TECHNICAL MANUAL

SX-1, SX-2.5, AND SX-5 AM TRANSMITTER

OPERATORS MANUAL

HARRIS

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MANUAL REVISION HISTORY

SX-1, SX-2.5, AND SX-5 AM TRANSMITTER OPERATORS MANUAL

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REV. #	DATE	ECN	PAGES AFFECTED
002	06-08-83	27566	Replace the following pages: Title Page, SA-3, SA-4, A-3, A-4, A-5, and A-6 Add the following page: Manual Revision History page

WARNING

THE CURRENTS AND VOLTAGES IN THIS EQUIPMENT ARE DANGEROUS. PERSONNEL MUST AT ALL TIMES OBSERVE SAFETY REGULATIONS.

This manual is intended as a general guide for trained and qualified personnel who are aware of the dangers inherent in handling potentially hazardous electrical/electronic circuits. It is not intended to contain a complete statement of all safety precautions which should be observed by personnel in using this or other electronic equipment.

The installation, operation, maintenance and service of this equipment involves risks both to personnel and equipment, and must be performed only by qualified personnel exercising due care. HARRIS CORPORATION shall not be responsible for injury or damage resulting from improper procedures or from the use of improperly trained or inexperienced personnel performing such tasks.

During installation and operation of this equipment, local building codes and fire protection standards must be observed. The following National Fire Protection Association (NFPA) standards are recommended as references:

- Automatic Fire Detectors, No. 72E
- Installation, Maintenance, and Use of Portable Fire Extinguishers, No. 10
- Halogenated Fire Extinguishing Agent Systems, No. 12A

WARNING

ALWAYS DISCONNECT POWER BEFORE OPENING COVERS, DOORS, ENCLOSURES, GATES, PANELS OR SHIELDS. ALWAYS USE GROUNDING STICKS AND SHORT OUT HIGH VOLTAGE POINTS BEFORE SERVICING. NEVER MAKE INTERNAL ADJUSTMENTS, PERFORM MAINTENANCE OR SERVICE WHEN ALONE OR WHEN FATIGUED.

Do not remove, short-circuit or tamper with interlock switches on access covers, doors, enclosures, gates, panels or shields. Keep away from live circuits, know your equipment and don't take chances.

WARNING

IN CASE OF EMERGENCY ENSURE THAT POWER HAS BEEN DISCONNECTED.

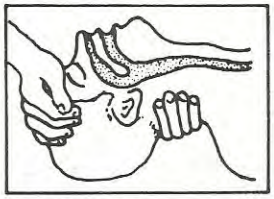
Treatment of Electrical Shock

1. If victim is not responsive follow the A-B-Cs of basic life support.

PLACE VICTIM FLAT ON HIS BACK ON A HARD SURFACE

(A) AIRWAY

IF UNCONSCIOUS,
OPEN AIRWAY



LIFT UP NECK
PUSH FOREHEAD BACK
CLEAR OUT MOUTH IF NECESSARY
OBSERVE FOR BREATHING

(B) BREATHING

IF NOT BREATHING,
BEGIN ARTIFICIAL
BREATHING

TILT HEAD
PINCH NOSTRILS
MAKE AIRTIGHT SEAL

4 QUICK FULL BREATHS

REMEMBER MOUTH TO MOUTH RESUSCITATION
MUST BE COMMENCED AS SOON AS POSSIBLE

CHECK CAROTID PULSE

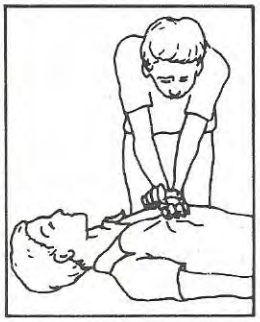
IF PULSE ABSENT,
BEGIN ARTIFICIAL
CIRCULATION

(C) CIRCULATION

DEPRESS STERNUM 1 1/2" TO 2"

APPROX. 80 SEC. { ONE RESCUER, 15 COMPRESSIONS, 2 QUICK BREATHS

APPROX. 60 SEC. { TWO RESCUERS, 5 COMPRESSIONS, 1 BREATH



NOTE: DO NOT INTERRUPT RHYTHM OF COMPRESSIONS
WHEN SECOND PERSON IS GIVING BREATH

Call for medical assistance as soon as possible.

2. If victim is responsive.

   a. keep them warm
   b. keep them as quiet as possible
   c. loosen their clothing
      (a reclining position is recommended)

FIRST-AID

Personnel engaged in the installation, operation, maintenance or servicing of this equipment are urged to become familiar with first-aid theory and practices. The following information is not intended to be complete first-aid procedures, it is brief and is only to be used as a reference. It is the duty of all personnel using the equipment to be prepared to give adequate Emergency First Aid and thereby prevent avoidable loss of life.

Treatment of Electrical Burns

1. Extensive burned and broken skin

   a. Cover area with clean sheet or cloth. (Cleanest available cloth article.)
   b. Do not break blisters, remove tissue, remove adhered particles of clothing, or apply any salve or ointment.
   c. Treat victim for shock as required.
   d. Arrange transportation to a hospital as quickly as possible.
   e. If arms or legs are affected keep them elevated.

NOTE

If medical help will not be available within an hour and the victim is conscious and not vomiting, give him a weak solution of salt and soda: 1 level teaspoonful of salt and 1/2 level teaspoonful of baking soda to each quart of water (neither hot or cold). Allow victim to sip slowly about 4 ounces (a half of glass) over a period of 15 minutes. Discontinue fluid if vomiting occurs. (Do not give alcohol.)

2. Less severe burns - (1st & 2nd degree)

   a. Apply cool (not ice cold) compresses using the cleanest available cloth article.
   b. Do not break blisters, remove tissue, remove adhered particles of clothing, or apply salve or ointment.
   c. Apply clean dry dressing if necessary.
   d. Treat victim for shock as required.
   e. Arrange transportation to a hospital as quickly as possible.
   f. If arms or legs are affected keep them elevated.

REFERENCE: ILLINOIS HEART ASSOCIATION

AMERICAN RED CROSS STANDARD FIRST AID AND PERSONAL SAFETY MANUAL (SECOND EDITION)

SECTION I

OPERATION

1-1. INTRODUCTION

1-2. The information contained in this section is intended to familiarize the operator with the preoperational setup and the operating procedures for the transmitter. A thorough study of the controls and indicators is recommended prior to turn-on and operation. This section also contains tabular data on the function of each control and indicator with reference illustrations showing their location.

1-3. The preoperational checkout and setup, operating procedures for turn-on and turn-off, and emergency procedures are described.

1-4. PERSONNEL PROTECTION

1-5. Extensive interlocking and safety switches have been provided on these transmitters because of the low impedance high current capabilities of the power supplies. The access doors to the transmitters are provided with three safety switches. The first safety switch is operated by a small pin protruding through a hole and, upon opening the door, interrupts the control voltage to the primary contactors allowing them to deenergize. Upon opening the door further, a large switch with heavy silver contacts is provided to discharge the energy storage capacitors through large resistors for current limiting. Upon opening the door further a switch operated also by the door shorts the power supply to the cabinet eliminating any possible voltage remaining on the filter capacitors.

WARNING

THE NORMAL PROCEDURE IN TRANSMITTER TURN OFF SHOULD BE FOLLOWED IN DEENERGIZING THIS TRANSMITTER. TURN OFF THE HIGH VOLTAGE BY DEPRESSING THE OFF BUTTON. IF YOU MUST ENTER THE TRANSMITTER, ALLOW THE POWER SUPPLY TO DISCHARGE AS INDICATED BY THE FRONT PANEL METERS. DISCONNECT PRIMARY POWER SERVICE. OPEN THE DOOR SLOWLY TO ALLOW THE INITIAL RESISTOR DISCHARGE MECHANISM TO FUNCTION. UPON OPENING THE DOOR FURTHER THE POWER SUPPLY WILL BE SHORTED TO GROUND AND MADE SAFE. A GROUNDING STICK IS PROVIDED IN THE TRANSMITTER AND SHOULD BE USED TO ASSURE THAT ALL VOLTAGE HAS BEEN REMOVED UNDER FAULT CONDITIONS.

1-6. If the preceeding warning is not heeded, substantial damage may be done to circuit card foil, grounding switches, and the capacitors themselves. Always allow the voltage to be discharged prior to opening the door. If immediate access is an absolute necessity it is recommended that the high voltage be turned off, the door be opened approximately 2 inches and be allowed to remain in this position for 2 seconds before opening further. The main high voltage filter capacitor bank is mounted on the door with resistors directly across the terminals of each capacitor to provide slow discharge of a capacitor in case the circuit board foil should open under fault conditions. In addition to this capacitor bank there is capacitance at the rectifier terminals themselves to provide transient protection in case of over voltage. Additional filter capacitance is connected directly to each PDM amplifier to remove high frequency transients from the high voltage bus directly at the source of the high frequency energy.

1-7. CONTROLS AND INDICATORS

1-8. Figures 1-1 thru 1-6 show the controls and indicators available from the exterior of the transmitter with the function for each control or indicator given in tables 1-1 thru 1-6.

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WARNING: Disconnect primary power prior to servicing.

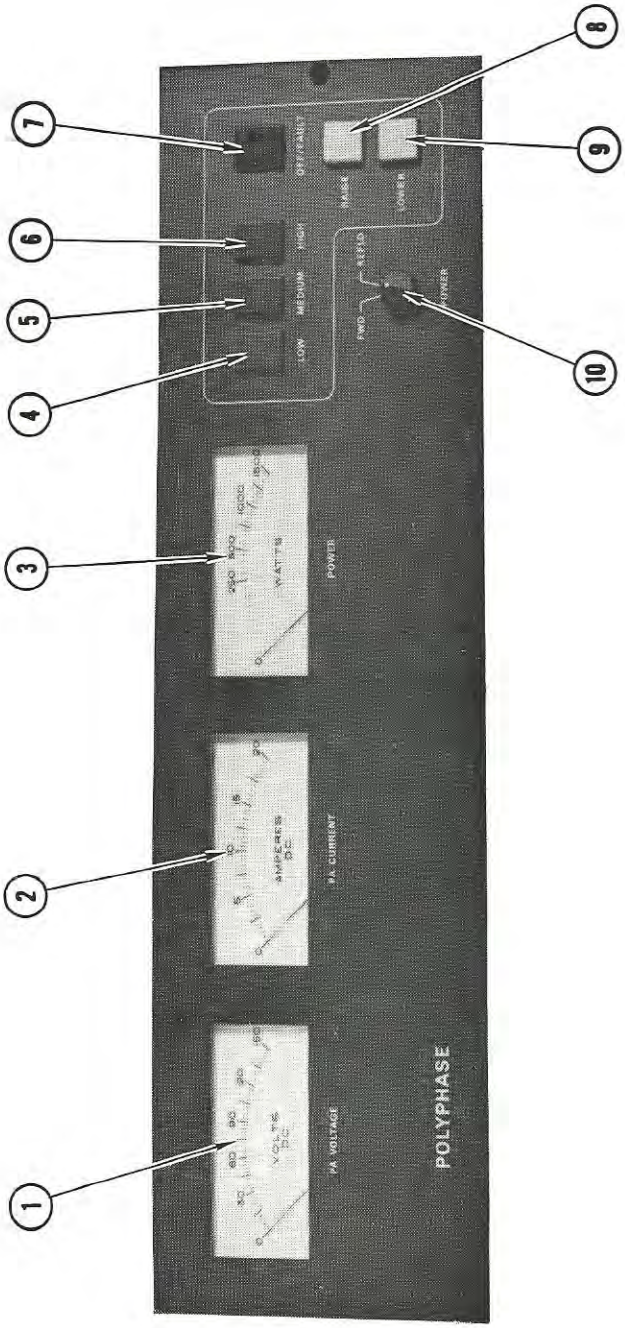

Figure 1-1. Meter Panel Controls and Indicators

WARNING: Disconnect primary power prior to servicing.

Table 1-1. Meter Panel Controls and Indicators

REF.	CONTROL/INDICATOR	FUNCTION
1	PA VOLTAGE meter	Indicates voltage being applied across one of the final power amplifiers.
2	PA CURRENT meter	Indicates the current being input to all of the final power amplifiers.
3	POWER meter	Indicates switch selected forward or reflected power out of the transmitter as monitored at the position of the directional coupler in the output network.
4	LOW, pushbutton	When depressed, commands the transmitter to change to the power level assigned to that control by the microprocessor. If FAULT lamp illuminated, depressing LOW pushbutton will extinguish FAULT lamp and bring transmitter back to LOW power setting. It is assumed that the cause of the original fault condition has been removed.
5	MEDIUM, pushbutton	When depressed, commands the transmitter to change to the power level assigned to that control by the microprocessor. If FAULT lamp illuminated, depressing MEDIUM pushbutton will extinguish FAULT lamp and bring transmitter back to MEDIUM power setting. It is assumed that the cause of the original fault condition has been removed.
6	HIGH, pushbutton	When depressed, commands the transmitter to change to the power level assigned to that control by the microprocessor. If FAULT lamp is illuminated, depressing HIGH pushbutton will extinguish FAULT lamp and bring transmitter back to HIGH power setting. It is assumed that the cause of the original fault condition has been removed.

WARNING: Disconnect primary power prior to servicing.

Table 1-1. Meter Panel Controls and Indicators (Continued)

REF.	CONTROL/INDICATOR	FUNCTION
7	OFF/FAULT, control, indicator	Used to turn the transmitter off and also indicates, when illuminated, that a fault has occurred. To clear the fault condition, depress either the OFF/FAULT, LOW, MEDIUM, or HIGH pushbuttons and the illumination will be extinguished.
8	RAISE, pushbutton	When depressed, microprocessor will acknowledge the action by illuminating the pushbutton and will simultaneously begin raising the output power level of the transmitter. The action is slow, so the pushbutton will have to be depressed for a period of time to see any action.
9	LOWER, pushbutton	When depressed, microprocessor will acknowledge the action by illuminating the pushbutton and will simultaneously begin lowering the output power level of the transmitter. The action is slow, so the pushbutton will have to be depressed for a period of time to see any action.
10	POWER, switch	Two position switch that selects parameters, as listed below, which will be displayed on POWER meter M3.
	FWD	When the POWER switch is in this position, forward power is indicated on POWER meter M3.
	REFLD	When the POWER switch is in this position, reflected power is indicated on POWER meter M3.

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Figure 1-2. Loading and Tuning Controls

Table 1-2. Loading and Tuning Controls

REF.	CONTROL/INDICATOR	FUNCTION
1	LOADING, control	Refer to Maintenance Manual for adjustment procedure. THIS CONTROL SHOULD NOT BE ADJUSTED BY AN INEXPERIENCED OPERATOR.
2	TUNING, control	Refer to Maintenance Manual for adjustment procedure. THIS CONTROL SHOULD NOT BE ADJUSTED BY AN INEXPERIENCED OPERATOR.

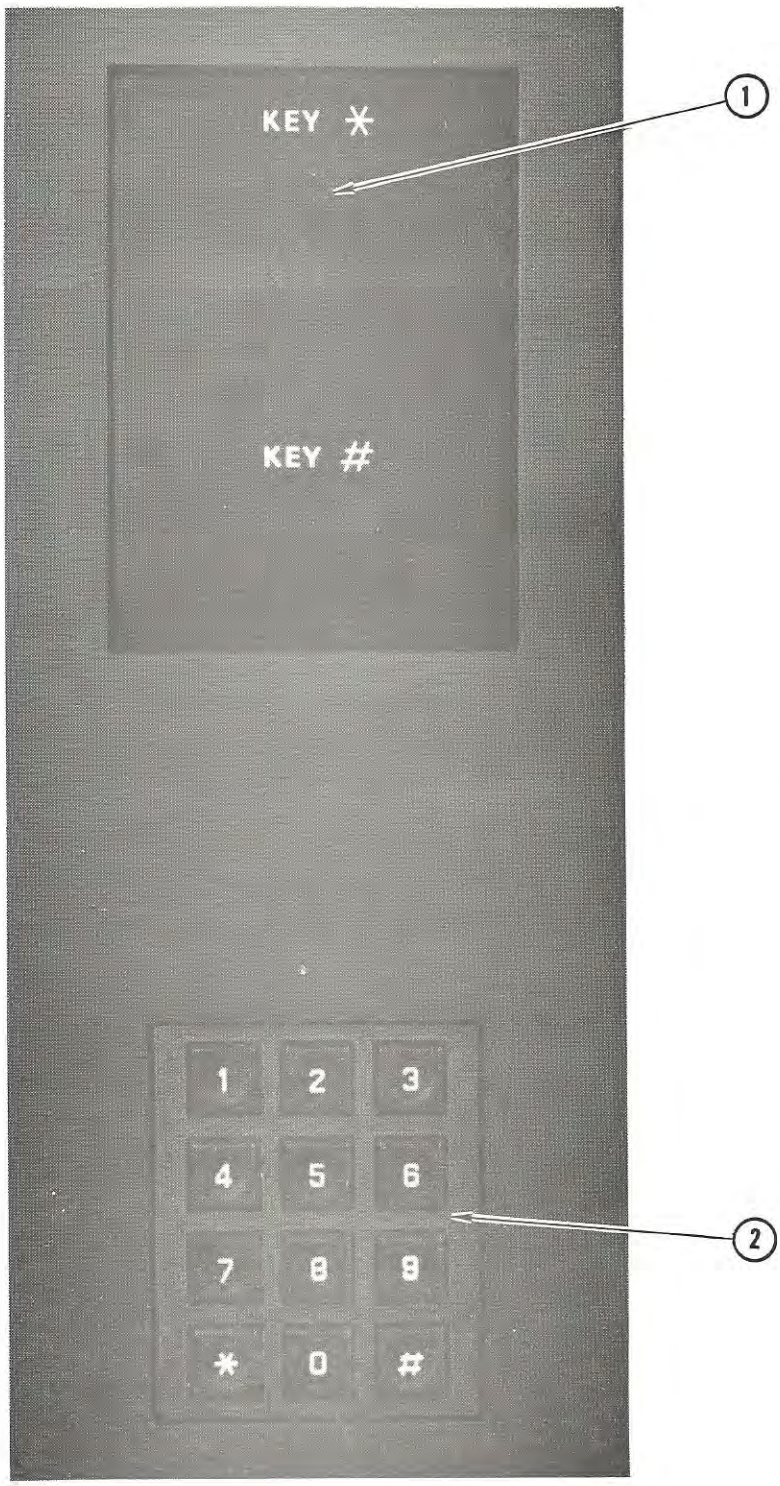

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Figure 1-3. Keyboard and Display Controls and Indicators

WARNING: Disconnect primary power prior to servicing.

Table 1-3. Keyboard and Display Controls and Indicators

REF.	CONTROL/INDICATOR	FUNCTION
		NOTE See Supplement A at rear of this manual for keypad code descriptions.
1	Display	Sixteen digit display divided into two distinct digital readouts to display data points as selected by the keyboard. Two digit code for particular data point will be displayed beside KEY * or KEY # depending upon which display is selected. Data will be displayed immediately below display selected (KEY * or KEY #).
2	Keyboard	Twelve key keypad with each key defined as follows:
	1	Used as input when the digit 1 is required and also used as the data point code number increment command key for the KEY * display. Microprocessor can distinguish between uses by its location in command structure.
	2	Used as input when the digit 2 is required.
	3	Used as input when digit 3 is required and also used as the data point code number increment command key for the KEY # display. Microprocessor can distinguish between uses by its location in command structure.
	4	Used as input when the digit 4 is required.

Table 1-3. Keyboard and Display Controls and Indicators (Continued)

REF.	CONTROL/INDICATOR	FUNCTION
	5	Used as input when the digit 5 is required.
	6	Used as input when the digit 6 is required.
	7	Used as input when digit 7 is required and also used as the data point code number decrement command key for the KEY * display. Microprocessor can distinguish between uses by its location in command structure.
	8	Used as input when the digit 8 is required.
	9	Used as input when digit 9 is required and also used as the data point code number decrement command key for the KEY # display. Microprocessor can distinguish between uses by its location in command structure.
	*	Used to select KEY * display on display panel (upper display).
	#	Used to select KEY # display on display panel (lower display).
EXAMPLES:		To read temperature of module A1 depress *, depress 1, and then depress 1 (or #11 to display on # readout). Display will read *11 66 where 66 is temperature reading for module A1. To read IPA Drive Level depress #10 (or *10 to display on * readout). Display will read #10 154 where 154 is the reading for IPA Drive Level.

WARNING: Disconnect primary power prior to servicing.

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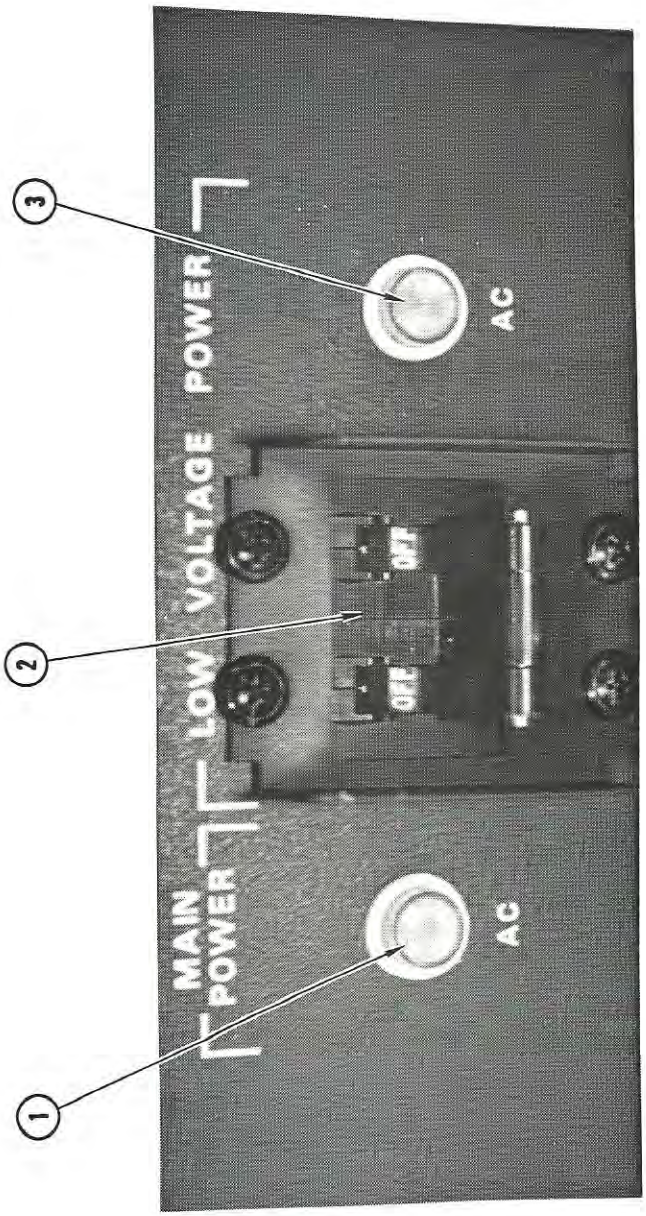


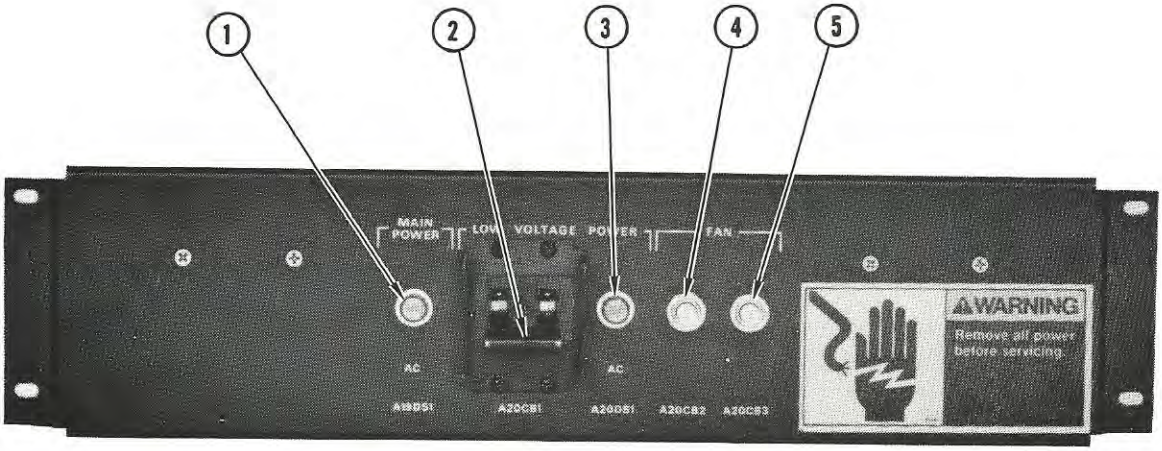
Figure 1-4. AC Power Panel for SX-1

WARNING: Disconnect primary power prior to servicing.

Table 1-4. AC Power Panel for SX-1, Controls and Indicators

REF.	CONTROL/INDICATOR	FUNCTION
1	POWER AC, indicator	When illuminated, indicates main ac power is applied to transmitter.
	LOW VOLTAGE POWER	
2	Circuit Breaker	When set to ON position, applies ac power to low voltage transmitter power supplies. Provides low voltage power lines with over current protection.
3	AC, indicator	When illuminated, indicates ac power supplied to low voltage circuits in transmitter.

WARNING: Disconnect primary power prior to servicing.



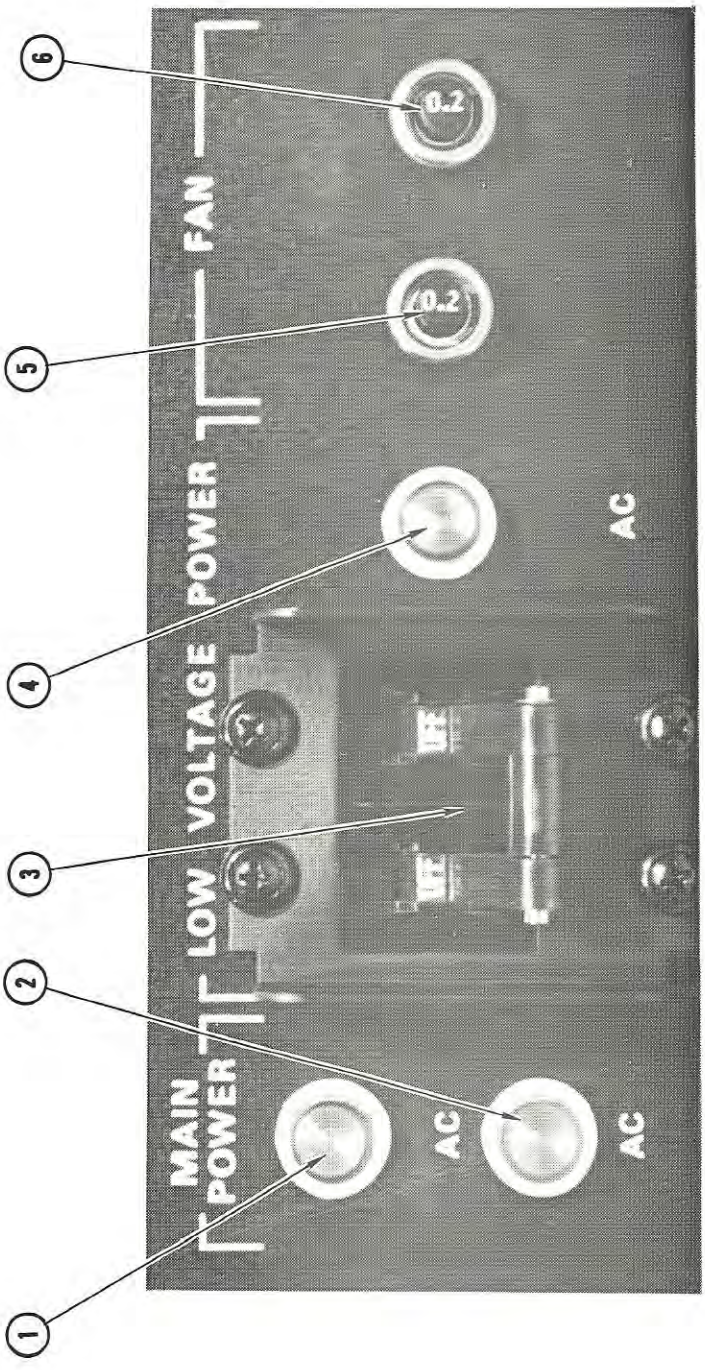
2125-6

Figure 1-5. AC Power Panel for SX-2.5

WARNING: Disconnect primary power prior to servicing.

Table 1-5. AC Power Panel for SX-2.5, Controls and Indicators

REF.	CONTROL/INDICATOR	FUNCTION
1	POWER AC, indicator	When illuminated, indicates main ac power is applied to transmitter.
	LOW VOLTAGE POWER	
2	Circuit Breaker	When set to ON position, applies ac power to low voltage transmitter power supplies. Provides low voltage power lines with over current protection.
3	AC, indicator	When illuminated, indicates ac power supplied to low voltage circuits in transmitter.
4 & 5	FAN circuit breakers	Provide over current protection for the fan in the SX-2.5.



2125-5

Figure 1-6. AC Power Panel for SX-5

WARNING: Disconnect primary power prior to servicing.

Table 1-6. AC Power Panel for SX-5, Controls and Indicators

REF.	CONTROL/INDICATOR	FUNCTION
1 & 2	POWER AC, indicators	When illuminated, indicate 3 phase main ac power is applied to transmitter.
	LOW VOLTAGE POWER	
3	Circuit Breaker	When set to ON position, applies ac power to low voltage transmitter power supplies. Provides low voltage power lines with over current protection.
4	AC, indicator	When illuminated, indicates ac power supplied to low voltage circuits in transmitter.
5 & 6	FAN circuit breakers	Provide over current protection for the fan in the SX-5.

WARNING: Disconnect primary power prior to servicing.

1-9. The SX Series of Transmitters are equipped with a front panel which allows the operator easy access to the control functions of the transmitter. These control functions include assuming one of three predetermined power levels when turning the transmitter on (low, medium, or high power), turning the transmitter off, changing output power level while transmitter is operating at one of three predetermined levels (low, medium, or high), raising or lowering power in small increments, and observing the power amplifier volts, amps, and power output of the transmitter in both forward and reflected modes.

1-10. The OFF/FAULT pushbutton is used to turn the transmitter off and also the illumination of the OFF/FAULT pushbutton indicates that a fault has occurred. This alerts the operator to examine the fault further using the keypad on the front of the transmitter. To clear the fault condition the operator must depress the LOW, MEDIUM, or HIGH power pushbutton and the red light will extinguish UNLESS A FAULT CONDITION STILL EXISTS which will prevent the transmitter from being turned on safely.

1-11. The three pushbuttons to the left of the OFF/FAULT pushbutton are the LOW, MEDIUM and HIGH power pushbuttons. If the operator wishes to bring the transmitter on the air at low power, depress the LOW pushbutton. If a change to high or medium power is desired, depress the pushbutton for HIGH or MEDIUM power respectively and the transmitter will automatically move to the power level assigned to that pushbutton. One may move from one power to another by depressing the LOW, MEDIUM, or HIGH pushbutton without depressing the OFF/FAULT pushbutton.

1-12. The RAISE or LOWER pushbuttons are used to raise or lower the output power of the transmitter, they control an internal digital potentiometer through the microprocessor (a light behind the pushbutton will illuminate to indicate the microprocessor has acknowledged the power change request and is acting upon it). The LOWER pushbutton lowers the transmitter power output and RAISE pushbutton raises the transmitter power output at a slow rate. These pushbuttons work on whichever power level (low, medium, or high) is selected when the pushbuttons are depressed.

NOTE

It may be necessary to hold the pushbutton for a few seconds to observe any power output change.

1-13. The ForWarD and REFLecteD POWER switch immediately to the left of the RAISE and LOWER pushbuttons is used to measure the forward and reflected power out of the transmitter at the position of the directional coupler in the output network but is not connected to the antenna. The POWER switch should be left in the ForWarD position to observe forward output power - remembering that the POWER meter on the front of the transmitter is not the meter to be used by the station as its indicator of power. This is ONLY an indication of the transmitter output power and due to losses in the antenna system may not reflect the output power on the antenna. The power on the transmitter POWER meter will most likely be higher than the power indicated at the base antenna current meter or the common point antenna current meter.

1-14. The REFLecteD position of the POWER switch is used to verify that the transmitter is properly tuned into the antenna. REFLecteD power on the output POWER meter should indicate a very small amount of reflected power. Any increase in reflected power should be noted and qualified maintenance personnel should be notified. The station log should be used as the reference to verify if there has been any change in reflected power for a given forward output power reading.

1-15. The PA CURRENT meter just to the left of the POWER meter is used to determine the PA current being input to the final power amplifier.

1-16. The Power Amplifier VOLTAGE meter to the far left on the front panel is used to indicate the power amplifier voltage being applied across the final power amplifier. The power amplifier voltage and power amplifier current multiplied together determine the input power to the final stage of the transmitter. These two meters are used if power is being calculated using the indirect method.

CAUTION

LOCATED BELOW THE METER PANEL ARE THE LOADING AND TUNING CONTROLS. THESE CONTROLS SHOULD NOT BE ADJUSTED EXCEPT BY THE CHIEF ENGINEER OR KNOWLEDGEABLE TECHNICIAN. ALSO THESE CONTROLS SHOULD NOT BE ADJUSTED UNLESS INDICATIONS SHOW THERE IS A NEED FOR ADJUSTMENT.

1-17. Located on the pull out drawer on the left of the transmitter is a display consisting of 16 digits and a 12 digit keypad resembling a telephone keypad. On the display panel are the words KEY * and KEY #.

NOTE

The display is divided into two digital readouts labeled respectively KEY * and KEY #. The * or # keys on the keypad determine which readout will display the information requested. There is functionally no difference between the two displays and any data point can be displayed on either readout or BOTH if so desired.

1-18. To display a particular data point within the transmitter use the following procedure.

a. Select which digital display (KEY * or KEY #) will present the data to be requested by depressing the * or # key on the keypad.

b. Select particular data point to be displayed (see Supplement A) by entering 2 digit code for the particular data point. This 2 digit code will appear beside KEY * or KEY # depending upon display selected in step a.

c. Upon entering the last digit of the 2 digit code, the data requested will immediately appear in the 6 digit display immediately below the display selected in step a.

NOTE

It is important to point out that if a code is listed as 02 and if the KEY # display is selected, the operator must input #02 to get the code to display properly. If only #2 is depressed, the entry will not be completed in the display beside the KEY # (a 2 and a blank will be displayed). If at this point it is detected that a wrong key has been depressed, depressing the # key will blank the display allowing the correct two digit entry to be made. While the display is blank, it is possible to return to the previous display code by depressing the # key a second time.

1-19. To increment or decrement through a series of readings on a particular display (KEY * or KEY #), the keypad keys 1, 7, 3, and 9 serve as increment and decrement keys. For example if KEY *04 has been selected and the operator wishes to view functions 05 and 06 on the KEY * display, depressing the 1 key will increment the KEY * display to 05. Depressing the 1 key a second time will increment the display to 06 and so on. Depressing the 7 key will likewise decrement the display by 1. Similar action can be obtained when using the KEY # display by depressing the 3 key (increment) or 9 key (decrement). At this time there are no special functions assigned to keys 0, 2, 4, 5, 6, or 8 and if these keys are depressed without the KEY * or KEY # having been selected previously, they will be ignored by the microprocessor.

1-20. The following paragraphs will discuss the AC Power Panel on the SX Series of Transmitters. For the SX-5, skip to paragraph 1-24.

1-21. On the SX-1 and SX-2.5 there are two indicators - one indicates POWER AC, and the other indicates LOW VOLTAGE POWER AC. If the transmitter is plugged into the wall or connected to the wall box, and the wall box is set to ON, the POWER AC indicator at the base of the SX transmitter will illuminate, indicating that the main ac is on to the transmitter. If the circuit breaker located in the center of the AC Power Panel is set to ON, the indicator to the right indicating low voltage power will illuminate.

NOTE

Both indicators, POWER AC and LOW VOLTAGE POWER AC must be on in order for the transmitter to be operational.

1-22. If a low voltage short has occurred, or some other fault caused the low voltage circuit breaker to trip to the OFF position, it may be reset by setting it to the ON position.

NOTE

Under emergency power off conditions it is permissible to set the low voltage circuit breaker to OFF position. This will remove all power from the power sections of the transmitter, deenergize the high voltage contactors, deenergize all low voltage circuitry, and disconnect the transmitter from mains ac. At the AC Power Panel, there will still be main ac connected inside the panel and it will be indicated by the POWER AC indicator.

1-23. On the SX-2.5 only, the two circuit breakers on the right of the AC Power Panel are circuit breakers associated with the fan in the SX-2.5. If these circuit breakers should operate (trip), it will be indicated by a white ring around the stem of the circuit breaker. To reset depress the circuit breaker in. The fan cannot be turned off by pulling out on the circuit breakers as they will not come out. If the fan should be disabled, the SX-2.5 has temperature monitoring circuits inside to measure the internal cabinet temperature and, if the temperature rises too high, the transmitter will automatically reduce its power output. However the fan should be running and if one of the FAN circuit breakers is out, depress it and the fan will resume operating again. If this operation is repeated and the circuit breaker will not stay in, then consult maintenance personnel for corrective action.

1-24. The SX-5 AC Power Panel contains three indicators and 3 circuit breakers. The indicators on the left indicate main 3 phase power. If all three phases to the transmitter are operating, these 2 indicators will be illuminated. If one phase is disabled, one of these indicators will

extinguish. In the center of the transmitter AC Power Panel is a LOW VOLTAGE POWER circuit breaker and an indicator. If the low voltage power is on, the circuit breaker will be set to the ON position and the AC indicator associated with low voltage power will be illuminated.

NOTE

All three indicators, MAIN POWER AC and LOW VOLTAGE POWER AC must be on in order for the transmitter to be operational.

1-25. If a low voltage short has occurred, or some other fault caused the low voltage circuit breaker to trip to the OFF position, it may be reset by setting it to the ON position.

NOTE

Under emergency power off conditions it is permissible to set the low voltage circuit breaker to OFF position. This will remove all power from the power sections of the transmitter, deenergize the high voltage contactors, deenergize all low voltage circuitry, and disconnect the transmitter from mains ac. At the AC Power Panel, there will still be main ac connected inside the panel and it will be indicated by the MAIN POWER AC indicators.

1-26. The 2 circuit breakers on the right of the AC Power Panel are circuit breakers associated with the fan in the SX-5. If these circuit breakers should operate (trip), it will be indicated by a white ring around the stem of the circuit breaker. To reset depress the circuit breaker in. The fan cannot be turned off by pulling out on the circuit breakers as they will not come out. If the fan should be disabled, the SX-5 has temperature monitoring circuits inside to measure the internal cabinet temperature and, if the temperature rises too high, the transmitter will automatically reduce its power output. However the fan should be running and if one of the FAN circuit breakers is out, depress it and the fan will resume operating again. If this operation is repeated and the circuit breaker will not stay in, then consult maintenance personnel for corrective action.

1-27. OPERATING PROCEDURES

1-28. These procedures describe the normal daily operations to be performed on the transmitter and the operations to be performed in case of emergency operating conditions. It is important that the operator be aware of normal transmitter performance and note any changes that may indicate a need for

WARNING: Disconnect primary power prior to servicing.

maintenance or corrective action before more serious problems develop. Turn-on and operation of the transmitter is accomplished though front panel controls.

WARNING

UNDER NO CIRCUMSTANCES IS THE OPERATOR TO OPEN ANY DOORS OR PANELS ON THE TRANSMITTER. REFER ALL SERVICE TO QUALIFIED TECHNICIANS.

1-29. DAILY PREOPERATIONAL CHECKOUT

1-30. Prior to normal daily turn-on, the following checks should be made:

a. Check the transmitter maintenance log to ensure that maintenance performed on the transmitter does not put any restriction on its operation or indicate abnormalities.

b. Ensure that all doors and panels are closed. Ensure that all external interlock devices are in place.

c. Ensure that the transmitter rf output is properly terminated into the antenna.

d. Ensure that power from the station ac distribution center is applied to the transmitter.

e. Ensure that all circuit breakers on the AC Power Panel are set to ON position and all AC indicators are illuminated.

1-31. TRANSMITTER TURN-ON PROCEDURE

1-32. To energize the transmitter, proceed as follows:

a. Ensure all AC indicators and circuit breakers on AC Power Panel are illuminated or set to ON respectively.

b. Set POWER switch to FWD position.

c. Depress the LOW, MEDIUM or HIGH pushbutton on the Meter Panel.

d. Verify pushbutton depressed is illuminated and that power output of transmitter (as observed on POWER meter) is correct for power level selected in step c.

NOTE

If MEDIUM or HIGH pushbuttons are depressed, but transmitter comes up in LOW or MEDIUM power levels respectively, check REFLF POWER levels. Transmitter will automatically step back in power if REFLD power is too high. If this occurs, notify maintenance personnel and make appropriate log entry.

e. Rotate POWER switch to REFLD position and compare reading on POWER meter with those logged previously. Any deviation should be reported to maintenance personnel.

f. Rotate POWER switch back to FWD for normal operation if REFLD reading is okay.

1-33. TRANSMITTER TURN-OFF PROCEDURE

1-34. To deenergize the transmitter, proceed as follows:

a. Depress OFF/FAULT pushbutton.

b. With POWER switch in FWD position, POWER meter should indicate zero power and PA VOLTAGE and PA CURRENT meters should indicate zero readings.

WARNING

AC POWER IS STILL APPLIED TO THE TRANSMITTER CABINET WHEN ONLY THE OFF/-FAULT SWITCH IS DEPRESSED. UNDER NO CIRCUMSTANCES SHOULD THE OPERATOR OPEN ANY DOORS OR PANELS ON THE TRANSMITTER. ONLY QUALIFIED MAINTENANCE PERSONNEL ARE TO PERFORM MAINTENANCE ON INTERIOR OF TRANSMITTER.

1-35. EMERGENCY OPERATING PROCEDURES

1-36. The following information is provided only as a guide to follow for some emergency operation circumstances that may occur and in no way represents all the emergencies that may occur. It is imperative that the operators and maintenance personnel work out proper communication channels so that the objective of minimum off-air time can be met. Under emergency conditions if the operator cannot readily and SAFELY return the transmitter to an on-air condition, maintenance and/or supervisory personnel should be notified immediately. Be prepared to give as much information to the maintenance personnel as possible - especially any abnormalities noted prior to emergency.

1-37. AC POWER FAILURE

1-38. No operator action required. Transmitter will return to an on-air condition when ac power is restored if the ac power returns within approximately one hour. If ac power is not restored for a time frame greater than one hour, the operator will need to restore the transmitter to an on-air condition by following normal transmitter turn on procedures.

SUPPLEMENT A

KEYPAD CODE AND OVERLOAD INFORMATION

SX MULTIMETER CODE DESCRIPTIONS

CODE #	DESCRIPTION	FORMAT
	BASIC CONTROL & STATUS	
00	STATUS/FAULT DISPLAY	999
01	POWER SUPPLY VOLTAGE	999
02	POWER SUPPLY CURRENT	99.9
03	FORWARD POWER [UNCAL.]	999
04	REFLECTED POWER [UNCAL.]	999
05	POWER AMPLIFIER CURRENT	99.9
06	PHASE 2 PA VOLTS	999
07	PHASE 1 PA VOLTS	999
08	PHASE 4 PA VOLTS	999
09	PHASE 3 PA VOLTS	999
10	IPA DRIVE LEVEL	999
	TEMPERATURE READINGS	
11	A1 TEMP	999
12	A2 TEMP	999
13	A3 TEMP	999
14	A4 TEMP	999
15	IPA TEMP	999
16	PHASE 2 TEMP	999
17	PHASE 1 TEMP	999
18	PHASE 4 TEMP	999
19	PHASE 3 TEMP	999
20	PHASE ANGLE DETECTOR OUTPUT	9.99
	FAULT/STATUS PER MODULE	
21	A1 FUSE FINDER	999
22	A2 FUSE FINDER	999
23	A3 FUSE FINDER	999
24	A4 FUSE FINDER	999
25	IPA FUSE FINDER	999
26	A6 Q19 & Q20	999
27	A7 Q19 & Q20	999
28	A8 Q19 & Q20	999
29	A9 Q19 & Q20	999
36	A6 Q39 & Q40	999
37	A7 Q39 & Q40	999
38	A8 Q39 & Q40	999
39	A9 Q39 & Q40	999
	USER PROGRAMMING	
40	IDLE POWER LEVEL	.999
41	LOW POWER LEVEL	.999
42	MEDIUM POWER LEVEL	.999
43	HIGH POWER LEVEL	.999
44	PRESENT POWER LEVEL	.999
45	FREQUENCY SYNTHESIZER FREQUENCY & LOCK IND	9999.F or .0
46	TOTAL NUMBER OF FAULTS	999

CODE #	DESCRIPTION	FORMAT
	INTERNAL REFERENCES	
50	+5 VOLT POWER SUPPLY	9.99
51	+15 VOLT POWER SUPPLY	99.99
52	+10.0000 VOLT REFERENCE	99.99
71	STORED PWR SUPPLY VOLTAGE	999
72	STORED PWR SUPPLY CURRENT	99.9
73	STORED FORWARD POWER	999
74	STORED REFLECTED POWER	999
75	STORED PA CURRENT	99.9
76	STORED PHASE 2 VOLTS	999
77	STORED PHASE 1 VOLTS	999
78	STORED PHASE 3 VOLTS	999
79	STORED PHASE 4 VOLTS	999
80	STORED IPA DRIVE LEVEL	999
81	STORED PHASE ANGLE DETECTOR VOLTAGE	9.99
	TEST ROUTINES	
88	LAMP TEST	.8.8.8.8.8.
	COMMANDS	
95	FREQUENCY SYNTHESIZER FREQUENCY PROGRAMMING	95XXXX
99	CLEAR FAULT STATUS MEM	

FAULT/STATUS DISPLAY CODES (PRESS #00 or *00) *

1 MAIN POWER SUPPLY VOLTAGE OVERLOAD
2 POWER AMPLIFIER CURRENT OVERLOAD
4 RF DRIVE TO POWER AMPLIFIER INSUFFICIENT (UNDERDRIVE)
8 RF DRIVE TO POWER AMPLIFIER EXCESSIVE (OVERDRIVE)
16 MAIN POWER SUPPLY CURRENT OVERLOAD
32 50 OHM DIRECTIONAL COUPLER DETECTED HIGH VSWR (REFLECTED POWER)
64 PHASE DETECTOR INDICATES IMPROPER LOAD FOR PA (VSWR)

PROBABLE CAUSES:

1) MAIN POWER SUPPLY VOLTAGE OVERLOAD
   a. Primary tap on main transformer (A19T1 set wrong)
   b. Power line surges or poor transient response on power line

2) POWER AMPLIFIER CURRENT OVERLOAD
   a. Exessive modulation density
   b. Peak modulation in excess of 130% (reduce modulation to 125%)
   c. Improper setting on loading control (check reflected power meter)

4) RF DRIVE TO POWER AMPLIFIER INSUFFICIENT (UNDERDRIVE)
   a. Faulty IPA or faulty IPA tuning network
   b. Loss of output from oscillator (check fuse on oscillator)
   c. IPA tuning network improperly tuned

8) RF DRIVE TO POWER AMPLIFIER EXCESSIVE (OVERDRIVE)
   a. IPA tuning network improperly tuned
   b. Crystal on incorrect frequency

16) MAIN POWER SUPPLY CURRENT OVERLOAD
   a. Attempt to turn on transmitter with door(s) open
   b. Excessive modulation density (turntable rumble)
   c. Faulty PDM amplifier module

32) 50 OHM DIRECTIONAL COUPLER DETECTED HIGH VSWR (REFLECTED POWER)
   a. Improper setting on tuning and loading controls (check reflected power meter) NOTE: Reduce power and retune transmitter output section
   b. Antenna or phasor impedance incorrect (i.e. VSWR greater than 1.5:1)
   c. Antenna connecting cable or wire disconnected

64) PHASE DETECTOR INDICATES IMPROPER LOAD FOR PA (VSWR)
   a. See above for 50 ohm directional coupler
   b. Lightning in area or static discharge (transmitter is protected)
   c. Faulty component in output network

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* NOTE: Number displayed when #00 or *00 depressed represents the sum of the faults (i.e. display 09 on display panel would indicate both fault 8 [RF DRIVE TO POWER AMPLIFIER EXCESSIVE] and fault 1 [MAIN POWER SUPPLY VOLTAGE OVERLOAD] occured)

APPENDIX A

THE FOLLOWING LAMINATED PAGES ARE INTENDED TO BE REMOVED FROM TECHNICAL MANUAL AND PLACED WITH TRANSMITTER FOR REFERENCE.

WARNING: Disconnect primary power prior to servicing.

SX MULTIMETER CODE DESCRIPTIONS

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08	PHASE 4 PA VOLTS	999
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15	IPA TEMP	999
16	PHASE 2 TEMP	999
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18	PHASE 4 TEMP	999
19	PHASE 3 TEMP	999
20	PHASE ANGLE DETECTOR OUTPUT	9.99
	FAULT/STATUS PER MODULE	
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22	A2 FUSE FINDER	999
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43	HIGH POWER LEVEL	.999
44	PRESENT POWER LEVEL	.999
45	FREQUENCY SYNTHESIZER FREQUENCY & LOCK IND	9999.F or .0
46	TOTAL NUMBER OF FAULTS	999

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81	STORED PHASE ANGLE DETECTOR VOLTAGE	9.99
	TEST ROUTINES	
88	LAMP TEST	.8.8.8.8.8.
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   a. Primary tap on main transformer (A19T1 set wrong)
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2) POWER AMPLIFIER CURRENT OVERLOAD
   a. Exessive modulation density
   b. Peak modulation in excess of 130% (reduce modulation to 125%)
   c. Improper setting on loading control (check reflected power meter)
4) RF DRIVE TO POWER AMPLIFIER INSUFFICIENT (UNDERDRIVE)
   a. Faulty IPA or faulty IPA tuning network
   b. Loss of output from oscillator (check fuse on oscillator)
   c. IPA tuning network improperly tuned
8) RF DRIVE TO POWER AMPLIFIER EXCESSIVE (OVERDRIVE)
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   a. Attempt to turn on transmitter with door(s) open
   b. Excessive modulation density (turntable rumble)
   c. Faulty PDM amplifier module
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   b. Antenna or phasor impedance incorrect (i.e. VSWR greater than 1.5:1)
   c. Antenna connecting cable or wire disconnected
64) PHASE DETECTOR INDICATES IMPROPER LOAD FOR PA (VSWR)
   a. See above for 50 ohm directional coupler
   b. Lightning in area or static discharge (transmitter is protected)
   c. Faulty component in output network

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   b. Loss of output from oscillator (check fuse on oscillator)
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