UNCLASSIFIED

TECHNICAL MANUAL

for

AUXILIARY FRAME

TECHNIMATIC TRANSMITTER

TSTE-10K

THE TECHNICAL MATERIEL CORPORATION

MAMARONECK, N.Y. OTTAWA, ONTARIO

UNCLASSIFIED

TECHNICAL MANUAL

for

AUXILIARY FRAME

TECHNIMATIC TRANSMITTER

TSTE-10K

THE TECHNICAL MATERIEL CORPORATION

MAMARONECK, N.Y. OTTAWA, ONTARIO

IN-352

Issue Date: 30 March 1966

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

Warranty

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

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

1. That any claim of defect under this warranty is made within sixty (60) days after discovery thereof and that inspection by TMC, if required, indicates the validity of such claim to TMC's satisfaction.

2. That the defect is not the result of damage incurred in shipment from or to the factory.

3. That the equipment has not been altered in any way either as to design or use whether by replacement parts not supplied or approved by TMC, or otherwise.

4. That any equipment or accessories furnished but not manufactured by TMC, or not of TMC design shall be subject only to such adjustments as TMC may obtain from the supplier thereof.

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

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

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

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

*Electron tubes also include semi-conductor devices.

PROCEDURE FOR RETURN OF MATERIAL OR EQUIPMENT

Should it be necessary to return equipment or material for repair or replacement, whether within warranty or otherwise, a return authorization must be obtained from TMC prior to shipment. The request for return authorization should include the following information:

1. Model Number of Equipment.
2. Serial Number of Equipment.
3. TMC Part Number.
4. Nature of defect or cause of failure.
5. The contract or purchase order under which equipment was delivered.

PROCEDURE FOR ORDERING REPLACEMENT PARTS

When ordering replacement parts, the following information must be included in the order as applicable:

1. Quantity Required.
2. TMC Part Number.
3. Equipment in which used by TMC or Military Model Number.
4. Brief Description of the Item.
5. The *Crystal Frequency* if the order includes crystals.

PROCEDURE IN THE EVENT OF DAMAGE INCURRED IN SHIPMENT

TMC's Warranty specifically excludes damage incurred in shipment to or from the factory. In the event equipment is received in damaged condition, the carrier should be notified immediately. Claims for such damage should be filed with the carrier involved and not with TMC.

All correspondence pertaining to Warranty Claims, return, repair, or replacement and all material or equipment returned for repair or replacement, within Warranty or otherwise, should be addressed as follows:

THE TECHNICAL MATERIEL CORPORATION
Engineering Services Department
700 Fenimore Road
Mamaroneck, New York

CHANGE NO. 1 Aux. Frame TSTE-10K

INSTRUCTION BOOK CHANGE NOTICE

Date 9/26/66

Manual affected: Auxiliary Frame, TechniMatiC Transmitter, IN -352
TSTE-10K (issue date: 30 Mar., 1966)

Page i.

Page i of the manual is obsolete and is superseded by page i provided with this change notice.

SHOULD ADDITIONAL COPIES OF THIS CHANGE NOTICE BE REQUIRED, PLEASE CONTACT:
THE TECHNICAL MATERIEL CORP., 700 Fenimore Road, Mamar neck, New Y rk
Attn.: Director of Eng. Services.

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

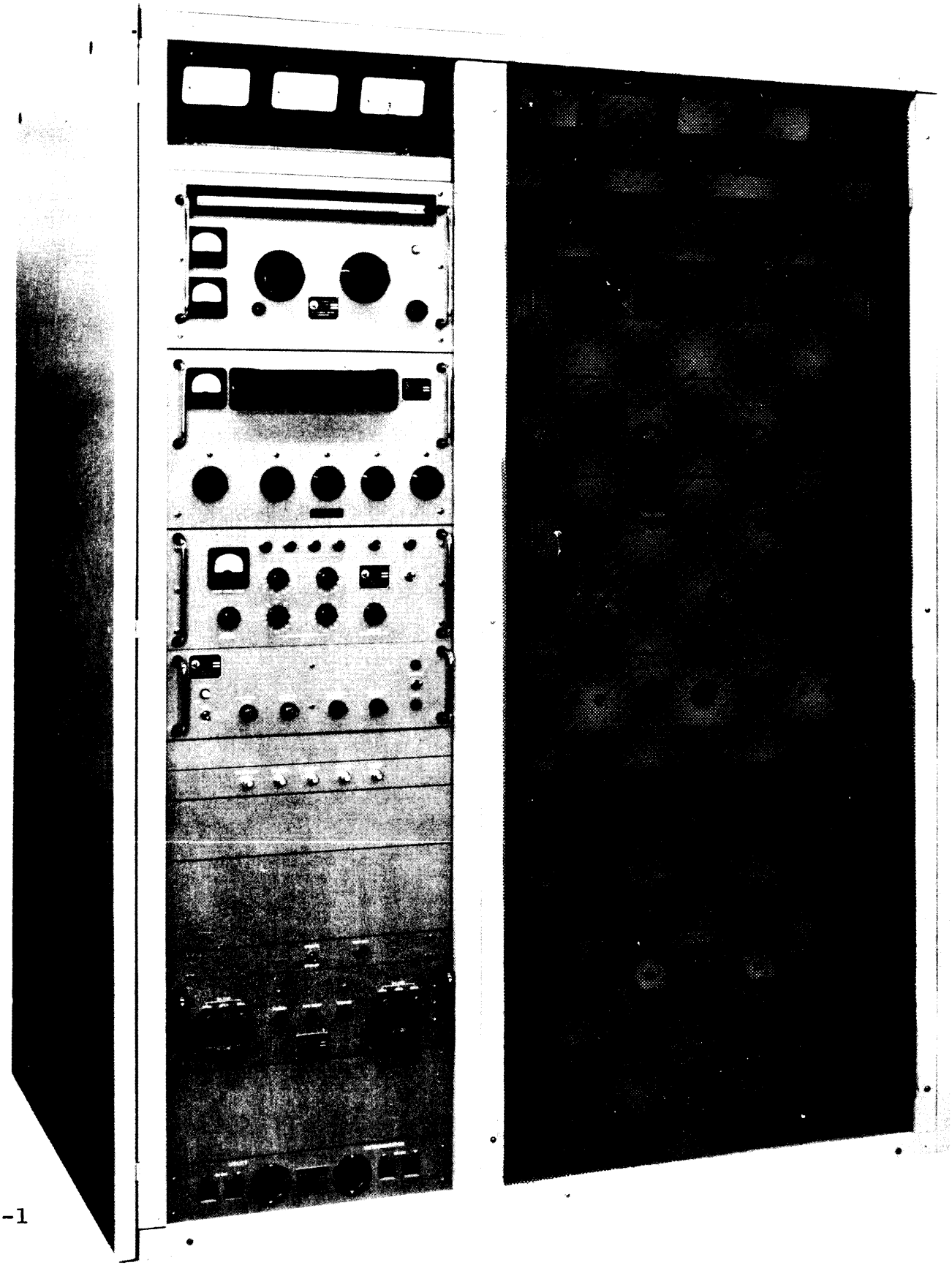
RECORD OF CORRECTIONS MADE

Change No.	Date of Change	Date Entered	Entered By

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES



352-1

659.28-3

Figure 1-1. Auxiliary Frame, Technimatic Transmitter, TSTE-10K

SECTION 1
GENERAL INFORMATION

1-1. PURPOSE OF EQUIPMENT.

The Auxiliary Frame (figure 1-1) of the TSTE-10K transmitter contains synthesized four-channel sideband exciter equipment that provides at least .250 watts PEP across an impedance of 50 ohms over the frequency range of 2 to 32 megacycles. The output signals are stable to within 1 part in 10^8 per day. The exciter develops single, double, or independent sideband transmission with various degrees of carrier insertion. The equipment can be operated either manually or by remote control. When operated by remote control, bandswitching and frequency tuning are automatic functions.

1-2. TECHNICAL SPECIFICATIONS.

The technical specifications of the auxiliary frame are listed below.

Frequency Range	2-32 mcs.
Types of Operation	SSB, ISB, DSB, AME, CW, FSK, amd FAX with appropriate converter.
Operating Modes	1. Manual 2. Remote Control. (Used with remote control equipment such as the TMC Model AX-568.)

*Trademark applied for

1-2. TECHNICAL SPECIFICATIONS (Cont)

Stability	1 part 10^8 per day.
Tuning:	100 cycle increments.
Manual	All bandswitching and tuning controls mounted on front panel.
Remote	Remote tuning automatically bandswitches and frequency tunes the frequency translator.
Inputs:	
Number	Four; channels B2, B1, A1, A2.
Impedance	600 ohms per input channel.
Level	-26 to +5 dbm.
Bandwidth	200-3100 cps each channel; total bandwidth approximately 12 kilocycles.
Output:	
Impedance	50 ohms.
Power	.250 watts PEP.
Carrier Suppression	At least -55 db below full power out.
Carrier Reinsertion	Can reinsert carrier by front panel control at the following levels below full power out: 0 db, 5 db, 10 db, 15 db, and 20 db.
Intermodulation Distortion	3rd and 5th order products at least 40 db below tone level of a two-tone test at rated .250 watt PEP output.
Crosstalk	Crosstalk at least 40 db below tone level of a 2-tone test at rated .250 watt PEP output.

1-2. TECHNICAL SPECIFICATIONS (Cont)

Hum	At least 50 db below rated output of .250 watts PEP.
Harmonics	All harmonics suppressed at least 50 db below rated output of .250 watts PEP.
Primary Power Requirements	24 volts dc; 115 volts, 48-60 cps, 1-phase.
Operating Temperature	0° to 50°C for humidity as high as 90%.

1-3. DESCRIPTION OF EQUIPMENT.

Refer to figure 1-2. The auxiliary frame houses the exciter components of the transmitter. The frame is divided into a front and rear section by a partition which supports miscellaneous controls, connectors, and terminal boards. An AUXILIARY FRAME MAIN POWER contactor, located on the rear of the inner partition, controls the application of primary power to the auxiliary frame. Front and rear fans provide forced air cooling of the auxiliary frame components.

a. METER PANEL AX-107. - Meter Panel AX-107, mounted at the top of the auxiliary frame, contains three meters. These monitor the PA screen grid voltage, PA grid bias voltage, and PA plate voltage of the associated transmitter equipment. The AX-107 functions closely with the main frame circuits; therefore, it is covered in Volume 2.

b. RF TRANSLATOR, MODEL CHGR-3A. - RF Translator CHGR-3A produces a maximum of four sideband channels centered aroung a carrier in the frequency range of 2- to 32 megacycles with

a power level of .250 watts. The output signals are stable to within 1 part in 10^8 per day. The bandswitching and frequency tuning functions of the CHGR can be performed automatically when remote control signals are applied to the auxiliary frame.

c. CONTROL SYNTHESIZER, MODEL HFSA-2. - Control Synthesizer HFSA stabilizes the HFO in the CHGR unit and converts coded data from a remote control unit into bandswitching and tuning data.

d. SIDEBAND EXCITER, MODEL CMRA-1. - Sideband Exciter, CMRA utilizes audio frequency input signals to produce a maximum of four sideband channels centered about a carrier frequency of 1.75 megacycles. Carrier is normally suppressed but can be reinserted by a front panel control. The composite sideband channel output signal is applied to the CHGR.

e. CONTROL TERMINATOR, MODEL LRCD-1. - Control Terminator LRCD is used together with the remote control equipment and controls the automatic bandswitching and frequency tuning operations. In addition, the LRCD provides the d-c power required to operate the remote control equipment.

f. ADAPTER PANEL ASSEMBLY, MODEL AX-570. - Adapter Panel Assembly, Model AX-570 contains five front-panel mounted jacks. The jacks are test points for monitoring the servo amplifier signals in the associated transmitter equipment.

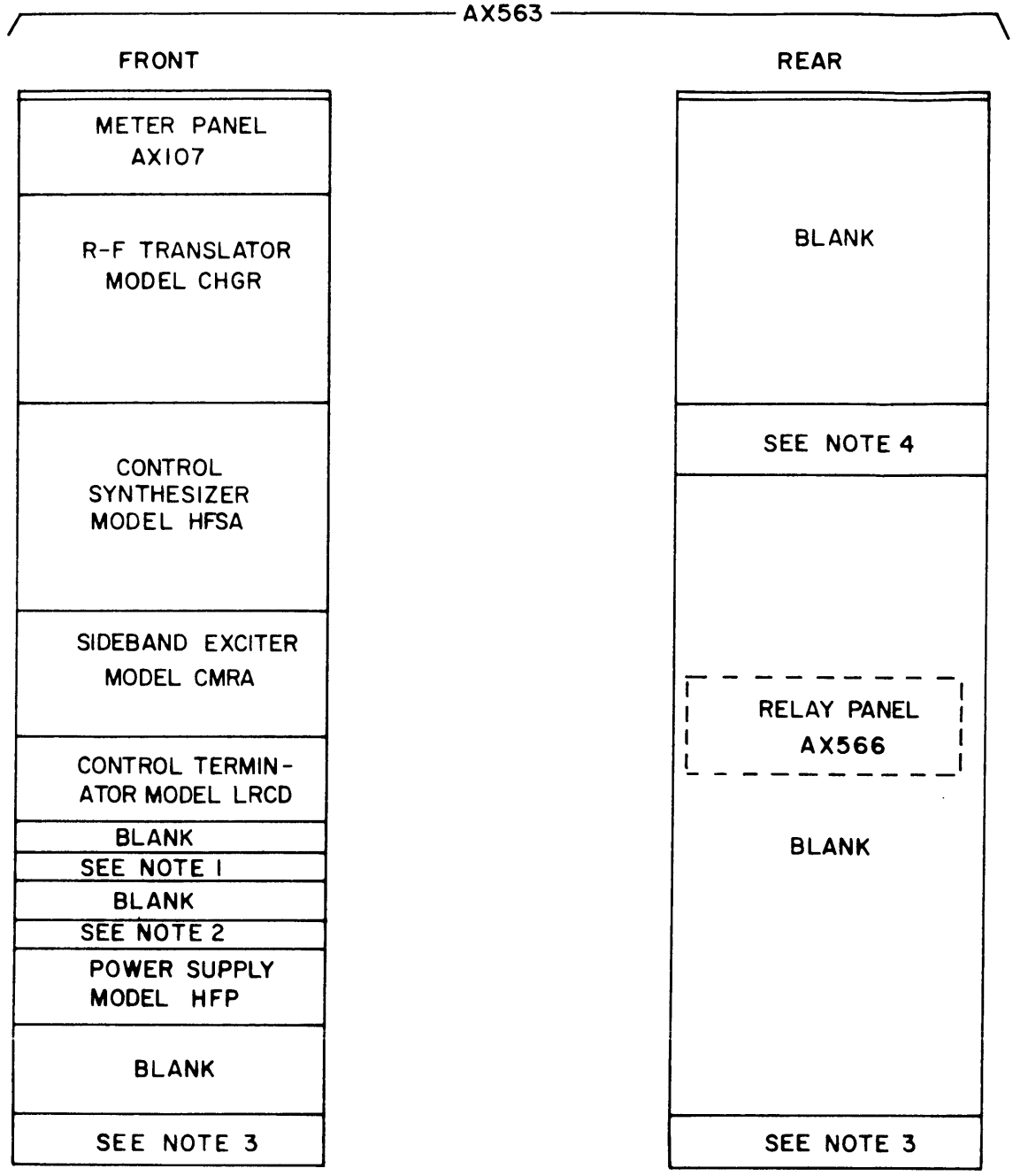
g. CONTROL PANEL ASSEMBLY, MODEL AX-560. - Control Panel Assembly AX-560 contains a switch and test key. Operating the switch energizes Power Supply HFP-1. Operating the test key controls the level of carrier reinsertion at the CMRA-1.

h. POWER SUPPLY, MODEL HFP-1. - Power Supply HFP provides the plate, bias, and filament voltages for the CHGR and HFSA units and routes 115 volts ac to the CMRA unit. The HFP-1 requires 115 volts, 50 to 60 cycles, single-phase power for operation, and is activated by a switch on Control Panel Assembly AX-560.

i. AUXILIARY POWER PANELS, MODEL APP-11. - The two APP-11 Auxiliary Power Panels contain circuit breakers and receptacles. The receptacles can be used to connect test equipment to the 115 volt ac power line.

j. STANDING WAVE CONTROL UNIT SWCU-1. - Standing Wave Control Unit SWCU is rack-mounted at the rear of the auxiliary frame. This unit contains an SWR overload relay, a dc amplifier and a power supply. During unbalanced operation of the of the transmitter, SWR on the transmission line is monitored. When the SWCU detects excessive SWR, the overload relay operates, removing high voltage from the transmitter. Since the SWCU functions closely with the main frame section of the transmitter, further information on this unit is contained in Volume II (Main Frame).

k. RELAY PANEL AX566. - Relay Panel AX566 contains relays that enable any one or all of the four channels; permit measurement of either the forward or reflected power from the associated transmitter circuits; controls the application of high voltage to the transmitter circuits; resets the high voltage if an overload should occur. The relays require 24 volt d-c for operation



352-2

NOTES:

1. ADAPTER PANEL ASSEMBLY MODEL AX570.
2. CONTROL PANEL ASSEMBLY MODEL AX560.
3. AUXILIARY POWER PANEL MODEL APP.
4. STANDING WAVE CONTROL UNIT SWCU.

Figure 1-2. Auxiliary Frame, Chassis Layout

SECTION 2

PRINCIPLES OF OPERATION

2-1. GENERAL

The principles of operation given in this section is limited to a block-diagram analysis of the high-frequency ISB exciter and of control and monitoring stages of the auxiliary frame. For detailed circuit analysis of any unit contained in the auxiliary frame, refer to the appropriate modular-unit manual.

2-2. HIGH FREQUENCY ISB EXCITER (See Figure 2-1)

The high frequency ISB exciter, comprising Sideband Exciter CMRA, Control Synthesizer HFSA, RF Translator CHGR, and Control Terminator LRCD provides: (1) four sideband channels centered about a carrier operating within the frequency range of 2- to 32-mc; (2) automatic band selection and frequency tuning; (3) facilities for remote-control operation.

Four separate audio input signals, each within the frequency range of 350- to 3040-cycles per second, are applied to each of four channels (A1, A2, B1, and B2) in Sideband Exciter CMRA where they are mixed with carrier injection signals to produce a 1.75-mc composite i-f. This composite i-f signal consists of: (1) the lower sideband (channel B2) of a suppressed 1756.29 kc carrier; (2) independent upper and lower sidebands (Channels B1 and A1 respectively) of a 1750.0-kc carrier which may be reduced or suppressed; (3) the upper sideband (channel A2) of a suppressed 1743.71-kc carrier. The carrier injection signals of 1.74371, 1.75000, and 1.75629 mc are derived by synthesizer circuits in the CMRA from a highly-stable 1-mc signal supplied by Control Synthesizer HFSA. The 1.75-mc

carrier output of the CMRA is suppressed a minimum of -55 db below full power out; a front-panel control (manually or remotely operated) permits carrier reinsertion at levels ranging from 0- to 30-db below full power output. The 1.75-mc carrier is fully reinserted (either by manual operation of the TEST KEY on Control Panel AX-560, or automatically by circuitry within Relay Panel AX-566) during transmitter tuning.

It should be noted that the outboard sidebands (channels A2 and B2 are inverted with respect to the inboard sidebands (channels A1 and B1) in accordance with standard practice in 4-channel multiplexing systems. Power level for each channel can be controlled at the front panel of the CMRA.

Within RF Translator CHGR, the 1.75-mc composite signal from Sideband Exciter CMRA is mixed with a 3.75- to 33.75-mc signal to produce an operating frequency in the range of 2- to 32-mc. This 2- to 32-mc signal is amplified to a level as high as 250 milliwatts and is then applied to r-f amplifier circuits in the main frame of the transmitter. The balanced modulator of RF Translator CHGR inverts the composite sideband signal thereby placing channels A1 and A2 above the carrier and channels B1 and B2 below the carrier. A control voltage originating in the main frame or at the remote control equipment is applied to the balanced modulator and thus determines the output level from the CHGR.

The 3.75- to 33.75-mc injection signal for the balanced modulator in the CHGR is generated by a high-frequency oscillator (hfo) which in turn stabilized by a control voltage originated within Control Synthesizer HFSA. A sample of the hfo output (3.75- to 33.75-mc) is extended to the HFSA where it is converted to a 4.25- to 3.25 mc signal; this signal contains the error, if any, of the hfo circuit

contained in RF Translator CHGR. Depending upon the setting of front-panel controls, Control Synthesizer HFSA develops a 4.25- to 3.25-mc signal. A phase detector circuit in the HFSA compares the two nominally identical signals and develops a d-c voltage that is used to correct the hfo stage of the CHGR thereby maintaining a stability equal to that of the 1-mc standard contained in the HFSA. Control circuits in the HFSA are variable in steps of 100 cycles. As a result, the CHGR can furnish approximately 300,000 highly-stable output frequencies.

Automatic band switching is accomplished as follows: stepping switches (MC, 100 KC, 10 KC, 1 KC, and 1 KC) in Control Synthesizer HFSA respond to 4-bit binary digit 28 volt d-c codes sent from associated remote-control equipment. When the stepping switches have been moved to their proper positions, sequential relays in the LRCD make connection between a wafer mounted on the shaft of the MC switch and a notch homing switch in RF Translator CHGR. The homing switch then actuates a bandswitch motor which selects the desired band (one of eight). In addition, band and position data are applied from Control Terminator LRCD and from the HFSA to associated transmitter IPA and PA equipment. The bandswitching operation is controlled by sequential relays in the LRCD. The LRCD also ensures that frequency tuning does not start until the bandswitching operation is completed.

Automatic frequency tuning is accomplished as follows: when Control Synthesizer HFSA and RF Translator CHGR are out of synchronization with each other, a phase detector circuit in the HFSA pro-

duces an error voltage. When this error voltage is within the "capture range", the SYNC relay in the HFSA energizes and enables the servo amplifier in the LRCD. At the same time, the d-c error voltage from the phase detector in the HFSA is applied to the servo amplifier via relay contacts of the sequential relays in the LRCD. This action applies operating current to the tuning motor in the CHGR and starts a search sequence. The motor rotates clockwise or counterclockwise depending upon a direction-of-search signal applied from the HFSA to the servo amplifier. Rotation of the motor adjusts the CHGR tuning control which diminishes the d-c correction voltage until the HFSA and CHGR units are synchronized with each other. This point is indicated by a zero center-of-scale reading on the SYNCHRONIZE meter. Any consequent tendency of the CHGR to drift is quickly corrected by the phase detector circuit in the HFSA. The HFSA also applies a tuning signal to the associated transmitter IPA and PA equipment.

2-3. CONTROL AND MONITORING STAGES

Control circuitry for local and remote transmitter tuning, for remote monitoring of transmitter power output and reflected power, for remote high-voltage control, for remote channel enable/disable control, and for primary power on/off control of Power Supply HFP is contained in Control Panel AX-560 and Relay Panel AX-566.

During local operation (LOCAL/REMOTE switch S4002 set at LOCAL) relay K3009 is energized by 24vdc from the main frame and ground return through S4002. With K3009 energized, the operate paths of channel enable relays K3005 through K3008 and B+ relay K3002 are completed. Under these conditions, all 4 channels are

enabled (unshorted) and carrier keying by means of the TEST KEY on Control Panel AX-560 is possible. Also, the operate path for high-voltage contactors K3000 and K3001 is completed through contacts of relay K3002 and contacts of relay K3010.

During remote operation (LOCAL/REMOTE switch S4002 set at REMOTE), relay K3009 is de-energized. At this time, relay K3002 can only be energized by application of a control signal from the remote control equipment. Similarly, the channel enable relays can only be energized by application of control signals from the remote control equipment and the presence of a 24vdc "ON AIR" signal from the main frame.

Relay K3004 in the AX-566 provides for remote monitoring of forward and reflected power. This relay is operated by 24vdc and by a control signal from the remote control panel. When K3004 is de-energized the forward power signal is routed to the PA OUTPUT meter in the main frame and the reflected power signal is routed to Standing Wave Control Unit SWCU. When K3004 is energized, the forward and reflected power signals are extended to remote control equipment where they may be monitored.

Phase-2 voltage from the main frame is extended to relay K3003. Upon application of a control signal, from the remote control equipment, this $\phi 2$ voltage is extended to the reset coils of all latching-type overload relays (located in the SWCU and 10-KW Relay Panel of the main frame) in the transmitter. Alternately, this $\phi 2$ voltage may be applied to the overload relay reset coils by operation of a pushbutton in the main frame.

Carrier re-insertion (necessary for transmitter tuning) is controlled by relay K1001 in Sideband Exciter CMRA. During local

operation, the operate path for K1001 is completed through relay K3009 in the AX-566 and through TEST KEY S2 on Control Panel AX-560. Operation of the TEST KEY opens the operate path of relay K1001 therefore providing full carrier re-insertion for tuning. During remote operation, K1001 is energized by the 24vdc "ON AIR" from the main frame. Carrier therefore is fully re-inserted until automatic tuning is completed.

2-4. MONITORING CIRCUITRY.

Adapter Panel AX-570 contains five jacks that are used to monitor servo amplifier signals; these signals are applied to the jacks from the main frame of the transmitter. Two jacks (J1006 and J1007), accessible through the rear of the auxiliary frame, permit monitoring of r-f signals from main-frame amplifier stage.

Circuitry for monitoring 10-KW PA Tube supply voltages is contained in Meter Panel AX-107. Meter Panel AX-107 functions closely with circuits contained in the main frame; refer to Volume 2 for further information on this unit.

2-5. POWER SUPPLY.

Primary power (115vac, single phase) is routed to Control Terminator LRCD, Standing Wave Control Unit SWCU, Auxiliary Power Panels APP and Power Supply HFP via AUXILIARY FRAME MAIN POWER circuit breaker CB3000. Power for front fans B3002 and B3003 is also routed through this circuit breaker; fuse F3000 provides additional protection for this circuit.

Power Supply HFP provides the plate, bias, and filament voltages required for operation of RF Translator CHGR and Control Synthesizer HFSA, and also routes 115vac from a built-in receptacle

to Sideband Exciter CMRA. A time-delay circuit in the HFP provides a 60-second delay to prevent premature application of plate voltage to the CHGR and HFSA; 60 seconds after switch S1 of Control Panel AX-560 is set at OPERATE, full power is applied to the CHGR and HFSA.

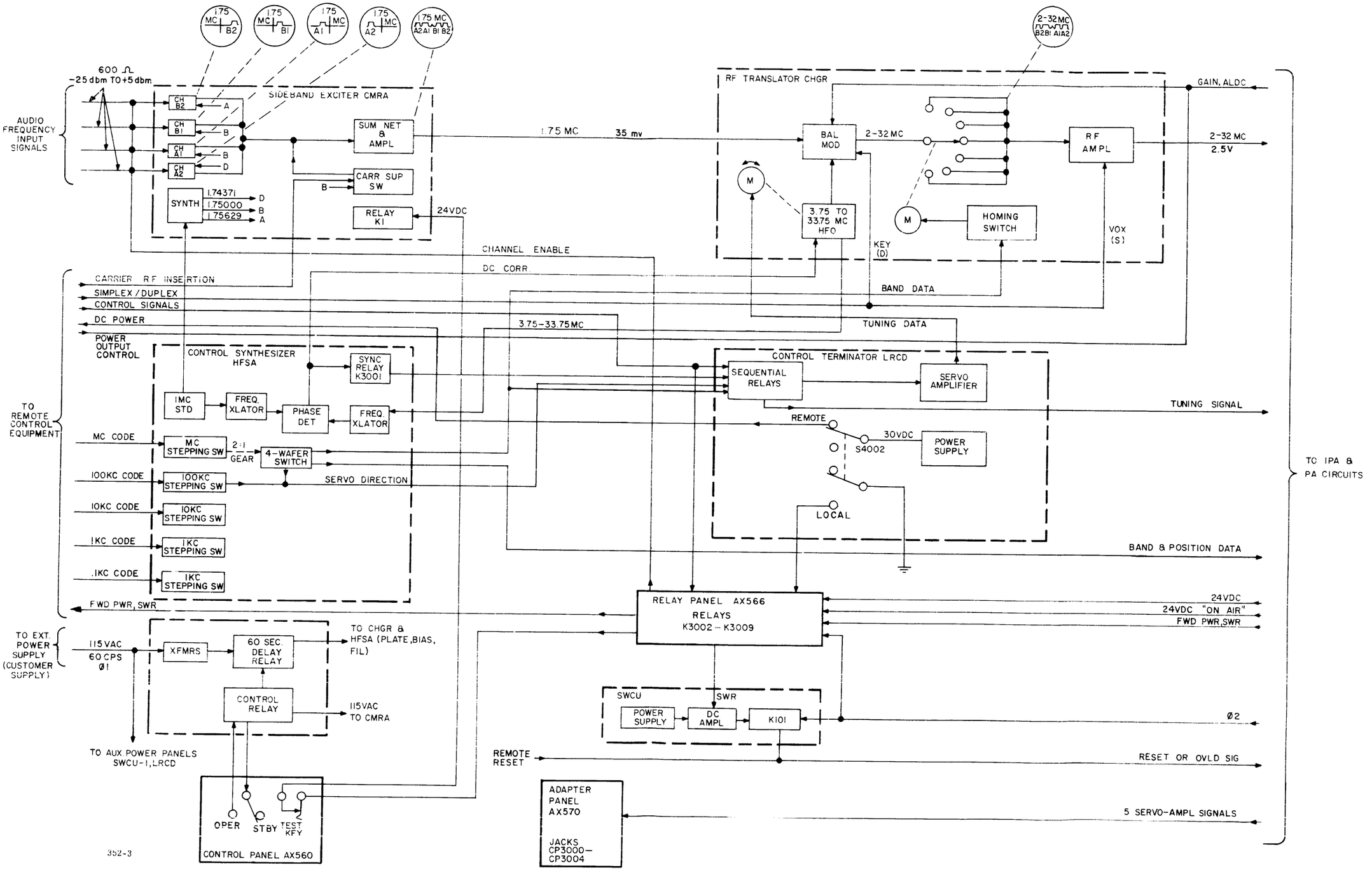


Figure 2-1. Auxiliary Frame, Functional Block Diagram
2-8/2-9

SECTION 3

MAINTENANCE

3-1. PREVENTIVE MAINTENANCE.

The auxiliary frame equipment has been designed to provide long-term, trouble-free operation under continuous duty conditions. However, in order to prevent failure of the equipment due to corrosion, dust, or other destructive elements, it is suggested that at six-month intervals the equipment should be cleaned and inspected. For specific maintenance instructions, refer to the associated equipment manual.

All accessible covers should be removed and the wiring and all components inspected for dirt, corrosion, charring, discoloring or grease. Remove dust with a soft brush or vacuum cleaner. Remove dirt or grease from other parts with any suitable cleaning solvent. Use of carbon tetrachloride should be avoided due to its highly toxic effects. Trichlorethylene or methyl chloroform may be used, providing the necessary precautions are observed.

NOTE

When using toxic solvents, make certain that adequate ventilation exists. Avoid prolonged or repeated breathing of the vapor. Avoid prolonged or repeated contact with skin. Flammable solvents shall not be used on energized equipment or near any equipment from which a spark may be received. Smoking, "hot work", etc. is prohibited in the immediate area.

CAUTION

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

3-2. TROUBLESHOOTING.

Refer to table 3-1; troubleshooting information given in table 3-2 will aid in localizing a trouble to a particular unit in the auxililiary frame. Once the trouble has been localized to a particular unit, refer to the associated technical manual for information necessary to locate the faulty component.

NOTE

To troubleshoot the auxiliary frame, power must be applied to the main frame; also the appropriate switches must be set for automatic tuning (refer to operator's manual).

TABLE 3-1. TROUBLESHOOTING CHART

STEP	OPERATION	NORMAL INDICATION	PROBABLE CAUSE OF ABNORMAL INDICATION
1.	Set POWER switches of SWCU and LRCD at ON.	AC ON lamp of SWCU and POWER lamp should light.	AC POWER fuses open. Line Filter L1003, L1004, C1036 thru C1039 defective.
2.	Set Circuit Breaker CB3000 at ON.	a. Blowers B3002 and B3003 should operate.	a. Fuse F3000 open; CB3000 defective.
		b. STANDBY Lamp of Power Supply HFP should light.	b. Fuses in HFP open. MAIN POWER switch on rear of HFP set at OFF.
3.	Set POWER switch of CMRA at ON.	POWER and STANDBY lamps should light.	Defective POWER lamp; AC fuse of CMRA open.
4.	Set LOCAL-REMOTE switch of LRCD at REMOTE.	REMOTE lamp of LRCD should light.	DC POWER INTERNAL fuse of LRCD open.

TABLE 3-1. TROUBLESHOOTING CHART (CONT)

STEP	OPERATION	NORMAL INDICATION	PROBABLE CAUSE OF ABNORMAL INDICATION
5.	Set STANDBY-OPERATE switches of AX560 at OPERATE.	STANDBY light of HFP should go off; TIME DELAY lamp should light. After 60 seconds, OPERATE lamp should light.	STANDBY-OPERATE switch of AX560 defective. Tune Delay relay and associated circuitry of HFP defective.
6.	Select desired frequency on associated AX568.		
	a. Push B+ button on AX568.	a. B+ pushbutton lamp should light. PA PLATE meter in auxiliary frame should indicate 7.5 kv.	a. B+ relay in AX-566 defective, Relays K3001 and associated circuitry in AUX frame defective.
	b. Push TUNE button on AX568.	b1. Frequency selected at AX568 should appear on digital indicator of HFSA.	b1. Relay K4001 of LRCD and associated circuitry defective. Defective wiring between AX568 and LRCD. Ledex switches and associated circuitry of HFSA defective.
		b2. CHGR bandswitch should rotate and stop at selected band.	b2. Bandswitch motor or notch-homing switch on CHGR defective. Control MC switch on HFSA defective.
		b3. Cursor of CHGR should stop at frequency displayed on digital indicator of HFSA.	b3. Defective Servo amplifier AZ103 and associated circuits of LRCD or CHGR. SYNC relay K3001 and associated circuits of HFSA defective.
		b4. SYNC IND lamp of HFSA should light.	b4. Same as b3.

TABLE 3-1. TROUBLESHOOTING CHART (CONT)

STEP	OPERATION	NORMAL INDICATION	PROBABLE CAUSE OF ABNORMAL INDICATION
7.	Transmitter does not complete tuning cycle.	FAULT lamp of AX568 should light.	Q4002, relay K4007 of LRCD and associated circuitry of AX568 and main frame defective.
8.	Transmitter completely tuned (with audio channel(s) enabled).	Meter M4001 on AX568 should indicate desired power level.	Meter M4001 and associated circuitry of AX568 and main frame defective.
9.	Connect scope, (with counter connected to scope's vertical output) to J1014 of CMRA.	Scope should indicate a modulated signal; Counter should display 1.75 mc.	Defective audio channel in CMRA. 1 mc signal from HFSA not present at J1013 of CMRA.
10.	Connect scope to J1001 of CHGR.	Scope should indicate a modulated signal; Counter should display frequency indicated on HFSA digital indicators.	Defective RF amplifier stage in CMRA; No HFO sync input from HFSA.

3-3. EQUIPMENT PERFORMANCE CHECKS.

The procedures given in the following paragraphs are continuous and must be performed in the order given. Refer to figures 1-2 and 3-1 for the location of equipment and components in the auxiliary frame.

a. TEST EQUIPMENT REQUIRED. - Table 3-2 lists the test equipment required to test the auxiliary frame.

TABLE 3-2. TEST EQUIPMENT REQUIRED

QTY	ITEM	MODEL
1	Spectrum Analyzer	TMC, Model PTE or equivalent
1	Volt ohmmeter	Simpson, Model 260 or equivalent
1	VTVM	Hewlett Packard, Model 410B or equivalent
1	Remote Control Unit	TMC, Model AX568 or equivalent

b. PRELIMINARY CONTROL SETTINGS. - Set controls as follows:

UNIT	CONTROL	SETTING
CHGR	RF GAIN control	Mid-range
CMRA	TEST/NORMAL switch (mounted inside unit)	TEST
	B1, B2, A1, A2 CHANNEL PRIORITY controls	100
	METER FUNCTION switch	A1

UNIT	CONTROL	SETTING
CMRA (cont)	CARRIER SUPPRESSION switch	FULL
	POWER switch	ON
LRCD	REMOTE-LOCAL switch	REMOTE
	POWER switch	ON
AX-560	STANDBY/OPERATE switch	OPERATE
	TEST KEY	Normal position

c. POWER CHECK. - Upon completion of paragraph 3-3b, proceed as follows:

(1) At the rear of the frame, set MAIN POWER circuit breaker CB3000 at ON; 115-volt a-c power should be applied to Power Supply HFP, Control Terminator LRCD, and Sideband Exciter CMRA. Front fans B3002 and B3003 should operate. After a delay of approximately 90 seconds, operating voltages should be applied to RF Translator CHGR and Control Synthesizer HFSA.

(2) Connect DC VTVM to TP8001 of HFP. If necessary, adjust "Voltage Adjust A" until meter indicates +200 vdc.

(3) Connect DC VTVM to TP8002 of HFP. If necessary, adjust "Voltage Adjust B" until meter indicates +200 vdc.

d. INTERMODULATION DISTORTION TEST. - Proceed as follows:

(1) Ensure that procedures outlined in paragraphs 3-3b and 3-3c have been performed.

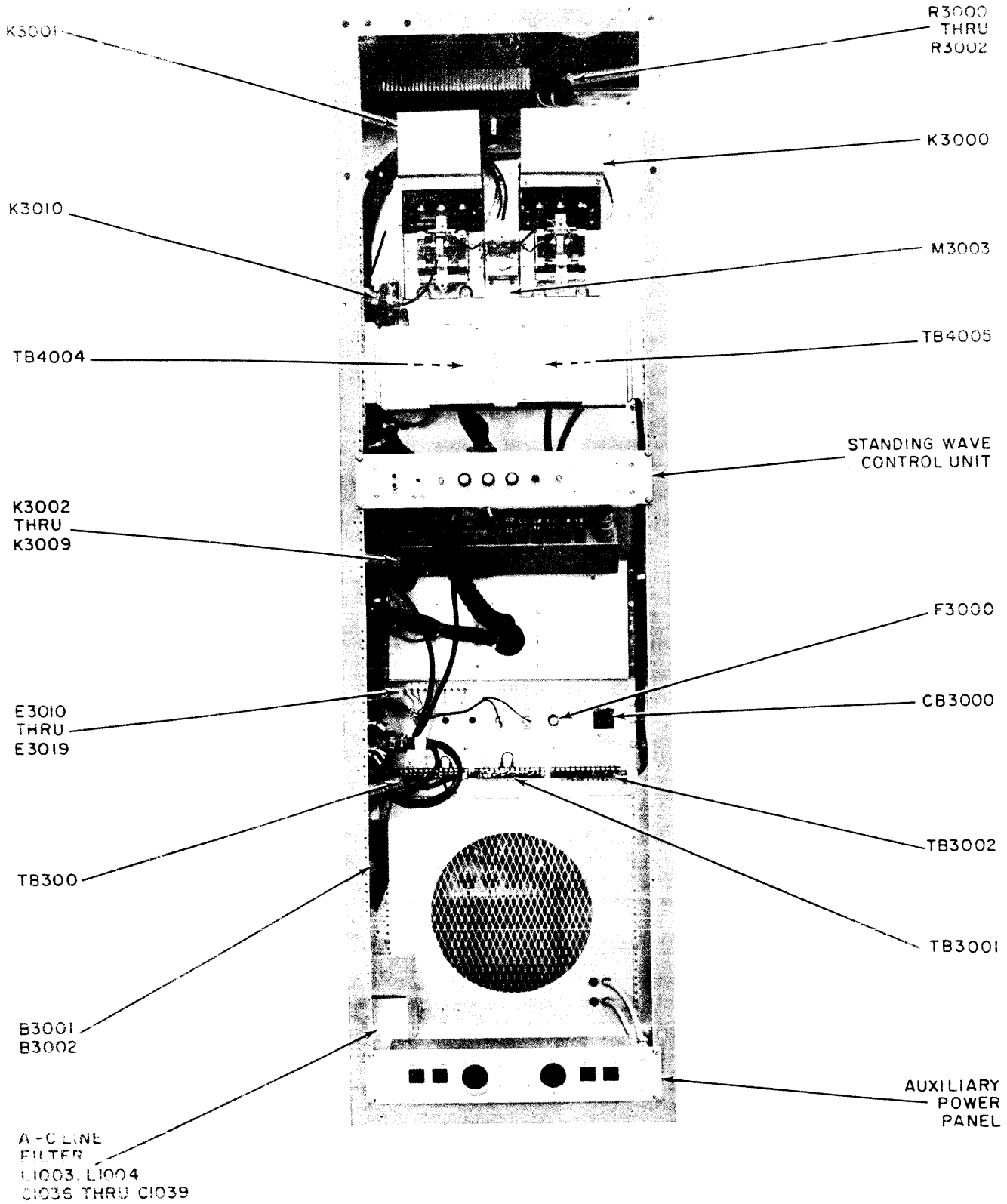


Figure 3-1. Auxiliary Frame, Rear View

(2) At rear of frame, remove relay K3005 from Relay Panel AX-566; place jumper across terminals 1 and 2 of TB4004.

(3) Using shielded pair, connect two a-f tones from PTE analyzer to TB3002 (channel 1). Disconnect the CHGR output cable at J3001, and connect the analyzer RF SIGNAL INPUT to J3001 through a "T" connector. Connect AC VTVM to "T" connector.

(4) At CMRA, set A1 CHANNEL PRIORITY control for a -10 db indication on INPUT LEVEL meter.

(5) At AX-568, set controls as follows:

CONTROL	POSITION
SIMPLEX/DUPLEX	DUPLEX
CARRIER SUPPRESSION	FULL
CARRIER FREQUENCY	2 MC
Switch S-4012 (located in rear)	down

(6) At AX-568, press TUNE SYNC pushbutton. Nixie lights on HFSA should indicate 2 mcs; bandswitch on CHGR should be set to band #1; CHGR should search and tune to 2 mcs. When it reaches 2 mcs, SYNC IND lamp on CHGR and TUNE SYNC lamp on AX-568 will light and some output should be indicated on the RF LEVEL meter of CHGR.

(7) At CHGR adjust the RF GAIN control for output of 2.5 volts on the a-c VTVM.

(8) At PTE, tune VOX to 2.5 mcs. Then set PTE controls as follows:

(a) VOX output for approximately 0.1 ma.

(b) GAIN control fully clockwise.

(c) AMPLITUDE SCALE switch at LOG.

(d) IF ATTEN switch -20 db.

(e) INPUT ATTENUATOR switches as required to place the two-tone signal on the zero db reference line while maintaining the GAIN control approximately fully clockwise.

(9) At PTE, adjust VOX frequency control slightly to position the two-tone signal presentation in center of analyzer screen. The displayed signal in conjunction with 2.5 volts across the 50 ohms load represents the rated PEP output on a scale from 0 to 40 db. Then, place the IF ATTEN switch at 0 db. The scale should be expanded to 60 db (0 db line now becomes 20 db).

(10) From the presentation, measure 3rd order products. These products should be not less than 40 db below either tone of the two-tone signal at the rated output of 2.5 volts RMS. If 3rd order products are not within designated specifications, distortion products of either the CMRA or CHGR are excessive. To localize distortion to CMRA or CHGR, do the following: connect PTE to TP12 of CMRA. If 3rd order products are not excessive at this point, distortion is localized to balanced modulator or r-f amplifier circuits of CHGR. However, if distortion is excessive at TP12, distortion is localized to output amplifier and channel i-f module of CMRA. Once distortion has been localized to a particular unit, refer to the individual modular-unit manual to narrow distortion down to a particular component.

When the 3rd order products are only slightly higher than the designated specifications, improper tuning may be the cause. In this case, the CMRA and CHGR units should be retuned until 3rd order products are within designated specifications (refer to the individual manuals for tuning information).

3. CARRIER SUPPRESSION TEST. - Proceed as follows:

(1) Ensure that procedures outlined in paragraphs 3-3b, 3-3c, and 3-3d have been completed.

(2) With PTE controls unchanged, remove a-f tones from channel A1.

(3) Turn CARRIER SUPPRESSION switch of AX-568 to "0". The CARRIER SUPPRESSION switch on the CMRA should also go to "0".

(4) Readjust RF GAIN control of CHGR for indication of 2.5 volts RMS on AC VTVM.

(5) At PTE, set IF ATTEN at -20 db. Adjust displayed signal to 0 db line. Center signal on screen with VOX.

(6) At AX-568, vary CARRIER SUPPRESSION switch from "0" to FULL; CARRIER SUPPRESSION switch should provide a variation from 0- to 30-db and a maximum carrier suppression of not less than 55 db below rated outputs.

f. SPURIOUS SIGNAL TEST. - Proceed as follows:

(1) Ensure that procedures outlined in paragraphs 3-3b, 3-3c, 3-3d, and 3-3e have been completed.

(2) At AX-568, set CARRIER FREQUENCY switches to read 12 mcs; then, press TUNE SYNC pushbutton. Nixie lights on Control Synthesizer HFSA should indicate 12 mcs; RF Translator CHGR should switch to the asscoiated band and search and tune to 12 mcs. When it reaches 12 mcs, SYNC IND lamp on CHGR and TUNE SYNC lamp on AX-568 will light, and some output should be in-

dicated on CHGR RF LEVEL meter.

(2) Set CARRIER SUPPRESSION switch of CMRA and RF GAIN control of CHGR for rated output of 2.5 volts.

(3) Set analyzer presentation to 0-db reference line with IF ATTEN at -20 db.

(4) Set analyzer sweep frequency to 14 kcs. Position displayed signal so that carrier is centered on screen.

(5) Set analyzer IF ATTEN at 0 db; spurious signals should be at least 40 db below rated output of 2.5 volts FMA or .250 watts PEP. If proper indication is not obtained, refer to maintenance information provided in CMRA and CHGR technical manuals.

(6) Remove all test equipment; at CMRA set the TEST/NORMAL switch (inside unit) at NORMAL; reconnect the CHGR output cable to J3001; replace relay K3005 in Relay Panel AX-566; remove jumper wire across terminals 1 and 2 of TB4004.

SECTION 4

PARTS LIST

Parts list information for the equipment rack and accessory units employed in the auxiliary frame is contained in the appendix to this volume (VOL. 1). Parts list information for Sideband Exciter CMRA, RF Translator CHGR, Control Terminator LRCD, Control Synthesizer HFS, and Power Supply HFP is contained in the individual modular-unit manuals.

Although Meter Panel AX-107 and Standing Wave Control Unit SWCU are mounted in the auxiliary frame, they function closely with circuits contained in the main frame of the transmitter. Therefore, detailed information for these units is contained in Volume II.

SECTION 5
SCHEMATIC DIAGRAMS

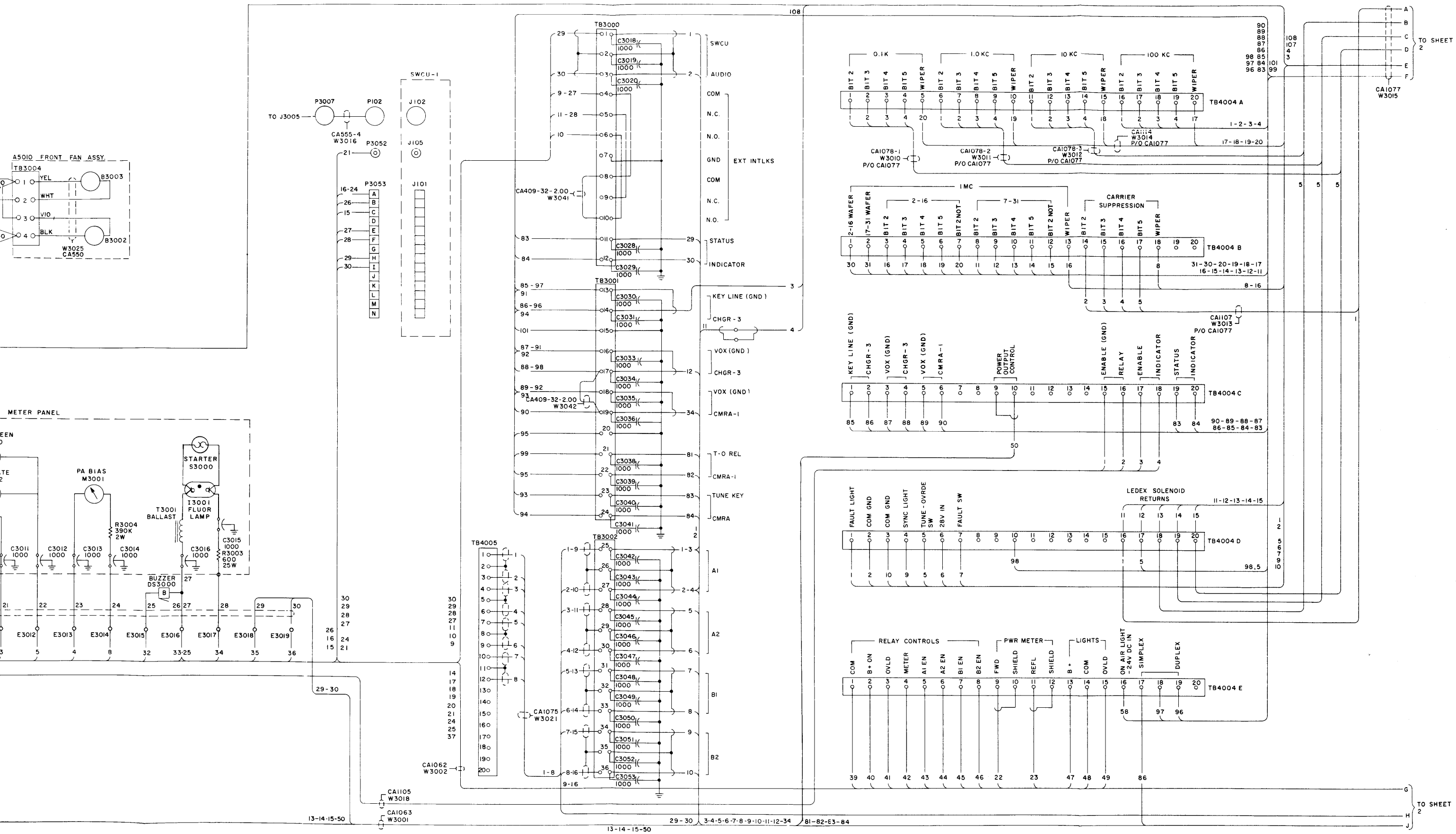
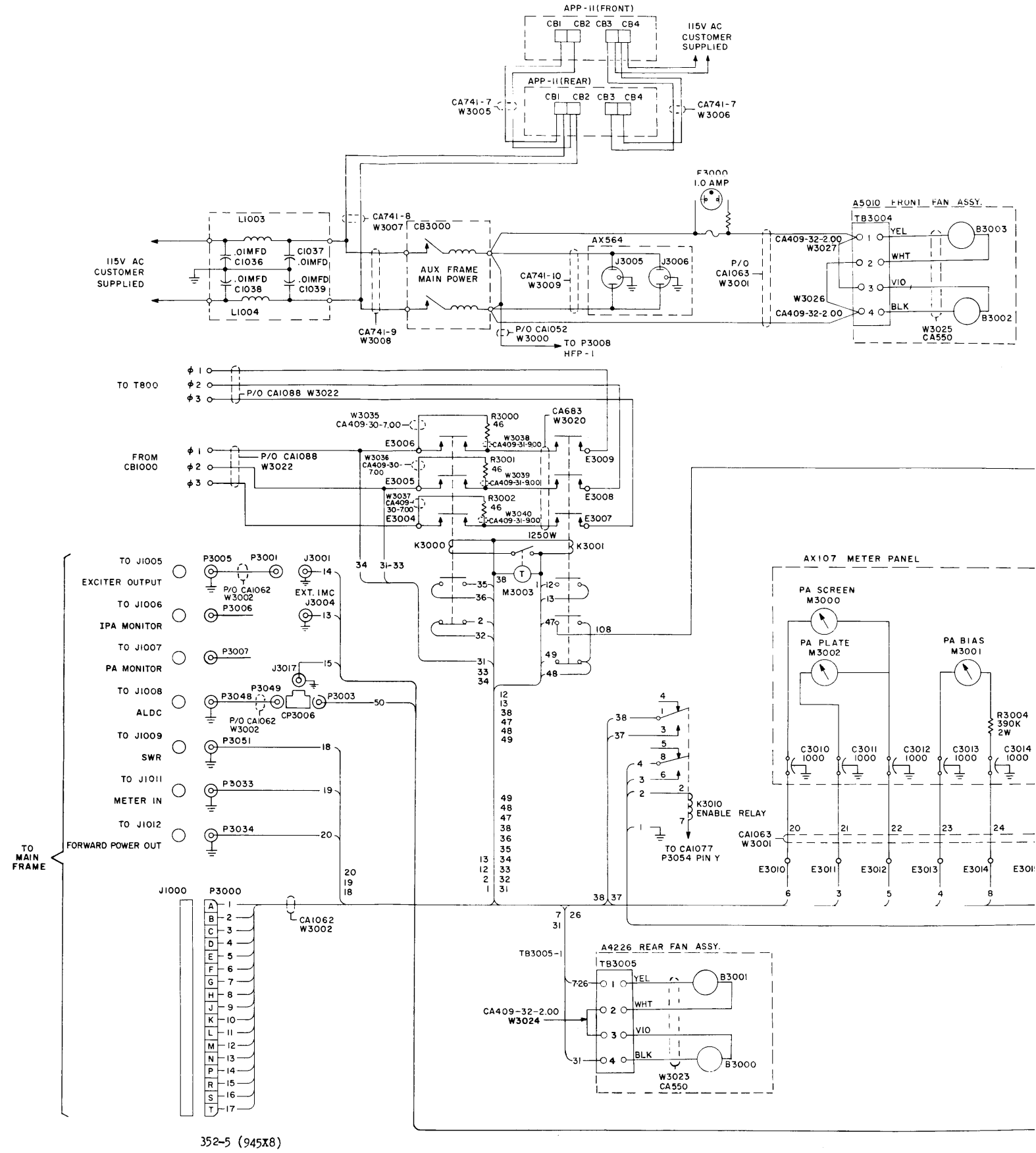


Figure 5-1. Auxiliary Frame Inter-connect Cabling Diagram, TSTE-10K (sheet 1 of 2)



352-5 (945X8)

003660352

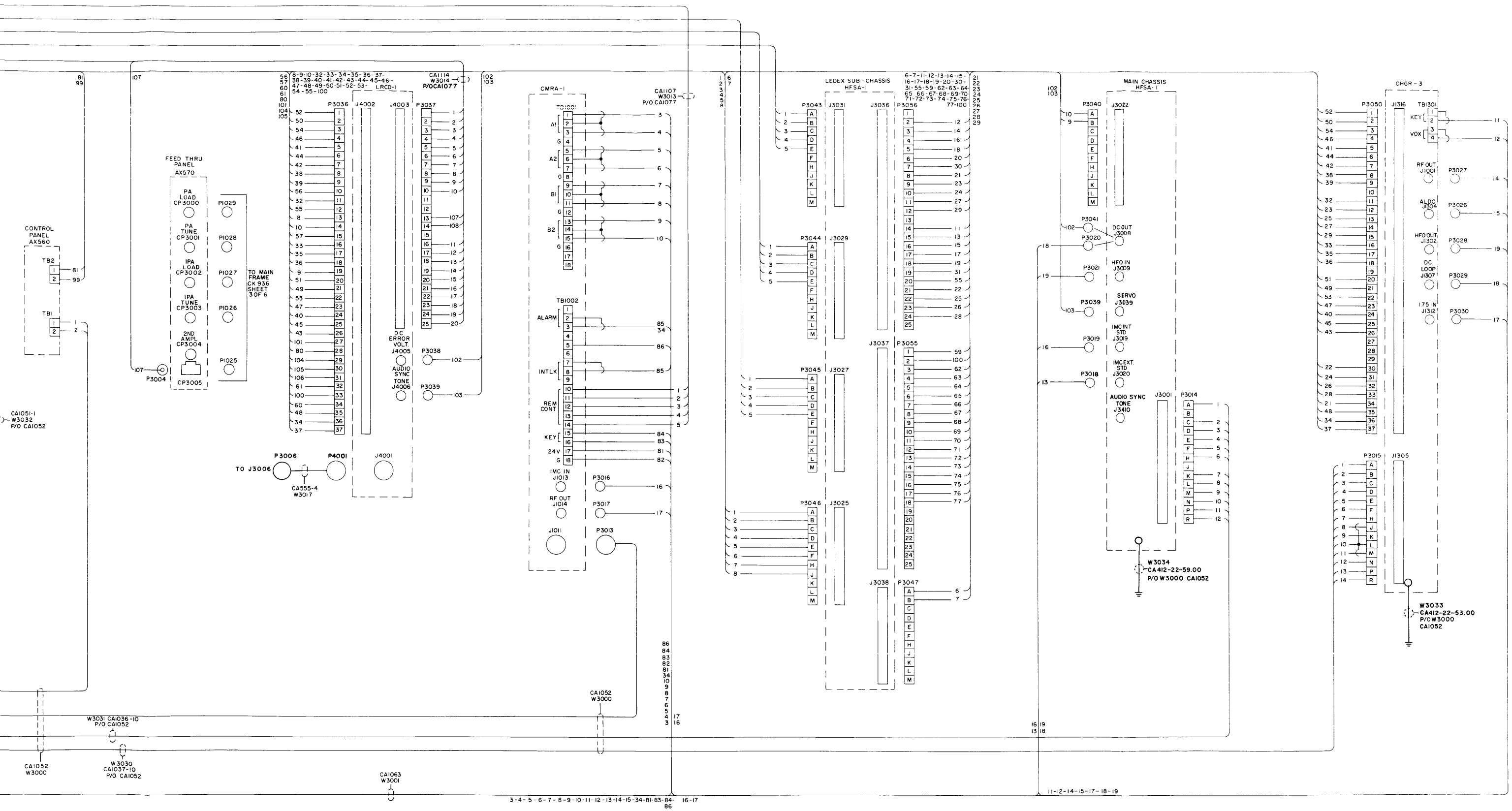
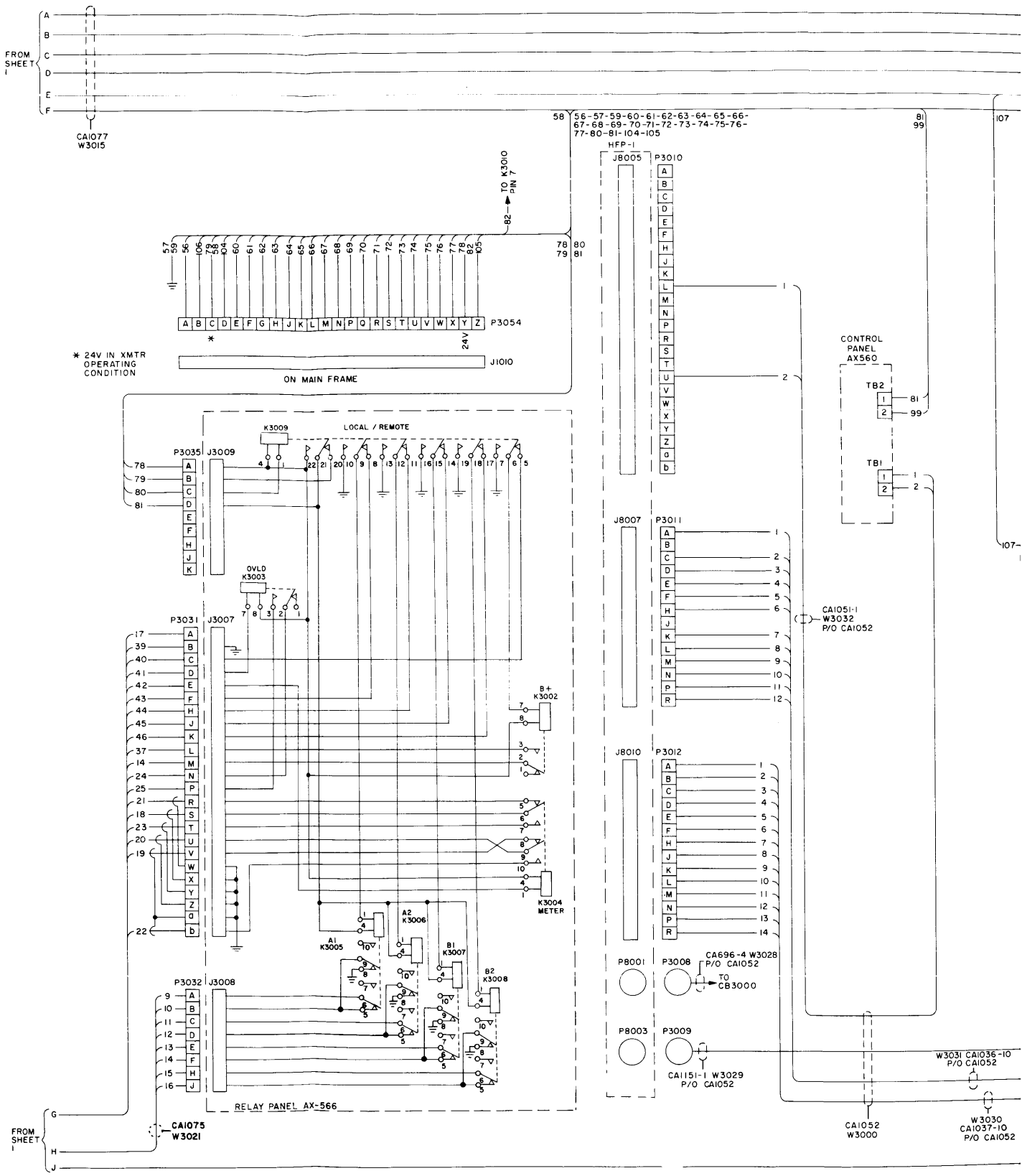


Figure 5-1. Auxiliary Frame Inter-connect Cabling Diagram, TSTE-10K (sheet 2 of 2)



352-6 (945X8)

003660352