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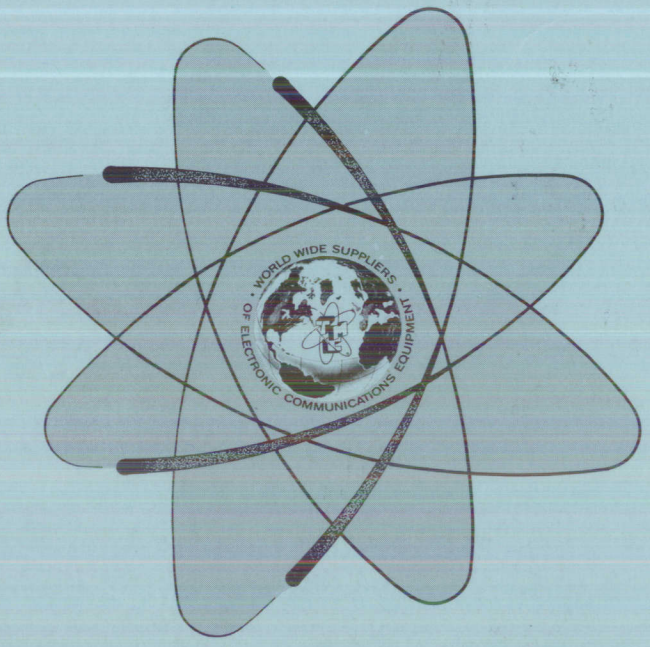
TECHNICAL MANUAL

for

DUAL DIVERSITY RECEIVING SYSTEM

MODEL SYM3202



THE TECHNICAL MATERIEL CORPORATION

MAMARONECK, N.Y. OTTAWA, ONTARIO

Printed in U.S.A.

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for

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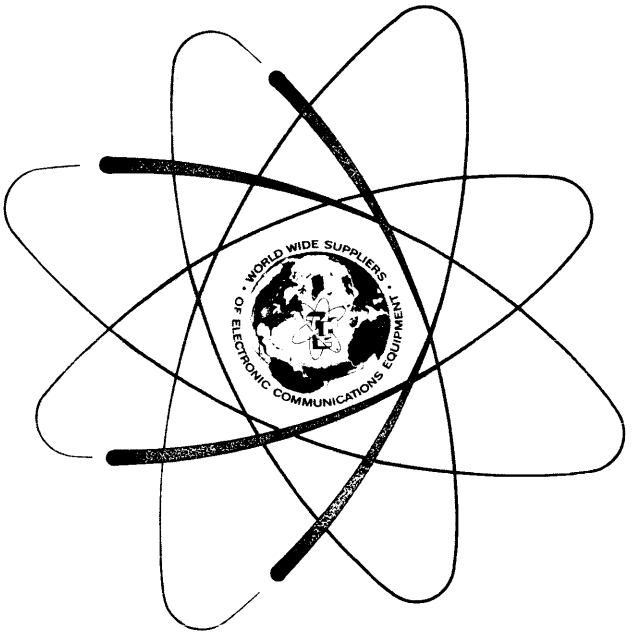

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MAMARONECK, N.Y. OTTAWA, ONTARIO

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TM 3202 ISSUE DATE: February 1974

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.

RECORD OF CORRECTIONS MADE

Change No.	Date of Change	Date Entered	Entered By

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

LIST OF TABLES

SECTION 1

GENERAL INFORMATION

1-1. FUNCTIONAL DESCRIPTION

The Dual Diversity RTTY Receiving System, TMC Model SYM3202, is designed for space diversity reception of hf teletype signals in the 2 to 30 MHz frequency range. The frequency shifted audio outputs of the two (2) hf receivers in the system are combined and demodulated into dc pulses suitable for operating TTY printers. The system also includes an af/dc patch panel that provides the operator greater system flexibility by enabling the selection of outputs of the various system components.

1-2. PHYSICAL DESCRIPTION

The SYM3202 receiving system (shown in figure 2-2) is comprised of modular units mounted in an equipment cabinet. The modular units are described briefly in the paragraphs which follow; for more detailed information pertaining to these units, refer to the technical manuals for the individual modular units.

a. FREQUENCY SHIFT CONVERTER, 174 MODEL 3. The 174 converter accepts the frequency shifted audio output signal from two radio receivers. The audio tones of each channel are separately limited, demodulated and then combined to provide dc pulses suitable for operating TTY printers.

b. HF RECEIVER, 3020A. The 3020A receiver is a general purpose/general coverage synthesized receiver operating in the 15 kHz to 30 MHz frequency range. In the SYM3202 system the (two) 3020A receivers are primarily used in the RTTY mode of operation.

c. AF/DC JACKFIELD. The af/dc jackfield is a system patch panel which provides audio tone and dc loop outputs of the component units within the SYM-3202 system. The jackfield provides maximum flexibility for patching to the SYM3202 Receiving System.

d. POWER CONTROL PANEL, DCP-2. The DCP-2 receives the primary power input and provides control of the ac power to the SYM3202 system by means of a front panel circuit breaker. The DCP-2 control panel also includes a main power indicator lamp and fused ac utility outlets.

SECTION 2

INSTALLATION

2-1. INITIAL UNPACKING AND INSPECTION

The SYM3202 receiving system was assembled and tested at the factory before shipment. Inspect all packages for possible damage during transit. With respect to damage to the equipment for which the carrier is liable, The Technical Materiel Corporation will assist in describing methods of repair and in furnishing of replacement parts. Carefully unpack each crate as indicated by the packing list provided with the receiving system shipment. Inspect all packing materials for parts that may have been shipped as loose items (mounting hardware, connectors, etc.).

2-2. POWER REQUIREMENTS

The units of the SYM3202 receiving system leave the factory wired for 220 vac, 50 Hz operation; change may be made to 115 vac, 60 Hz operation by making minor wiring changes. Refer to the installation sections of the technical manuals for each modular unit receiving line voltage.

CAUTION

If 115 vac, 60 Hz operation is used, all line fuses must be increased to twice their rated current values to provide proper circuit protection.

2-3. INSTALLATION

a. GENERAL. A minimum number of assemblies, subassemblies, components and hardware have been disassembled from the equipment and separately packaged thus reducing the possibility of equipment damage during transit. This method of disassembly and separate packaging also permits realistic equipment handling. Cables, wires, and other miscellaneous items that were disconnected during equipment disassembly for shipment are tagged and taped to the equipment. The information on a given tag indicates the designated terminal on a component to which the tagged item will be connected during installation.

b. MECHANICAL INSTALLATION. The SYM3202 receiving system should be mechanically installed by locating the equipment cabinet in an appropriate site and by installing the components that were removed during disassembly for shipment.

(1) Cabinet Location. The equipment cabinet may be located in any enclosure (room, deck or van) with sufficient clearances and with adequate ventilation. The cabinet dimensions and mounting details are shown in figure 2-1.

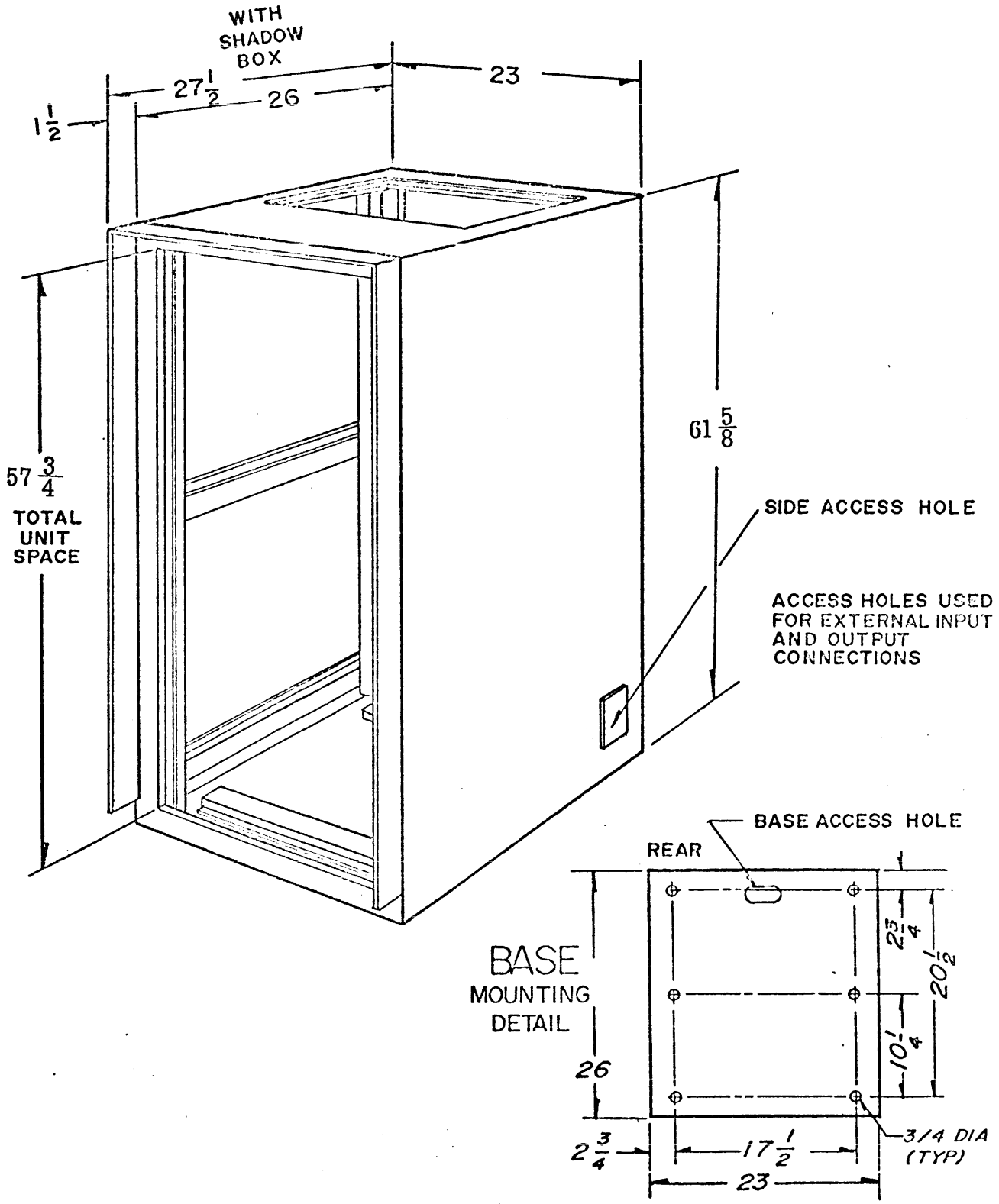


Figure 2-1. SYM3202 Cabinet Dimensions

A clearance of approximately two feet should be left on the sides, rear and top of the equipment cabinet for ease of access and for adequate heat dissipation. In addition to the cabinet depth dimension (shown in figure 2-1) is the extension of the console table (shown in figure 2-2); the console table extends approximately 13-1/2 inches out from the edge of the cabinet.

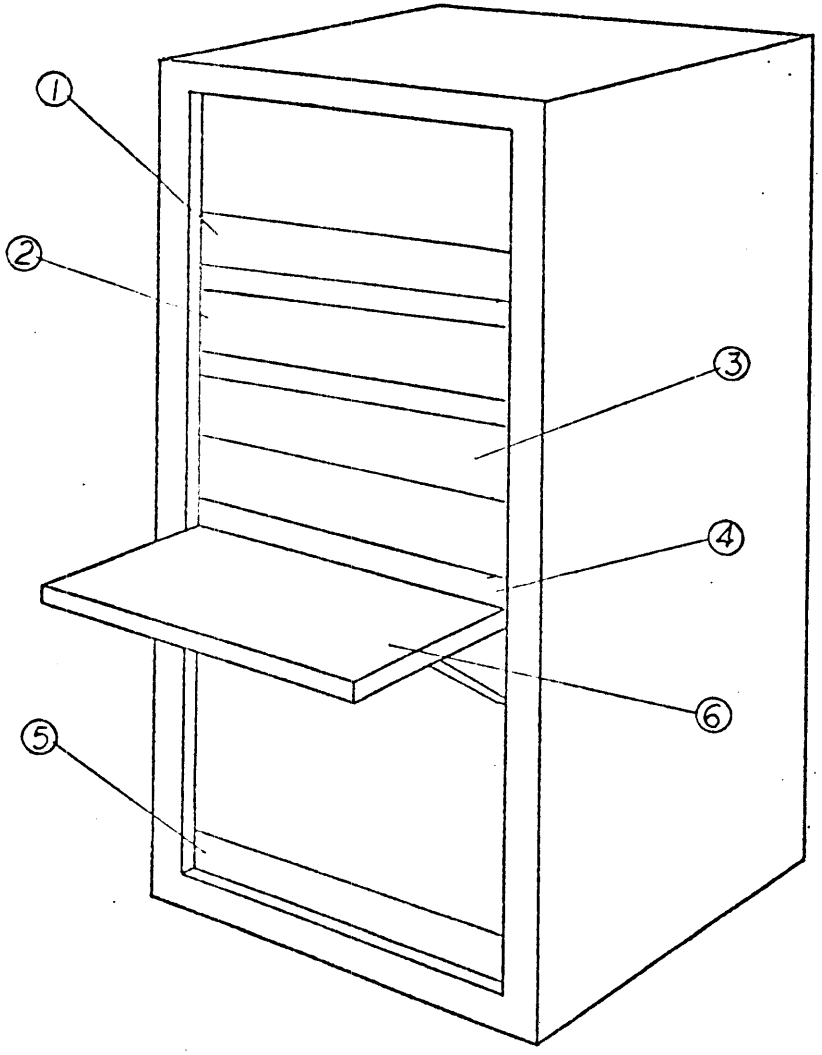
(2) Component Installation. The component location for the SYM-3202 receiving system is shown in figure 2-2. The components that were removed from the SYM3202 during disassembly for shipment are listed in table 2-1; the loose items, supplied with the system and required for its installation and operation, are listed in table 2-2.

Table 2-1. SYM3202 Components Packaged Separately

Quantity	Model Number	Description
1	174/3	Converter
2	3020A	HF Receivers
1		Console Table

Table 2-2. SYM3202 Loose Items Supplied

Quantity	Part Number	Description	Function
2	UG88/U	Connector	Antenna input connections
1	TM105-12AR	Terminal Strip	Audio line connections
1	PL190-NG	Electrical Plug	Primary power input connection
4	CA566-2	Patch Cable	AF/DC jackfield connections
4	------	Wood Screw	Console table mounting
4	SCBP1032BN10	Screw	Console table mounting
4	FW10HBN	Flat Washer	Console table mounting
4	WA101-5	Fiber Washer	Console table mounting
2	------	Brackets	Console table mounting



Key to Figure 2-2

1. Frequency Shift Diversity Converter Type 174 Model 3
2. Receiver Type 3020A
3. Receiver Type 3020A
4. AF/DC Jackfield
5. Power Control Panel. Model DCP-2
6. Console Table

Figure 2-2. SYM3202 Component Location

The 174 converter and 3020A receiver units should be installed in their proper positions within the equipment cabinet (reference figure 2-2) and secured in place, using the appropriate mounting hardware. The internal cabinet wiring connections should then be made to these units (reference figure 2-3 and wire designation tags).

The console table should be installed in its proper position (reference figure 2-2) in accordance with the following procedure:

(a) Using the appropriate hardware, mount the brackets so that the top edge of the brackets is flush with the top edge of the blank panel (located just below the console table position).

(b) Lift the console table (formica side up), and slide it into the open position between the two blank panels.

(c) Force the table back against the frame of the cabinet, and allow it to rest on the top of the brackets.

(d) Using the four wood screws supplied, secure the brackets to the underside of the console table.

c. ELECTRICAL INSTALLATION.

WARNING

BEFORE MAKING EXTERNAL CONNECTIONS TO THE SYM3202 RECEIVING SYSTEM, INSURE THAT THE EXTERNAL PRIMARY POWER SOURCE IF OFF AND TAGGED.

(1) Electrical Interconnection. Refer to the interconnect wiring diagram (figure 2-3), and connect all plugs and wires, that are not already connected, to their respective jacks and terminals. All interconnecting cables and wires are tagged, indicating their designated terminals.

(2) Interface Panel Connections. External connections are made at the interface panel, located in the lower-rear portion of the equipment cabinet. There is one terminal board, TB1, located on the interface panel. This terminal board is used in external loop connections. The TM105-12AK terminal strip (supplied as a loose item) should be utilized when making these connections. Table 2-3 lists the interface panel connections.

Table 2-3. Interface Panel Connections

Terminals	Function	Connection
TB1-1,2,3	Set 2 converter output to TTY receive equipment.	Connect TTY lines to pins 1, 2, and 3 on TB2. Use shielded pair; pin 3 is the shield connection.
TB1-4,5,6	Set 1 converter output to TTY receive equipment.	Connect TTY lines to pins 4, 5, and 6 on TB2. Use shielded pair; pin 6 is the shield connection.

NOTE

If TTY receive equipments are not connected to TB1 terminals, jumpers must be connected to complete loops (pins 1 and 2, 4 and 5).

(3) Antenna Input Connections. The antenna input connections to the SYM3202 receiving system are made directly to the 3020A receivers. Using the UG88/U connectors (supplied as loose items), connect the antenna cables (50-ohm transmission lines) to J26 on the rear of each 3020A receiver.

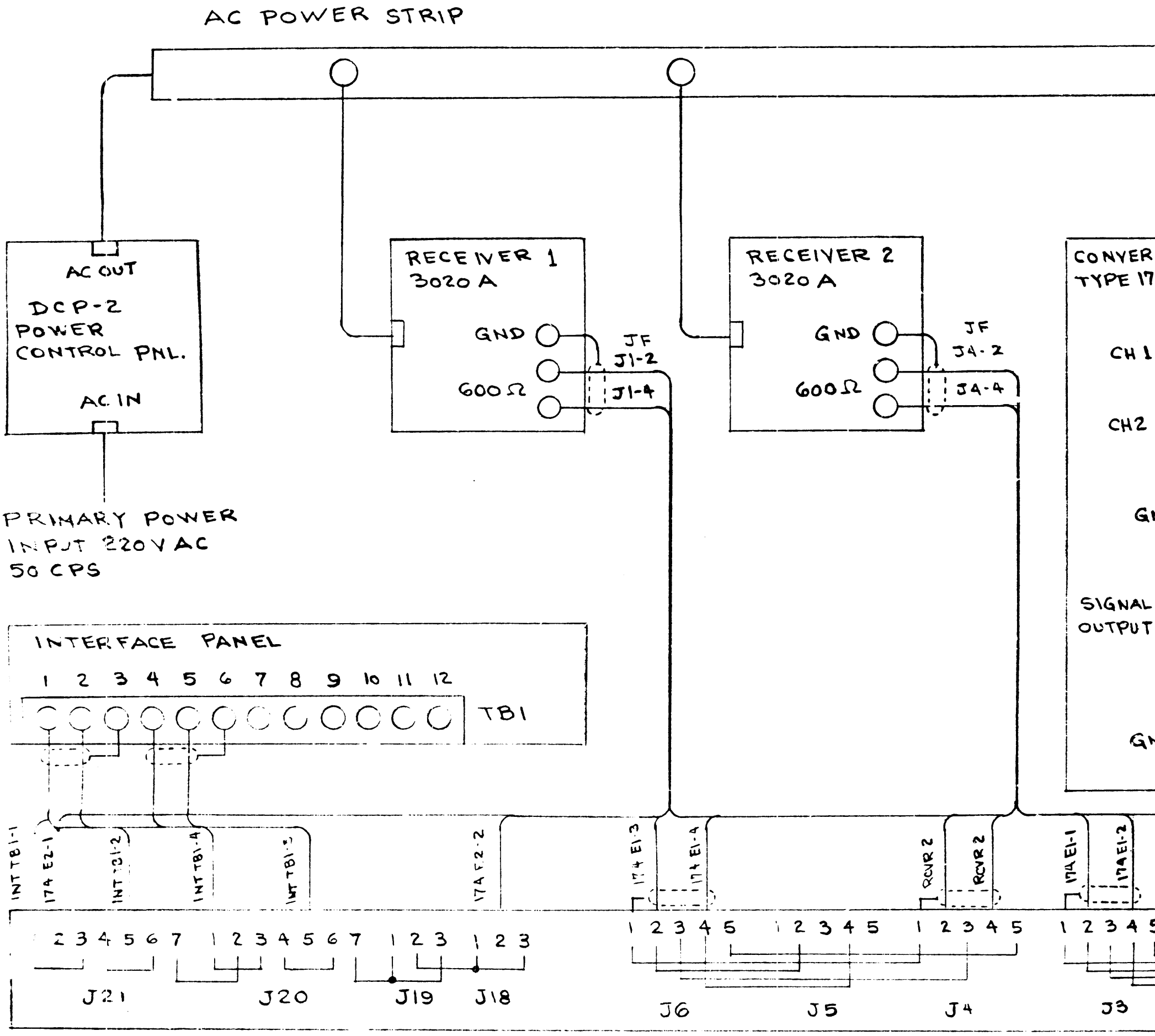
(4) Primary Power Connection. The SYM3202 receiving system leaves the factory wired for 220 vac, 50 Hz operation, unless otherwise specified by the customer. Primary power connection is made to the power jack located in the bottom-rear of the equipment cabinet. Using the PL190-NG electrical plug (supplied as a loose item), connect the primary power input lines to the power jack.

3Φm 202

Interface Panel Must have jumpers
from Pin [illegible] + [illegible]

L. Klein

Requires change notice



NOTE: INTERFACE PANEL MUST HAVE JUMPERS FROM PINS 1 TO 2 AND 3 TO 4 WHEN EXTERNAL EQUIPMENT IS NOT USED.

QTY / UNIT	MODEL USED ON	ASS'Y NO.
APPLICATION		
	CODE	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE CHEMICALLY APPLIED OR PLATED FINISHES

TOLERANCES ON

DECIMALS	FRACTIONS
.X ± .05	± 1/64
.XX ± .01	ANGLES
.XXX ± .005	± 0° 30′

MATERIAL

FINISH

QTY. REQ.

FINAL AP

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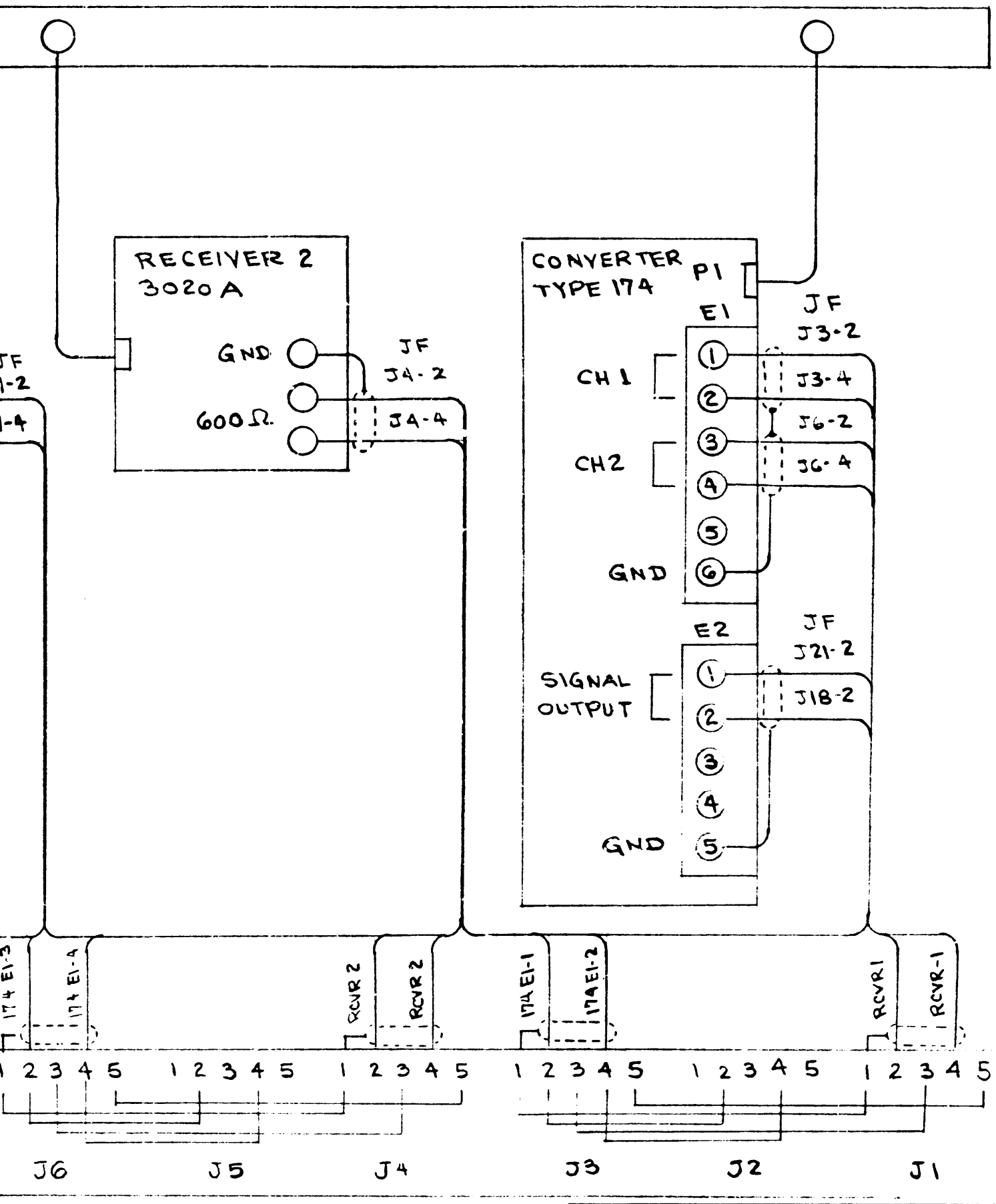
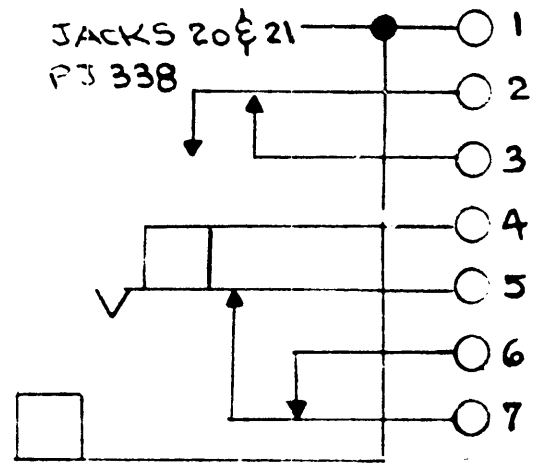
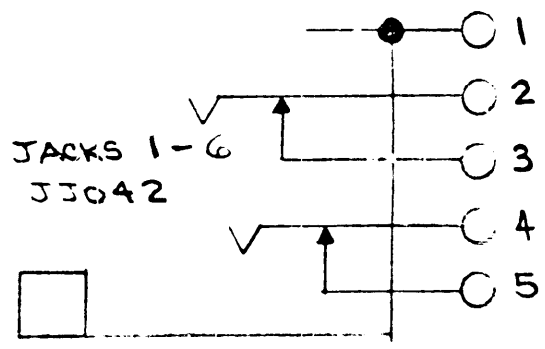
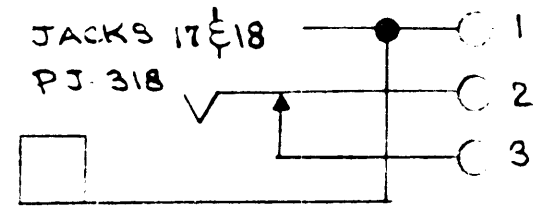








QTY. REQ.	ITEM	PART NO.	DESCRIPTION	SYMBOL

LIST OF MATERIAL

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE CHEMICALLY APPLIED OR PLATED FINISHES

TOLERANCES ON

DECIMALS	FRACTIONS
.X ± .05	± 1/64
.XX ± .01	ANGLES
.XXX ± .005	± 0° 30′

MATERIAL

FINISH

	DATE
FINAL APPROVAL	
MECH. DES.	
ELECT. DES.	
CHECKED	
DRAWN	

THE TECHNICAL MATERIEL CORP.
MAMARONECK, NEW YORK

SYM 3202

INTERCONNECT WIRING DIAGRAM

SIZE	CODE IDENT.NO.	DWG NO.	ISSUE
C	82679	FIGURE 2-3	

SCALE

N | ASS'Y NO.

ON

SECTION 3

OPERATOR'S SECTION

3-1. GENERAL

This system contains general operating instructions for the SYM3202 receiving system. Detailed operating instructions for the units that comprise the system are contained in the individual technical manual for the modular units.

3-2. CONTROLS AND INDICATORS

With the exception of the af/dc jackfield, the location and function of all controls and indicators of the SYM3202 are contained in the operator's sections of the individual technical manuals for the modular units comprising the system. The operator should familiarize himself with all operating controls and indicators on the SYM3202 receiving system by referring to the individual manuals and the paragraph which follows.

a. AF/DC JACKFIELD. A front panel view of the af/dc jackfield is shown in figure 3-1; the jack numbers correspond to the reference designations for af/dc jacks shown on the interconnect wiring diagram, figure 2-3. Table 3-1 lists the system inputs and outputs which are available at each jack and describes the normal-thru circuits of the patch panel. The normal-thru circuits are broken by insertion of the patch cord plugs; the input/output appearing at a particular jack may thus be directed elsewhere in the system.

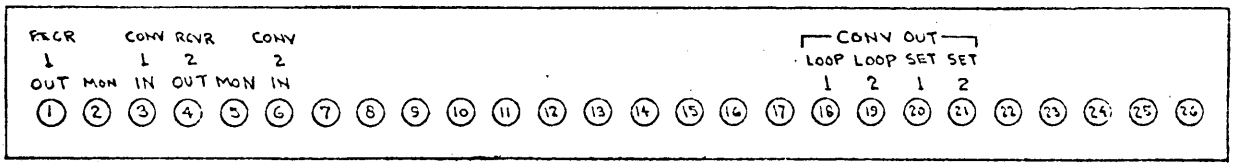


Figure 3-1. AF/DC Jackfield

Table 3-1. Functions of AF/DC Jackfield

Jack Designation	Input/Output	Normal-thru
1	Audio output line from 3020A receiver #1.	To channel 1 input on 174 converter.
2	Audio output line from receiver #1 for monitoring.	----------
3	Tone input line to 174 converter, channel 1.	----------

TABLE 3-1. Functions of AF/DC Jackfield (cont)

Jack Designation	Input/Output	Normal-thru
4	Audio output line from 3020A receiver #2.	To channel 2 input on 174 converter.
5	Audio output line from receiver #2 for monitoring.	----------
6	Tone input line to 174 converter, channel 2.	----------
7	----------	
8	----------	
9	----------	
10	----------	
11	----------	
12	----------	
13	----------	
14	----------	
15	----------	
16	----------	
17	----------	
18	DC loop output line from converter.	To loop 2 converter output jack.
19	DC loop line from loop 1 converter output jack.	To set 1 converter output jack.
20	DC loop line from loop 2 converter input jack and DC common input from interface panel TB1-4.	To interface panel TB1-1 and to set 2 output jack.
21	DC loop line from set 1 output jack and dc loop common input from interface panel, TB1-2.	To interface panel TB1-2 dc loop and converter.

Table 3-1. Functions of AF/DC Jackfield (cont)

Jack Designation	Input/Output	Normal-thru
22	----------	
23	----------	
24	----------	
25	----------	
26	----------	

3-3. OPERATING PROCEDURES

Detailed operating procedures for the individual units comprising the SYM3202 receiving system are contained in the modualr technical manuals. In normal operation of the system, primary power should be applied to the SYM3202 by operation of the DCP-2 power control unit. The 3020A receivers should be tuned to the desired frequency and operated in a sideband mode for receipt of FSK signals. Tone intelligence will be applied to the 174 frequency shift converter which, when operated properly, will provide dc pulse output for operation of the associated TTY receive equipment.

SECTION 4

PRINCIPLES OF OPERATION

4-1. INTRODUCTION

The SYM3202 receiving system is comprised of two hf receivers and a dual diversity frequency shift converter. The system combines the tone intelligence output of the receivers and converts them into a single channel output of dc pulses to drive TTY printing equipment.

4-2. BLOCK DIAGRAM ANALYSIS (Refer to figure 4-1)

A 50-ohm impedance antenna input is applied to each of the 3020A receivers, normally operating in a sideband mode for receipt of FSK signals. The audio outputs of both receivers are routed to the system's af/dc jackfield. The jackfield provides monitoring jacks for both receiver audio lines. The audio outputs are normalled-thru the jackfield to the channel 1 and channel 2 inputs of the 174 frequency shift converter. The converter output, is then routed in series to the loop and set jacks and the terminal board for connection of external equipment. The series connection provides a continuous dc loop with a return line to the converter.

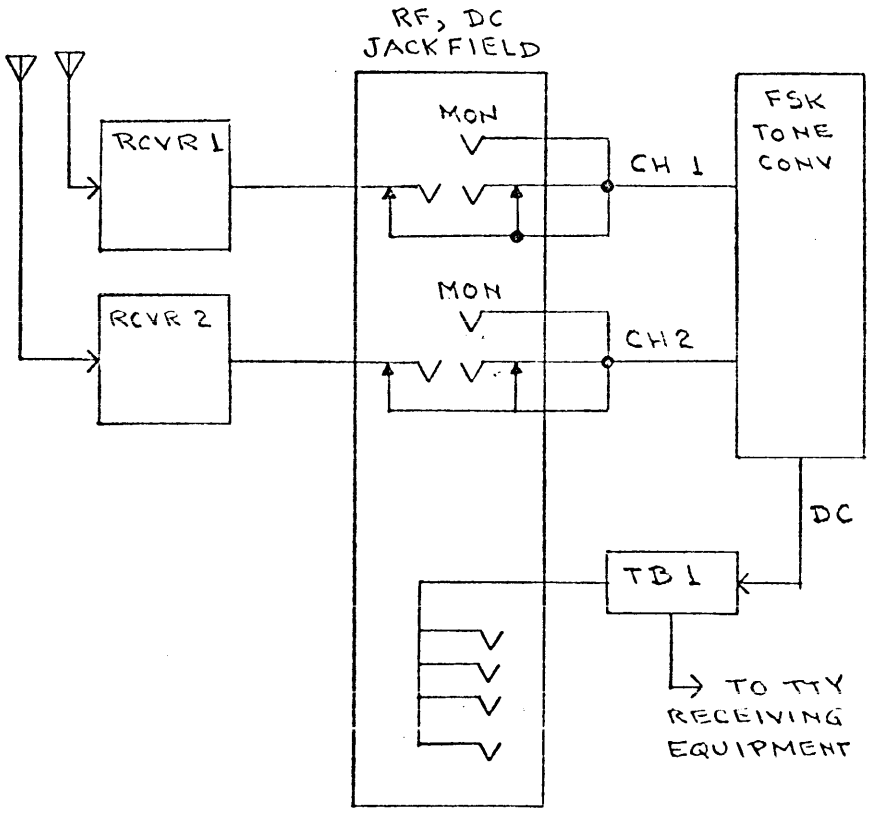


Figure 4-1. SYM3202 Block Diagram

SECTION 5

MAINTENANCE

5-1. PREVENTIVE MAINTENANCE

In order to prevent equipment failure due to dust, dirt or other destructive elements, it is suggested that a schedule of preventive maintenance be set up and adhered to.

At periodic intervals, the equipment should be removed from its mounting for cleaning and inspection. The wiring and all components should be inspected for dirt, dust, corrosion, grease or other harmful conditions. Remove dust with a soft brush or vacuum cleaner. Remove dirt or grease with any suitable cleaning solvent. 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.

WARNING

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

CAUTION

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

5-2. TROUBLESHOOTING

When a piece of equipment has been operating satisfactorily and suddenly fails, the cause of failure may be due to symptons of past failures or due to component aging.

The first step in troubleshooting is to ascertain that proper equipment voltages are present, interconnecting cables are secure, and that all fuses are in functional condition.

NOTE

Never replace a fuse with one of a high rating unless brief continued operation is more important than probable equipment damage. If a fuse burns out immediately after replacement, do not replace it a second time until the cause has been located and corrected.

Visual troubleshooting of the modular unit chassis components and tune conditions may also help localize the fault. Refer to the individual modular unit technical manuals for associated unit troubleshooting procedures.

The following troubleshooting aids are provided in this system technical manual:

a. Interconnect Wiring Diagram for SYM3202 (figure 2-3).

b. Block Diagram for SYM3202 (figure 4-1).

SECTION 6

PARTS LIST

The modular units which comprise the SYM3202 receiving system are listed on table 6-1. The parts list breakdowns for these units, with the exception of the af/dc jackfield, are contained in the individual technical manuals. The parts breakdown for the af/dc jackfield is listed in table 6-2.

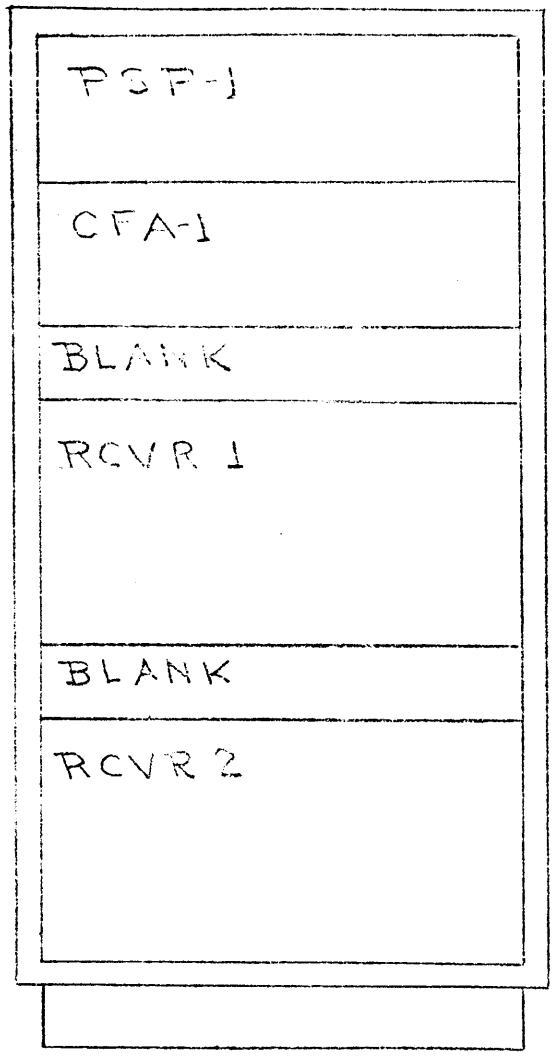
Table 6-1. Parts List for SYM3202 Receiving System

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
	Power Control Panel	DCP-2
	HF Receiver	3020A
	Frequency Shift Converter	174 Model 3

Table 6-2. Parts List for AF/DC Jackfield

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
J1 thru J6	Jack, Panel	JJ042
J7 thru J17	Not Used	
J18	Jack, Panel	PJ318
J19	Same as J18	
J20	Jack, Panel	PJ338
J21	Same as J20	
J22 thru J26	Not Used	

APPLICATION			REVISIONS						
QTY	MODEL USED ON	ASS'Y NO.	LTR	DESCRIPTION	DATE	E.M.N.NO	DRAFT	CHKD	APPD



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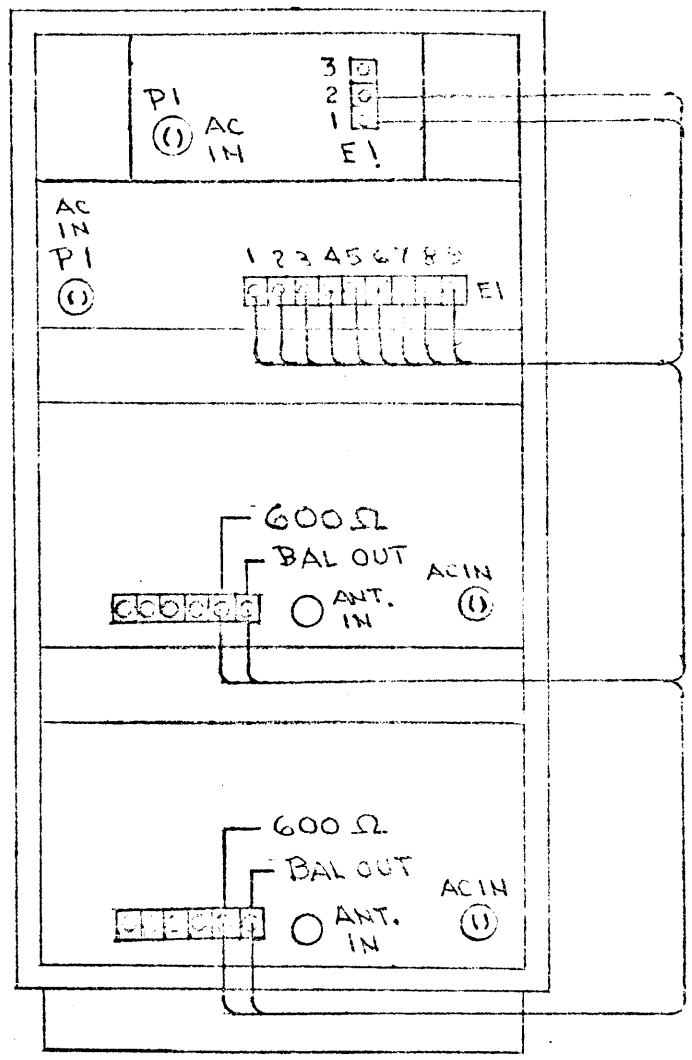

REAR

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES AND INCLUDE CHEMICALLY APPLIED OR PLATED FINISHES	REQ'D	ITEM	PART NUMBER	DESCRIPTION	SYM.
DECIMALS .X ± .05, .XX ± .01, .XXX ± .005 TOLS. FRACTIONS 1/64 ANGLES 0° 30'				LIST OF MATERIAL	
MATERIAL	FINAL APPROVAL	DATE		THE TECHNICAL MATERIEL CORP. MAMARONECK, NEW YORK	
FINISH	MECH. DES.	DATE			
	ELECT. DES.	DATE		DUAL DIVERSITY RECEIVING SY	
	CHECKED	DATE			
	DRAWN	DATE			

SIZE	CODE IDENT. NO.	DWG NO.
A	82679	

SCALE SHEET OF

DUAL DIVERSITY
RECEIVING SYSTEM
MODEL SYM3202

INSTALLATION INSTRUCTIONS

1. GENERAL.

The Dual Diversity Receiving System, Model SYM3202, is comprised of the following modular units:

(1) Equipment Cabinet, Model RAK-4.

(1) Power Supply, Model PSP-1.

(1) Frequency Shift Converter, Model CFA-1.

(2) Receivers, Model 3020A.

Separate technical manuals are supplied for each modular unit of the SYM3202.

2. INSTALLATION.

The modular units PSP-1, CFA-1, and 3020A's are removed from the RAK-4 equipment cabinet for shipment. When installing the equipment, the units should be mounted in the equipment cabinet and interconnected as shown in the attached figure. The ac power cords for the modular units should be connected to the ac terminal strip in the equipment cabinet, and the primary power (220 vac) connection should be made to the two leads at the base of the terminal strip. Antenna input connections and line audio output connections should be made at the rear of the 3020A receiver units.