MOORE INDUSTRIES

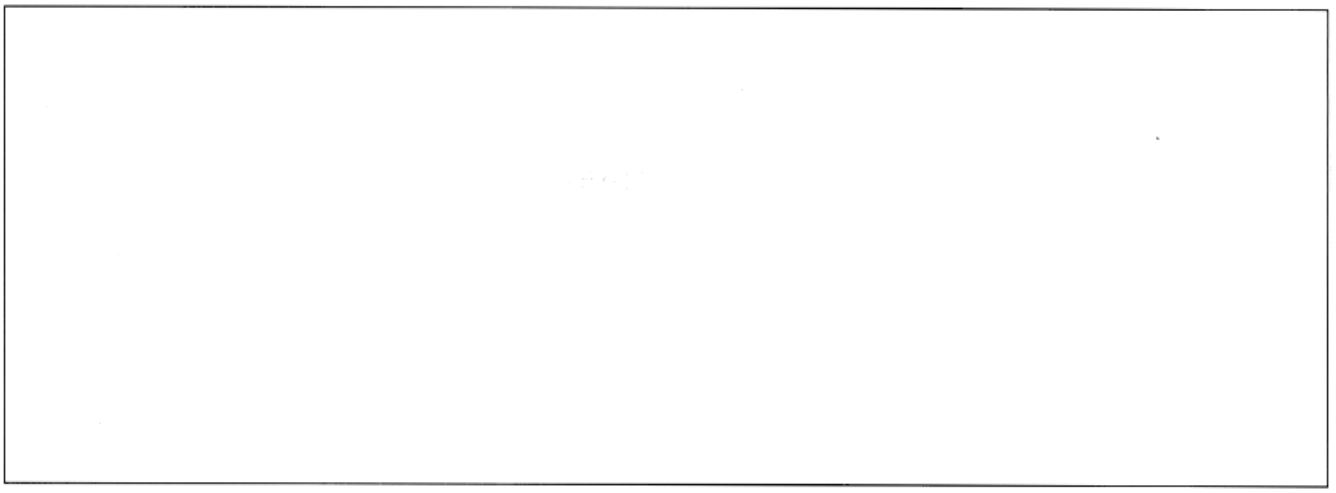
INSTRUCTION MANUAL

FFX

Frequency-to-Frequency Transmitter

Form 165-702-00A

January 1982



GENERAL INFORMATION

1.1 SCOPE OF MANUAL

This manual contains operating and maintenance information on the two wire Frequency-to-Frequency Transmitter (FFX), manufactured by MOORE INDUSTRIES INC., Sepulveda, California. The manual consists of six sections as follows:

Section 1, General Information, introduces the equipment function and describes the equipment physical appearance, the equipment specifications, and options available for the unit. The introduction also provides information on the use and description of the MOORE model numbering system.

Section 2, Calibration, provides all the information necessary to calibrate the unit before installation. This section contains a list of the tools necessary for calibrating the equipment; and illustrates the test setups essential to perform that task. The section also lists the various procedures required for calibration of the units in any configuration.

Section 3, Installation and Operation, supplies all the information needed to install and operate the equipment. The section contains figures that specify the installation requirements for the units, and text that informs the user on recommended wiring practices for the equipment as well as defines the electrical connections for each unit regardless of physical modifications. A brief outline of periodic observations required during the equipment operation is also included here.

Section 4, Theory of Operation, gives the maintenance personnel a detailed explanation of the internal function of the unit. The circuit theory is based on a block diagram that shows the functional elements of the unit. Each element operation is then described, first in relation to the other element, then independently where its major components' use and purpose are described.

Section 5, Maintenance, offers complete disassembly procedures for all unit configurations available. Troubleshooting information is also provided in this section as well as component replacement techniques to aid the technician in the repair of the equipment.

Section 6, Unit Documentation, acquaints the user with the MOORE IND. computerized parts listing and identification system. The section also provides a recommended spare parts list. All schematics and parts assembly drawings referred to by the text are located in the back of Section 6.

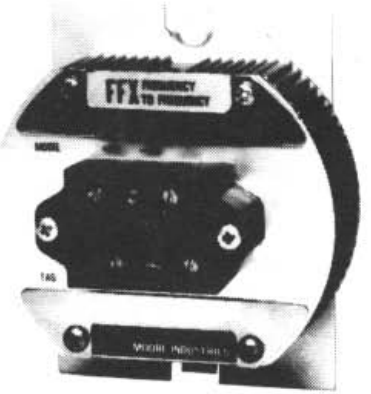
1.2 EQUIPMENT DESCRIPTION

The FFX is a two wire Frequency-to-Frequency transmitter that converts a low or high level voltage signal to a current pulse. Typical input signals are from magnetic pickups. The unit accepts input voltage signals from 5 mV peak-to-peak to 200V peak-to-peak. The two wire output signal is a current pulse from 2 mA to 10 mA whose frequency is the same as the input signal frequency. The input signal return and the current loop return are common.

1.3 STANDARD UNIT PHYSICAL DESCRIPTION

The FFX consists of a printed circuit board that holds all the electronic components. A small additional board is mounted vertically across the center of the main board. This small board provides the circuit strips connections for the plug-in connector.

The boards are enclosed in an oval protective housing resembling a hockey puck, whence the name of the standard housing is derived. Electrical connections information is given in Section 3, Installation and Operation.



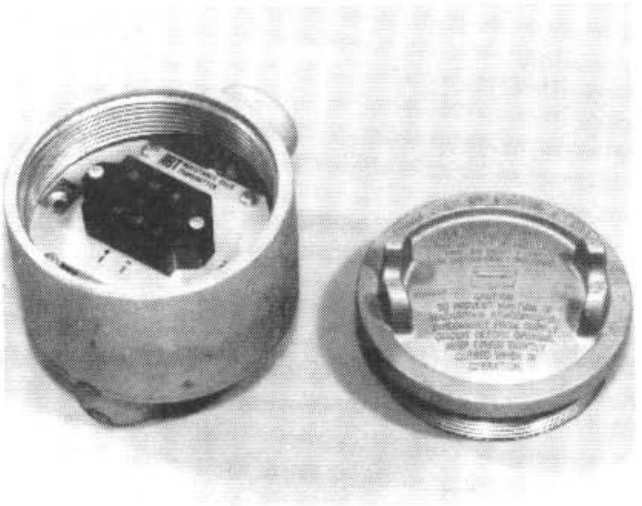
Standard Unit (HP) Housing

1.4 EXPLOSION-PROOF UNIT, PHYSICAL DESCRIPTION

The explosion-proof enclosure option consists of the standard enclosure described in paragraph 1.3 and inserted into a two-piece cast aluminum alloy enclosure. The two pieces consist of a screw-type cover and a housing with hubs. The standard enclosure is modified mechanically only to allow mounting of the hockey puck housing into the explosion-proof housing. The modification consists of an additional locking bolt that threads through the hockey puck housing and wedges the standard unit into place.

1.5 RF UNIT PHYSICAL DESCRIPTION

The RF unit option consists of standard FFX electronics with the addition of an RF filter input. This additional electronic process requires some mechanical modifications to the input connections. An RF filter replaces the standard input connector. Input and output connections are effected through a flex cable wired between the PC board and the filter. This configuration mechanically fastens the housing cover to the PC board; thus both assemblies must be removed together for maintenance.



Explosion-Proof Housing

1.6 SPECIFICATIONS

The specifications for the unit are listed in Table 1-1.

1.7 MODEL NUMBER EXPLANATION AND USE

MOORE INDUSTRIES' model numbers describe an instrument's type, functional characteristics, operating parameter, and include option identification. If all accompanying documentation of a unit is missing, the model number may be used to obtain technical information on the unit by following the example of Table 1-2. The model number for standard units is located on the identification label on the cover. For explosion-proof units, the model number is stamped on a stainless steel tag on top of the enclosure.

1.8 SERIAL NUMBER USE AND LOCATION

A complete history is kept on every MOORE unit. This information is keyed to the serial number. Whenever service data is required on a unit, it is necessary to provide the factory with a serial number as well as a model number. This identification is usually located with the model number (see paragraph 1.7 for location on the equipment).

TABLE 1-1. UNIT SPECIFICATIONS

INPUT SENSITIVITY:
100 mV peak, minimum from DC to 10 KHz
Below 100 Hz: —1 mV/Hz to 5 Hz, i.e. 5 mV @ 5 Hz
Below 5 Hz: —5 mV
Maximum input: 200V peak-to-peak
Signal must be zero based but does not have to be sinusoidal or symmetrical about zero.

INPUT RESISTANCE: 40K ohms

FRONT PANEL ADJUSTMENTS: None

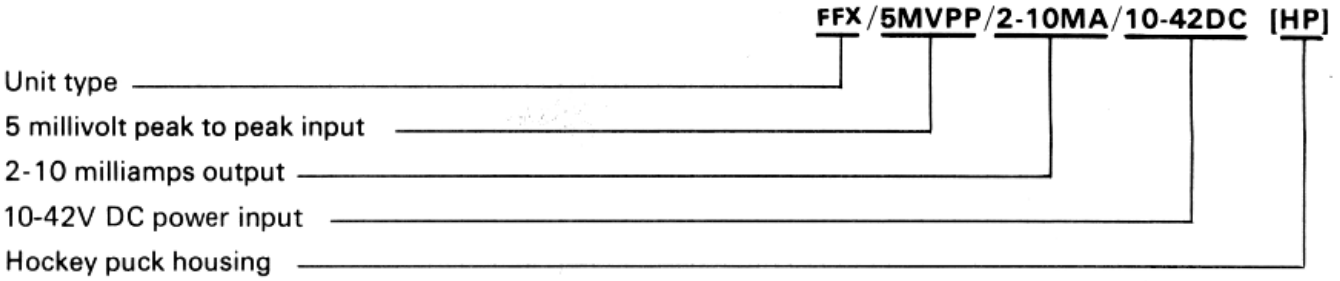
OUTPUT:
2-10 mA (limited @ 10 mA) pulse
Rise and fall time: 10 us

PULSE:
Load Capability:
1400 ohms with 24V DC supply
3200 ohms with 42V DC supply

PERFORMANCE:
Ambient Temperature Effect:
Range: —20°F (—28.9°C) to +180°F (82.2°C)

POWER INPUT: 10V DC minimum to 42V DC maximum measured at the input terminals

TABLE 1-2. MODEL NUMBER EXAMPLE



CALIBRATION

2.1 GENERAL INFORMATION

This section normally provides information about unit calibration. Units with standard input and output levels are normally calibrated at the factory. After the unit is unpacked, general operating level checks of units is recommended. Since the units have no adjustments, the operation checks consist of connecting the unit as shown in Figure 2-1 and checking for the signals illustrated in Figure 2-2. Use equipment available in the field for the input source. Output monitoring can be effected by either a milliammeter or the optional voltmeter and resistor combination.

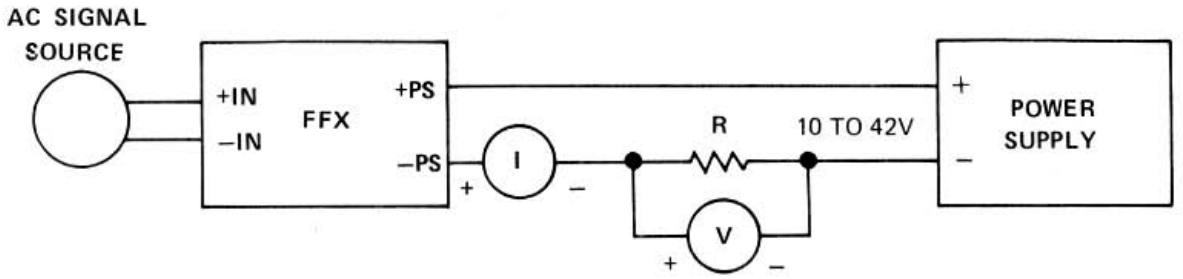


Figure 2-1. Test Set-Up

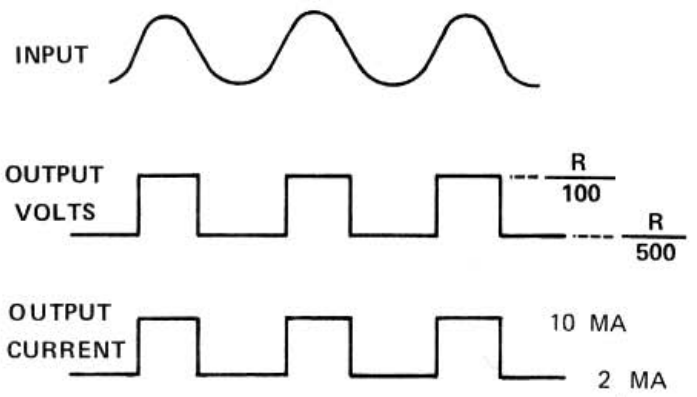


Figure 2-2. FFX I/O Signals Timing Diagram

INSTALLATION AND OPERATION

3.1 MECHANICAL INSTALLATION

Units may be obtained in various physical configurations. Figures 3-1 and 3-2 show the outline dimensions and other installation requirements for the available configurations. Select the proper outline and dimension figure applicable to the unit purchased. Be sure to observe the applicable special procedures and precautions given with the illustration. Although the units are designed to operate in free air at quite a high ambient temperature, it is advisable, if possible, to mount the unit on a surface made of material that can serve as a heat sink.

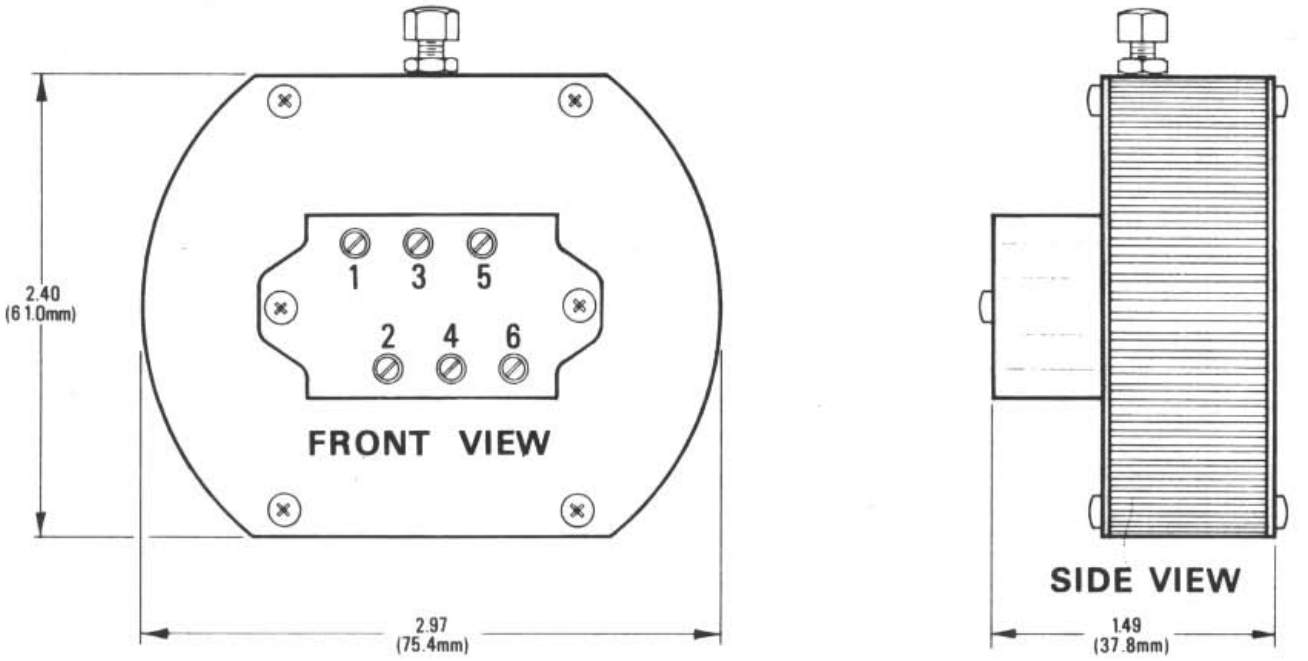


Figure 3-1. Standard Unit and Unit, Outline and Dimension

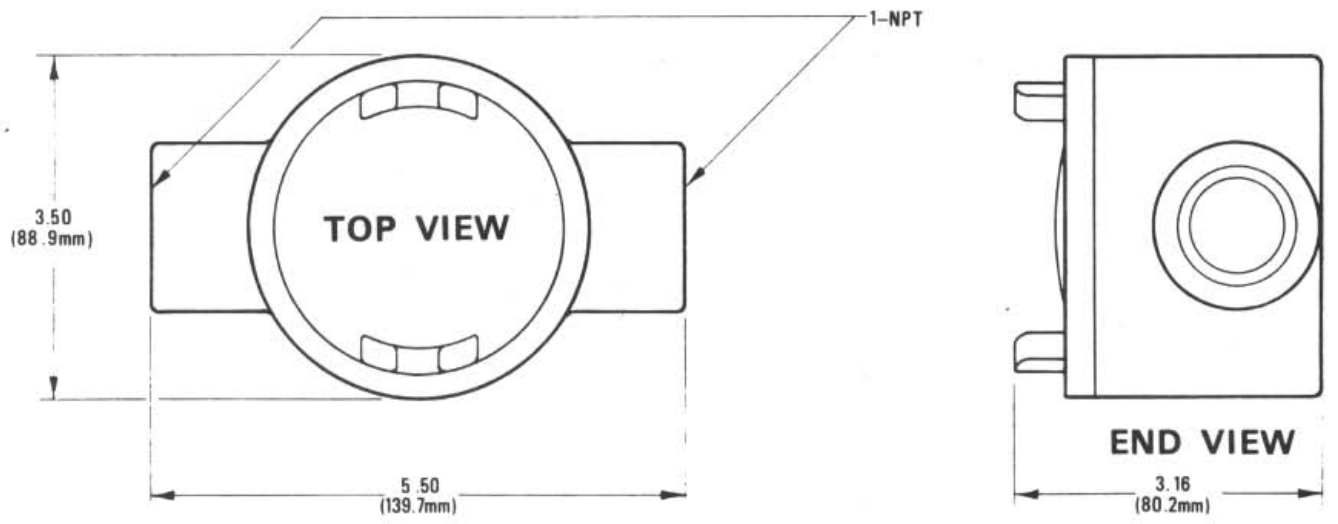


Figure 3-2. Standard Unit in Explosion-Proof Enclosure, Outline and Dimensions

[5]

3.2 ELECTRICAL CONNECTIONS

All electrical connections to standard units are made to the connector on the unit. Terminals used for standard units and their options are defined in the following paragraph.

3.2.1 General Wiring Information

No special wire or cable is required for signal connections to the unit. To avoid transients and stray pickups, it is recommended that twisted conductors be used where they are run close to other services (such as power wiring).

Wiring Information for Standard Units. Figure 3-3 illustrates the connector pin locations and identification for the standard units. Table 3-1 provides the complete labeling nomenclature for the units. Terminal labeling appears next to the terminal it identifies on standard units. For explosion-proof units, terminal labeling is marked on the unit housing with the referenced terminals identified numerically.

Wiring Information for All Explosion-Proof Units. Units mounted in explosion-proof boxes are standard units with or without the options listed in Table 3-1. Dress all wiring to and from terminals through conduit openings.

3.2.2 Power Connections

Units are designed to operate directly from a DC power source. Connect power leads to the ±PS terminals.

3.3 OPERATION AND PERIODIC OBSERVATION

Once calibrated and installed, the unit may be operated unattended. There are no controls or indicators on the unit. Because the circuit uses highly reliable solidstate components with no moving parts, the unit should operate virtually maintenance-free for a long period of time. However, if a malfunction should occur, refer to Section 5 for maintenance information.

A periodic check of input and output connections is recommended every six months to ensure continued dependability of operation.

A unit may become warm during operation, especially where the ambient temperature is rather high. This is perfectly normal and should not be a cause for alarm unless a malfunction is also observed.

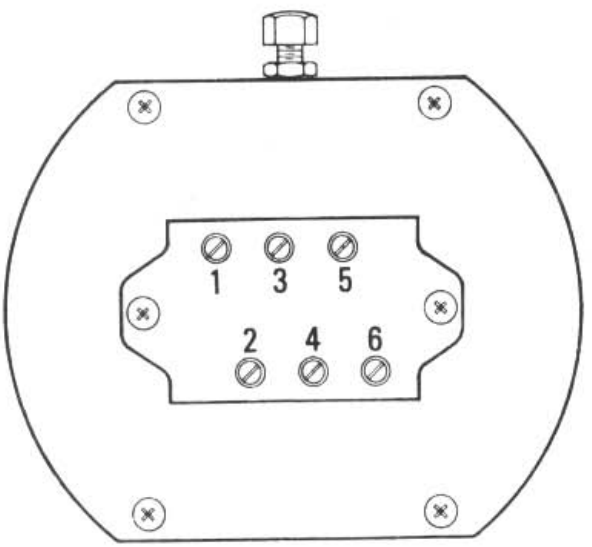


Figure 3-3. Terminal Strips and Terminal Blocks Identification

TABLE 3-1. TERMINAL NOMENCLATURE

Options	Terminal Positions					
	1	2	3	4	5	6
NONE	(+) PS	(+) IN	(—) PS	(—) IN		

THEORY OF OPERATION

4.1 INTRODUCTION

This section describes the unit operation. An overall view of the unit function based on the block deagram of Figure 4-1 introduces the user to the unit functional elements. This functional analysis is further detailed in the circuit description paragraphs that follow. Each of these paragraphs also contains a detailed description of the circuit operation. These descriptions are based on the schematic diagram included in Section 6, Unit Documentation.

A rapid familiarization of the unit can be obtained by reading the general functional description (paragraph 4.2). Detailed circuits descriptions provide sufficient data so that troubleshooting, if required, can be performed intelligently and rapidly.

4.2 GENERAL FUNCTIONAL DESCRIPTION

The FFX is a device that converts a voltage level to a current signal. Figure 4-1 functionally illustrates the unit. The input voltage level is reduced to levels that will not harm the unit internal components by a limiter circuit. The reduced signal is then processed by an input amplifier. The output of this circuit is related to a reference voltage derived by a constant current source. The comparison is effected by a comparator whose output drives a current switching circuit producing the output current signal.

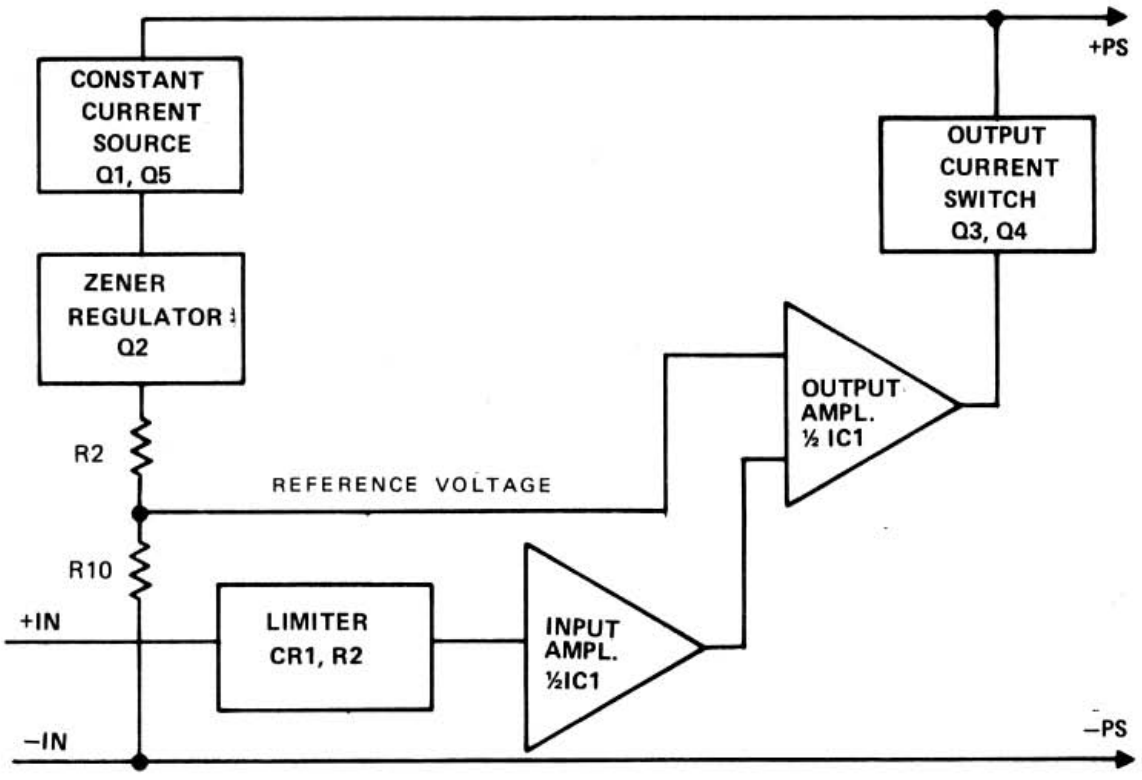


Figure 4-1. FFX Functional Block Diagram

4.3 INPUT CIRCUITS DESCRIPTION

The input circuit consists of resistors R1, R9 and R4, diodes CR1 and CR2 and 1/2 of IC1. These components limit the input signal level to prevent damage to IC1, then store the signal level to a value useful to the comparator. Resistor R1 provides current limiting for large amplitude input signals while diodes CR1 and CR2 limit the voltage to the input terminal 3 of IC1. Resistors R4, R9 and 1/2 of IC1 form a high gain non-inverting amplifier for the low level input signals. Figure 4-2 illustrates this circuit.

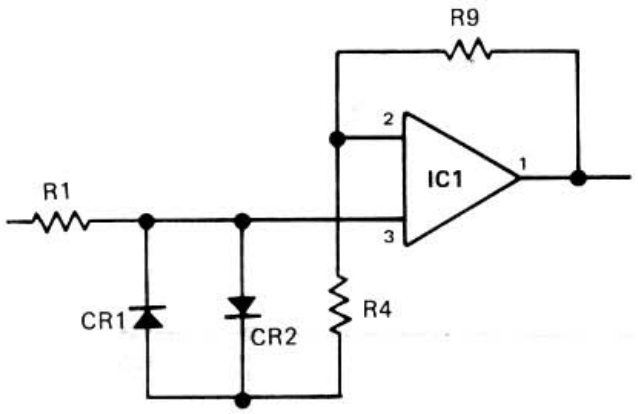


Figure 4-2.

4.4 COMPARATOR CIRCUITS DESCRIPTION

The comparator circuits consist of the other half of IC1 and associated components. Figure 4-3 illustrates this circuit. The output signal from the amplifier is fed to terminal 5 of the other half of IC1 which is connected as a comparator. The reference voltage for the comparator is derived from the resistive divider comprised of resistors R2 and R10. The source voltage for the divider is from transistor Q2 which is operating as a zener diode. When the input to terminal 5 of IC1 is less than the reference voltage, the output at terminal 7 is close to ground potential thus transistor switch Q4 is cut off. When the input voltage at terminal 5 is equal to the reference voltage at terminal 6, transistor Q4 is switched on.

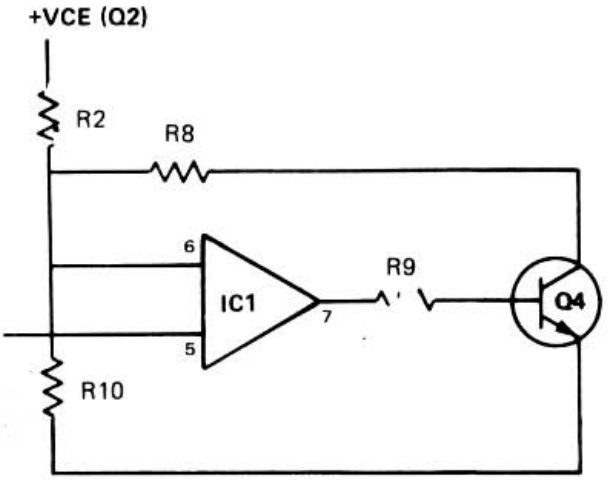


Figure 4-3.

4.5 OUTPUT CIRCUITS DESCRIPTION

The output circuit is a current switch consisting of Q3, Q4 and associated components. Resistor R9 limits the base drive to Q4. When transistor Q4 is switched on and transistors Q2 and Q3 and resistor R7 form a current sink to provide a 8mA pulse on top of the 2mA quiescent current, resistor R8 shunts resistor R10 changing the reference voltage and thus provides hysteresis for the comparator. Figure 4-4 illustrates this circuit.

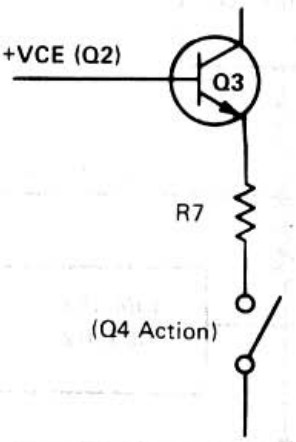
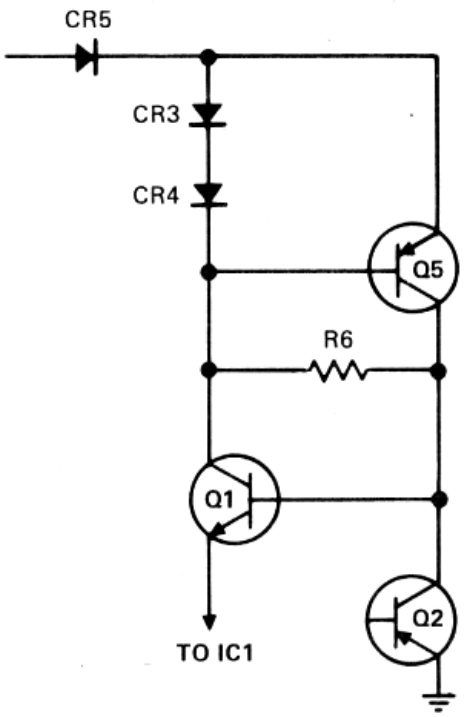


Figure 4-4.

4.6 CONSTANT CURRENT SOURCE SUPPLY, CIRCUITS DESCRIPTION

The supply circuit consists of polarity reversal diode CR5 and a constant current supply. Transistor Q5, diodes CR3 and CR4, resistors R5 and R6 form a constant current bias source for transistor Q2. Bias voltage for IC1 is one junction drop lower than the voltage developed across transistor Q2. A constant current also flows through CR3, CR4, Q1 and IC1. Thus, load on the external power source remains constant.



MAINTENANCE

5.1 INTRODUCTION AND GENERAL INFORMATION

This section contains information to aid in the maintenance of the unit. This includes disassembly instructions for all mechanical options, as well as general troubleshooting. Precautions and special techniques required to replace component are also described.

5.2 DISASSEMBLY

When unit troubleshooting is required, it is first necessary to disassemble the unit. The physical configuration of the unit determines the steps to be followed in disassembly. These are described in the following paragraphs.

NOTE

Always identify wires—usually by tagging—before disconnecting existing connections.

CAUTION

DISCONNECT INPUT SIGNAL AND REMOVE POWER INPUT BEFORE DISASSEMBLING UNIT.

5.2.1 Disassembly of Standard Unit

To disassemble a standard unit, remove the unit from its installed position. After the unit has been removed from its installed position, disassemble the unit as follows to gain access to the circuit board.

a. Tag and disconnect wires from unit.

b. Remove four cover-mounting Phillips-head screws at top of unit.

NOTE

To test unit in place, ignore steps c,d and perform step e only.

NOTE

Exercise care not to lose or damage mica washer when removing Q8 mounting screw.

c. Using a blade screwdriver, loosen slot-head screw holding Q8 to the case, and remove nut and mica washer.

d. Using appropriate screwdriver, loosen Phillips-head screw on the opposite side of the Q8 mounting screw.

e. Remove two connector mounting screws on unit cover and plug in free connector directly onto PC board.

5.2.2 Disassembly of Units in EX Enclosures

Use the following procedure to disassemble unit:

a. Using a bar wrench, attach to wrench lugs and loosen the housing cover from the base.

b. Disconnect wires from unit connector.

c. Using a 1/4-inch wrench, reach in and carefully loosen nut that locks wedging bolt in place.

d. Back wedging bolt away from casing.

e. Gain access to unit internal wiring by using the procedure of paragraph 5.2.1. When replacing unit into casing ensure that one of the flat sides of the hockey pock housing is facing the hubs that carry the external wiring.

5.3 TROUBLESHOOTING

The schematic diagrams include flagged numbers at various points in the circuit. Table 5-1 gives the voltages and waveforms at these points for specified input-signal conditions. The assembly drawing shows the physical locations of the parts on the circuit board. Bear in mind that the circuit board is protected with a moisture-resistant coating. Therefore, it may be necessary to use a needle-point probe and exert a fair amount of pressure to break through the coating when it is desired to observe the signal or voltage at a specific point. When connecting a probe to a component on the circuit board, exercise care to make

sure the probe does not short-circuit to an adjacent component.

In general, troubleshooting is carried out by tracing the signal with an oscilloscope and referring to the schematic diagrams to determine what component might be causing an observed abnormal indication. If the original symptom was a complete failure of the unit to operate, the most logical components to suspect are those associated with the constant current supply in the unit (including any voltage regulators). If the unit is producing an incorrect (but not zero) output, check the outputs from the input circuit and trace the resulting signal through the unit.

5.3.1 Plug-In Board Connector Cleaning

Occasionally, modules which have been in service for a long period of time may develop resistive coatings on the gold-plated contacts of the plug-in boards. This coating, if allowed to build up, may cause malfunctions by decreasing the noise margin of a circuit.

There are two types of foreign material coatings which can develop on the gold-plated contacts of a plug-in module. The first type is INORGANIC. This type of contamination results when copper "bleeds" through the gold plating and oxidizes. The second form of contamination involves ORGANIC substances, which usually are a result of careless handling, and are mainly made up of fingerprints, salts, and oils deposited when the plug-in boards are handled by the gold-plated contacts. Contamination by organic substances can be greatly reduced by careful handling of the modules.

Although plug connectors are usually of the self-cleaning type, it may become necessary to clean the module fingers to ensure reliable connection. When module contacts are in need of cleaning, the following procedures are recommended:

Removal of Inorganic Contaminants

a. Immerse contacts of plug-in board in an ultrasonic bath of deionized water and a detergent, such as Liquinyx, for at least 30 seconds.

b. Repeat step (a) with pure deionized water only.

CAUTION

REMOVE WATER IMMEDIATELY FROM CONTACTS. IF THIS IS NOT DONE QUICKLY, DAMAGE TO CONTACTS MAY RESULT.

c. Remove water by immersing contacts in an ethane or methanol bath to same depth used during the ultrasonic cleaning of step (a). Never wipe or use an abrasive cleaner on the contacts. If wiping is necessary, use K-Dry towels or equivalent.

Removal of Organic Contaminants

a. After inorganic contaminants and water have been removed, organic materials may be removed by immersion of contacts in trichloroethane for at least 30 seconds.

CAUTION

NEVER USE AN ERASER ON THE CONTACTS. THE USE OF ABRASIVE CLEANERS OR ERASERS ON PLUG-IN BOARD CONTACTS IS CONSIDERED A PHYSICAL ABUSE TO THE PLUG-IN UNIT AND MAY VOID THE UNIT WARRANTY.

b. Let contacts air dry or wipe with a very fine, nonabrasive material such as K-Dry towels or equivalent.

5.3.2 Component Replacement General Information

Replace all defective components with identical parts. Refer to Section 6 for a list of recommended replacement parts. The last row of numbers in the parts list is the number of spares recommended to be kept on hand for that part, per unit, for up to ten units of the same type. For more than ten units, a spares complement of 10% on the indicated parts should be used.

5.3.3 Component Replacement Techniques

Most parts used in the unit are quite small and are located in a confined area. Therefore, small hand tools are a necessity when servicing the unit. The following is a summary of the general techniques and precautions that should be observed to prevent damage to components in the unit:

a. Use a transformer-operated low-voltage soldering iron with a grounded tip and rated at not more than 50 watts. A temperature-controlled tip is desirable.

b. Use extreme care when unsoldering the

leads to any component. Do not keep the soldering iron on a point for more than a few seconds at a time. Use a sunction-type solder-removing tool (solder sucker) as an aid in unsoldering transistors and integrated circuits. The protective coating on the unit may be removed with trichlorethane or equivalent. Be sure adequate ventilation is provided when using this or any other chemical.

NOTE

Unused connections on integrated circuits are left unsoldered to aid in removal. Refer to the assembly drawing for more complete information.

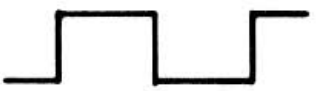
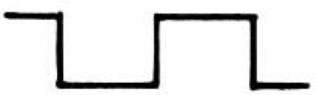
c. Do not excessively bend or twist the leads of small components; they break easily.

d. Before removing a component, observe the lead dress. Be sure that the lead dress of the replacement is the same as that of the original.

e. Remove all flux from soldered joints with trichlorethane or equivalent.

f. Test the unit for proper operation and, if necessary, recalibrate by the procedure given in Section 2.

TABLE 5-1.

TEST POINT	WAVE FORM AND VOLTAGE LEVEL
1	COMMON
2	0.7V 0.3V  SAME FREQUENCY AS INPUT SIGNAL
3	6.5V DC
4	6V :30 ms. 0V  SAME FREQUENCY AS INPUT SIGNAL
5	6V :30 ms. 0V  SAME FREQUENCY AS INPUT SIGNAL

SECTION 6
UNIT DOCUMENTATION

6.1 GENERAL

This section consists of a computer print-out table that provides parts identification information for the unit. Wiring lists have been provided in this section as an aid to the maintenance personnel.

Parts information is grouped according to the number of assemblies. If the unit contains two PC boards, the table will be divided into two major sections: one section will contain information related to PC1 and the other section will list PC2 components information. Each major section in the table contains a complete parts list headed LIST OF MATERIALS specifying which PC board it is describing. This list is usually found at the end of the section. The list of materials consists of the following headings:

ITEM: A reference numeral used for data processing and not used by maintenance personnel.

NAME: Gives the nomenclature of the part.

DESCRIPTION: Identifies the component by manufacturer's part number, usually followed by component's parameters or value.

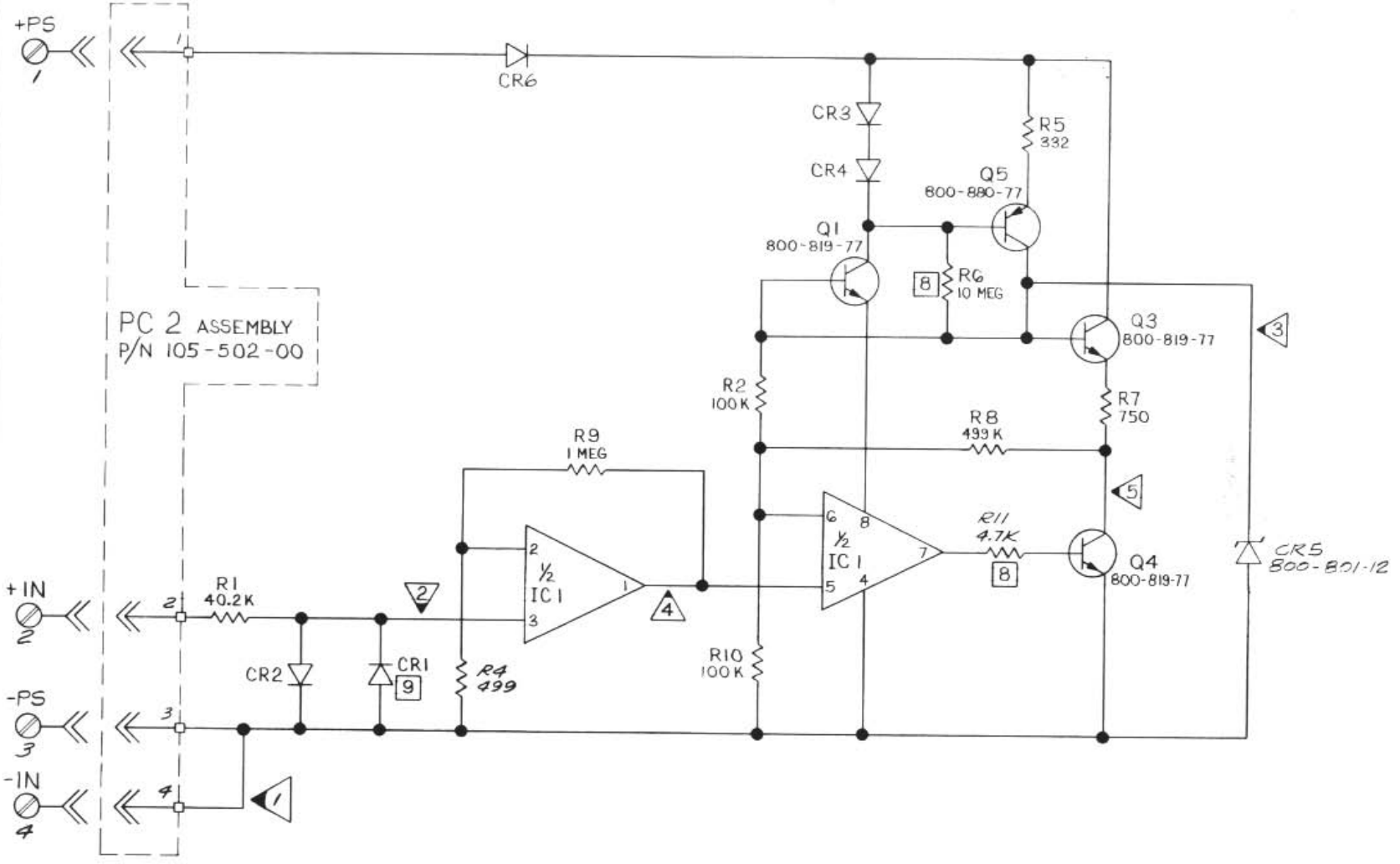
REF: Lists the reference designation for the components described in Section 4 and illustrated in the schematics and assembly drawings.

PART NUMBER: This column specifies the Moore Industries assigned part number. This is the part identification required when ordering parts from Moore Industries.

SPARE: The numeral in this column specifies the recommended number of component spares per unit type that should be kept on hand by maintenance personnel.

6.2 GLOSSARY OF ABBREVIATIONS

C	Capacitor
CR	Diode — Zener included
HW	Special hardware
J	Connecting buss wire
L	Inductor
LB	Label
PC	Printed circuit board
R	Resistor
T	Transformer
IC	Integrated circuit
Q	Transistor
LED	Light emitting diode
TB	Terminal block
VS	Voltage regulating varistor
VR	Voltage Regulator



9. CR1 IS P/N 800-2835-10.
8. CARBON COMP. RESISTOR, ¼ W, ±10% TOL.
7. IC1 IS M.I.I. P/N 800-817-31.
6. PC 2/TERMINAL BLOCK, CONTACT FINGER & RECEPTACLE. 6 POSITION CONNECTOR.
5. □ INDICATES PC1/PC2 INTERCONNECT PIN.
4. △ INDICATES TEST POINT; FILLED END IS POINTER. SEE SECTION 5 OF MANUAL, "MAINTENANCE".
3. ⊘ INDICATES TERMINAL BLOCK POSITION.
2. RESISTORS ARE METAL FILM, ±1% TOL., DIODES ARE IN4148.
1. RESISTANCE IS IN OHMS.

NOTES: UNLESS OTHERWISE SPECIFIED

MOORE INDUSTRIES
16650 Schoenborn Street
Sepulveda, California 91343

DO NOT SCALE DRAWING

TOLERANCES UNLESS NOTED: X ±.1, .XX ±.03, .XXX ±.010, ANGLES ±30'

DRAWN T. HART 2-21-77
CHECKED
ENGINEER
SCALE

STANDARD 2-WIRE FX (PC1 & PC2)

CATEGORY SCHEMATIC

DRAWING NUMBER 105-401-00

REVISED BY ECO 3821 | DATE 7/5/79 | BY JLV | APPROVAL | REVISION D

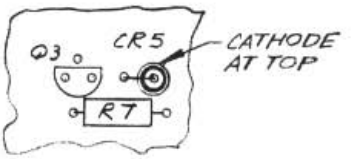
MOORE INDUSTRIES
16650 Schoenborn Street
Sepulveda, California 91343

DO NOT SCALE DRAWING

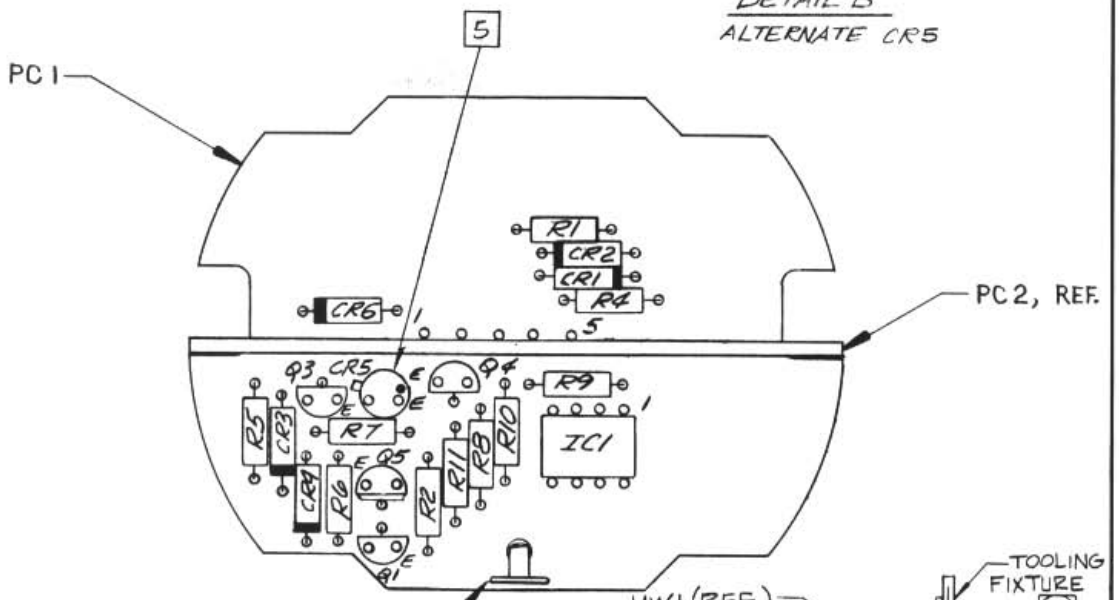
TOLERANCES UNLESS NOTED		DRAWN	T. HART	2-16-77
X	±.1	CHECKED		5/27/77
XX	±.03	ENGINEER		5/27/77
XXX	±.010	SCALE	2/1	
ANGLES	±30'			

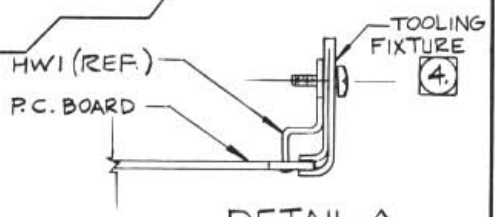
STANDARD 2-WIRE FFX (PCI)

DRAWING NUMBER 105-501-00 REVISION E
CATEGORY P.C. ASSEMBLY
REVISED BY ECO 6201 DATE 2/3/77 BY JMD APPROVAL

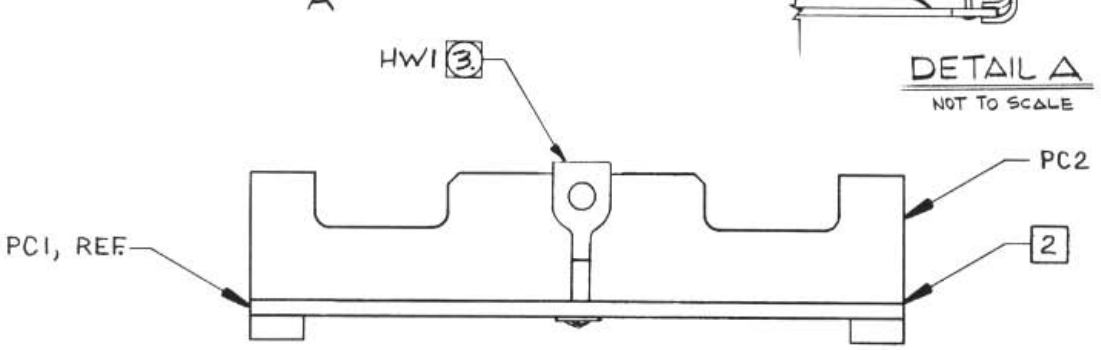


DETAIL B
ALTERNATE CR5





DETAIL A
NOT TO SCALE



5 NOTE POLARITY DOT, OR SEE DETAIL B.

4. USE TOOLING FIXTURE #200-213-10 TO HOLD HW1 IN PLACE WHEN SOLDERING AS SHOWN DETAIL 'A'.

3. BEND HW1 WITH TOOLING FIXTURE #200-213-11 BEFORE ASSEMBLING TO BOARD.

2. PC2 MUST SIT FLAT ON & PERPENDICULAR TO PC1.

1. ALL LEADS MUST BE SOLDERED TO PADS.

NOTES: UNLESS OTHERWISE SPECIFIED

105-501-00
P.C. ASS'Y, STD. 2-W FFX(PCI)

EAST FREE CORP HANGER EM115

MOORE INDUSTRIES
16650 Schoenborn Street
Sepulveda, California 91343

DO NOT SCALE DRAWING

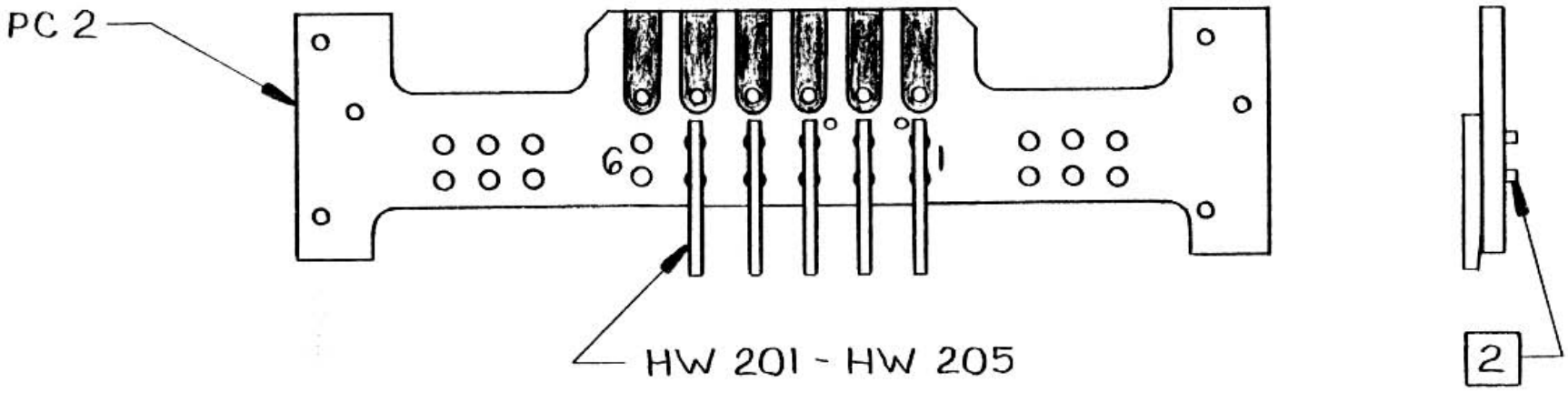
TOLERANCES UNLESS NOTED		DRAWN	T. HART	2-19-77
.X	±.1	CHECKED		
.XX	±.03	ENGINEER		2/1/77
.XXX	±.010	SCALE	2/1	
ANGLES	±30'			

STANDARD 2-WIRE FFX (PC2)

DRAWING NUMBER	REVISION
105-502-00	A

CATEGORY: P.C. ASSEMBLY

REVISED BY	DATE	BY	APPROVAL
INITIAL RELEASE	2/19/77	T.H.	



2 TRIM EXCESS.

1. HW 201 - HW 205 MUST BE SOLDERED TO PADS.

NOTES: UNLESS OTHERWISE SPECIFIED

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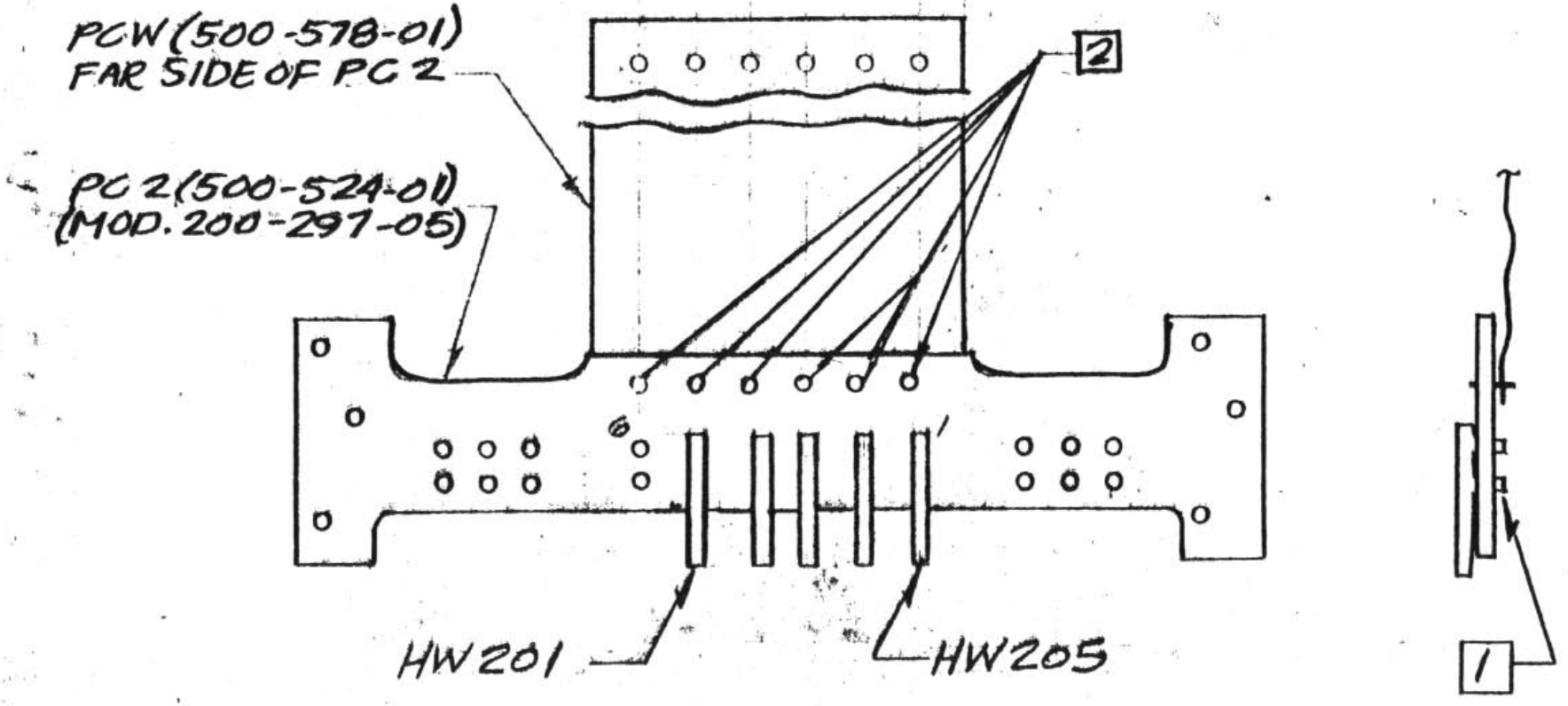
DO NOT SCALE DRAWING

TOLERANCES UNLESS NOTED
X ±.1
.XX ±.03
.XXX ±.010
ANGLES ±30'

DRAWN 8/22/78
CHECKED
ENGINEER 8/22/78
SCALE 2/1

STD. 2-WIRE FFX PC2, R.F. OPTION

DRAWING NUMBER 105-503-00 E
CATEGORY P.C. ASSEMBLY
REVISED BY ECO 3636 DATE 6/8/79 BY JAD APPD



2 INSTALL 22 AWG BUSS WIRE THRU PC2 & PCW, SOLDER THIS SIDE OF PC2 & FAR SIDE OF PCW.

1 TRIM EXCESS FROM HW201 THRU HW205.

NOTES: UNLESS OTHERWISE SPECIFIED

105-404-00
FFX DIN SCHEM

MOORE INDUSTRIES
16650 Schoenborn Street
Sepulveda, California 91343

DO NOT SCALE DRAWING

TOLERANCES UNLESS NOTED: .X ±.1, .XX ±.03, .XXX ±.010, ANGLES ±30'

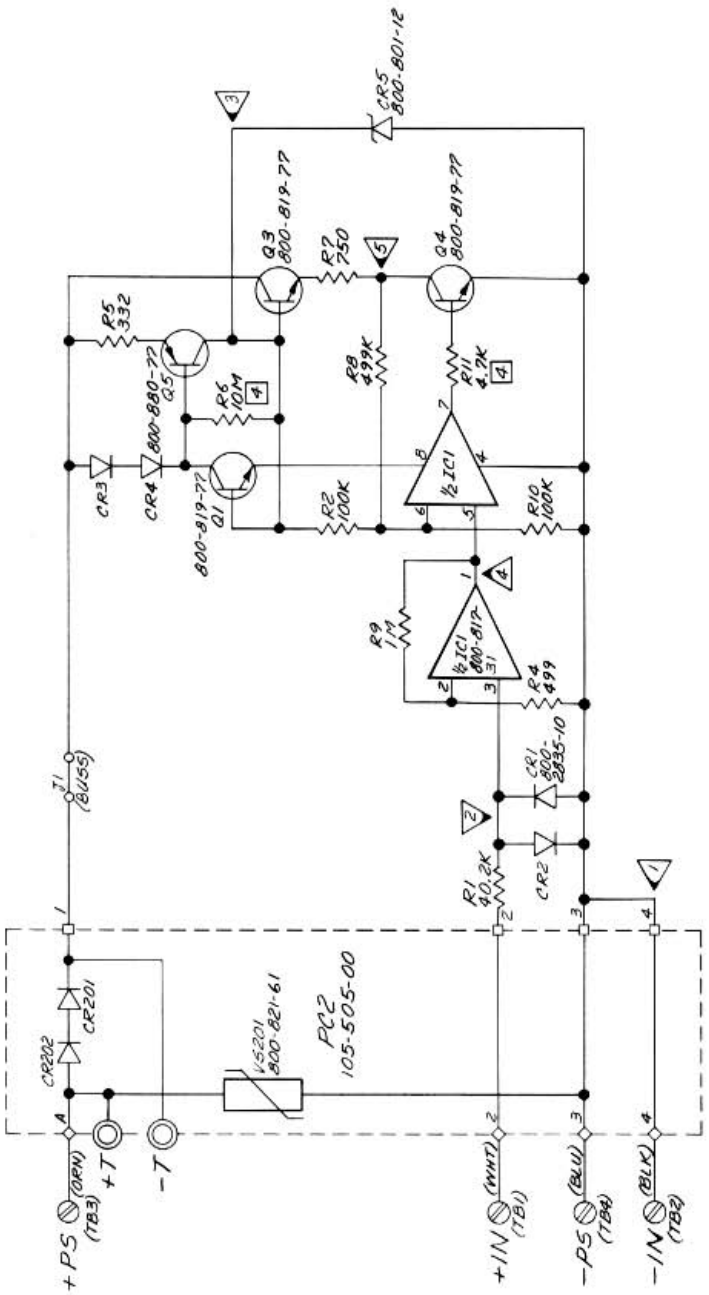
DRAWN R. Kelley 9/27/83 | CHECKED | ENGINEER | SCALE

FFX DIN
PC1 & PC2

DRAWING NUMBER 105-404-00 | REVISION A

CATEGORY SCHEMATIC

REVISED BY	DATE	BY	APPROVAL
INITIAL RELEASE	2/16/84	JAD	

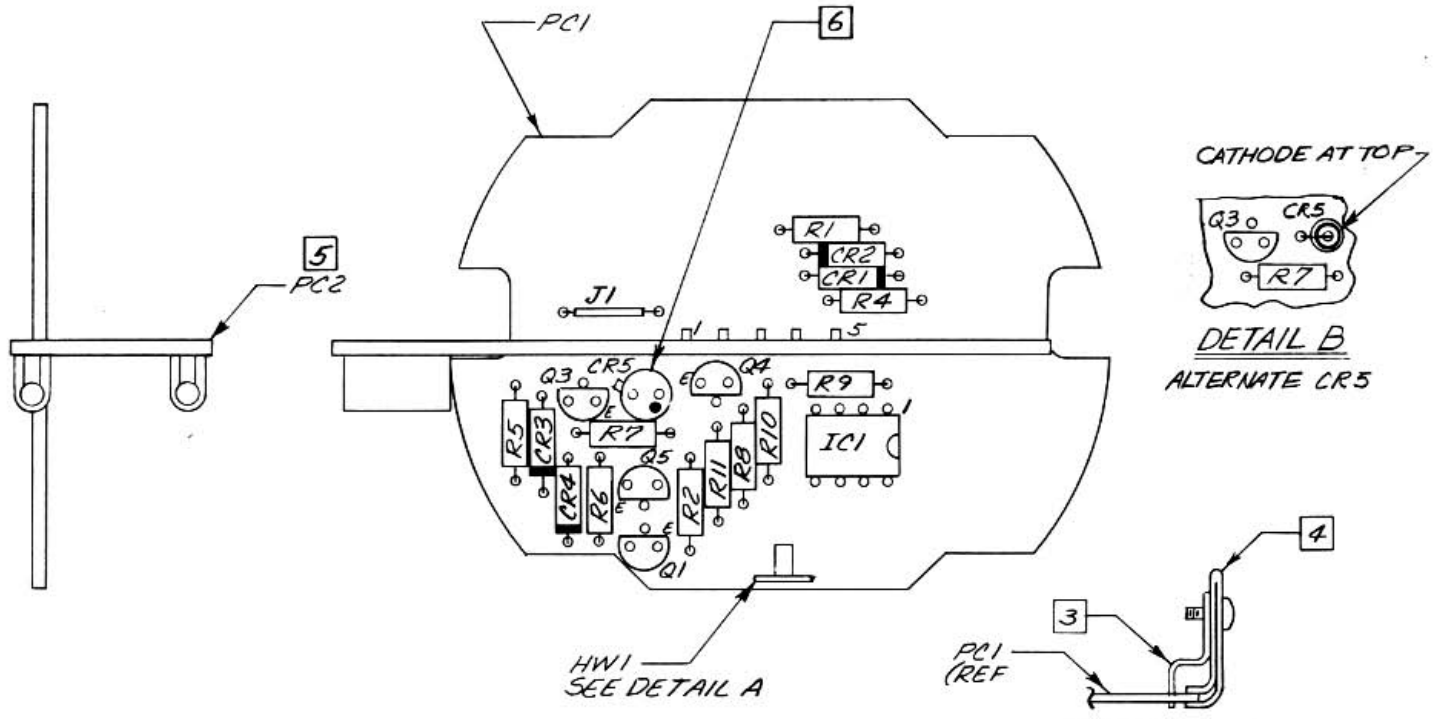


NOTES: UNLESS OTHERWISE SPECIFIED.

1. RESISTANCE IN OHMS.
2. ALL RESISTORS ARE (RN55C) METAL FILM, ±1%, 1/10 W.
3. ALL DIODES ARE 800-4148-11 (1N4148).
4. SCREW TERMINAL CONNECTION.
5. CARBON COMP. RESISTOR (RC07F), ±10%, 1/4 W.
6. ▶ TEST POINT; FILLED END IS POINTER. REFER TO SECTION 5 OF MANUAL, "MAINTENANCE".
7. ◇ WIRING PAD ON PC2.
8. □ PC1/PC2 INTERCONNECT PIN.
9. ◎ TEST JACK ON FRONT PANEL FOR .080 PHONE TIP PROBE.

EASI FILE CORP IRVINE CA HANGER EFH24

105-504-00	
FFX DIN PC1	



6 NOTE POLARITY DOT OR SEE DETAIL B

5 PC2 MUST SIT FLAT ON & PERPENDICULAR TO PC1.

4 USE FIXTURE 200-213-10 TO HOLD HW1 IN PLACE WHEN SOLDERING.

3 USE FIXTURE 200-213-11 FOR BENDING HW1.

2. JUMPER IS 22AWG, TEFLON SLEEVED.

1. ALL LEADS TO BE SOLDERED TO PADS.

NOTES:

MOORE INDUSTRIES
16650 Schoenborn Street
Sepulveda, California 91343

DO NOT SCALE DRAWING

TOLERANCES UNLESS NOTED
X ±1
XX ±.03
XXX ±.010
ANGLES ±30'

DRAWN K. Kelley 3/83
CHECKED
ENGINEER
SCALE 2-1

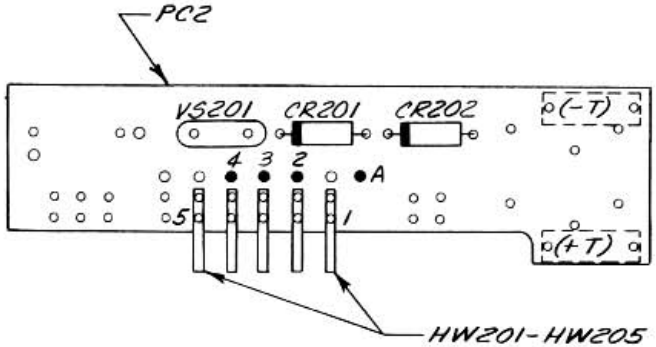
FFX DIN
PC1

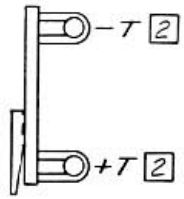
DRAWING NUMBER 105-504-00
CATEGORY ASSEMBLY
REVISED BY GCC 6201 3/11 BY JAD
APPROVED
REVISION B

CLEARPRINT 1020-10

EASI FILE CORP IRVINE CA MANGER EFH24

105-505-00	
FFX DIN PC2	





2. +T & -T MUST MOUNT FLAT ON BOARD.
1. ALL LEADS TO BE SOLDERED TO PADS.

NOTES:

MOORE INDUSTRIES
16650 Schoenborn Street
Sepulveda, California 91343

DO NOT SCALE DRAWING

TOLERANCES (UNLESS NOTED)
X ±1
XX ± 03
XXX ± 010
ANGLES ±30

DRAWN K. Kelley 9/83
CHECKED
ENGINEER
SCALE 2-1

FFX DIN PC2

DRAWING NUMBER 105-505-00
CONTENT ASSEMBLY
REVISED BY INITIAL REL.
DATE
BY
APPROVED
REVISION A

RETURN PROCEDURES

To return equipment to Moore Industries for repair, follow these four steps:

1. Call Moore Industries and request a Returned Material Authorization (RMA) number.

   Warranty Repair –
   If you are unsure if your unit is still under warranty, we can use the unit's serial number to verify the warranty status for you over the phone. Be sure to include the RMA number on all documentation.

   Non-Warranty Repair –
   If your unit is out of warranty, be prepared to give us a Purchase Order number when you call. In most cases, we will be able to quote you the repair costs at that time. The repair price you are quoted will be a "Not To Exceed" price, which means that the actual repair costs may be less than the quote. Be sure to include the RMA number on all documentation.

2. Provide us with the following documentation:
   a) A note listing the symptoms that indicate the unit needs repair
   b) Complete shipping information for return of the equipment after repair
   c) The name and phone number of the person to contact if questions arise at the factory

3. Use sufficient packing material and carefully pack the equipment in a sturdy shipping container.

4. Ship the equipment to the Moore Industries location nearest you.

The returned equipment will be inspected and tested at the factory. A Moore Industries representative will contact the person designated on your documentation if more information is needed. The repaired equipment, or its replacement, will be returned to you in accordance with the shipping instructions furnished in your documentation.

MOORE INDUSTRIES

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