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TECHNICAL MANUAL

FOR

FREQUENCY SHIFT CONVERTER SYSTEM

SYM-5213

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THE TECHNICAL MATERIEL CORPORATION

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

Warranty

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

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

1. That any claim of defect under this warranty is made within sixty (60) days after discovery thereof and that inspection by TMC, if required, indicates the validity of such claim to TMC's satisfaction.
2. That the defect is not the result of damage incurred in shipment from or to the factory.
3. That the equipment has not been altered in any way either as to design or use whether by replacement parts not supplied or approved by TMC, or otherwise.
4. That any equipment or accessories furnished but not manufactured by TMC, or not of TMC design shall be subject only to such adjustments as TMC may obtain from the supplier thereof.

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

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

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

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

*Electron tubes also include semi-conductor devices.

PROCEDURE FOR RETURN OF MATERIAL OR EQUIPMENT

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

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

PROCEDURE FOR ORDERING REPLACEMENT PARTS

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

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

PROCEDURE IN THE EVENT OF DAMAGE INCURRED IN SHIPMENT

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

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

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

PREFACE

This technical manual discusses the information you will require to install, operate and maintain the SYM-5213 Frequency Shift Converter System. This manual is intended for operators and technicians who will be responsible for the proper functioning of the equipment.

This text is compiled in two parts:

SYM-5213	Frequency Shift Converter System	Part I
CFA-2	Frequency Shift Converter.	Appendix A

You should read this manual in sequence, section by section, to become totally familar with the system. After completing this manual, you should be able to install, operate, and depending on your level of technical training, perform maintenance to the component level.

Changes are periodically made to this manual through publication of TECHNICAL NEWSLETTERS that are distributed to users of the equipment. The REGISTRATION CARD located at the front of this manual should be completed and sent to:

THE TECHNICAL MATERIEL CORPORATION
700 Fenimore Road
Mamaroneck, New York 10543
Attention: Technical Data Group

Your name and address will be entered on permanent TMC records and applicable publications automatically mailed to you. Requests for related publications should be made to your TMC representative, to a TMC field office in your area, or to TMC at the above address.

REQUEST FOR SPARE PARTS: Forms are available at the back of this manual.

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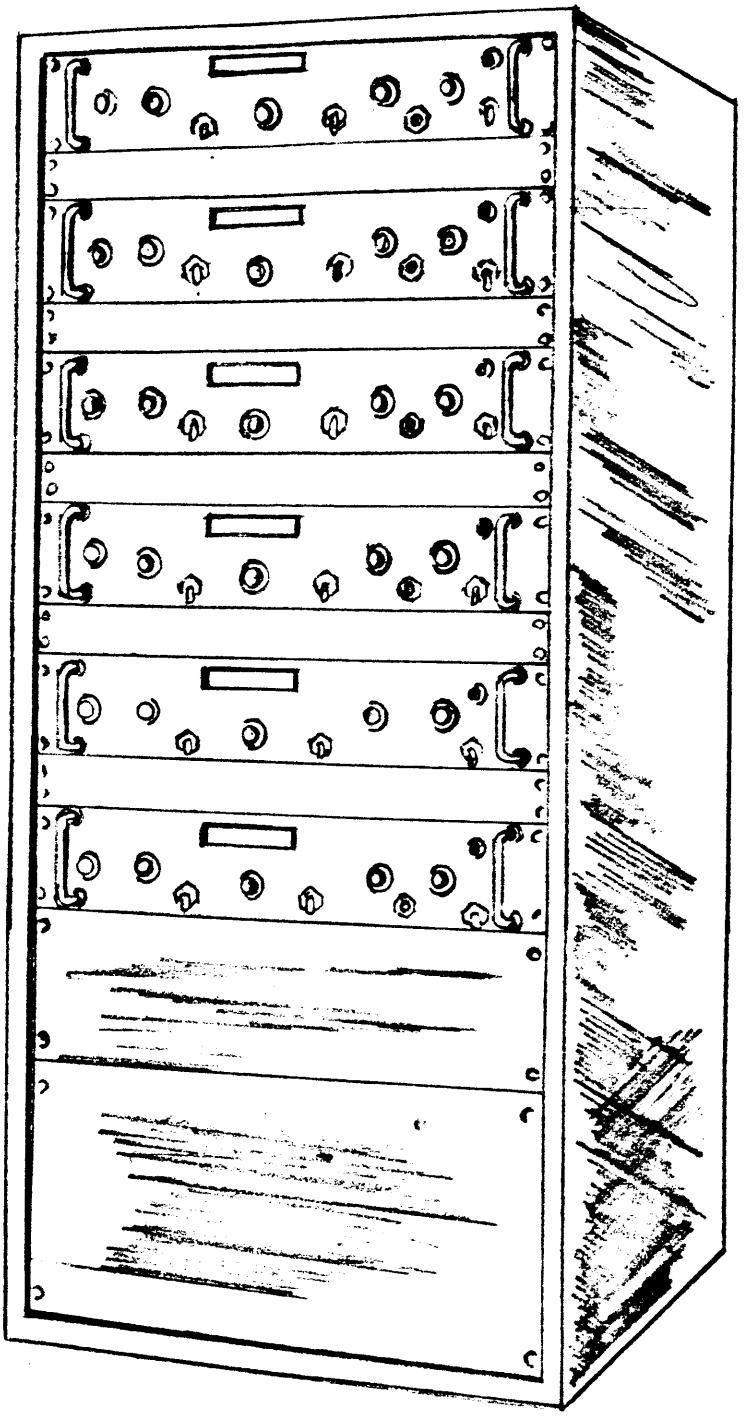

Figure 1-1

FREQUENCY SHIFT CONVERTER SYSTEM SYM-5213

SECTION I

GENERAL INFORMATION

1-1. GENERAL DESCRIPTION

The SYM-5213 Frequency Shift Converter System, is comprised of (6) CFA-2 Frequency Shift Converters.

The SYM-5213 System is housed in (1) Rack, utilizing (1) Interface Cable, all connections are juntioned at (1) Interface Panel.

1-2. FUNCTIONAL DESCRIPTION

The SYM-5213 System (figure 1-1), is comprised of (6) solid state audio type dual-channel frequency shift converters designed to be used with either diversity or single receiver communication systems. The CFA converts frequency-shift tone signals (Mark-Space) into d-c pulses the operate teleprinter equipment. The CFA accepts frequency shifts of 40 to 1000 cps through a simple change of switched discriminator networks. D-c clamping and a two-stage memory circuit provide automatic centering of the discriminator. An automatic MARK-HOLD feature places the output circuit in "marking" state during signal drop-outs. A keying stage functions as a neutral relay for the output signal to teleprinter.

1-3. DESCRIPTION OF MODULAR UNITS

General - Paragraph (a)gives a brief description of the modular units (CFA) which comprise the SYM-5213. For more detailed information pertaining to the CFA-2 refer to appendix A.

APPENDIX A	FREQUENCY SHIFT CONVERTER	CFA-2

TABLE 1-1

Appendix of Modular Units

a. FREQUENCY SHIFT CONVERTER, MODEL CFA-2.

The CFA comprises seven major sections: (1) input module, (2) discriminator module, (3) detector amplifier Module, (4) driver module (5) output (6) line supply module and (7) low voltage supply module.

The Input Section provides input circuits for two 600-ohm line channel inputs that accept incoming FSK audio frequency signals.

SECTION 2

INSTALLATION

2-1. UNPACKING AND HANDLING

The SYM-5213 system has been calibrated and tested at the factory before shipment. When the equipment is received at the operating site, inspect the packing cases and their contents immediately for possible damage; unpack the equipment carefully. Inspect all packing material for parts which may have been shipped as "loose items" (Technical Manuals, connectors, mounting hardware, etc.). 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 the furnishing of replacement parts.

2-2 POWER REQUIREMENTS

The SYM-5213 is designed for 115 or 230 volts $\pm$ 10%, 50 to 60 Hz single phase AC power. On the rear of the RACK (see figure 2-1), an AC input connector is located on the interface panel. When AC power is connected to input J101 (AC in) the units assembled in the rack will have AC power potential. Individual front panel AC power switches must be activated for unit operation.

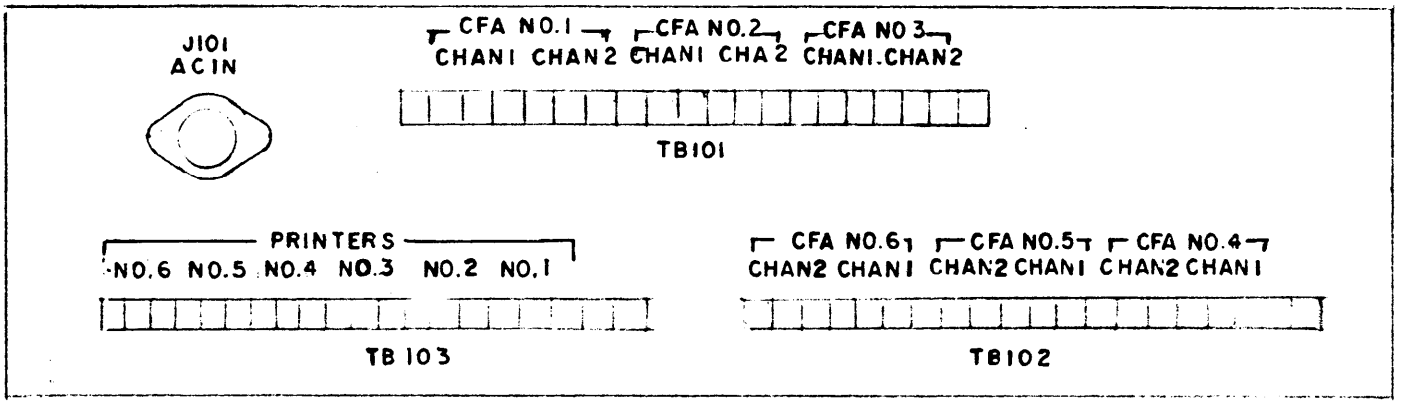

Figure 2-1

INTERFACE PANEL SYM-5213

2-3. INSTALLATION

The SYM-5213 is designed to house (6 CFA's), prime considerations when installing the SYM-5213 are: adequate ventilation, sufficient space to withdraw the units for servicing. The CFA-2 is designed for rack mounting. The CFA-2 (6) is equipped with a standard 19 inch front panel and is 3½ inches high and 16 inchs deep. Figure 7-1 describes all connections that exist in the system. The Interface panel (figure 2-1) is positioned on the rear of the rack so as to receive all external interfacing that may be required when operating the SYM-5213.

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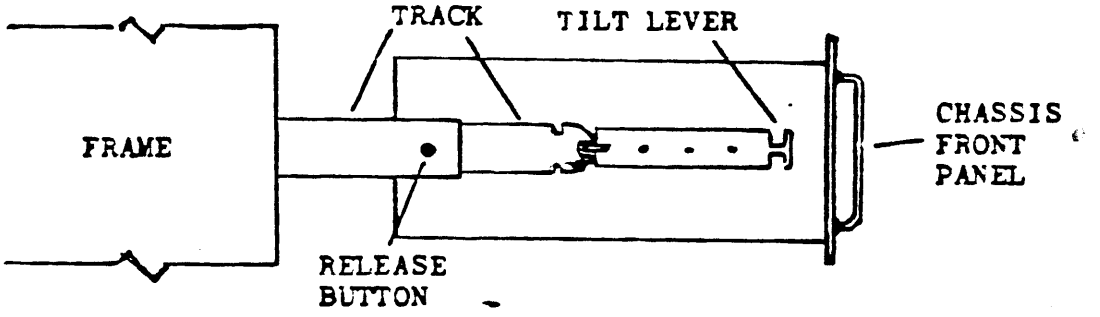
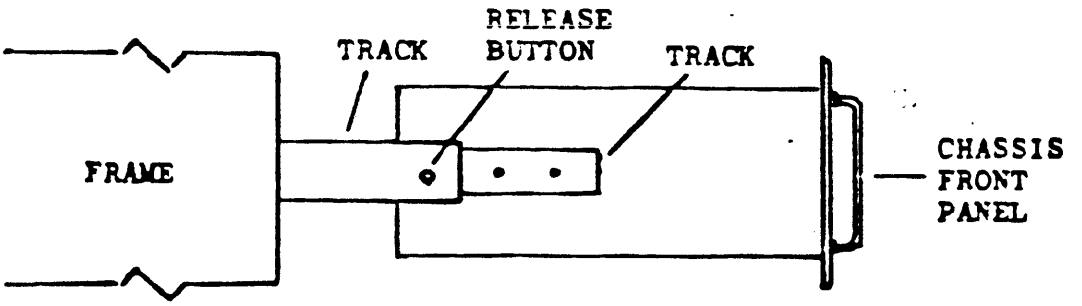
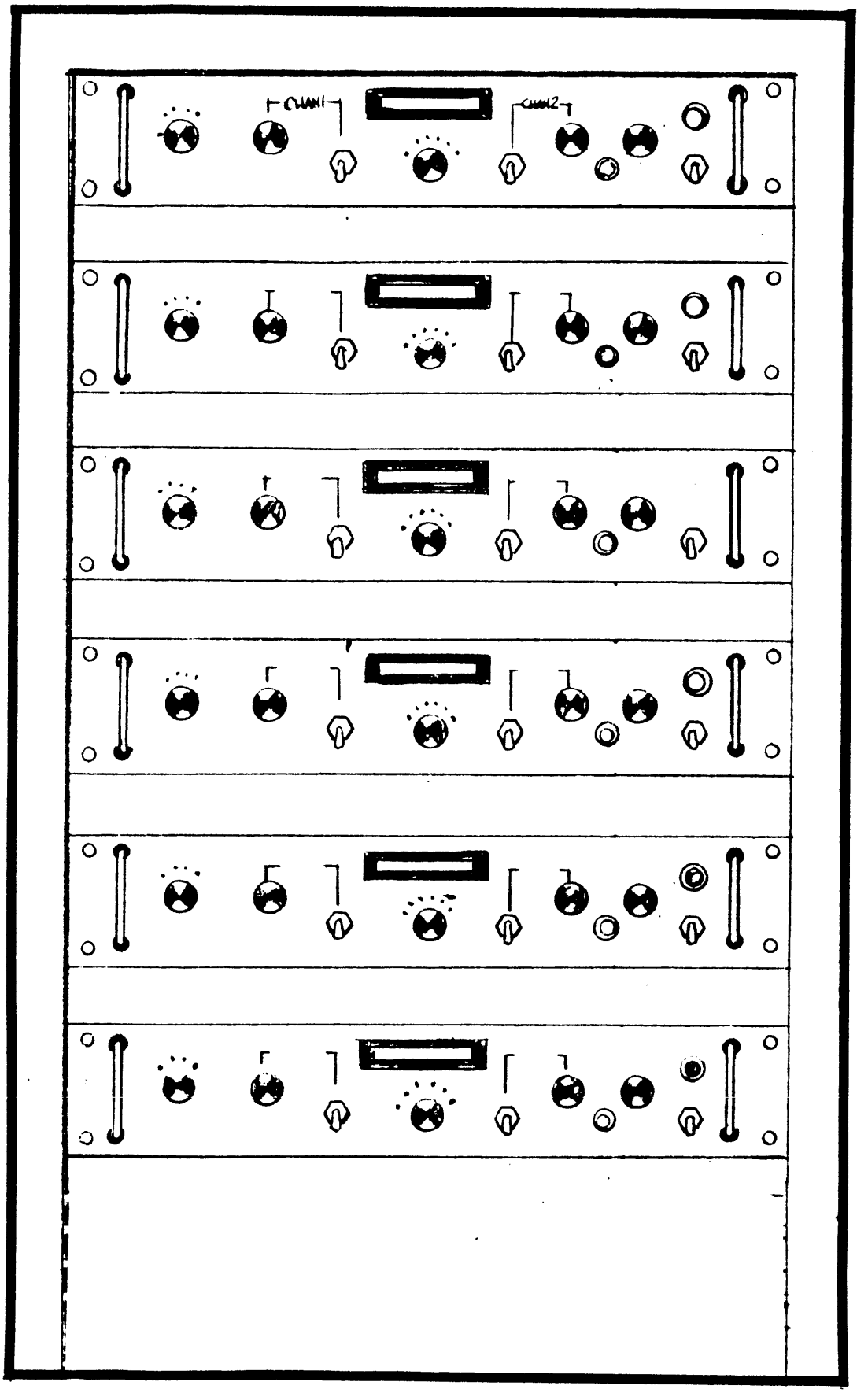
NOTE:
UTILIZATION OF CHASSIS SLIDES DEPENDS UPON TYPE OF CABINET IN USE.



TILT CHASSIS SLIDE



NON-TILT CHASSIS SLIDE



(6) CFA-2

NOTE:
CONFIGURATION MAY VARY SLIGHTLY DEPENDING UPON TYPE OF CABINETS USED

SYM-5213
FIGURE 2-2

SECTION 3

OPERATOR'S SECTION

3-1. OPERATING CONTROLS

The operating controls and indicators for the SYM-5213 are listed in figure 3-1 of Appendix A.

NOTE

Because all units are the same the OPERATOR'S SECTION of Appendix A will describe in detail all controls and indicators.

SECTION 4

PRINCIPLES OF OPERATION

4-1. GENERAL

The SYM-5213 system consists of (6) CFA-2 units, all inputs and outputs including AC power for all of the units are junctioned at the interface panel located in the rear of the rack. Figure 4-1 and Figure 7-1 in this section details all internal rack wiring and Section (4) page 4-0 of Appendix A describes in length the Principles of Operation of a CFA-2.

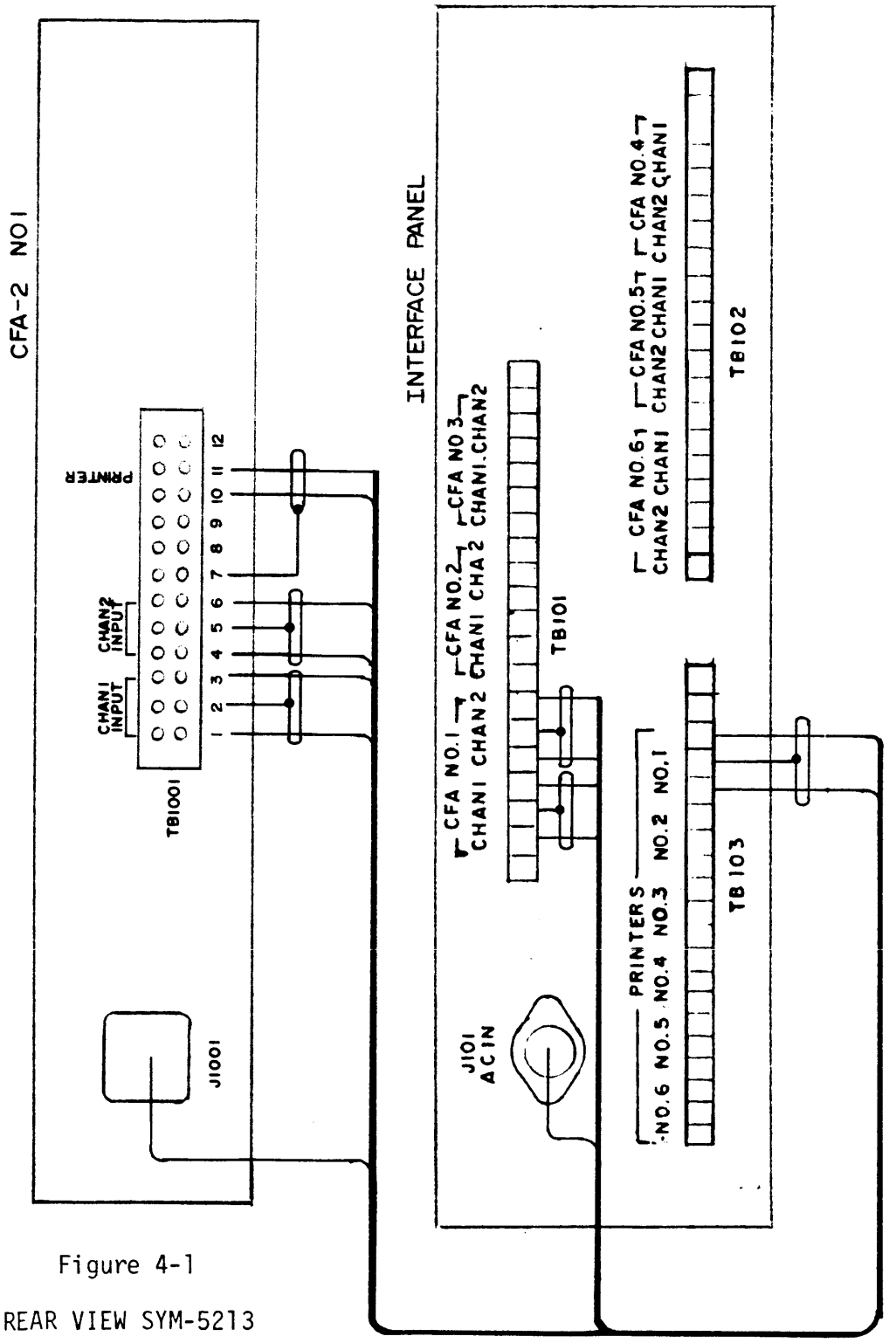


Figure 4-1

REAR VIEW SYM-5213

(TYPICAL CONNECTION)

SECTION 5

MAINTENANCE AND TROUBLESHOOTING

5-1. PREVENTIVE MAINTENANCE

a. General - The SYM-5213 has been designed to provide long term, trouble free operation under continuous duty conditions. However, in order to prevent failure of the equipment due to corrosion, dust, or other destructive elements, it is suggested that 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. All accessible covers should be removed and the wiring and all components inspected for dirt, corrosion, charring, discoloring or grease. Remove dust with a soft brush or vacuum cleaner. Remove dirt or grease from other parts with any suitable cleaning solvent. Use of carbon tetrachloride should be avoided due to its highly toxic effects.

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

SECTION 6

PARTS LIST

6-1. INTRODUCTION

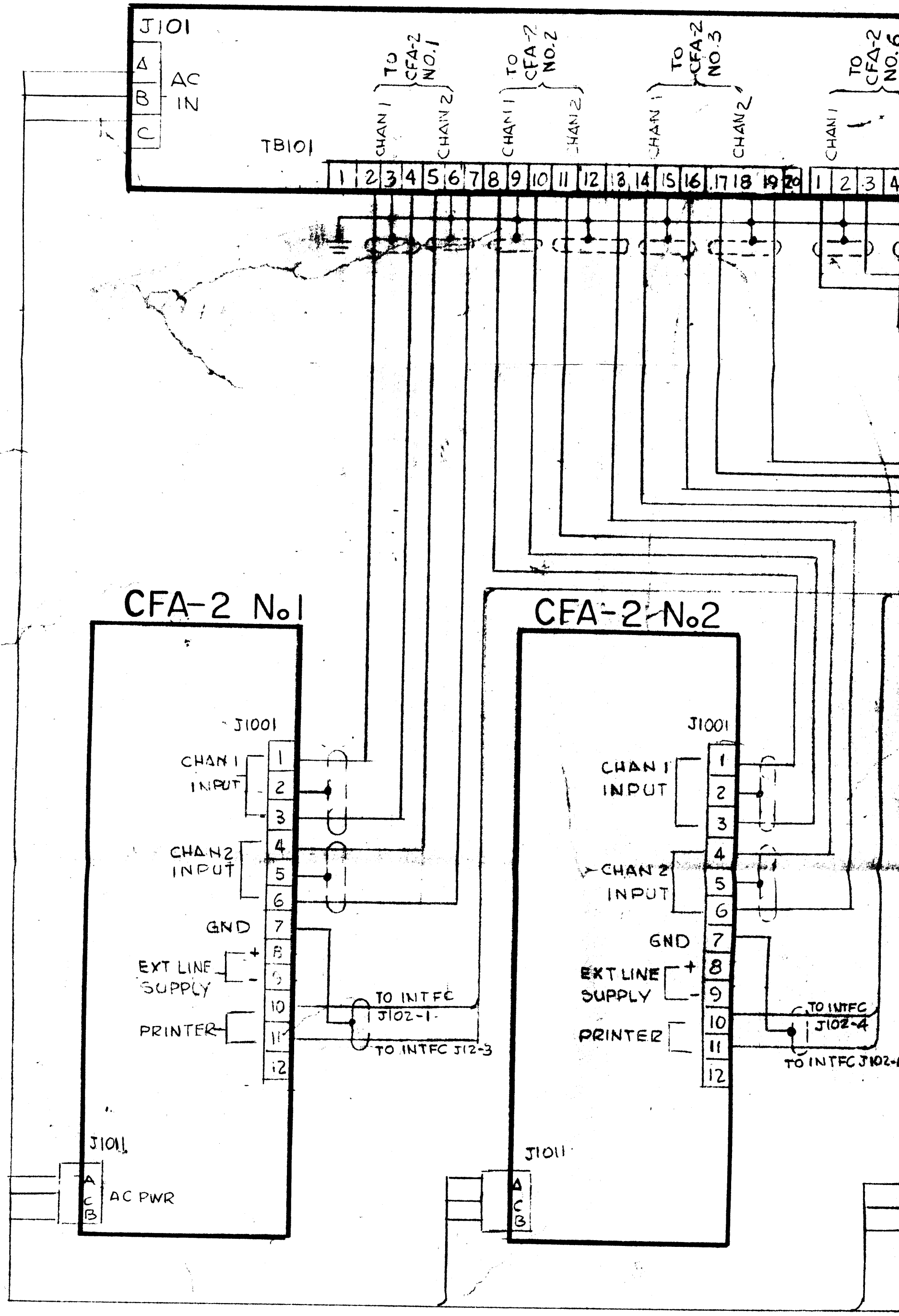
Reference designations have been assigned to identify electrical parts of the System exclusive of the modular units making up the system. The parts lists for the modular units will be found in the modular unit technical manual, Appendix A.

The system parts designations will be found on the system interconnect wiring diagram. The following is a listing of the parts and their corresponding description. The TMC part number is the number to be used when ordering the part from The Technical Materiel Corporation, 700 Fenimore Road, Mamaroneck, New York, 10543.

REF SYMBOL	DESCRIPTION	TMC PART NUMBER
J202	Connector, AC Power	JJ175
TB101	Terminal Board	TM100-20
TB102	Terminal Board	TM100-20
TB103	Terminal Board	TM100-20

SECTION 7

SCHEMATIC DIAGRAM


J101
A
B
C
AC IN
TB101
TO CFA-2 NO.1
TO CFA-2 NO.2
TO CFA-2 NO.3
CHAN 1
CHAN 2
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
CFA-2 No1
J1001
CHAN 1 INPUT
CHAN 2 INPUT
GND
EXT LINE SUPPLY
PRINTER
1 2 3 4 5 6 7 8 9 10 11 12
TO INTFC J102-1
TO INTFC J12-3
J1011
AC PWR
CFA-2 No2
J1001
CHAN 1 INPUT
CHAN 2 INPUT
GND
EXT LINE SUPPLY
PRINTER
TO INTFC J102-4
TO INTFC J102-
J1011

5 4

INTERFACE PANEL

TO CFA-2 NO.6 CHAN 2 | TO CFA-2 NO.5 CHAN 1 CHAN 2 | TO CFA-2 NO.4 CHAN 1 CHAN 2

TB102: 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20

TB103: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17

PRINTER NO.6 | PRINTER NO.5 | PRINTER NO.4 | PRINTER NO.3 | PRINTER NO.2 | PRINTER NO.1

TO CFA-2 NO.6 | TO CFA-2 NO.6 | TO CFA-2 NO.5 | TO CFA-2 NO.5 | TO CFA-2 NO.4 | TO CFA-2 NO.4 | TO CFA-2 NO.3 | TO CFA-2 NO.3 | TO CFA-2 NO.2 | TO CFA-2 NO.2 | TO CFA-2 NO.1 | TO CFA-2 NO.1

CFA-2 No.3

J1001

CHAN 1 INPUT	1, 2, 3
CHAN 2 INPUT	4, 5, 6
GND	7
EXT LINE SUPPLY	8, 9
PRINTER	10, 11, 12

TO INTFC J102-7

TO INTFC J102-9

TO INTFC J102-4

TO INTFC J102-6

J1011: A C B

CFA-2 No.4

J1001

CHAN 1 INPUT	1, 2, 3
CHAN 2 INPUT	4, 5, 6
GND	7
EXT LINE SUPPLY	8, 9
PRINTER	10, 11, 12

TO INTFC J102-11

TO INTFC J102-13

J1011: A C B

CFA-2

CHAN 1 INPUT

CHAN 2 INPUT

EXT LINE SUPPLY

PRINTER

J1011

REVISIONS							
E.M.N.NO	DRAFT	CHKD	ZONE	LTR	DESCRIPTION	DATE	APPROVED
	S.D.L			X	ON INTFC ON TB 102 INVERT DESIG. REF OF A-4 & NO 6 - ON TB 103 INVERT DESIG. REF: PRINTER NO.1 THRU. PRINTER NO 6 -	5-27-82	

PRINTER NO 2
PRINTER NO 1
14 15 16 17 18 19 20

TO CFA-2 NO.2
TO CFA-2 NO.1
TO CFA-2 NO 1

CFA-2 No.5

J1001

CHAN 1 INPUT
1
2
3

CHAN 2 INPUT
4
5
6

GND 7

EXT LINE SUPPLY
8
9

PRINTER
10
11
12

TO INTFC J102-14

TO INTFC J102-16

J1011

CFA-2 No. 6

J1001

CHAN 1 INPUT
1
2
3

CHAN 2 INPUT
4
5
6

GND 7

EXT LINE SUPPLY
+ 8
- 9

PRINTER
10
11
12

TO INTFC J102-17

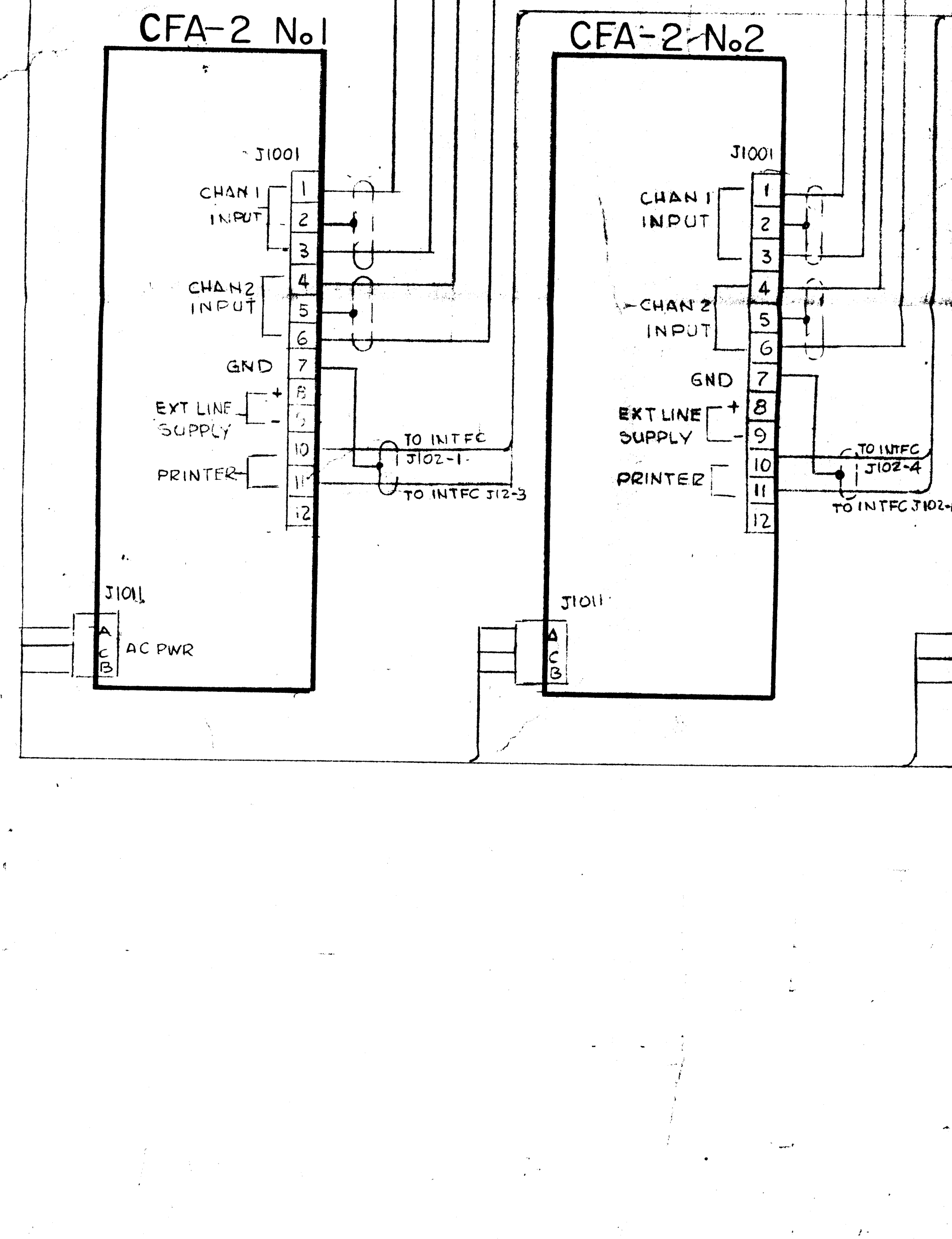
TO INTFC J102-19

J1011
A
C
B

D
C
B

CK 2247 X

C


CFA-2 No1
J1001
CHAN 1 INPUT
1
2
3
CHAN 2 INPUT
4
5
6
GND
7
8
EXT LINE SUPPLY
+
-
9
10
PRINTER
11
12
TO INTFC J102-1
TO INTFC J12-3
J1011
A
C
B
AC PWR
CFA-2 No2
J1001
CHAN 1 INPUT
1
2
3
CHAN 2 INPUT
4
5
6
GND
7
8
EXT LINE SUPPLY
+
-
9
10
PRINTER
11
12
TO INTFC J102-4
TO INTFC J102-
J1011
A
C
B

8 7 6

TO CFA-2 NO.6
TO CFA-2 NO.6
TO CFA-2 NO.5
TO CFA-2 NO.5
TO CFA-2 NO.4
TO CFA-2 NO.4
TO CFA-2 NO.3
TO CFA-2 NO.3
TO CFA-2 NO.2
TO CFA-2 NO.2
TO CFA-2 NO.1
TO CFA-2 NO.1

CFA-2 No.3

J1001

CHAN 1 INPUT

CHAN 2 INPUT

GND

EXT LINE SUPPLY

PRINTER

1 2 3 4 5 6 7 8 9 10 11 12

TO INTFC J102-7

TO INTFC J102-9

J1011

A C B

CFA-2 No.4

J1001

CHAN 1 INPUT

CHAN 2 INPUT

GND

EXT LINE SUPPLY

PRINTER

1 2 3 4 5 6 7 8 9 10 11 12

TO INTFC J102-11

TO INTFC J102-13

J1011

A C B

CFA-2

CHAN 1 INPUT

CHAN 2 INPUT

EXT LINE SUPPLY

PRINTER

J1011

SYM 5213

QTY / UNIT	MODEL USED ON	ASS'Y NO.

APPLICATION

CODE

UNLESS DIMEN AND INCL OF

DECIMA .X ± .1 .XX ± .0 .XXX ± .0

MATERIAL

FINISH

5 4 3

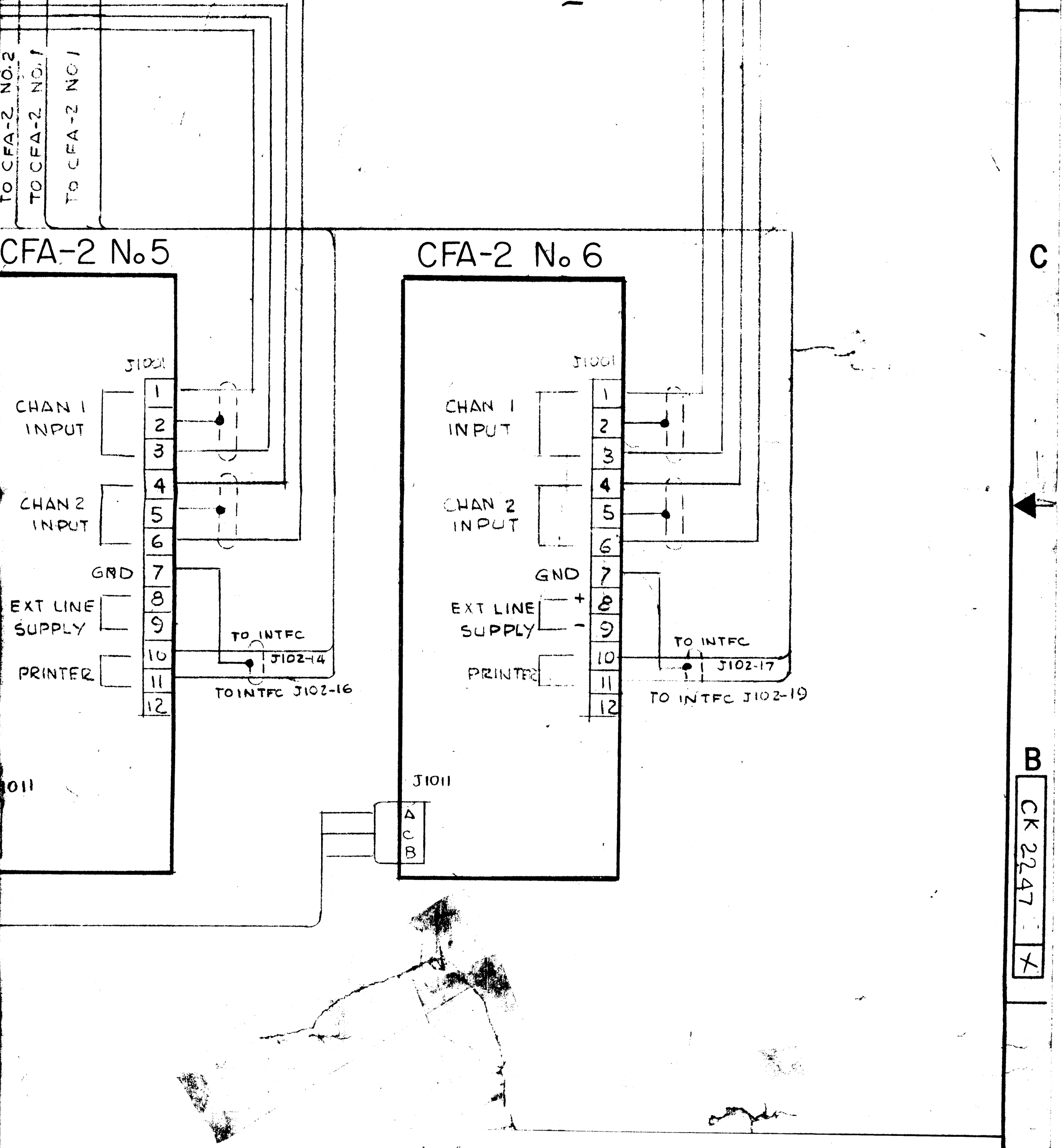


Figure 7-1

INTERCONNECT WIRING DIAGRAM

SYM-5213

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

N39990