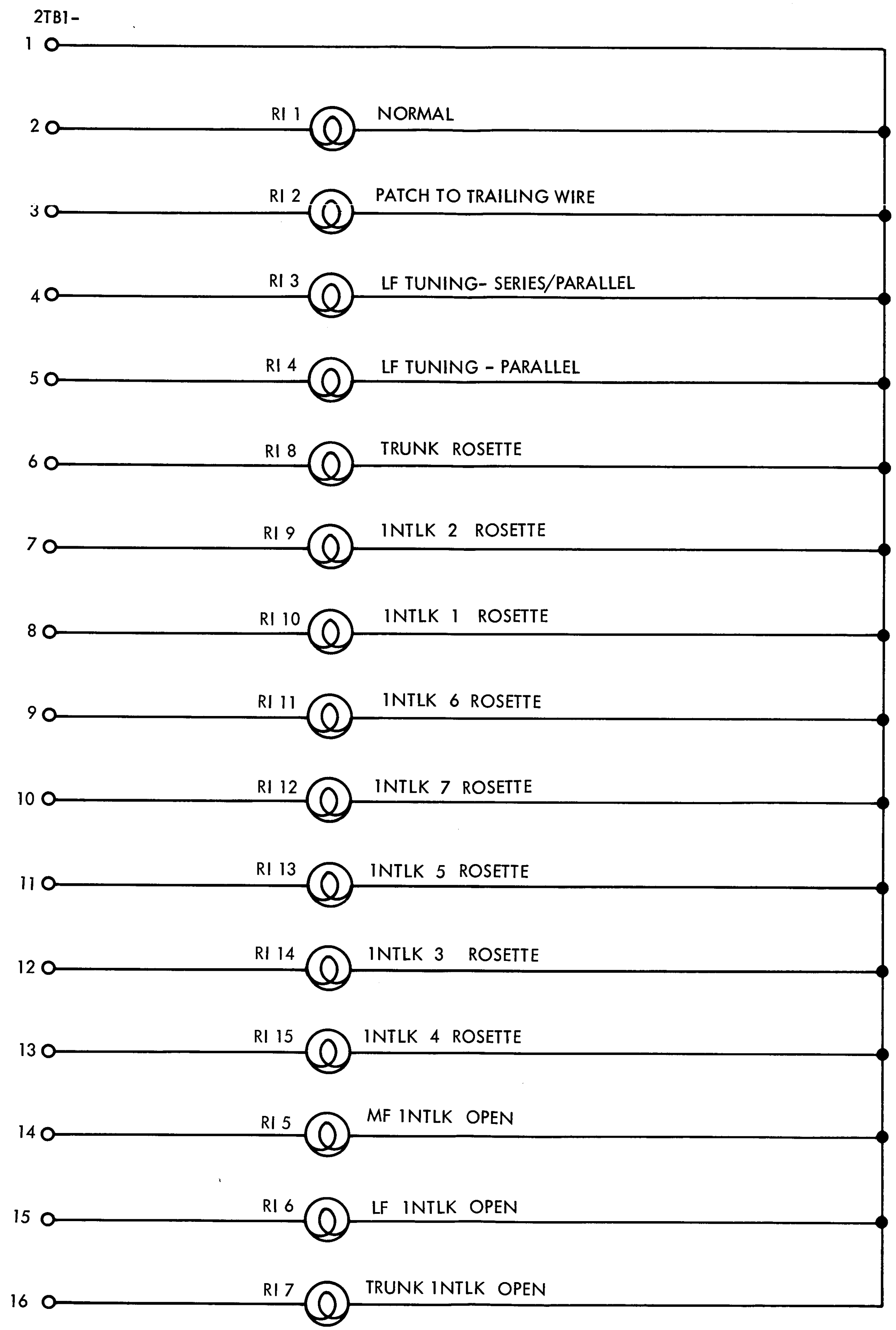


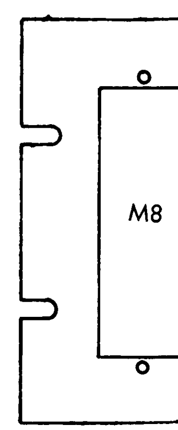
REMOTE STATUS PANEL (FRONT VIEW)

Figure 7-2c. Control Ladder Schematic (Remote Status Panel-Typical Selsyn Readout)



CAPACITORS VALUES 0.1 MFD





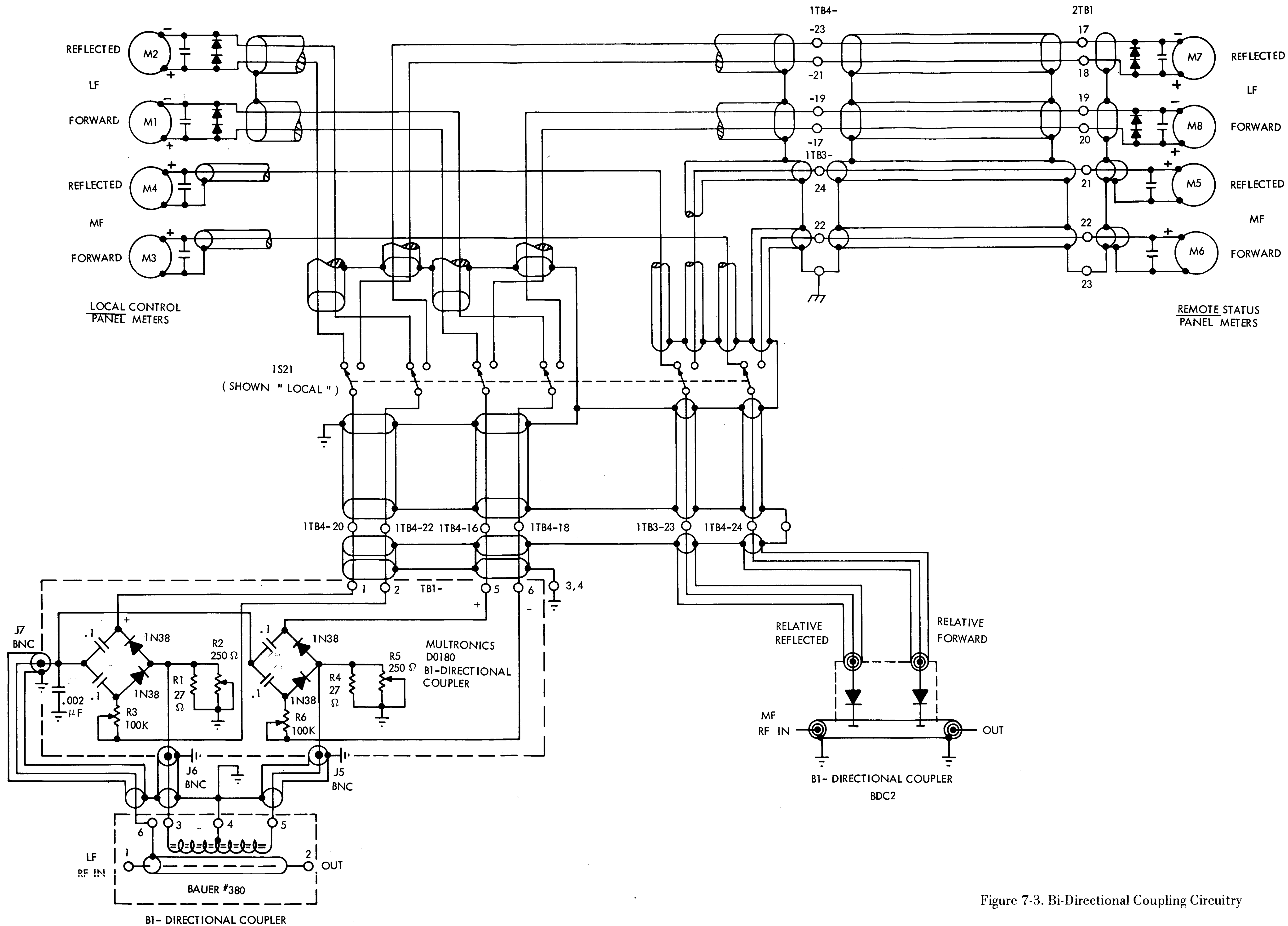


Figure 7-3. Bi-Directional Coupling Circuitry

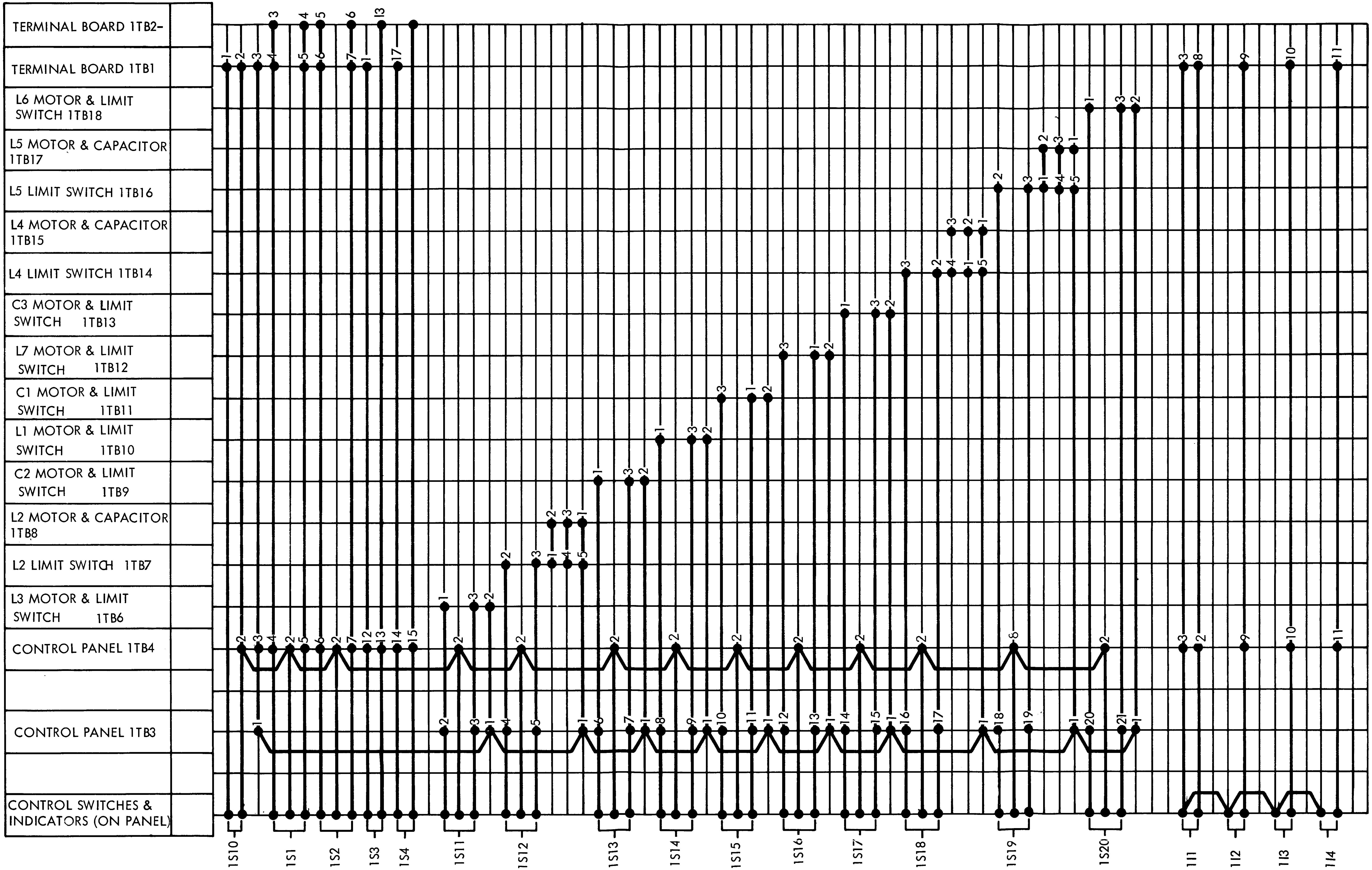


Figure 7-4a Wiring Chart (A.C. Control & Motors)

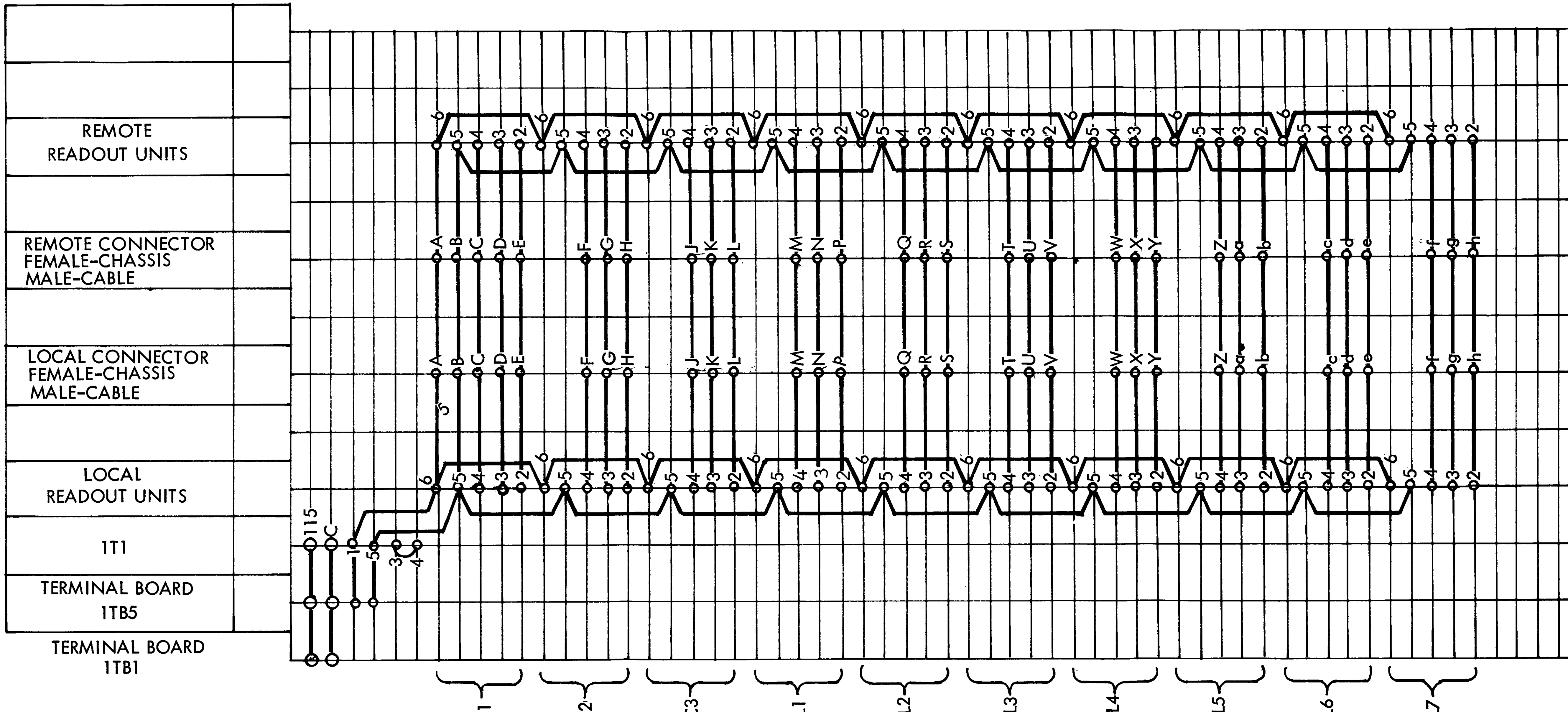


Figure 7-4b Wiring Chart (Local Remote Readout Units)

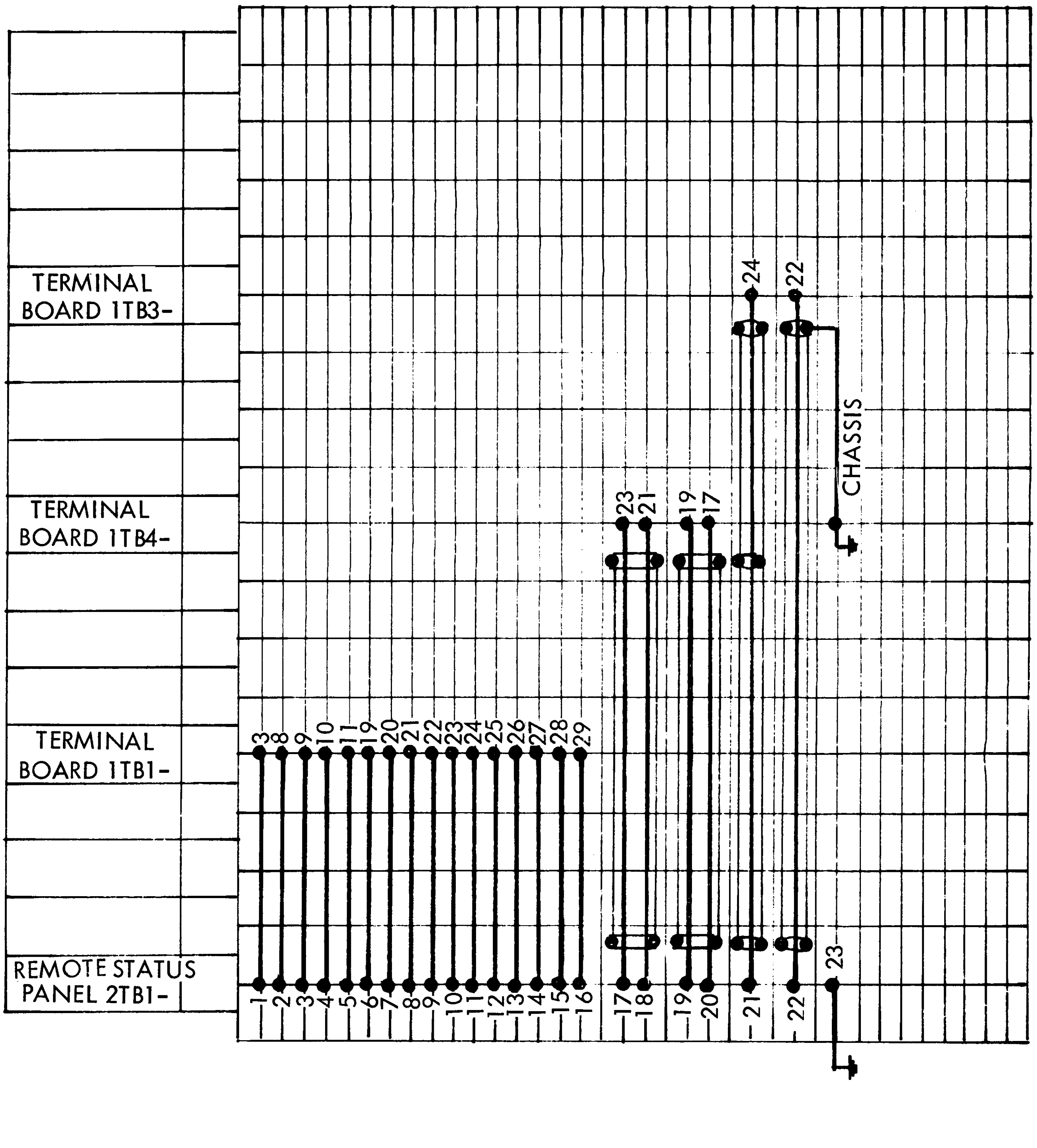


Figure 7-4c. Wiring Chart (Remote Status Panel)