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DEPARTMENT OF THE AIR FORCE TECHNICAL ORDER TO 31S5-2FYQ42-151

OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT, GENERAL SUPPORT, AND DEPOT MAINTENANCE MANUAL

FILTER, ISOLATION, AND CONVERTER UNITS FOR AUTOMATIC DIGITAL MESSAGE SWITCHING CENTERS AN FYQ-42(V)1 THROUGH AN FYQ-42(V)12 AND AN FYQ-42(V)T1

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DEPARTMENTS OF THE ARMY, THE NAVY, AND THE AIR FORCE

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WARNING

DEATH or SERIOUS INJURY may result from hazards in this equipment, unless the proper safety measures are observed. READ AND OBSERVE the referenced warnings concerning the following hazards in *this* equipment:

EXPOSED TERMINALS (para 2-13a(2))

EXPOSED TERMINALS (para 3-14a(2)(a))

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DEPARTMENTS OF THE ARMY,
THE NAVY, AND THE AIR FORCE

WASHINGTON, D.C., 15 October 1968

Operator, Organizational, Direct Support, General Support, and Depot Maintenance Manual

FILTER, ISOLATION, AND CONVERTER UNITS FOR AUTOMATIC DIGITAL MESSAGE SWITCHING CENTERS AN/FYQ-42(V)1 THROUGH AN/FYQ-42(V)12 AND AN/FYQ-42(V)T1

LIST OF ILLUSTRATIONS

LIST OF ILLUSTRATIONS-Continued

Figure

CHAPTER 1

INTRODUCTION

1-1. Scope

This manual contains instructions for the operation, maintenance, and repair of the filter, isolation, and converter units (fig. 1-1) used in Automatic Digital Message Switching Centers (ADMSC) which are a part of the Automatic Digital Network (AUTODIN). The filter, isolation, and converter units described in this manual, together with their common names, are listed in table 1-1.

Table 1-1. List of Filter, Isolation, and Converter Units With Common Names

Equipment	Type designation	Common name	Philco part No.
Filter Unit, Audio	F-1145/FYA	Audio Isolation facility	100001408-003
Filter Unit, Audio	F-1157/FYA	Audio Isolation facility	100001408-001
Isolation Unit, Data-Timing	AN/FYA-35	Red/black isolation facility	100001415-002
Isolation Unit, Data-Timing	OA-8323/FYA-15	Red/black isolation facility	100001415-004
Isolation Unit, Data-Timing	OA-8324/FYA-16	Red/black isolation facility	100001415-005
Isolation Unit, Data-Timing	AN/FYA-60	Red/black isolation facility	100001415-001
Isolation Unit, Data-Timing	AN/FYA-64	Red/black isolation facility	100001415-007
Isolation Unit, Data-Timing	OA-8343/FYA-T1	Red/black isolation facility	100001415-006
Converter Unit, Signal Level	OU-20/FYA-11	Signal level converter facility	100001407-002
Converter Unit, Signal Level	OU-21/FYA-12	Signal level converter facility	100001407-003
Converter Unit, Signal Level	OU-23/FYA-13	Signal level converter facility	100001407-004
Converter Unit, Signal Level	OU-24/FYA-14	Signal level converter facility	100001407-006
Converter Unit, Signal Level	OU-25/FYA-15	Signal level converter facility	100001407 007
Converter Unit, Signal Level	AN/FYA-58	Signal level converter facility	100001407-009
Converter Unit, Signal Level	OU-26/FYA-18	Signal level converter facility	100001407-010
Converter Unit, Signal Level	OU-27/FYA-19	Signal level converter facility	100001407-011
Converter Unit, Signal Level	OU-28/FYA-20	Signal level converter facility	100001407-012
Converter Unit, Signal Level	OU-29/FYA-21	Signal level converter facility	100001407-013
Converter Unit, Signal Level	OU-20/FYA-22	Signal level converter facility	100001407-014
Converter Unit, Signal Level	OU-31/FYA-T1	Signal level converter facility	100001407-001
Filter Unit, Radio Frequency	F-1146/FYA	Shield point isolation facility	100001409-101
Filter Unit, Radio Frequency	F-1147/FYA-11	Shield point isolation facility	100001409-102
Filter Unit, Radio Frequency	F-1148/FYA-11	Shield point isolation facility	100001409-301
Filter Unit, Radio Frequency	F-1151/FYA-12	Shield point isolation facility	100001409-103
Filter Unit, Radio Frequency	F-1152/FYA-12	Shield point isolation facility	100001409-302
Filter Unit, Radio Frequency	F-1153/FYA-13	Shield point isolation facility	100001409-104
Filter Unit, Radio Frequency	F-1154/FYA-13	Shield point isolation facility	100001409-303
Filter Unit, Radio Frequency	F-1155/FYA-13	Shield point isolation facility	100001409-105
Filter Unit, Radio Frequency	F-1156/FYA-14	Shield point isolation facility	100001409-304
Filter Unit, Radio Frequency	F-1158/FYA-14	Shield point isolation facility	100001409-106
Filter Unit, Radio Frequency	F-1159/FYA-15	Shield point isolation facility	100001409-305
Filter Unit, Radio Frequency	F-1160/FYA-16	Shield point isolation facility	100001409-107
Filter Unit, Radio Frequency	F-1161/FYA	Shield point isolation facility	100001409-306

Table 1-1. List of Filter, Isolation, and Converter Units With Common Names - Continued

Equipment	Type designation	Common name	Philco part No.
Filter Unit, Radio Frequency	F-1162/FYA-17	Shield point isolation facility	100001409-108
Filter Unit, Radio Frequency	F-1163/FYA-17	Shield point isolation facility	100001409-307
Filter Unit, Radio Frequency	F-1164/FYA-18	Shield point isolation facility	100001409-109
Filter Unit, Radio Frequency	F-1165/FYA-18	Shield point isolation facility	100001409-308
Filter Unit, Radio Frequency	F-1166/FYA-19	Shield point isolation facility	100001409-110
Filter Unit, Radio Frequency	F-1167/FYA-19	Shield point isolation facility	100001409-309
Filter Unit, Radio Frequency	F-1173/FYA-20	Shield point isolation facility	100001409-111
Filter Unit, Radio Frequency	F-1174/FYA-21	Shield point isolation facility	100001409-112
Filter Unit, Radio Frequency	F-1175/FYA-22	Shield point isolation facility	100001409-113
Filter Unit, Radio Frequency	F-1176/FYA-22	Shield point isolation facility	100001409-310
Filter Unit, Radio Frequency	F-1200/FYA-201	Shield point isolation facility	100001409-201

1-2. Indexes of Equipment Publications

a. New Editions, Changes, or Additional Publications. Determine whether there are any new editions, changes, or additional information pertaining to your equipment by referring to DA Pam 310-4 (Army), NAVSANDA Publication 2002 (Navy), or Numerical Index and Requirement Table T.O. 0-1-01N (Air Force).

b. Modification Work Orders. Refer to the latest edition of DA Pam 310-7 to determine whether there are any Modification Work Orders (MWO's) pertaining to the equipment.

1-3. Forms and Records

a. Report of Maintenance and Unsatisfactory Equipment. Use equipment forms and records in accordance with instructions in TM 38-750 (Army, NW OD-25-546 (Navy), or TO-00-35D (Air Force).

b. Report of Packaging and Handling Deficiencies. Fill out and forward DD Form 6 (Report of Packaging and Handling Deficiencies) as prescribed in AR 700-58 (Army)/NAVSUP Pub 378 (Navy)/AFR 71-4 (Air Force)/MCO P4030.29 (Marine Corps), and DSAR 4145.8.

c. Discrepancy in Shipment Report. Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38 (Army)/NAVSUPINST 4610.33/AFM 75-18/MCO P4610.19A (Marine Corps), and DSAR 4500.15.

d. Report of maintenance. Records and reports of preventive maintenance repairs must be made in accordance with procedures in TM 38-750- (Army), OPNAV Form 4700, Subject: Planned Maintenance System Feedback Report (Navy), or AFM 66-1 (Air Force).

e. Report of Equipment Manual Improvements. The reporting of errors, omissions and recommendations for improving this publication by the individual user are encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications) and forwarded direct to Commander, US Army Electronics Command, ATTN: AMSEL-MA-CW, Fort Monmouth, NJ 07703 (Army); NAVSHIPS 5600/2 (REV 10-67 (formerly NAVSHIPS 4914) and forwarded to: Commander, Naval Electronics System Command, ATTN: 0451C, Washington, DC 20360 (Navy); or AFTO Form 22 (Technical Order System Publications Deficiency Report) and forwarded to: Commander, Oklahoma City Air Material Area, ATTN: OCNDT (B-F) Tinker Air Force Base, OK 73145 (Air Force).

f. Administrative Storage. For procedures, forms and records, and inspections required during administrative storage of this equipment, refer to TM 740-90-1.

1-4. General Information

a. There are four types of facility racks, each performing a specific function at the AUTODIN site. Tables 1-2 through table 1-5 list the major components continued in each rack, and the maximum number of major components installed in each rack.

Table 1-2. Audio Isolation Facility, Major Components

Name of component	F-1145/ FYA	F-1157/ FYA
Filter box assembly	4	3
Audio filter............................	66	52

Table 1-3. Red/Black Isolation Facility, Major Components

Name of component	AN/FYA-35	AN/FYA-60	AN/FYA-64	OA-8323/ FYA-15	OA-8323/ FYA-16	OA-8323/ FYA-T1
Power Supply Assembly PP-4830/G	2	2	2	2	2	2
Red/black isolation unit	64	33	35	34	86	51
Fuse panel	4	4	4	4	4	4
RFI cover plate	42	63	61	62	60	45

Table 1-4. Signal Level Converter Unit, Major Components

Name of component	AN/FY A-58	OU-20/ FYA-11	OU-21/ FYA-12	OU-23/ FYA-13	OU-24/ FYA-14	OU-25/ FYA-15	OU-26/ FYA-18	OU-27/ FYA-19	OU-28/ FYA-20	OU-29/ FYA-21	OU-30/ FYA-22	OU-31/ FYA-T1
Power Supply Assembly PP-4824/FYA.	1	1	2	2	1	1	1	2	2	1	1	1
Plug-in high-to-low dc/dc signal converter.	26	47	64	79	39	19	51	86	27	28	87	20
Plug-in low-to-high dc/dc signal converter.	26	47	64	79	39	19	51	86	27	23	87	20
DC/DC converter shelf	65	8	11	14	7	4	9	15	5	4	7	4
Fuse panel	1	1	2	2	1	1	1	2	1	1	1	1

Table 1-5. Shield Point Isolation Facility, Major Components

Name of component	RFI shield point enclosure	Audio isolation filter
F-1146/FYA	1	200
F-1147/FYA-11	1	22
F-1148/FYA-11	1	174
F-1151/FYA-12	1	164
F-1152/FYA-12	1	188
F-1153/FYA-13	1	188
F-1154/FYA-13	1	196
F-1155/FYA-14	1	137
F-1156/FYA-14	1	172
F-1158/FYA-15	1	135
F-1159/FYA	1	121
F-1160/FYA-16	1	168
F-1161/FYA	1	127
F-1162/FYA-17	1	171
F-1163/FYA-17	1	133
F-1164/FYA-18	1	107
F-1165/FYA-18	1	149
F-1166/FYA-19	1	125
F-1167/FYA-19	1	169
F-1173/FYA-20	1	160
F-1174/FYA-21	1	8
F-1175/FYA-22	1	154
F-1176/FYA-22	1	185
F-1200/FYA-19	1	22

b. This manual describes the maximum functional configuration for each rack, regardless of the actual number of assemblies in the rack. For example, the red/black isolation facility contains two redundant power supply units, four fuse panels, and as many as 96 red/black isolation switches (table 1-2). Since both power units, all fuse panels, and all 96 switches perform the same function, the detailed description is limited to a discussion of one redundant power supply unit, one fuse panel, and one switch.

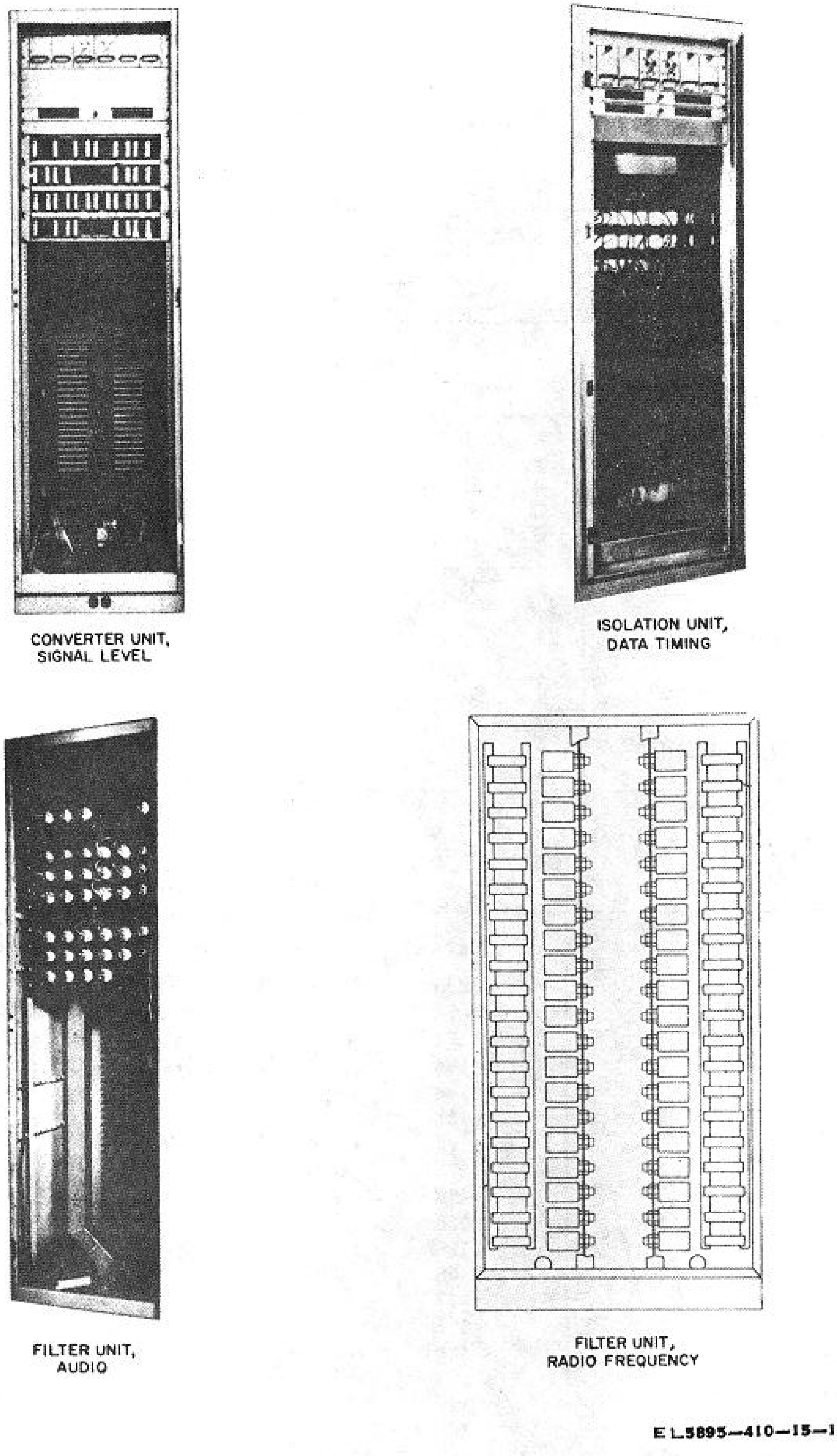

Figure 1-1. Modular circuitry equipment cabinets (typical).

CHAPTER 2

SIGNAL LEVEL CONVERTER FACILITY

Section I. INTRODUCTION

2-1. General

This chapter describes the signal converter facility (fig. 2-1) and provides instructions for performing maintenance and troubleshooting.

2-2. Purpose and Use

The signal level converter facility performs two basic functions at the AUTODIN site. High-level polar and neutral signals received at the AUTODIN site on high-level dc circuits or generated by the site modem facility are converted to low-level polar signals for use in the AUTODIN center. Low-level polar signals from the AUTODIN center must be changed to high-level signals for the modems within the center and for the high-level dc circuits leaving the center.

2-3. Description of Equipments

a. General. The signal level converter facility is contained in one equipment cabinet (fig. 2-1). Components installed in the equipment cabinet include the redundant power supply units, fuse panels, and converter shelf assemblies. Each converter shelf assembly contains a maximum of 12 plug-in printed-circuit card assemblies, 6 high-to-low dc-to-dc signal level converters (hi/lo converters), and 6 low-to-high dc-to-dc signal level converters (lo/hi converters). Signal level converter facilities which contain 10 or fewer shelf assemblies contain 1 redundant power supply unit and 1 fuse panel. Signal level converter facilities which have from 11 to 16 shelf assemblies contain 2 redundant power supply units and 2 fuse panels so that sufficient operating power will be furnished to the full complement of converters in the shelves. Descriptions of the redundant power supply unit, fuse panel, and signal level converters are given in the following paragraphs.

b. Redundant Power Supply Unit. The redundant power supply unit (fig. 2-1), located at the top of the cabinet, contains four plug-in power supply modules and two plug-in common modules. Two of the power supply modules function as a redundant source of positive dc operating power, and the other two power supply modules function as a redundant source of negative dc operating power for the signal level converters. The common modules (each associated with one positive and one negative power supply module) monitor the output of the power supplies and provide an alarm if any of the power supplies becomes defective. Indicator lamps on the various modules provide indications of the status of the modules. Locations of the modules in the redundant power supply unit are (from left to right) as follows:

Position 1-positive power supply module Position 2-negative power supply module Position 3-common module	Power Supply 1
Position 4 common module Position 5-positive power supply module Position 6-negative power supply module	Power Supply 2

c. Fuse Panel. Each fuse panel (fig. 2-1) contains 40 mechanical indicating fuses; each fuse protects the positive or negative dc line feeding 6 of the signal level converters. When a fuse blows because of an overload, a small flag on the fuse becomes visible, and an alarm lamp on the fuse panel lights to indicate the blown fuse status.

d. Signal Level Converters. The hi/lo and lo/hi signal level converters (fig. 2-2) are plug-in printed circuit cards which mount in the shelf assemblies in the equipment. Each converter has a front panel switch which selects either neutral or polar mode of operation.

2-4. System Application

a. The signal level converter facility interfaces equipment using high-level telegraph signals with equipment using low-level tell graph signals. High-level signals are used external to the ADMSC site and in Terminal Telegraph AN/FCC-19 of the site modem facility of the site; low-level signals are used by all other telegraph equipment of the site. Two types of signal level converters are required. The lo/hi converter receives standard low-level polar dc signals and converts them to high-level polar or neutral dc signals used by the AN/ FCC-19 or the dc circuits leaving the site. The hi/lo converter receives high-level polar or neutral dc signals and converts them to the standard low-level dc signals used within the ADMSC site.

b. AC power from the site power system is fed to the redundant power supply unit. Two redundant power supply modules in the power supply unit provide + 14-volt dc operating power to a bus which routes the power to the fuse panel. The remaining two power supply modules in the power supply unit provide the redundant -14-volt dc operating power to the fuse panel. The outputs of the two power supply modules with the same voltage polarity are connected through a diode to the same voltage bus. This ensures that power will be present on the busses even if one of the power supplies fails or if its output voltage falls below the required output. When either situation occurs, a power alarm signal is generated by the associated common module in the redundant power supply unit. One +14 and one -14-volt dc power supply module is associated with one common module.

c. The fuse panel distributes the +14 and -14-volt dc operating power to the signal level converters. One positive and one negative fuse on the fuse panel protects six converters. If a converter draws excessive current, the applicable fuse on the panel opens, provides a visible signal at the front panel, provides a blown fuse signal indication on the fuse panel, and provides a remote alarm through the common module.

2-5. Technical Characteristics

Technical characteristics of the facility and its components, including electrical parameters and physical dimensions of the equipments, are given in table 2-1.

Table 2-1. Signal Level Converter Facility Technical Characteristics

Characteristic	Value
Signal level converter cabinet	
Height	77 1/8 in.
Width	21 1/16 in.
Depth	24 1/8 in.
Redundant power supply unit	
Height	5 1/4 in.
Width	19 in.
Depth	13 3/4 in.
Number of power supply modules.	4.
Number of common modules.	2.
Input power	105 to 125 volts ac, 50 to 60 cps.
Output voltage	+14.2 and -14.2 volts dc (nominal).
Output voltage range	Adjustable 0 to 14.2 volts dc.
Output current	0 to 1.5 amperes dc.
Line voltage regulation.	Less than 0.01 percent.
Load voltage regulation.	Less than 0.01 percent or 1 millivolt dc, whichever is greater.
Line current regulation.	Less than 0.01 percent current change.
Load current regulation.	Less than 0.02 percent current change.
Stability	Output current variation less than 0.05 percent or 1 milliampere, whichever is greater, 8 hours after warmup.
Ripple	Less than 0.1 millivolt rms.
Fuse panel	
Height	1 3/4 in.
Width	19 in.
Depth	4 3/4 in.

Table 2-1. Signal Level Converter Facility Technical Characteristics-Continued

Characteristic	Value
Fuse panel-Continued	
Number of fuses..........	40 (maximum) (20 positive and 20 negative dc).
Fuse type	Mechanical indicating (BUSS GMT).
Hi/lo signal level converter card	
Height	2 3/4 in.
Width	5/8 in.
Depth	5 5/8 in.
Dc input power:	
+Mark condition	+14 volts dc at 4 milliamperes (maximum), -14 volts dc at 0 milliampere.
-Space condition	+14 volts dc at 23 milliamperes (maximum), -14 volts dc at 24 milliamperes (maximum).
Input characteristics:	
Loop voltages (polar).	±48, 50, 60, 80, and 130 volts dc.
Loop currents (polar).	20 and 30 milliamperes.
Loop voltages (neutral).	-or + 120 and 130 volts dc.
Loop current (neutral).	60 milliamperes (nominal), 70 milliamperes (maximum).
Impedance	100 ±5 ohms.
Sensitivity	1.5 volts peak-to-peak (minimum).
Output characteristics:	
Output voltage	Polar square wave of + and -6.0 ±0.6 volts do balanced to within ±10 percent of each other.
Receive line impedance.	6800 ±680 ohms shunted by not more than 300 picofarads.
Current......................	1 milliampere (nominal).
Impedance	100 ohms (maximum).
Short-circuit current.	100 milliamperes (maximum).
Waveform	Square wave symmetrical with respect to positive- and negative-going crossover within ±1% for baud rates up to 150 bauds.
Rise and fall time	Between 5 and 10 microseconds.
Discontinuity of waveform.	Not exceeding 0.5 microsecond at crossover point.
Open-circuit mark or space holding.	Open circuit maintains output at last operated condition (mark or space).

Table 2-1. Signal Level Converter Facility Technical Characteristics-Continued

Characteristic	Value
Hi/lo signal level converter card-Continued	
Special characteristics:	
Speed	45.5 to 150 bauds (22.5 to 75 cps square wave).
Cumulative average distortion	Less than 1 percent.
Lo/hi signal level converter card	
Height	2 3/4 in.
Width	5/8 in.
Depth	5 5/8 in.
Dc input power:	
+Mark condition	+ 14 volts dc at 20 milliamperes (maximum), -14 volts dc at 23 milliamperes (maximum).
- Space condition	+ 14 volts dc at 0 milliampere, -14 volts dc at 3 milliamperes (maximum).
Input characteristics:	
Loop voltage (mark or one).	+ 6 ±0.6 volts de.
Loop voltage (space or zero).	- 6 ±0.6 volts de.
Current	1 milliampere (nominal).
Impedance	6800 ±680 ohms shunted by not more than 300 picofarads.
Sensitivity	+0.5 to +6.0 volts read as mark or one. -0.5 to -6.0 volts read as space or zero.
Operation cutoff	Circuit will not operate with input voltage less than +0.3 and -0.3 volt.
Output characteristics:	
Loop voltages (polar).	±48, 50, 60, 80, and 130 volts dc.
Loop currents (polar).	20 and 30 milliamperes.
Loop voltages (neutral).	-or +120 or 130 volts dc.
Loop current (neutral).	60 milliamperes (nominal), 100 milliamperes (maximum).
Impedance	100 ohms or less.
Waveform rise and fall time (polar operation only).	Not less than 5 percent nor more than 8 percent at 150 bauds.
Open-circuit mark or space holding.	Open circuit maintains output at last operated condition (mark or space).
Special characteristics:	
Speed	45.5 to 150 bauds (22.5 to 75 cps square wave).
Distortion	Less than 1 percent

Section II. OPERATION

2-6. Operator's Controls and Indicators

a. Redundant Power Supply Unit. Operator's controls and indicators on the modules of the redundant power supply unit are illustrated in figure 2-4 and described in table 2-2. The unit contains four identical power supply modules and two identical common modules. These modules are designated by their positions in the power supply unit, position 1 on the left through position 6 on the right. The power supply modules at positions 1 and 2 and the common module at position 3 are one power supply. The common module at position 4 and the two power supply modules at positions 5 and 6 are the other power supply.

Table 2-2. Signal Level Converter Facility, Redundant Power Supply Unit, Operator's Controls and Indicators

Control or Indicator	Function
Power supply module (position 1)	
DC ON lamp	Indicates that positive dc voltage is applied to common module (position 3).
Power supply module (position 2)	
DC ON lamp	Indicates that negative dc voltage is applied to common module (position 3).
Common module (position 3)	
POS lamp	Indicates that positive bus voltage is supplied from positions 1 and/or 5.
NEG lamp	Indicates that negative bus voltage is supplied from positions 2 and/or 6.
AC lamp	Indicates that primary ac power is applied to power supply modules (positions 1 and 2).
GRD jack	Ground connection to module.
POS IN jack	Monitors positive input voltage supplied to module from power supply (position 1).
NEG IN jack	Monitors negative input voltage supplied to module from power supply (position 2).

Table 2-2. Signal Level Converter Facility, Redundant Power Supply Unit, Operators Controls and Indicators -Continued

Control or indicator	Function
Common module (position 3)-Continued-	
+14 jack	Monitors positive output voltage of module (bus voltage).
-14 jack	Monitors negative output voltage of module (bus voltage).
Common module (position 4)	
POS lamp	Indicates that positive bus voltage is supplied from positions 1 and/or 5.
NEG lamp	Indicates that negative bus output voltage is supplied from positions 2 and/or 6.
AC lamp	Indicates that primary ac power is applied to power supply modules (positions 5 and 6).
GRD jack	Ground connection to module.
POS IN jack	Monitors positive input voltage supplied to module from power supply (position 5).
NEG IN jack	Monitors negative input voltage supplied to module from power supply (position 6).
+ 14 jack	Monitors positive output voltage of module (bus voltage).
-14 jack	Monitors negative output voltage of module (bus voltage).
Power supply module (position 6)	
DC ON lamp	Indicates that positive dc voltage is applied to common module (position 4).
Power supply module (position 6)	
DC ON lamp	Indicates that negative dc voltage is applied to common module (position 4).

b. Fuse Panel. Operator's controls and indicators on the fuse panel are illustrated in figure 2-5 and described in table 2-3.

Table 2-3. Signal Level Converter Facility, Fuse Panel, Operator's Controls and Indicators

Control or indicator	Function
Negative and positive fuse banks,	Protect negative and positive busses supplying operating power to converter cards. One positive and one negative fuse protect six converter cards; if fuse blows, small flag is displayed to indicate blown fuse status, fuse alarm lamp lights, and remote power alarm circuit is actuated.
ALARM-PUSH TO TEST switch-Indicator.	a. Lights whenever a fuse blows. b. When depressed, simulates a blown fuse condition; lights with switch depressed to indicate proper functioning of alarm circuit in fuse panel and also actuates the remote power alarm circuit.

c. Signal Level Converter Cards. The hi/lo and lo/hi signal level converter cards each contain a front-panel NEUT-POL selector switch. This switch (fig. 2-2) enables the operator to select the operating mode of the converter card for either neutral or polar signals.

2-7. Operating Procedures

a. General. The facility is a passive device which performs its functions without the need of an operator in attendance. Primary ac power is applied to the power supplies in the signal level converter facility whenever the site is in operation. Indicator lamps are provided so that operating personnel can determine the status of the facility power functions. An alarm test is performed when it is desired to check operation of the alarm circuits. A switch on each signal converter card permits selection of polar or neutral mode of operation. Monitoring, alarm test, and operating mode procedures are given in the following paragraphs.

b. Monitoring Procedure. Monitor the signal level converter facility power system for normal operation as follows:

(1) At redundant power supply unit (fig. 2-4), observe that DC ON lamp is lit on each of the four power supply modules.

(2) Observe that AC, POS, and NEG lamps are lit on each of the two common modules.

(3) Observe that ALARM lamp on fuse panels (fig. 2-5) are out and that each fuse does not show its blown fuse indicator flag.

c. Alarm Test Procedure. Perform the alarm test on each fuse panel in the signal level converter facility as follows:

(1) At fuse panel (fig. 2-5), depress ALARM-PUSH TO TEST switch-indicator.

(2) Observe that ALARM lamp lights and remote power alarm circuit is actuated, indicating normal operation of alarm circuit.

d. Polar or Neutral Mode Selection Procedure. Select the mode of operation of the hi/lo and lo/hi converter cards (fig. 2-2) by setting the NEUT-POL switch to either NEUT for operation with neutral signals or POL for operation with polar signals. Figure 6-10 illustrates the strapping options for using the hi/lo converter card with various input currents and for positive mark or negative mark operation.

Section III. THEORY OF OPERATION

2-8. Scope of Facility Description

The signal level converter facility basically consists of two functional systems. As shown in the block diagram (fig. 2-3), one system is the signal level converter, which provides interface between the low-level circuits utilized within the AUTODIN center and the high-level circuits for the AN/FCC-19 equipment and signal circuits external to the center. The other is the power system, which provides operating power to the signal level converter cards and also actuates an alarm circuit whenever a loss of operating power occurs or a fuse blows. This section provides block diagram descriptions of the power system of the signal level converter facility, and also contains block diagrams of three components in the facility; the hi/lo converter card, the lo/high converter card, the power supply module, and the common module in the redundant power supply unit.

2-9. Power System, Block Diagram Description

The power system (fig. 6-1) converts primary ac power into +14.2- and -14.2-volt dc operating power and routes the positive and negative power through the fuse panel to the signal level converter cards in the facility. This system also provides fuse protection for the cards. If a fuse blows, a power supply fails, or the dc operating voltages fall below preset values, the applicable condition is sensed by failure detection circuits, and the local and remote alarm circuits are actuated. The basic power system consists of the six modules in the redundant power supply and the fuse panel.

a. Redundant Power Supplies.

(1) The power system contains four identical power supply modules which provide +15 and -15 volts dc. Figure 2-6 is a simplification of part of figure 6-1, and illustrates how the power supplies are connected in a redundant configuration. The output of each power supply is floating. Grounding one side of the output on the receptacle of each module causes the module to be positive or a negative supply, depending on the position of the module in the shelf. Consequently, each power supply furnishes, to the common modules, either + 15 or -15 volts dc with reference to signal ground.

(2) The positive output of the power supply (position 1) is fed through isolation diode CR7 in the common module (position 3) to the positive bus of the fuse panel. Similarly, the positive output of the positive power supply (position 5) is fed through isolation diode CR7 in the, common module (position 4) to the positive bus of the fuse panel. Output current front power supply passes through both diodes CR7 in a forward direction, and both currents combine at the positive bus of the fuse panel. The voltage drop through a diode is approximately 0.8 volt. The isolation diodes prevent circulating currents between the power supplies in the event one power supply output differs from the other. In this manner, circuit power on the positive bus remains unaffected even if one of the power supplies fails. Diodes CR6 in each common module operate in an identical manner with respect to the negative power supplies at positions 2 and 6.

(3) Zener diode CR8 in each common module is provided for protection of the converters against high voltages. In normal operation, the Zener diode is not actuated. In case the power supply voltage rises above 18 volts, due to failure in the power supply, the zener diode operates and keeps the bus voltage at 18 volts. Diode CR8 in the common module (position 3) protects the positive dc bus, and diode CR8 in the common module (position 4) protects the negative dc bus.

b. Power Distribution. The fuse panel (fig. 6-1) provides fuse protection for the positive and negative busses and distributes the operating power to the signal level converter cards. The panel contains is as many as 20 fuses for -each bus (one typical positive fuse and one typical negative fuse as shown in fig. 6-1). One positive fuse and one negative fuse protect the power lines which feed a group of six signal level converter cards. If a malfunction in a card occurs which causes the fuse to blow, the spring-loaded fuse opens (F1, for example) and automatically connects the bus voltage to the alarm relay in the fuse panel. The energized alarm relay actuates the local and remote alarm circuits in the common module. Any fuse, when blown, will actuate the fuse alarm circuit. A detailed description of the fuse alarm circuit is given in paragraph 2-9c (3).

c. Power Alarms. The power system contains circuits which provide local and remote alarms whenever a malfunction occurs in the system. Alarm circuits are actuated when one or more of the power supply modules fails, when one or more output voltages from the power supply modules is above or below a preset limit, or when a fuse opens in the fuse panel. Relay K3 in common module (position 3) is in the energized state during normal (nonalarm) conditions and is deenergized during alarm conditions (fig. 6-1). The following paragraphs describe in detail how the alarm circuits control relay K3 in common module (position 3) during normal (nonalarm) conditions and then how the circuits operate for each alarm condition.

(1) *Normal (nonalarm) operation*. Seven relays are used in the alarm circuits, three in each of the two common modules and one in the fuse panel (fig. 6-1). Table 2-4 lists the status of each relay during normal operation. Basically, relay K3 in common module (position 3) and relay K3 in common module (position 4) must be energized in the no alarm condition.

Table 2-4. Power Alarm System, Status of Relays During Nonalarm Conditions

Components	*Relay*	*Status*
Common module (position 3) ...	K1	Deenergized
	K2	Deenergized
	K8	Energized
Common module (position 4) ...	K1	Deenergized
	K2	Deenergized
	K3	Energized
Positive fuse panel	K1	Deenergized

(*a*) *Relay K3, common module (position 3).* This relay remains energized if the positive bus voltage is applied to one side of the coil and the negative bus voltage is applied to the other side of the coil. Positive voltage is applied through normally closed contacts of relays K1 and K2 in the module. Negative voltage is applied from the negative bus through the upper contacts of normally deenergized relay K1 in the fuse panel and normally energized relay K3 in common module (position 4). Thus a current loop is completed from the positive bus, through relay K3, and back to the negative bus.

(*b*) *Relay K3, common module (position 4).* Positive voltage is applied to this relay in the same manner as described for relay K3 in common module (position 3). Negative voltage is applied directly from the negative bus. Thus a current loop is also completed from the positive bus, through relay K3, to the negative bus.

(2) *Alarm operation for incorrect power supply voltage.*

(*a*) Relays K1 and K2 in common module (position 3) provide the following alarm functions: K1 (energized) lower negative output of power supply (position 2) or higher positive output of power supply (position 1); K2 (energized) lower positive output of power supply (position 1) or higher negative output of power supply (position 2). Similarly, relays K1 and K2 in common module (position 4) provide alarm functions for negative power supply (position 6) and positive power supply (position 5). To simplify the discussion, only one of the common modules is considered, and only one of the circuits in the module is described in detail since both of the circuits function in the same manner.

(*b*) The output of the negative and positive power supplies (fig. 6-1) are applied to sensitivity control resistor R5 in common module (position 3). This resistor is adjusted to provide a control voltage to the base of transistor switch Q1, which maintains the transistor in the cutoff state. With switch Q1 open, no current flows through relay K1 since the relay is in series with the transistor switch. Positive power is therefore applied to relay K3. If the negative power supply output drops or fails, or if the positive power supply output voltage rises, the positive voltage is applied to the base of switch Q1, causing it to saturate. Relay K1 energizes, breaking the circuit between the positive bus and relay KS, and relay K3 deenergizes to actuate the alarm circuits. Since the contacts of relays K1 and K2 are connected in series, an alarm will be produced if either one of the relays becomes energized.

(3) *Alarm operation for an open fuse*.

(*a*) If a fuse in the fuse panel opens, a spring contact, which forms an integral part of the fuse, makes contact with a blown fuse alarm bus. As shown in figure 6-1, if positive fuse F1 fails, positive voltage is applied to one coil of alarm relay K1. Similarly, if negative fuse F21 opens, negative voltage is applied to the other coil of the relay.

(*b*) With the circuit of alarm relay K1 closed, the relay energizes. This action breaks the circuit between the negative voltage bus and the closed contact of relay KS (relay in energized position) in common module (position 4.) Negative voltage is thus removed from relay K3 in common module (position 3), the relay deenergizes, and the alarm circuits are actuated. At the same time, ground is applied through the contacts of now-energized relay K1 in the fuse panel to ALARM lamp DS1 on the front of the fuse panel, to indicate that one of the fuses has opened.

(*c*) The fuse panel contains an alarm test circuit. The ALARM-PUSH TO TEST switch-indicator S1, part of the alarm indicator, is connected between the negative power bus and the negative blown fuse bus. When the switch is depressed, voltage is applied to relay K1 on the fuse panel, simulating a blown fuse on the negative bus. Since the switch is in parallel, the alarm operation is the same as described in (a) and (b) above.

d. 15-Volt Dc Power Supply Module. The 15-volt dc power supply (fig. 2-7) provides a highly regulated dc output voltage to the common module in the redundant power supply unit. The power supply module consists of a main power supply with voltage regulator and associated comparison bridge, a current limiter, and auxiliary power supplies.

(1) *Main power supply with voltage regulator and comparison bridge.*

(*a*) The main dc power output is produced by a full-wave rectifier, consisting of diodes CR204 and CR205. This output is supplied through a series regulator, consisting of power transistors Q101 and Q102, to the output terminals of the power supply. The series regulator, which is connected in series with the external load, maintains a constant output by varying its resistance. If the output voltage tends to increase, the resistance of the series regulator increases, causing an increased voltage drop across the series regulator, and reducing the voltage at the power supply output to its original value. If the output voltage tends to decrease, the resistance of the series regulator decreases, thus increasing the voltage at the power supply output.

(*b*) Variation of the series regulator resistance is accomplished by applying the output voltage to a comparison bridge which produces an error signal whenever the output voltage changes. This error signal is amplified by stages Q207, Q208, and Q202 and is applied to base driver Q203. The base driver controls the conduction of series regulator transistors Q101 and Q102, causing the voltage drop across the series regulator to compensate for any output voltage variations.

(*c*) The comparison bridge consists of zener diode CR212 (E_r), reference resistor R224 (R_R), the output load (E_O), and the voltage output control resistance R226 (R_{VC}). As shown in figure 2-8, a reference voltage E_r (established by the zener action of CR212) in series with the reference resistance (RR) is continuously compared with the output voltage (E_o) in series with the voltage control resistance (R_{VC}). At balance, a constant bridge current (I_b) flows through the bridge, keeping the error signal at bridge terminals A and B at approximately 0 volt. When the load current changes, the voltage across the external load will tend to change the constant bridge current through the load and R_{VC} and thereby produce an error signal at bridge terminals A and B. This error signal then regulates the output voltage as described in (b) above.

(2) *Current limiter.* Differential amplifier Q205 and Q206 and current overload amplifier Q204 comprise the current-limiting circuit. The base of stage Q206 is held at a voltage determined by the setting of current-limiting potentiometer R221, and the base of stage Q205 senses the voltage across current-sensing resistor R219. If an over-current condition exists, the voltage drop across resistor R219 will exceed the voltage determined by the setting of potentiometer R221. When this occurs, the base of Q205 becomes more positive, and Q205 conducts while Q206 is driven toward cutoff. Amplifier Q204, which was held at cutoff, now conducts. Error amplifier Q202 and base drive amplifier Q203 conduct more heavily and drive series regulators Q101 and Q102 toward cutoff, thus reducing the output current.

(3) *Auxiliary power supplies*. Within the 15-volt power supply module (fig. 2-7) there are three auxiliary power supplies: amplifier power supply, base drive amplifier power supply, and bias power supply. These power supplies provide operating voltages to the various circuits in the module. The amplifier power supply consists of full-wave rectifiers CR201 and CR202. Series regulator Q201 and zener diodes CR209 and CR210 provide regulated voltage for the error amplifiers Q202, 207, and 208, the current limiter Q204, the differential amplifiers Q205 and Q206, and the comparison bridge. The base drive amplifier power supply consists of half-wave rectifier CR203 and filter capacitor C202 and provides +11 vdc to base drive amplifier Q203. The bias power supply consists of full-wave rectifiers CR206 and CR207 and filter capacitor C204. This power supply produces a -40-volt bias voltage for series regulators Q101 and Q102.

e. Hi-/lo Signal Level Converter Card.

(1) The hi/lo signal level converter card (fig. 2-9 and 6-10) receives a high-level polar or neutral input signal and converts either signal to a low-level polar square-wave output signal. The card basically contains an input network, Schmitt trigger, relay driver, output pulse-generating relay, and output pulse-shaping circuits. Two strapping option connections and a mode select-or switch are incorporated in the card to allow for operation with either neutral or polar input signals.

(2) The high-level neutral or polar signals are applied across voltage divider R8 and R12. For operation with high-level polar input signals of 20 or 30 milliamperes, terminal A is strapped to terminal C. These signals develop a voltage of 2.0 or 3.0 volts, respectively, across the full voltage divider. The full signal is applied through resistor R6 to transistor Q1 of the Schmitt trigger. For operation with neutral input signals of 60 milliamperes, terminal B is strapped to terminal C. This signal develops a voltage of 2.4 volts across resistor R12 because of the voltage divider action of resistors R8 and R12. This voltage, at terminal B, is applied through resistor R6 to the Schmitt trigger.

(3) NEUT-POL switch S1 is set to the position which is compatible with the type of input signal applied, either neutral or polar.

When set to the NEUT position, one of two bias voltages is taken from voltage divider network R1, R9, and R13 and applied via the switch to the Schmitt trigger. For operation in the neutral mode with positive mark signals, terminal E is strapped to terminal F. For operation in the neutral mode with negative mark signals, terminal D is strapped to terminal F. When switch S1 is set to the POL position for operation with polar signals, bias for the Schmitt trigger is taken from balance control potentiometer R9.

(4) Transistors Q1 and Q2 comprise the Schmitt trigger, which controls relay driver Q3. When balance control potentiometer R9 is properly adjusted for polar operation, the Schmitt trigger remains in its last switched state. A feature of the Schmitt trigger is that it does not switch state unless the input signal voltage actually crosses 0 volt with respect to signal common (change from mark polarity to space polarity or the reverse). The Schmitt trigger therefore remains in its last switched state when the input signal is completely removed.

(5) Relay driver Q3 and the coil of relay K1 are connected in series across the positive and negative 14-volt busses. As the Schmitt trigger changes state in response to the input signal, it applies a gate signal which alternately drives the relay driver to cutoff and saturation. With Q3 conducting, +14 volts operating power is applied to the positive terminal of relay K1, energizing the relay. When Q3 is cut off, the relay returns to the deenergized state. Relay K1 is deenergized for a positive input to the card and energized for a negative input. The relay armature alternately selects +low voltage and -low voltage and provides a low-level square-wave output corresponding to the original high-level input. Output bias distortion control R17 compensates for relay irregularities which produce bias distortion during operation.

(6) Lamp DS1 performs two functions. It acts as a current-limiting device to protect the contacts of relay K1 and the + and - low battery lines from short circuits while maintaining a very low resistance with normal loads of approximately 1 milliampere. It also forms part of a resistive-capacitive output waveform shaping network for the + low battery line. The network consists of lamps DS1 and DS2 and capacitor C4. Resistor R11, capacitor C2, resistor R16, and capacitor C3 are provided for contact protection.

f. Lo/hi Signal Level Converter Card.

(1) The lo/hi signal level converter card (fig. 2-10 and 6-11) receives a low-level polar square-wave signal and converts it to a high-level polar or neutral output signal. The card basically contains a Schmitt trigger, relay driver, output pulse-generating relay, and output pulse-shaping circuits. A strapping option connection capability and a mode selector switch are incorporated to allow for generation of either neutral or polar output signals.

(2) The low-level polar signal is applied to Schmitt trigger Q1 and Q2, which controls relay driver Q3. When balance control potentiometer R8 is properly adjusted, the Schmitt trigger remains in its last switched state. A feature of the Schmitt trigger is that it does not switch state unless the input signal voltage actually crosses 0 volt with respect to signal common (change from mark polarity to space polarity or the reverse). The Schmitt trigger remains in its last switched state when the input signal is completely removed.

(3) Relay driver Q3 and the coil of relay K1 are connected in series across the positive and negative 14-volt busses. As the Schmitt trigger changes its state in response to the input signal, it applies a gate signal which alternately drives the relay driver to cutoff and saturation. With Q3 conducting, operating power is applied to relay K1, energizing the relay. When Q3 is cut off, the relay returns to the deenergized state. Relay K1 is deenergized for a negative (space) input to the card and energized for a positive (mark) input. The relay armature alternately selects - and + high-level battery voltages and provides a high-level polar or neutral output, depending on the high-level battery supplied, corresponding to the original low-level input.

(4) Output bias distortion control R14 compensates for relay irregularities which produce bias distortion during operation in the polar mode (NEUT-POL switch in the POL position). For operation in the neutral mode (switch in the NEUT position), neutral output signals require the contacts of relay K1 to remain in the normally open (NO) position for a longer interval in order to compensate for relay dead time and consequent increased bias distortion.

(Dead time is defined as the interval between break and make of the relay contacts.) During polar operation this dead time has little effect because capacitor C1 (fig. 6-11) in the shaping network maintains full output voltage when the relay armature moves from one contact to the other. R1 and C1, mounted on the rear side of the shelf, form the shaping network for the lo/hi signal converter card in the shelf. Resistors R2 through R6 and capacitors C2 through C6 are associated with the remaining five lo/hi signal converter cards in the shelf. During neutral operation capacitor C1 is disconnected from the shaping network, and dead time becomes a critical factor.

(5) In neutral operation the output voltage drops to zero the instant the armature leaves the NO position. This minute difference is sense(l as bias distortion. With switch S1 in the NEUT position, bias distortion is compensated for by relay bias control R12 and an associated diode, which provide a path for the reverse current generated by the collapsing field of relay K1. Resistor R12 controls the reverse current to regulate the increased time interval the armature of relay K1 will remain connected to the NO contacts during neutral mode output operation.

(6) Resistors R10 and R16 act as current-limiting devices to protect the contacts of relay K1 and the + and - high battery lines from short circuits. The resistor/capacitor combinations R11/C2 and R15/C3 are provided to protect the contacts of relay K1.

Section IV. MAINTENANCE

2-10. Scope of Maintenance

This section provides instructions for performing preventive and corrective maintenance of the facility. Preventive maintenance includes visually inspecting the equipment and checking the redundant power supply unit for proper voltages and resistances. Corrective maintenance includes troubleshooting, repair, and adjustment of the facility components. Parts location illustrations are provided to facilitate maintenance.

2-11. Maintenance Aids

a. Maintenance aids used for checking, troubleshooting, repair, and adjustment of the facility are listed in table 2-5.

Table 2-5. Signal Level Converter Facility Maintenance

Name	Use
Multimeter, Simpson model 260.	Measurement of ac and dc voltages, dc current, and resistance.
AC/DC differential voltmeter, Fluke model 803B.	Precision measurement of ac and dc voltages.
Diode substitution module (Philco-Ford dwg No. 368-43417).	Paralleling the diodes in the common module.
Power supply extender circuit card assembly (Philco-Ford dwng no. 368-43259).	Provides accessibility to test points on modules in the redundant power supply unit.
DC/DC converter extender card assembly (Philco-Ford dwg No. 398-8981).	Provides accessibility to test points on module(s in the dc/dc converter card shelf.

b. The purpose of the diode substitution module (fig. 2-11) listed in the table is to parallel the isolation diodes (CR6-CR7) of one of the common modules (fig. 6-8 and fig. 6-13) during preventive or corrective maintenance, thus ensuring a complete circuit through the common module regardless of whether one or more isolation diodes are open ill the module.

c. The diode substitution module consists of two diodes (1N1614) mounted in a small unit having four prongs. The prongs are positioned so that the unit plugs into the POS IN, +14, NEG IN, and - 14 test jacks located on the front of the common modules (fig. 2-4). These test jacks are TP1, TP3, TP2, and TP3, respectively. Figures 6-8 and 6-13 show that these test jacks are on each side of isolation (diodes CR6 and CR7.

d. The power supply and dc/dc extender card assemblies listed in the table provide a convenient method of testing modules during preventive and corrective maintenance procedures.

Therefore, whenever a voltage or resistance measurement must be made on the modules contained in the redundant power supply unit or the dc/dc converter card shelf, use the appropriate extender card.

2-12. Preventive Maintenance

a. Visual Inspection. Perform a visual inspection of the facility equipment cabinet (fig. 2-1) once a week, as follows:

(1) Open cabinet doors and check to see that power supply unit, fuse panels, and other components are securely mounted in place. Make sure that all hardware is tight.

(2) Make sure that all signal level converter cards are securely inserted in shelves.

(3) Check to see that wiring is neat and orderly and without excessive slack.

(4) Make sure that all pins are firmly inserted in taper pin blocks on the rear of the fuse panel.

(5) Make sure that all markings are clean and legible.

(6) Inspect cabinet for dirt and foreign matter; clean if necessary.

(7) Check to see that doors operate easily and that the hinges are not loose.

b. Redundant Power Supply Unit Voltage and Resistance Checks. Perform voltage and resistance checks of the redundant power supply unit (fig. 2-4) once a month, as follows:

NOTE

Do not remove any module of the redundant power supply unit before performing voltage checks of both common modules.

(1) *Voltage checks.*

(a) Using the Fluke differential vtvm, perform voltage checks on common module (positive 3) at the test points given in table 2-6. If voltage readings vary from those given in the table, proceed as directed in paragraph 2-13a(3) (troubleshooting) or paragraph 2-13-b (adjustment) as applicable.

(*b*) Repeat the voltage checks in (a) on common module (position 4).

Table 2-6. Common Module Voltage Readings

Test point	*Voltage*
POS IN and GRD	+ 15 ±0.2 vdc
NEG IN and GRD	- 15 ±0.2 vdc
+14 and GRD	+ 14.2 ±0.5 vdc
- 14 and GRD	- 14.2 ±0.5 vdc

(2) *Resistance checks*. Resistance checks of the redundant power supply consists of measuring the forward and reverse resistance of the common module isolation diodes.

NOTE

Do not perform isolation diode resistance checks before performing the voltage checks in (1) above.

(*a*) *Common module (position 3).*

1. Plug diode substitution module into test points TP1, TP3, TP2, and TP5 of common module (position 4). (The diode substitution module plugs into the four test points simultaneously.)

2. Remove common module (position 3) from redundant power supply unit.

3. Using Simpson multimeter model 260, set on the R x 1 scale, perform resistance checks at the test points given in table 2-7. If diode is faulty, replace common module with an operational unit and repair faulty unit.

(*b*) *Common module (position 4):*

1. Plug diode substitution module into test points of common module (position 3).

2. Remove common module (position 4) from redundant power supply unit.

3. Repeat step (a)3 above

Table 2-7. Resistance Test of Isolation Diodes in Common Module

Test point	*Diode current direction*		*Resistance*
NEG IN and -14	CR-6	Forward	9 ±4 ohms
		Reverse	>500 ohms
POS IN and + 14	CR-7	Forward	9 ±4 ohms
		Reverse	>500 ohms

2-13. Corrective Maintenance

a. Troubleshooting.

(1) *General. The* most probable causes of trouble are loss of a signal as the result of a defective signal level converter card or loss of a group of six signals as the result of a blown fuse on one of the fuse panels. A trouble will normally manifest itself as a malfunction associated with some other subsystem at the AUTODIN site or equipment external to the AUTODIN center. Troubleshooting information is limited to detection of a malfunction within the signal level converter facility. Before using this information, it is necessary to first establish that the trouble is definitely due to a malfunction in the signal level converter facility rather than a malfunction elsewhere in the site or at the external equipment. For system troubleshooting information, refer to TM 11-5895-391-15.

(2) *Facility troubleshooting*. Procedures for locating troubles within the signal level converter facility are given in table 2-8. The redundant power supply unit (fig. 2-4) should be checked to see that all lamps are illuminated. If one of the power supply modules is defective, the signal level converter facility will still operate normally because the redundant arrangement insures that operating power will still be fed to the signal level converter cards. If any indicator is not illuminated, troubleshooting must be performed on the redundant power supply unit. Any fault which occurs in the ac or dc power distribution circuits of the signal level converter facility will activate an alarm. To facilitate troubleshooting, simplified schematic diagrams of alarm relay K3 in common module (position 3) and alarm relay K3 in common module (position 4) are provided in figure 2-12.

WARNING

If necessary to work on ac terminals containing primary voltage, use insulated tools.

Table 2-8. Signal Level Converter Facility, Troubleshooting Procedures

Symptom	***Probable trouble***	***Corrective measure***
Loss of signal through one signal level converter card.	(1) Defective card (2) Defective wiring in equipment cabinet or between cabinet and associated distribution frame.	(1) Replace card. (2) Perform continuity check using multimeter. Refer to cabling diagram figure 6-3.
Loss of signals through six signal level converter cards; ALARM indicator illuminated on fuse panel.	Open fuse	Check fuse panel for flag indicator showing a blown fuse. Replace fuse.
Loss of signals through all signal level converter cards.	Loss of primary ac power to facility.	Check to see that AC indicators on both common modules are illuminated. If not, ac power is not being applied to redundant power supply units. Check ac distribution and/or cabling. (Refer to the applicable Site supplement manual.)
All signal level converter cards operate normally; one or more DC ON indicators on redundant power supply unit is not illuminated, but AC indicators are illuminated.	Malfunction in redundant power supply unit.	Perform troubleshooting of redundant power supply module. Refer to table 2-9.

(3) *Redundant power supply unit troubleshooting.* Procedures for troubleshooting the redundant power supply unit are given in table 2-9. Modules in the power supply unit are designated by their position in the unit, position 1 on the left through position 6 on the right (fig. 2-4).

NOTE

Before proceeding with table 2-9, perform the tests listed in paragraph 2-12b.

Table 2-9. Signal Level Converter Facility, Redundant Power Supply Unit Troubleshooting Procedures (fig. 6-8)

Symptom	***Probable trouble***	***Corrective measure***
A. Same voltage level between: TP4 and TP2, TP5 TP4 and TP1, TP3	Shorted isolation diode: CR6 CR7	Perform resistance check (para 2-12b(2)).
B. Incorrect voltage levels.	(1) Power supply output voltage improperly adjusted.	Adjust power supply output voltage (para 2-13b).
	(2) Trouble in power supply.	(*a*) Insert diode substitution module in common module 3 or 4 as follows: Position 4, if removing power supply (position 1 or 2). Position 3, if removing power supply (position 5 or 6). (*b*) Replace power supply.
C. No voltage on TP1 (POS IN) or TP6 (NEG IN) of common module (position 3 or 4).	(1) Blown fuse F101 in power supply.	(*a*) Perform B(2)(a). (*b*) Replace fuse.
	(2) Trouble in power supply.	Perform B(2).
D. AC INDICATOR of common module not illuminated but correct dc voltages measured on test points on common module.	Defective AC lamp (DS1) in common module.	Replace DS1.
E. DC ON indicator of power supply module not illuminated but correct dc voltage measured on associated test point (NEG IN or POS IN) of common module.	Defective DC ON lamp (DS101).	(*a*) Same as B(2)(a). (*b*) Remove power supply unit and replace DS101.
F. POS or NEG lamp on one of common modules not illuminated.	Defective POS (DS3) or NEG (DS2) lamp.	Replace lamp DS3 or DS2.

(4) *Power supply module troubleshooting.* Modules will be removed from facility for repair, troubleshooting, and adjustment of the current-limiting resistor (R221); and an operational module will be inserted in its place. Information helpful in troubleshooting may be found in the block diagram discussion (para 2-9), the schematic diagram (fig. 6-7), and parts location illustration (fig. 2-13).

NOTE

External provisions have not been provided for adjusting R221.

(5) *Fuse panel troubleshooting.* Procedures for troubleshooting the fuse panel (fig. 2-5) are given in table 2-10. The alarm test procedure given in paragraph 2-7c can be performed at any time to check the alarm circuit in the fuse panels (fig. 6-9).

b. Adjustment of Power Supplies. Procedures for adjusting the output of the power supply modules in the redundant power supply unit are given in the following paragraphs. Positive power supply (position 1) and negative power supply (position 2) are monitored at front panel pin jacks of common module (position 3). Positive power supply (position 5) and negative power supply (position 6) are monitored at common module (position 4). (Module positions in the redundant power supply unit are designated 1 through 6 from left to right.)

NOTE

Perform tests in paragraph 2-12b before adjusting power supplies.

Table 2-10. Signal Level Converter Facility, Fuse Panel Troubleshooting Procedures

Symptom	*Probable trouble*	*Corrective measure*
Alarm lamp (DS1) not illuminated when PUSH-TO-TEST switch (S1) is closed.	DS-1 defective .	Replace DS-1.
	Coil of relay (K1) in negative power line defective.	Remove panel and replace K1.
Alarm lamp (DS-1) not illuminated when negative or positive fuse is blown.	DS-1 defective	Replace DS-1.
	Coil of K1, in negative or positive power line, defective.	Remove panel and replace K1.
	Blown fuse not contacting alarm bus.	Clean alarm bus with approved cleaner.
Alarm lamp DS-1 illuminated when fuse is not blown.	Short between power and alarm bus.	Remove panel and visually inspect for short circuit. Clear short circuit.

(1) *Power supply (position 1).*

(*a*) Connect differential voltmeter to + 14 and GRD pin jacks on common module (position 3).

(*b*) Pull out positive power supply module (position 5) until DC ON indicator goes out.

(*c*) Observe voltmeter reading of the paralleled positive power supply (position 1). If voltmeter does not indicate +14.2 ±0.5 vdc, perform steps (d) through (g).

(*d*) Insert power supply module (position 5), and remove power supply module (position 1).

(*e*) Adjust resistor R226 at rear of power supply module position 1 (fig. 2-13), and replace power supply module in position 1.

(*f*) Pull out power supply module (position 5), and observe voltmeter reading.

(*g*) If voltmeter does not indicate + 14.2 ±0.05 vdc, repeat steps (d) through (f) until correct indication is obtained.

(*h*) Replace power supply module (position 5).

(2) *Power supply (position 2).*

(*a*) Connect voltmeter to -14 and GRD pin jacks on common module (position 3).

(*b*) Pull out negative power supply module (position 6) until DC ON indicator goes out.

(*c*) Observe voltmeter reading of the paralleled negative power supply (position 2). If voltmeter does not indicate -14.2 vdc, proceed with steps (d) through (f).

(*d*) Insert power supply module (position 6), and remove power supply module (position 2).

(*e*) Adjust resistor R226 at rear of power supply module (position 2) (fig. 2-13), and replace power supply module in position 2.

(*f*) Pull out power supply module (position 6), and observe voltmeter reading.

(*g*) If voltmeter does not indicate -14.2 ±0.05 vdc, repeat steps (d) through (f) until correct indication is obtained.

(*h*) Replace power supply module (position 6).

(3) *Power supply (position 5).*

(*a*) Connect differential voltmeter to +14 and GRD pin jacks on common module (position 4).

(*b*) Pull out positive power supply module (position 1) until DC ON indicator goes out.

(*c*) Observe voltmeter; proceed with steps (d) through (*f*) if voltmeter does not indicate 14.2 ±0.05 vdc.

(*d*) Insert power supply module (position 1), and remove power supply module (position 5).

(*e*) Adjust resistor R226 at rear of power supply module (position 5) (fig. 2-13), and replace power supply module in position 5.

(*f*) Pull out power supply module (position 1) and observe voltmeter.

(*g*) If voltmeter does not indicate 14.2 ±0.05 vdc, repeat steps (d) through (f) until correct indication is obtained.

(*h*) Replace power supply module (position 1).

(4) *Power supply (position 6).*

(*a*) Connect voltmeter to -14 and GRD pin jacks on common module (position 4).

(*b*) Pull out negative power supply module (position 2) until DC ON indicator goes out.

(*c*) Observe voltmeter; proceed with steps (d) through (f) if voltmeter does not indicate 14.2 ±0.05 vdc.

(*d*) Insert power supply module (position 2), and remove power supply module (position 6).

(*e*) Adjust resistor R226 at rear of power supply module (position 6) (fig. 2-13), and replace power supply module in position 6.

(*f*) Pull out power supply module (position 2) and observe voltmeter.

(*g*) If voltmeter does not indicate 14.2 ±0.05 vdc, repeat steps (d) through (f) until correct indication is obtained.

(*h*) Replace power supply module (position 2).

c. Repair. Modules will be removed from facility for repair and an operational module inserted in its place.

d. Parts Location Diagrams. Parts location diagrams of the 15-volt power supply module, common module, fuse panel, hi/lo converter module, and lo/hi converter module are shown in figures 2-13 through 2-17.

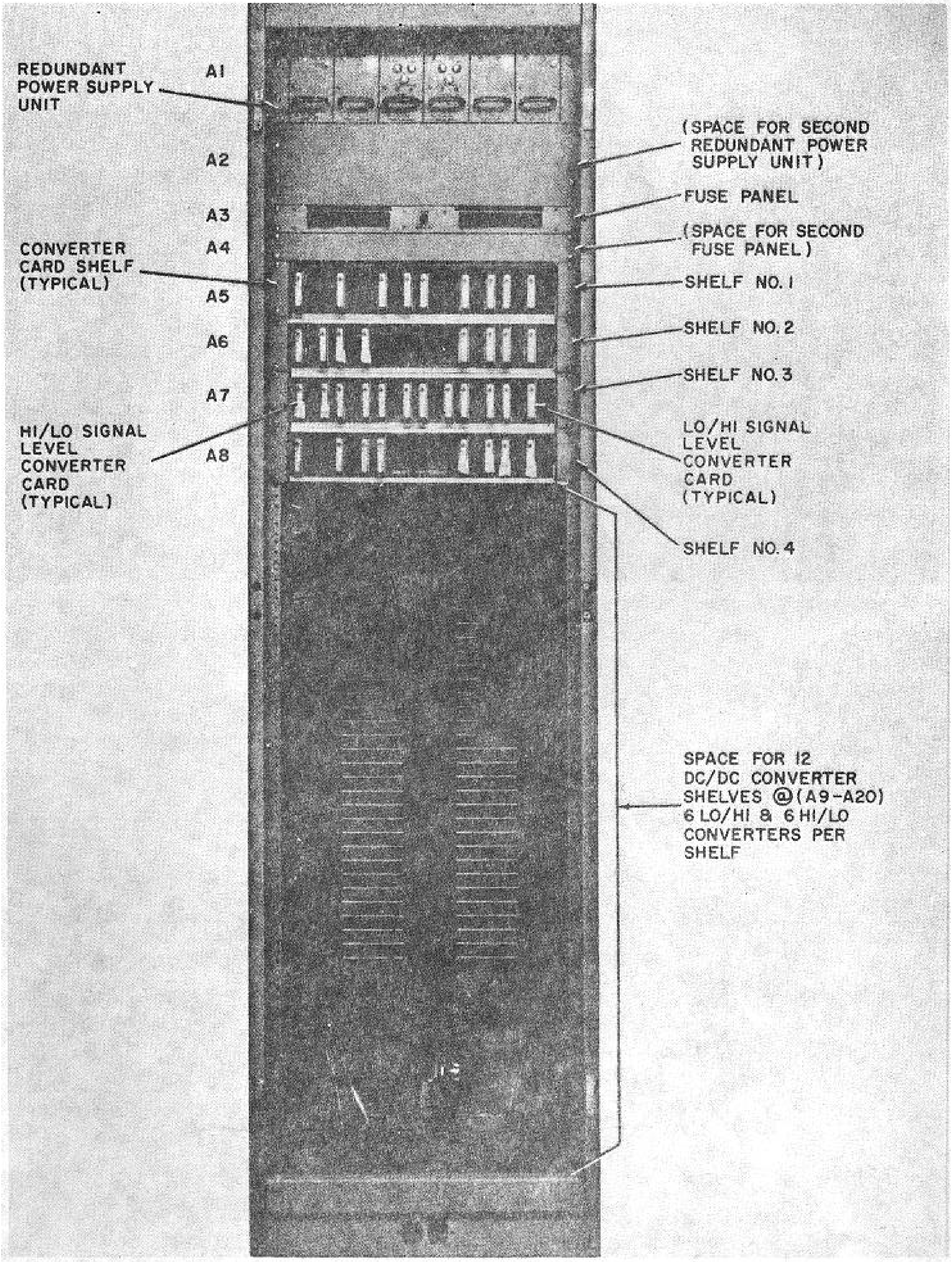

Figure 2-1. Signal level converter facility (typical), showing locations of assemblies.

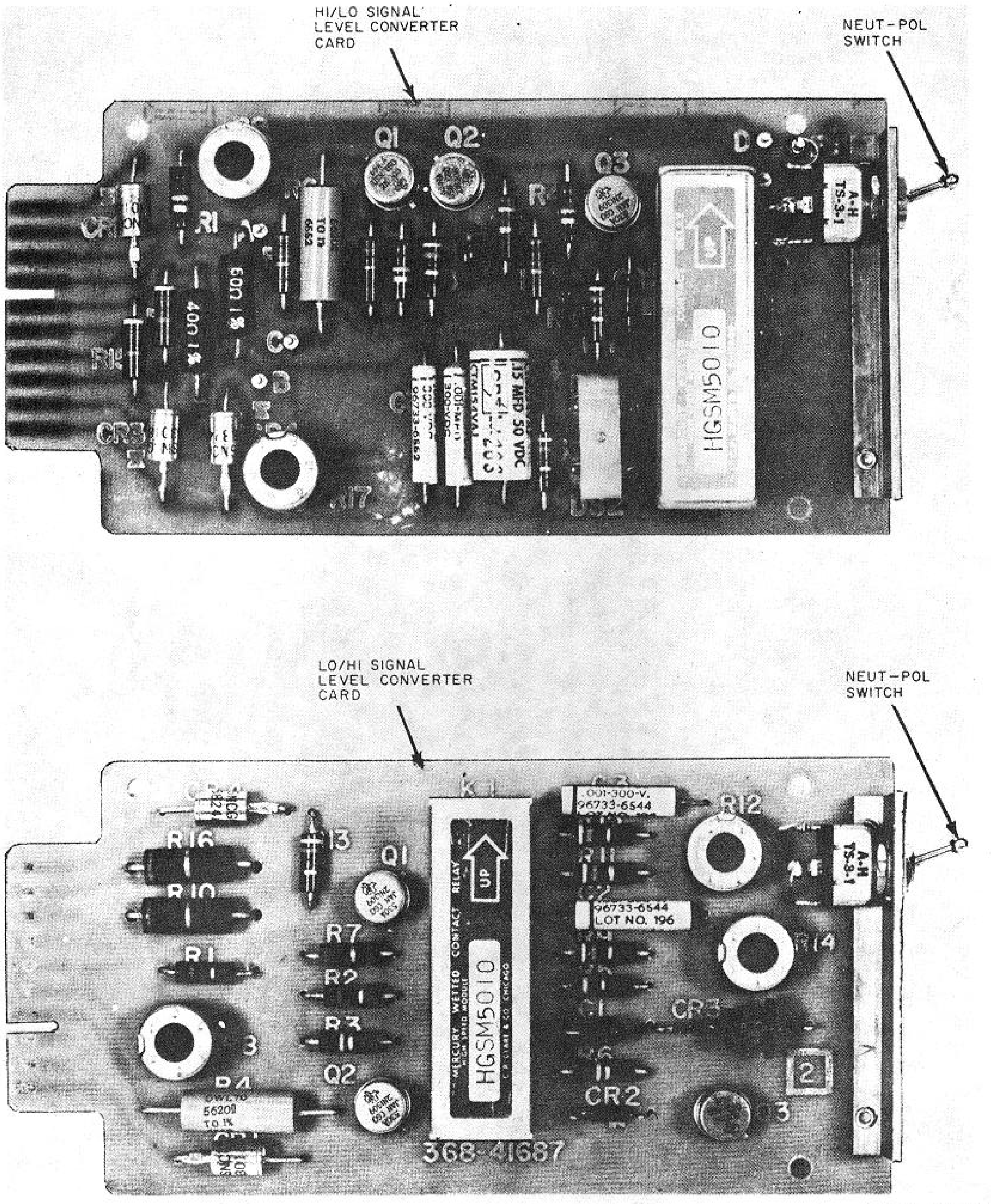

Figure 2-2. Signal level converter printed-circuit cards.

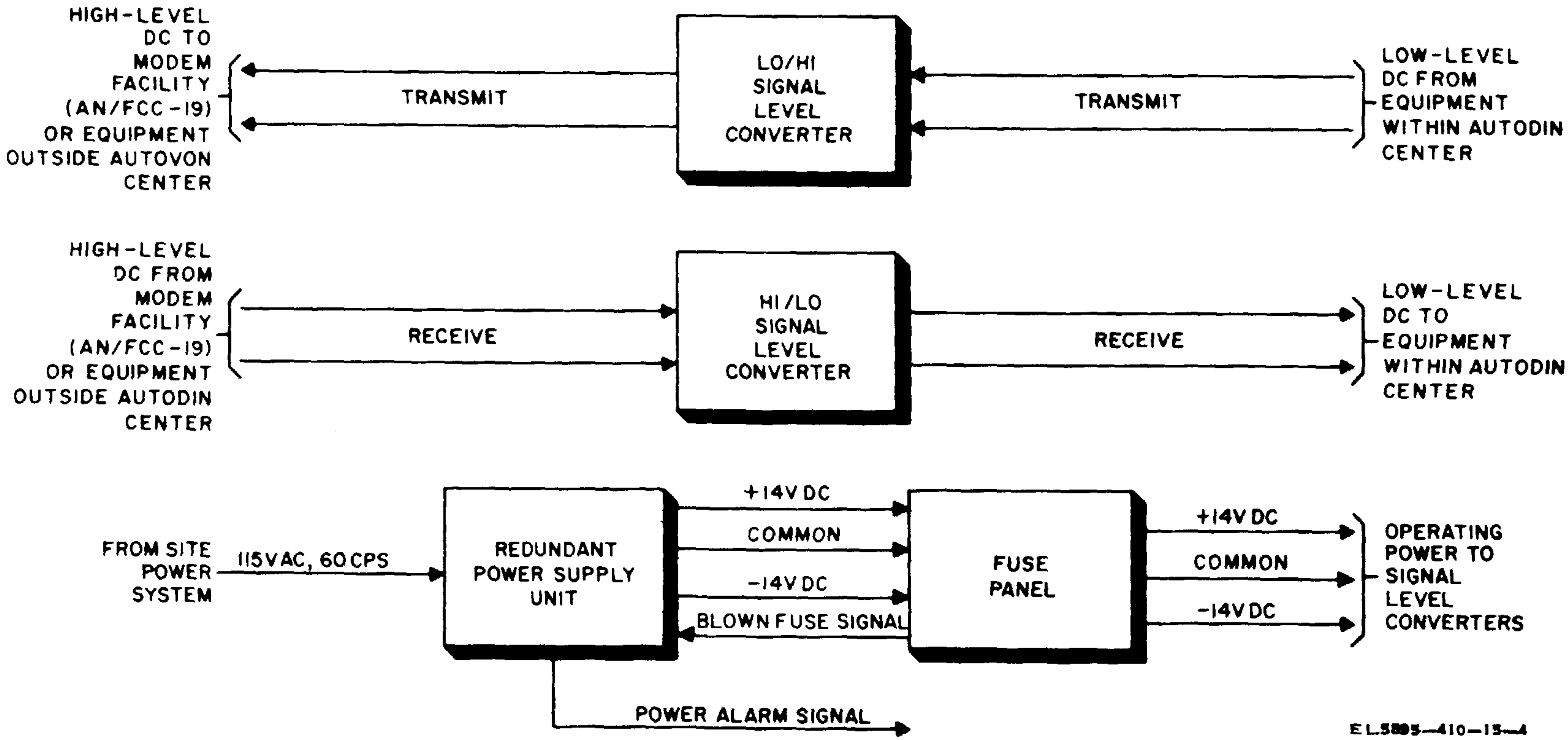

Figure 2-3. Signal level converter facility, functional block diagram.

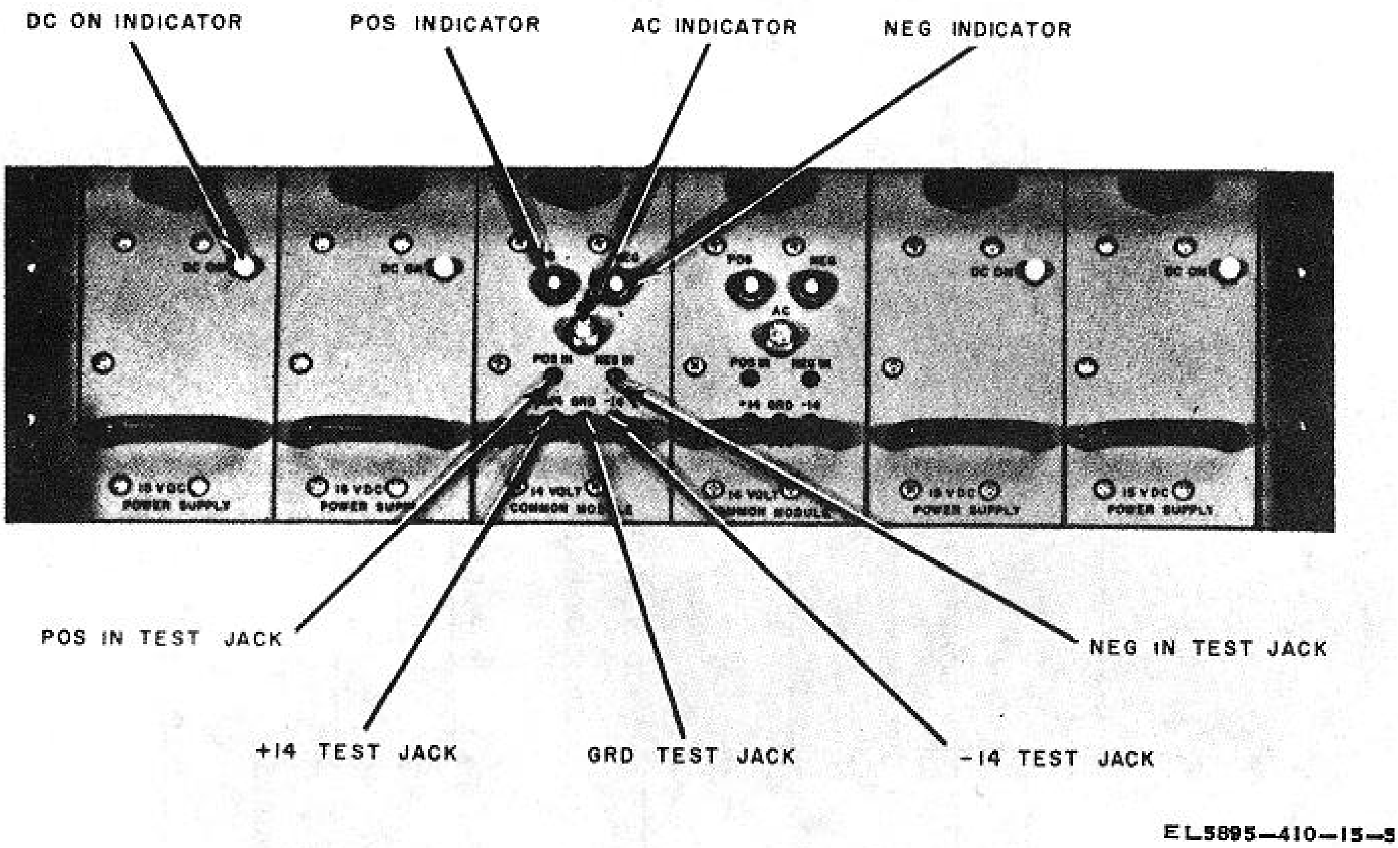

Figure 2-4. Signal level converter facility, redundant power supply unit, operator's controls and indicators.

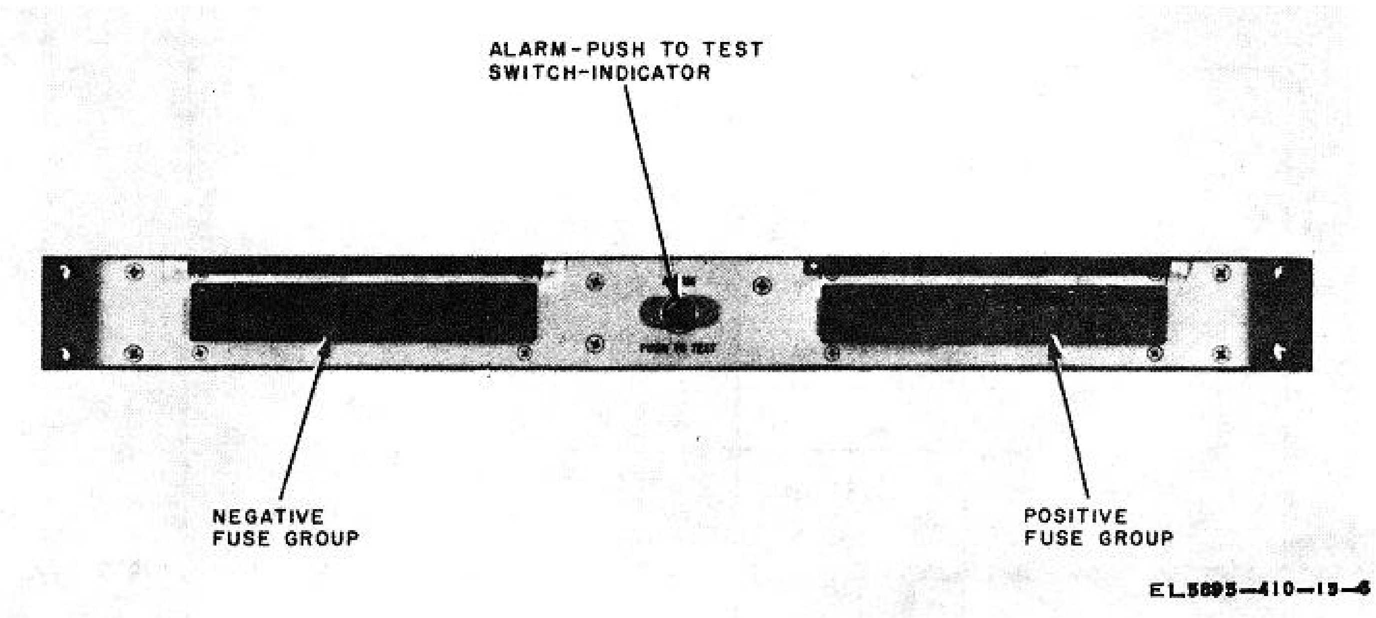

Figure 2-5. Signal level converter facility, fuse panel, operator's control and indicators.

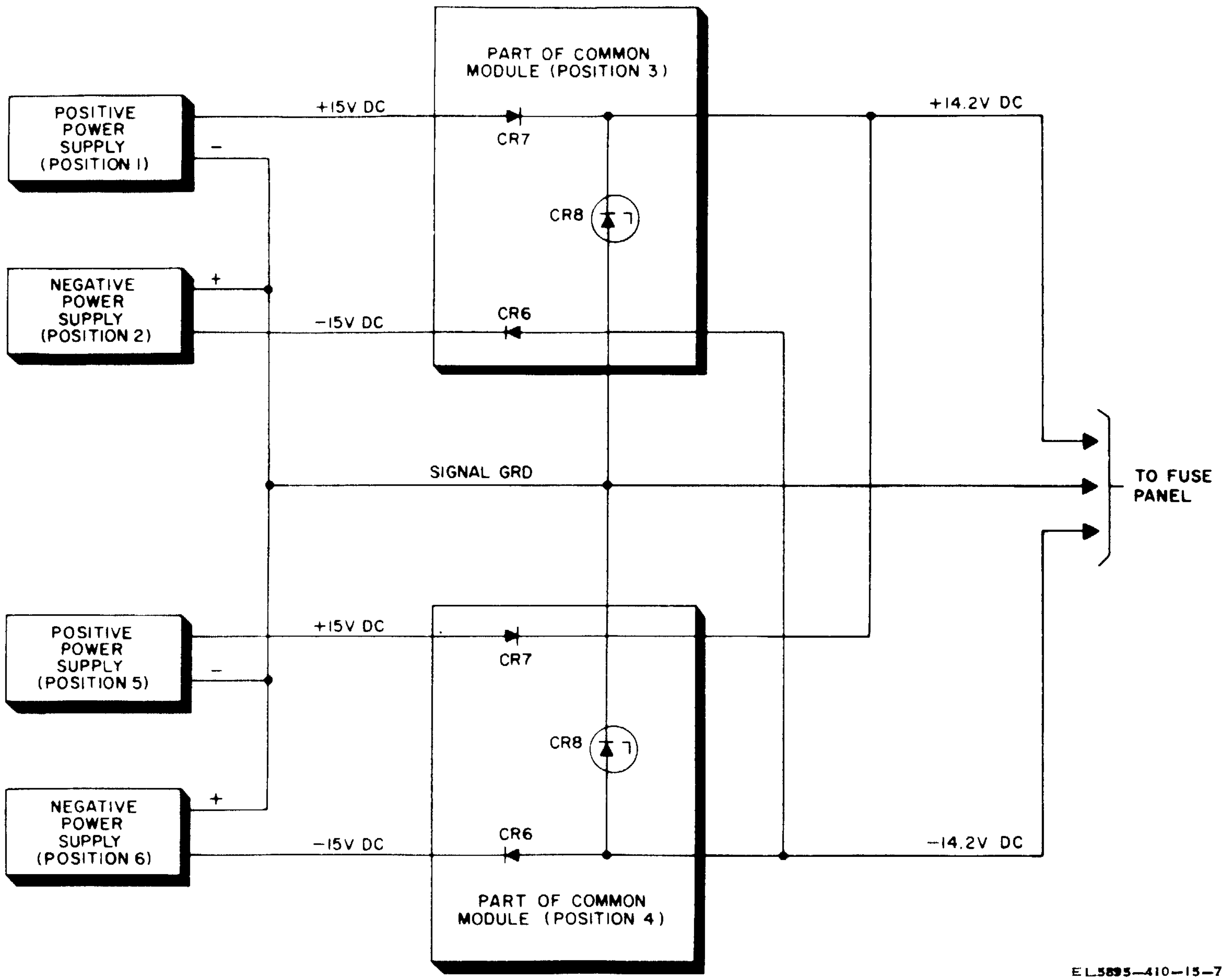

Figure 2-6. Signal level converter facility, redundant power supply circuit.

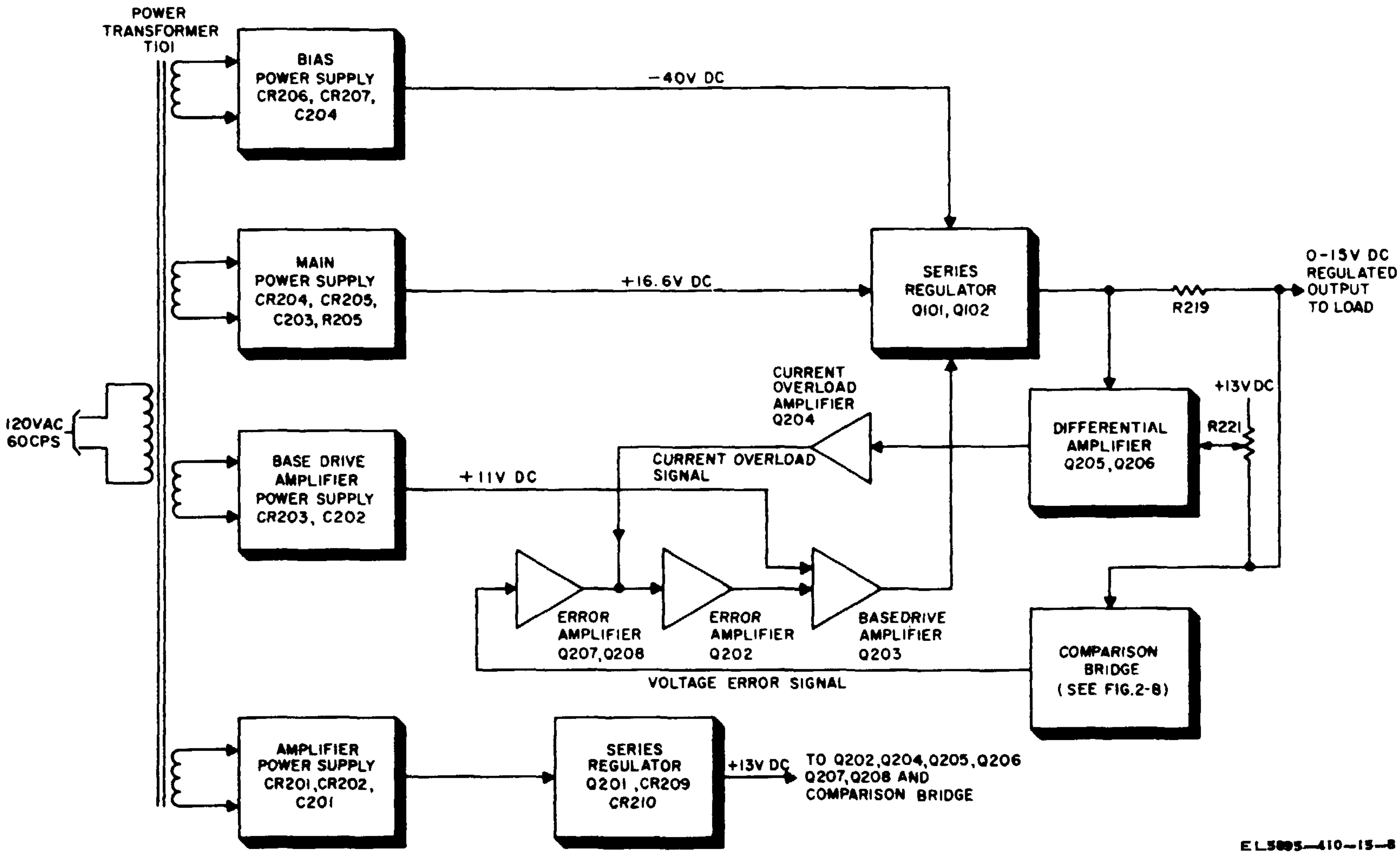

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Figure 2-7. 15-Volt de power supply module, functional block diagram

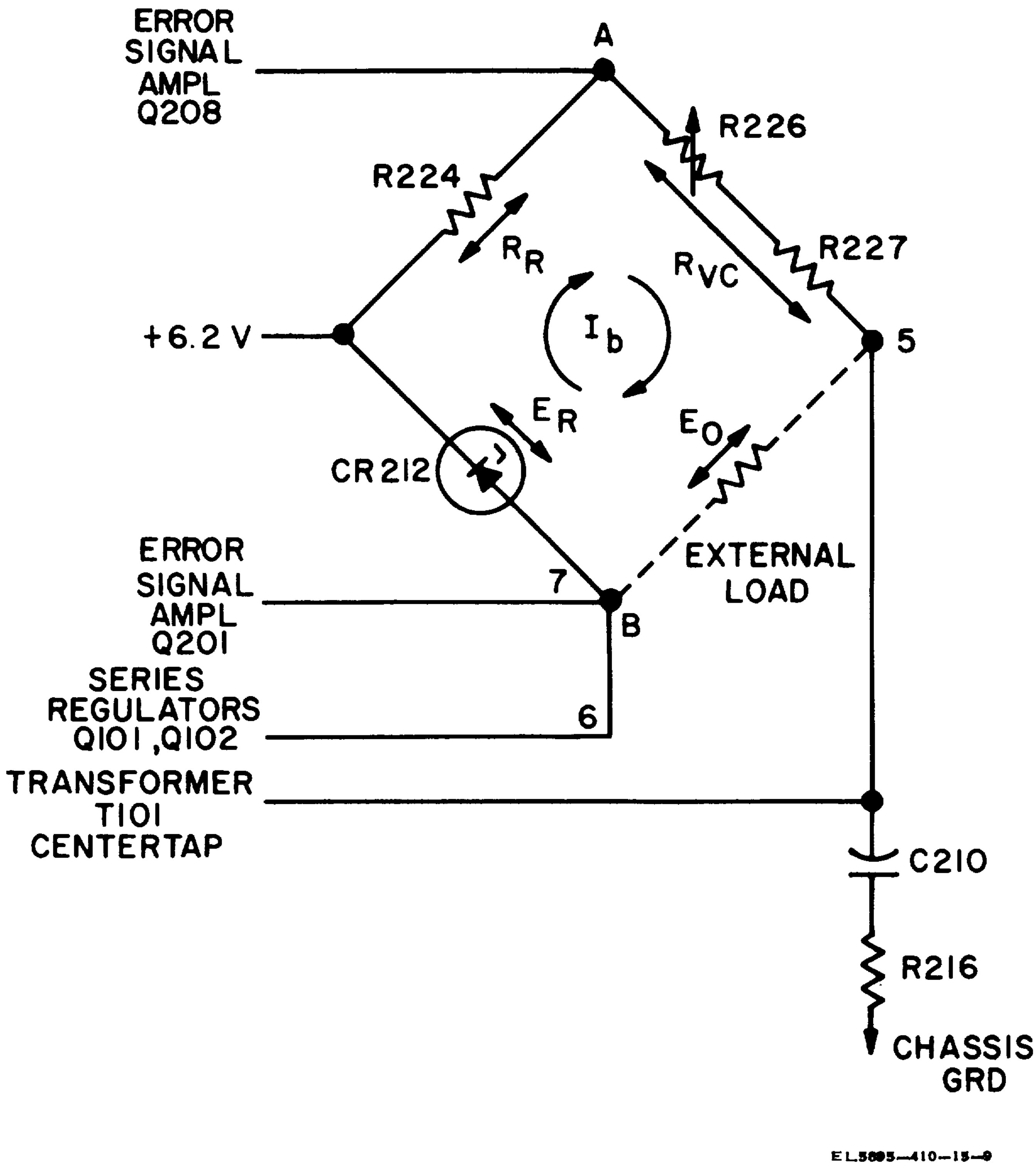
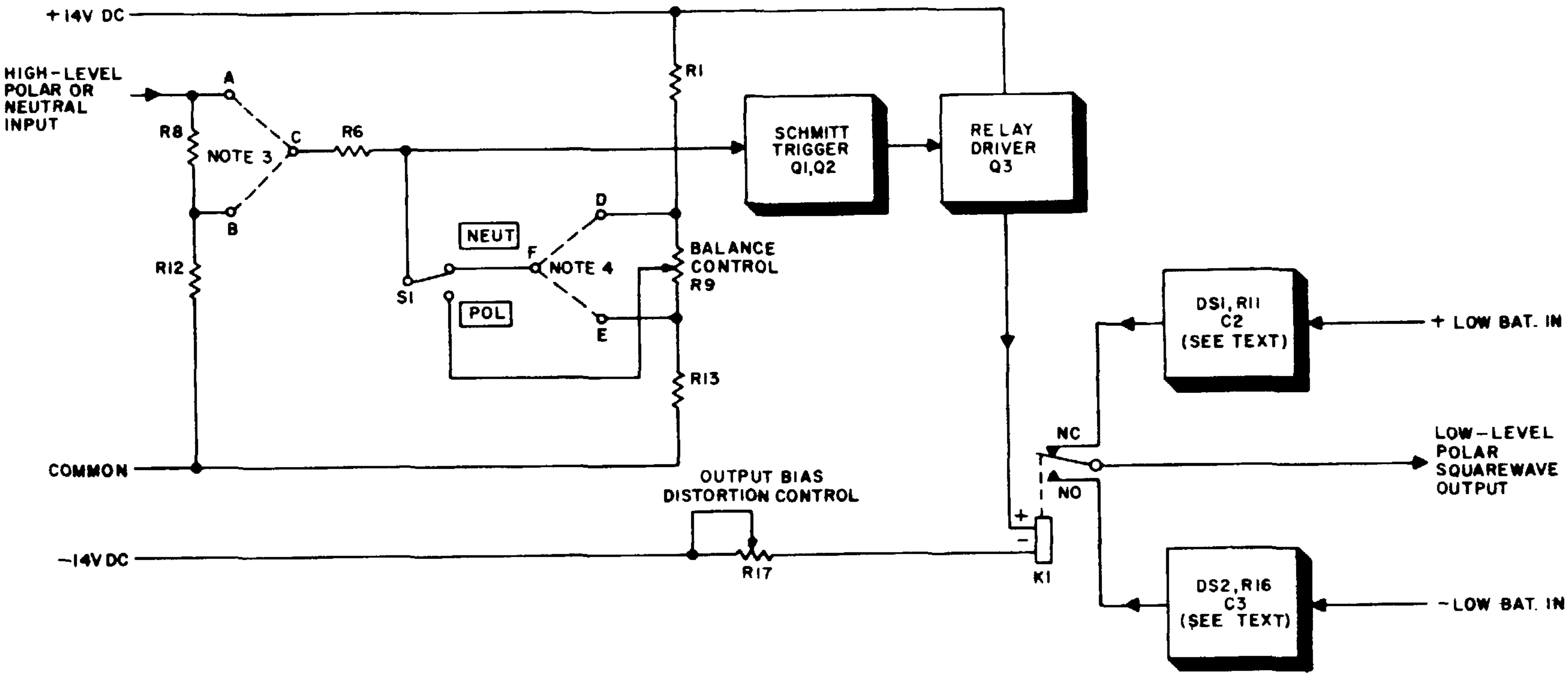


Figure 2-8. Power supply comparison bridge, simplified schematic diagram



1. ▭ INDICATES EQUIPMENT MARKING.
2. DASHED LINES INDICATE STRAPPING OPTIONS.
3. TERMINAL A IS STRAPPED TO TERMINAL C FOR 20 OR 30 MA. INPUT CURRENT; TERMINAL B IS STRAPPED TO TERMINAL C FOR 60 MA. INPUT CURRENT.
4. TERMINAL D IS STRAPPED TO TERMINAL F FOR NEUTRAL MODE NEGATIVE MARK OPERATION; TERMINAL E IS STRAPPED TO TERMINAL F FOR NEUTRAL MODE POSITIVE MARK OPERATION.

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Figure 2-9. Hi/lo signal level converter card, functional block diagrams

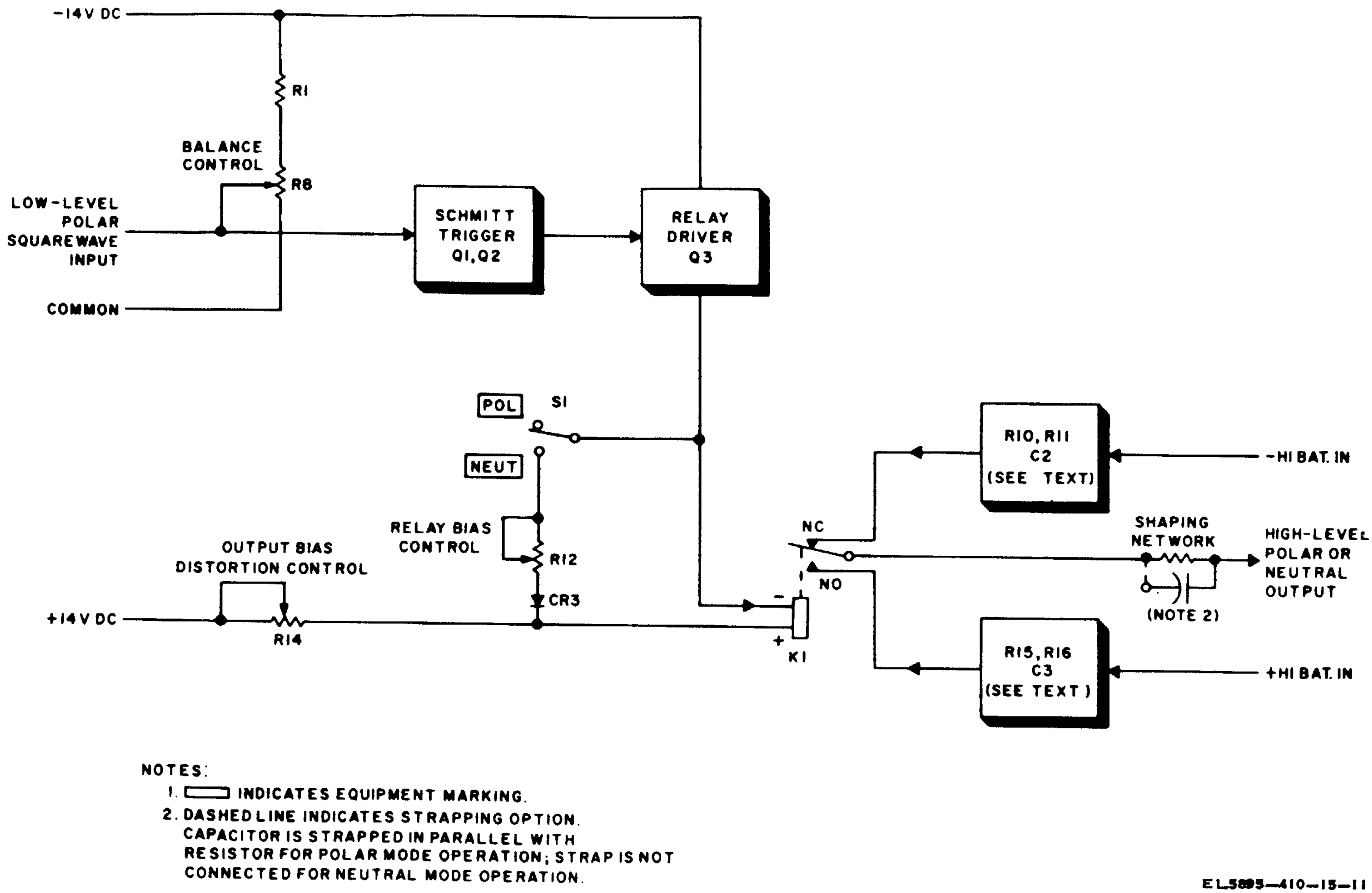


Figure 2-10. Lo/hi signal level converter card, functional block diagram.

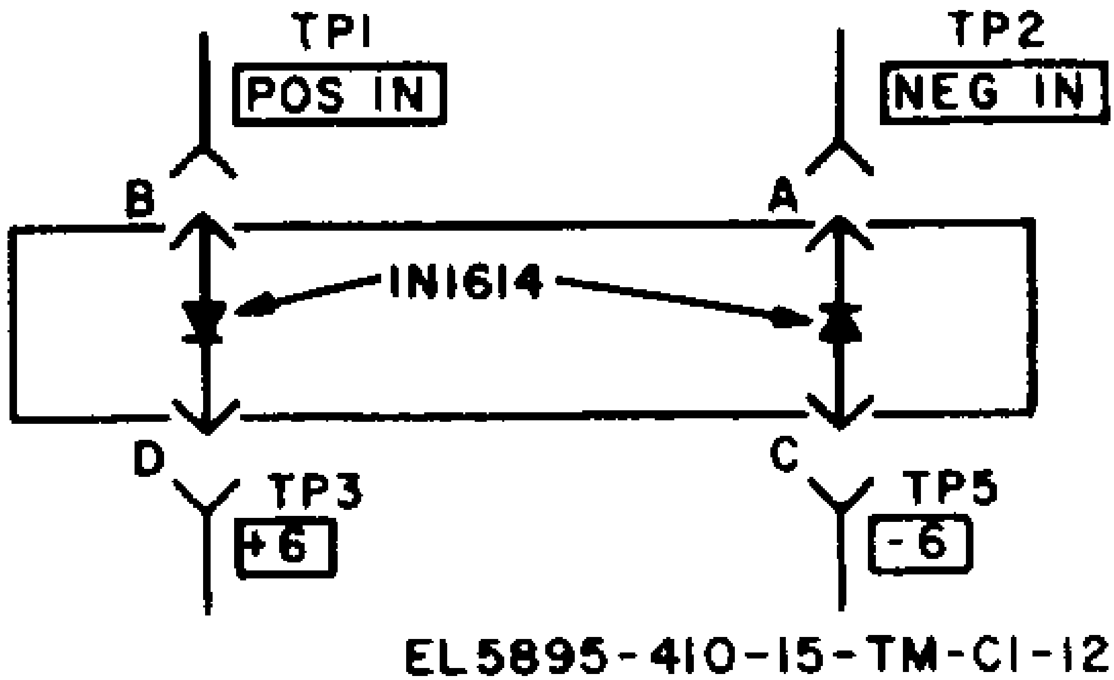
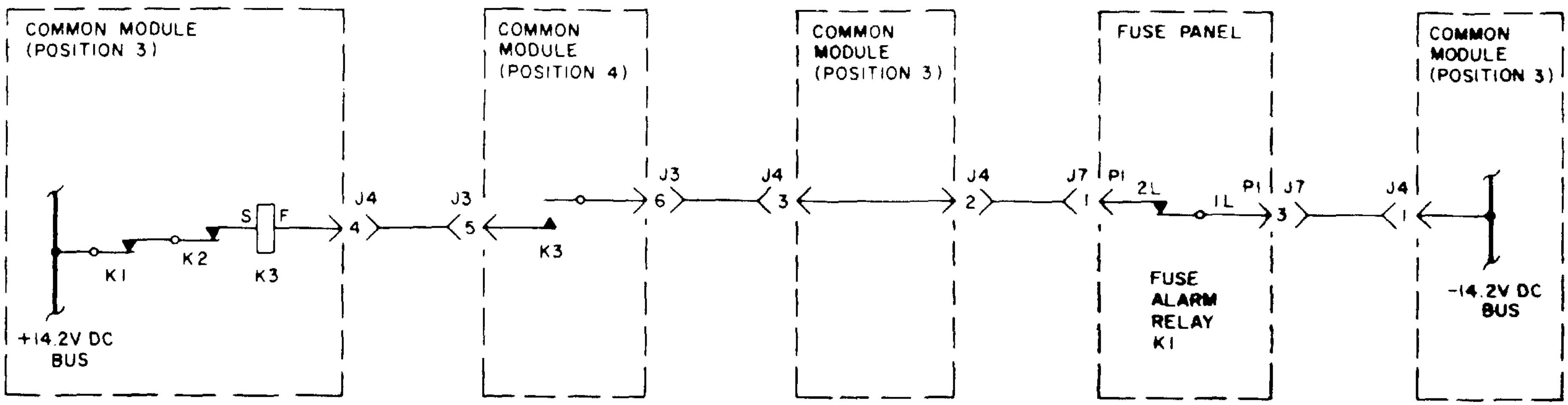
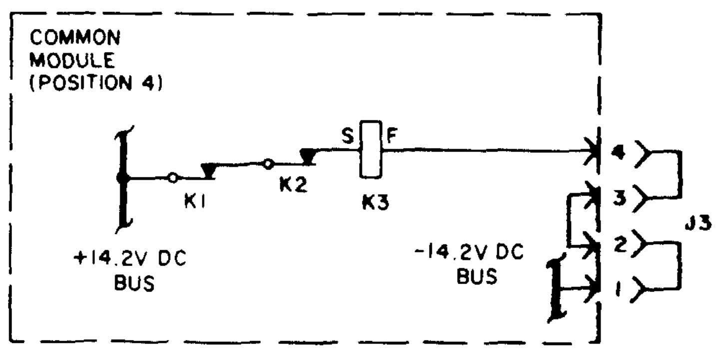


Figure 2-11. Diode substitution module (part number 368-43417-1), schematic diagram.

Change 1



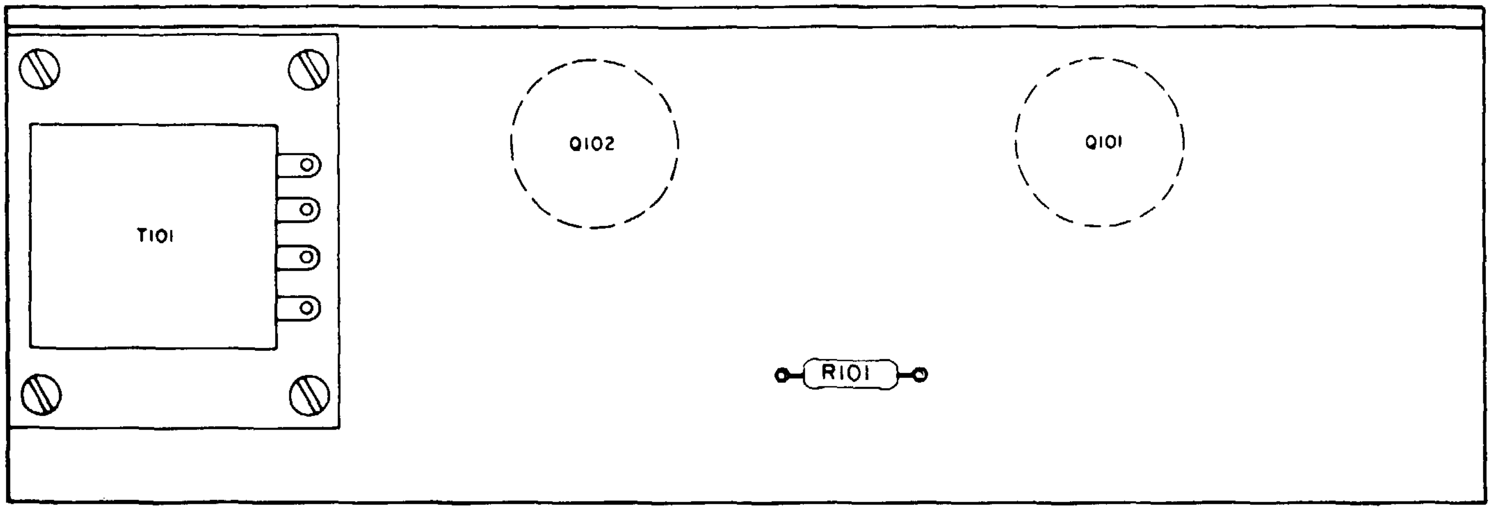
A. CONTROL CIRCUIT FOR RELAY K3 IN COMMON MODULE (POSITION 3)



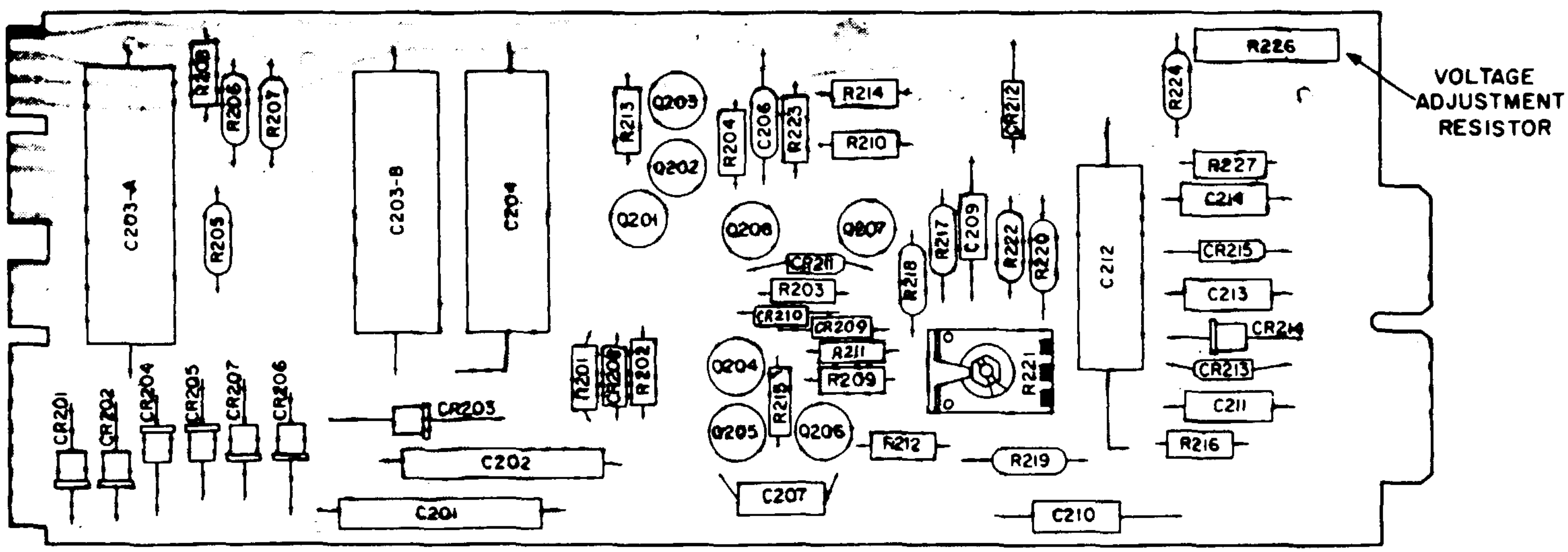
B. CONTROL CIRCUIT FOR RELAY K3 IN COMMON MODULE (POSITION 4)

EL5895-410-15-13

Figure 2-12. Signal level converter facility, alarm relay circuits, simplified schematic diagram.



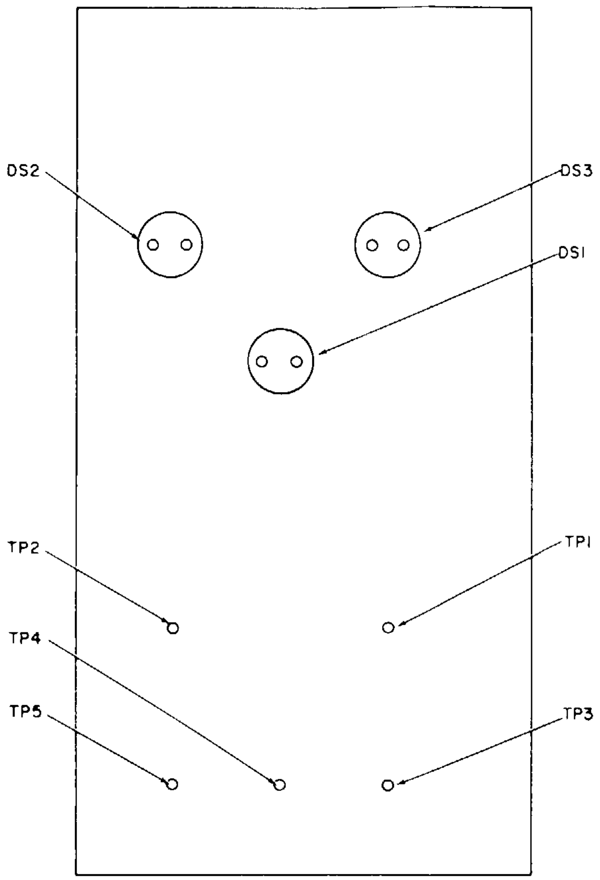
A. PARTS LOCATION, MAIN CHASSIS



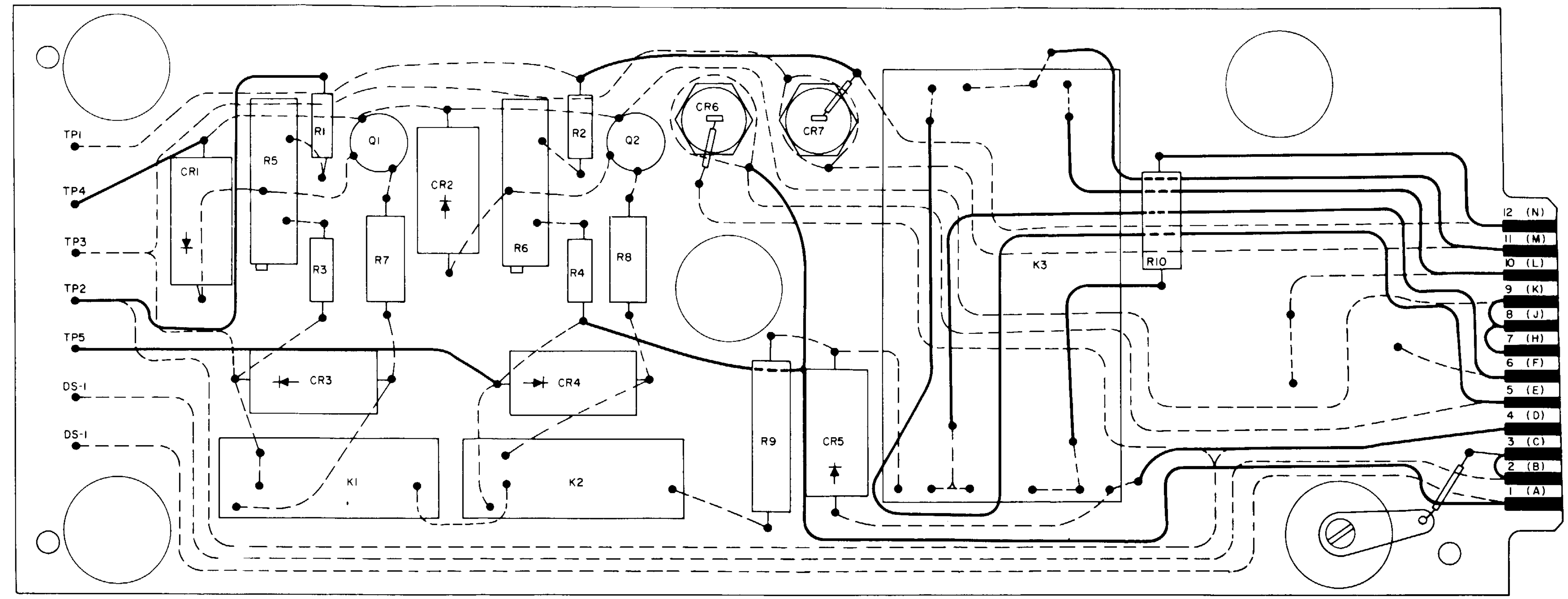
A. PARTS LOCATION,PRINTED-CIRCUIT BOARD

EL5985-410-15-14

Figure 2-13. Signal level converter facility, power supply module, parts location diagram



FRONT PANEL, REAR VIEW



PRINTED-CIRCUIT BOARD, TOP VIEW

LETTERS IN ( ) ARE USED FOR CONTACT DESIGNATIONS ON REAR SIDE.

EL5895-410-15-15

Figure 2-14. Signal level converter facility, 14-volt common module, parts location diagram.

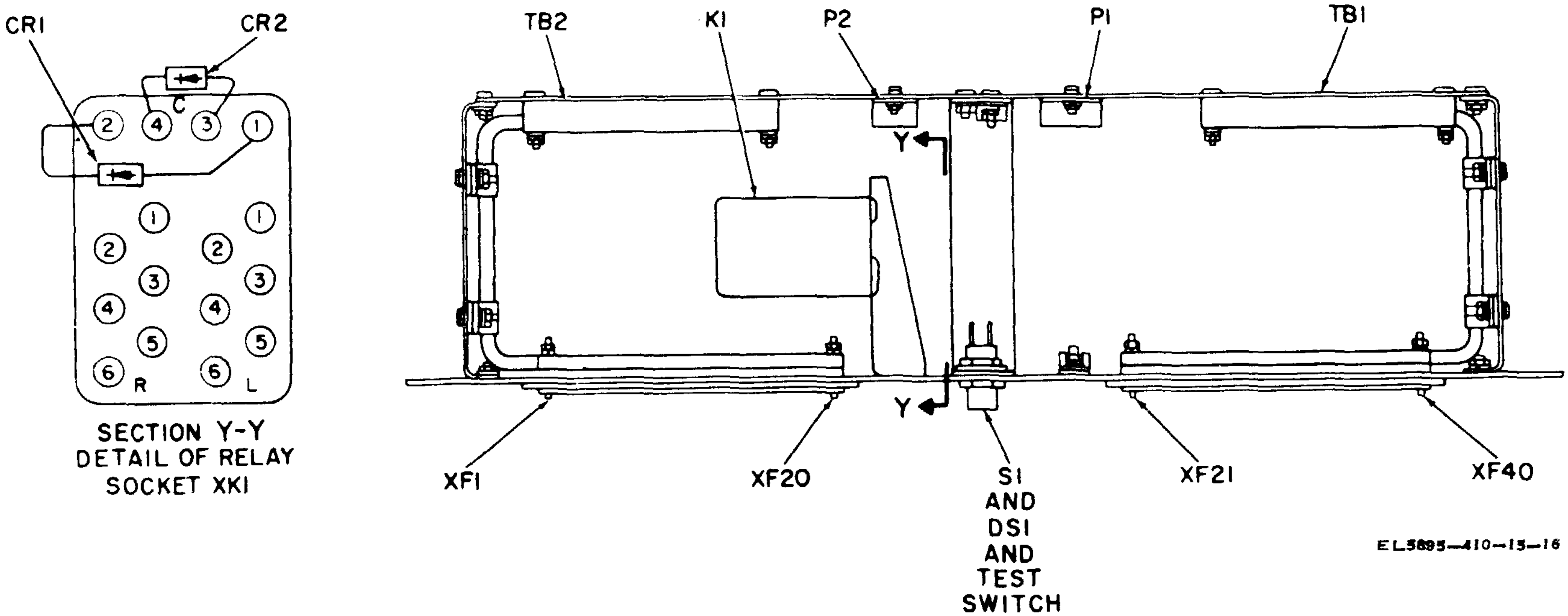


Figure 2-15. Signal level converter facility, fuse panel, parts location diagram.

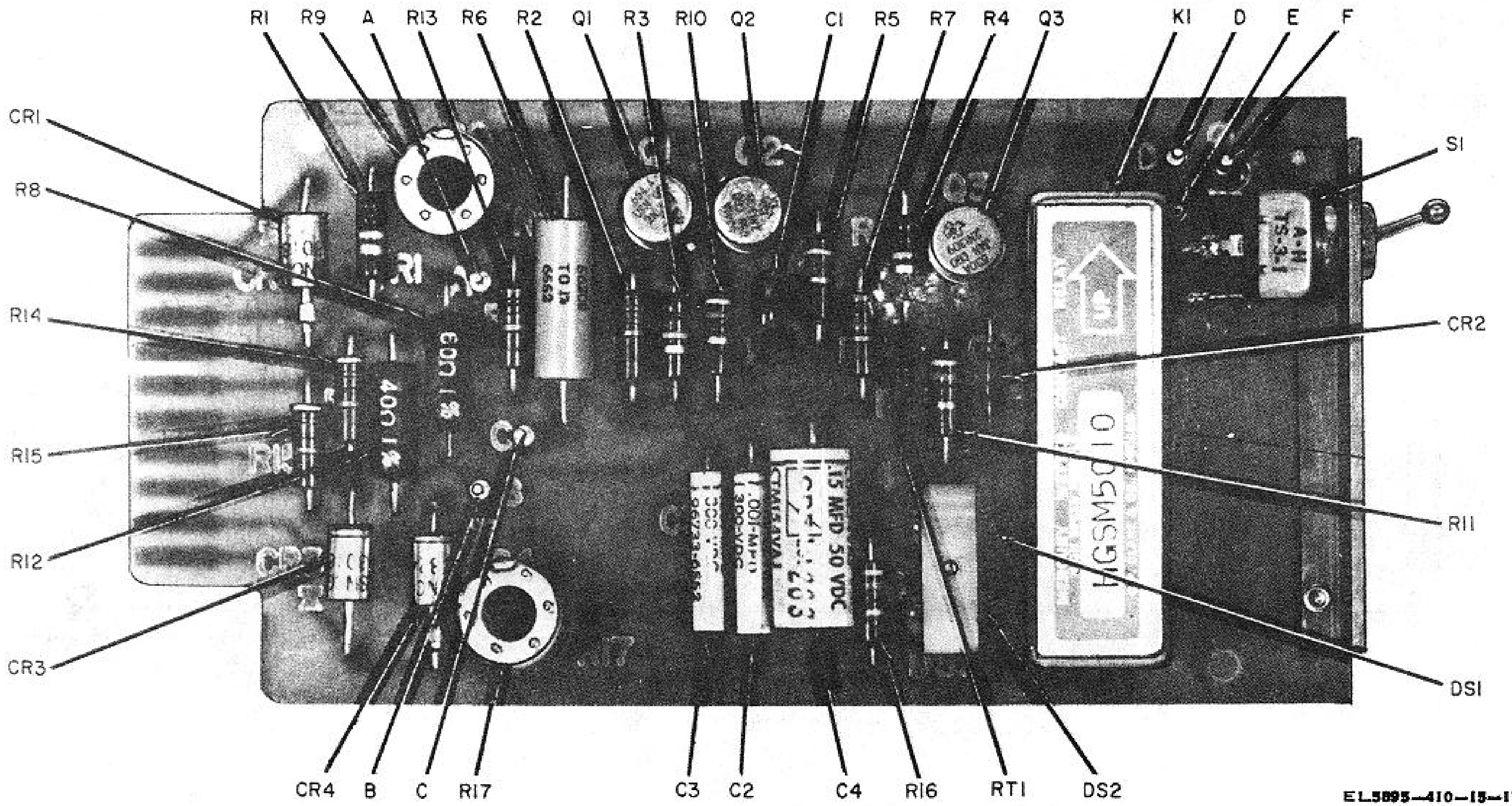


Figure 2-16. Signal level converter facility, hi/lo signal level converter module, parts location diagram

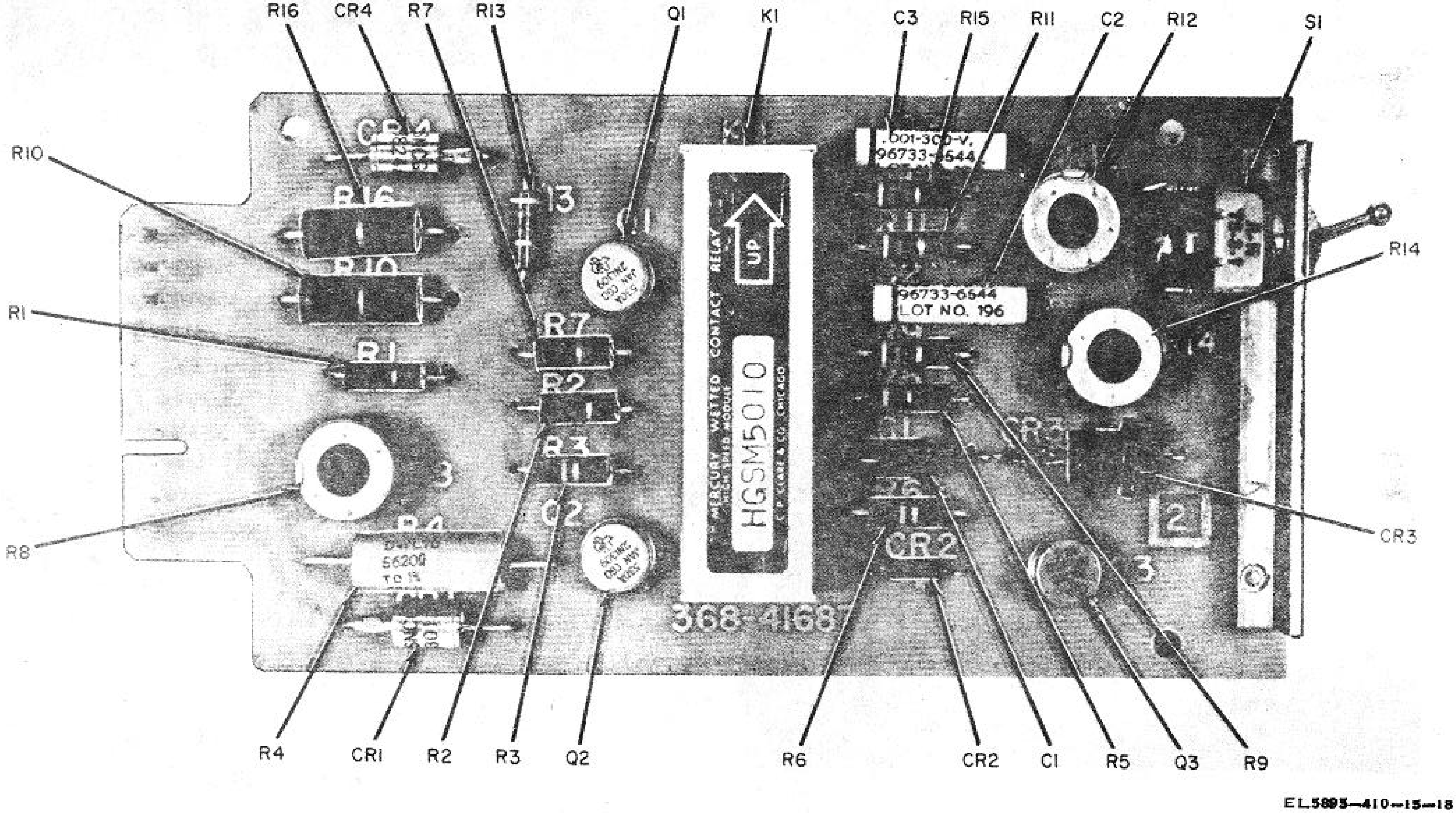


Figure 2-17. Signal level converter facility, lo/hi signal level converter module, ports location diagram.

CHAPTER 3
RED/BLACK ISOLATION FACILITY

Section I. INTRODUCTION

3-1. General
This chapter describes the red/black isolation facility (fig. 3-1) and provides instructions for performing maintenance and troubleshooting.

3-2. Purpose and Use
The red/black isolation facility is provided to meet the security requirements for both physical and electrical red/black isolation for the high-speed data and timing circuits passing between the red and black areas at the AUTODIN site. Paragraph 3-10*a* describes how the red/black isolation facility provides security requirements.

3-3. Description of Equipment
a. General. The red/black isolation facility is contained in one standard-size equipment cabinet (fig. 3-1). A partition which runs the full height of the cabinet divides the cabinet into two chambers. With the front and rear doors installed, each chamber is radiofrequency (RF) interference tight. The partition contains 96 rectangular holes in which up to 96 red/ black isolation switches can be installed. The actual number of isolation switches installed depends on the site requirements. The isolation switches pass signals from the red chamber (front) to the black chamber (rear) and from the black chamber to the red chamber. At installations which contains less than 96 isolation switches, cover plates are installed in the holes which do not contain switches, thus maintaining an RF tight partition shield between the two chambers of the cabinet. Identical power supply and distribution equipment is installed in the red and black sides of the cabinet. This equipment provides dc operating power for the modules of the red/black isolation equipment. Each side of the cabinet contains a redundant power supply unit, positive fuse panel, negative fuse panel, and power distribution panel. Descriptions of this equipment and of the isolation switch are given in the following paragraphs.

b. Redundant Power Supply Unit. The redundant power supply unit (fig. 3-1), located at the top of the cabinet, contains four plug-in power supply modules and two plug-in common modules. Two of the power supply modules function as a redundant source of positive dc operating power, and two power supply modules function as a redundant source of negative dc operating power. The common modules monitor the output of the power supplies and provide an alarm if any of the power supplies becomes defective. The common module also houses the isolation diodes and one zener diode. Indicator lamps on the various modules provide indications of the status of the modules. Locations of the modules in the redundant power supply unit are (from left to right) as follows:

Position 1--positive power supply module	Power supply 1
Position 2--negative power supply module	
Position 3--common module	
Position 4--common module	Power supply 2
Position 5--positive power supply module	
Position 6--negative power supply module	

c. Fuse Panel. Two fuse panels (fig. 3-1 and 3-11) are located immediately below the redundant power supply unit. One panel protects the positive bus, the other protects the negative bus. Each fuse panel contains a maximum of 40 fuses; each fuse used protects a dc line feeding three isolation switches (up to a maximum of 96 switches) through the power distribution panel. When a fuse blows because of an overload, a small flag on the fuse becomes visible, an alarm lamp on the fuse panel lights, and the remote fuse alarm circuit is actuated to indicate the blown fuse status.

d. Power Distribution Panel. The power distribution panel (fig. 3-1) routes one positive and one negative dc operating powerline from the positive and negative fuse panels to three isolation switches on each side of the cabinet.

e. Red/Black Isolation Switch. The isolation switch (fig. 3-2) consists of an input module, an output module, and an isolation device. The unit is designed to be mounted in the center partition of the red/black isolation cabinet. Two connectors are located on the face of the input module; one for operating power input, the other for signal input. Similarly, the output module contains two connectors; one for operating power input, and one for signal input. Each module of the unit is a sealed assembly which can be readily replaced if defective.

3-4. System Application

a. The primary function of the red/black isolation facility is to transfer polar low-level digital information within the AUTODIN site between red and black areas and, at the same time, prevent classified data from leaving the secure area. As shown in figure 33, the physical barrier between the areas is the center portion in the red/black isolation cabinet. The digital information in the receive and transmit directions is passed through separate isolation switches. The red/black isolation cabinet contains a maximum of 96 isolation switches. As shown in figure 3-11, as many as 56 isolation switches (40 signal and 16 timing) are used in the receive lines (with input module on black side), and 40 isolation switches are used in the transmit lines (with input module on red side).

b. Each side of the red/black isolation cabinet contains identical power supply and distribution circuits. These circuits provide dc operating power to the modules of the isolation switches. Two separate primary ac power lines from the site power system are fed to the redundant power supply unit. One half of each power supply module on the black and on the red side is connected to one circuit breaker. Two power supply modules in the power supply unit provide +6.2 volts dc operating power through the associated common module to a bus which routes the power to the positive fuse panel. Redundant connection of the power supply modules (connecting the output of each through an isolation diode to the same bus) ensures that power will be present on the bus even if one of the power supply modules fails or if its output voltage falls below the required output. When this situation occurs, a local and remote power alarm circuit is actuated by an associated common module in the redundant power supply unit. Two other power supply modules and the associated common module provide similar alarm functions and route -6 volts dc operating power to the negative fuse panel.

c. The +6-volt and -6-volt fuse panels distribute the operating power via a power distribution panel to the isolation switches. Each fuse on the fuse panel protects the input or output modules in three of the isolation switches located on one side. If the module draws excessive current, the applicable fuse on the panel opens, provides a lamp indication at the front panel, and actuates the power alarm circuit via the associated common module in the redundant power supply.

3-5. Technical Characteristics

Technical characteristics of the red/black isolation facility and its components, including electrical parameters and physical dimensions of the equipment, are given in table 3-1.

Table 3-1. Red/Black Isolation Facility, Technical Characteristics

Characteristic	Value
Red/black isolation cabinet	
Height	76 1/16 in.
Width	24 5/16 in.
Depth	32 1/8 in.

Table 3-1. Red/Black Isolation Facility, Technical Characteristics-Continued

Characteristic	Value
Redundant power supply unit	
Height	5 1/4 in.
Width	19 in.
Depth	13 3/4 in.
Number of power supply modules.	4.
Number of common modules.	2.
Input power	105 to 125 volts ac, 50 to 60 cps.
Output voltage	+ 7 volts and -7 volts dc (nominal).
Output voltage range	Adjustable 0 to 7 volts dc.
Output current	0 to 2 amp dc.
Line voltage regulation.	Less than 0.01%.
Load voltage regulation.	Less than 0.1% or 1 mv dc, whichever is greater.
Line current regulation	Less than 0.01% current change.
Load current regulation.	Less than 0.02% current change.
Stability	Output current variation less than 0.05% or 1 ma., whichever is greater, 8 hours after warmup.
Ripple	Less than 0.1 mv rms.
Fuse panel	
Height	1 3/4 in.
Width	19 in.
Depth	4 3/4 in.
Number of fuses	40 (max).
Fuse type	Mechanical indicating (Buss GMT).

Table 3-1. Red/Black Isolation Facility, Technical Characteristics-Continued

Characteristic	Value
Red/black isolation switch	
Height	2 1/4 in.
Width	2 1/4 in.
Depth	5 5/32 in.
Input module:	
Signal input	Polar square wave.
Loop voltage (mark or one).	+6 ±0.6 volts dc.
Loop voltage (space or zero).	-6 +0.6 volts de.
Current	1 ma. (nominal)
Sensitivity (mark or one).	+0.5 to +6.0 volts dc.
Sensitivity (space or zero).	-0.5 to -6.0 volts dc.
Cutoff of operation.	Less than ±0.3 volt de.
Impedance	6800 ±680 ohms shunted by 300 pf or less.
Output module:	
Signal output voltage (open circuit).	Polar square wave +6 ±0.6 volts dc and 6 ±0.6 volts dc; square waves balanced within 10% of each other.
Output current	1 ma. (nominal).
Discontinuity of waveform.	Does not exceed 0.5 µsec at crossover point.
Rise and fall time of waveform.	5 to 10 µsec.
Output impedance	100 ohms (max).
Speed of processed signals.	22.5 to 4800 cps square wave (45.6 to 9600 bauds).
Cumulative distortion.	Less than 1%.

Section II. OPERATION

3-6. Operator's Controls and Indicators

a. Redundant Power Supply Unit. Each side of the red/black isolation facility cabinet contains one redundant power supply unit. Operator's controls and indicators on the modules of the redundant power supply unit are described in table 3-2 and illustrated in figure 3-4. The unit contains four identical power supply modules and two identical common modules. The modules are designated by their positions in the power supply unit, position 1 on the left through position 6 on the right. The power supply modules at positions 1 and 2 and the common module at position 3 are related to each other functionally. Similarly, the common module at position 4 and the two power supply modules at positions 5 and 6 are also functionally related.

Table 3-2. Red/Black Isolation Facility, Redundant Power Supply Unit, Operator's Controls and Indicators

Control or indicator	Function
Power supply module (position 1)	
DC ON lamp	Indicates that positive dc voltage is applied to common module (position 3).

Table 3-2. Red/Black Isolation Facility, Redundant Power Supply Unit, Operator's Controls and Indicators -Continued

Control or indicator	Function
Power supply module (position 2)	
DC ON lamp	Indicates that negative dc voltage is applied to common module (position 3).
Common module (position 3)	
POS lamp	Indicates positive bus voltage supplied from power supply (position 1 and/or 6).
NEG lamp	Indicates negative bus voltage supplied from power supply (position 2 and/or 6).
AC lamp	Indicates that primary ac power is applied to power supply modules (positions 1 and 2).
GRD jack	Ground connection to module.
POS IN jack	Monitors positive input voltage supplied to module from power supply (position 1).
NEG IN jack	Monitors negative input voltage supplied to module from voltage supply (position 2).
+6 jack	Monitors positive output voltage of module (bus voltage).
-6 jack	Monitors negative output voltage of module (bus voltage).
Common module (position 4)	
POS lamp	Indicates positive bus voltage supplied from power supply (position 1 and/or 5).
NEG lamp	Indicates negative bus voltage supplied from power supply (position 2 and/or 6).
AC lamp	Indicates that primary ac power is applied to power supply modules (positions 5 and 6).
GRD jack	Ground connection to module.
POS IN jack	Monitors positive input voltage supplied to module from power supply (position 6).
NEG IN jack	Monitors negative input voltage supplied to module from power supply (position 6).
+6 jack	Monitors positive output voltage of module (bus voltage).

Table 3-2. Red/Black Isolation Facility, Redundant Power Supply Unit, Operator's Controls and Indicators -Continued

Control or indicator	Function
Common module (position 4)--Continued	
-6 jack	Monitors negative output voltage of module (bus voltage).
Power supply module (position 5)	
DC ON lamp	Indicates that positive dc voltage is applied to common module (position 4).
Power supply module (position 6)	
DC ON lamp	Indicates that negative dc voltage is applied to common module (position 4).

b. Fuse Panels. Each side of the red/black isolation facility cabinet contains two fuse panels, one protecting the positive power bus and the other protecting the negative bus. Each panel contains identical controls and indicators. Operator's controls and indicators on the fuse panels are described in table 3-3, and a typical fuse panel is illustrated in figure 3-5.

Table 3-3. Red/Black Isolation Facility, Fuse Panel, Operator's Controls and Indicators

Control or indicator	Function
Fuse	Each fuse protects input or output module of three isolation switches; if fuse blows, small flag is displayed to indicate blown fuse status; also fuse alarm lamp lights and local and remote power alarm circuit is actuated.
ALARM-PUSH TO TEST switch-indicator.	*a.* Lights whenever a fuse blows *b.* When depressed, simulates a blown fuse condition; lights with switch depressed to indicate proper functioning of alarm circuit in fuse panel; also actuates local and remote power alarm circuit

3-7. Operating Procedures

a. General. The facility is a passive device which performs its functions without the need of an operator in attendance. Primary ac power is automatically applied to the power supplies in the facility whenever the site is in operation.

Indicator lamps are provided so that operating personnel can determine the status of the facility power functions. An alarm test is performed when it is desired to check operation of the alarm circuits. Monitoring and alarm test procedures are described in the following paragraphs.

b. Monitoring Procedure. Monitor the facility power system for normal operation, as follows:

(1) At redundant power supply unit (fig. 3-4) on red side of equipment cabinet, observe the following:

(*a*) DC ON lamp lit on each of the four power supply modules.

(*b*) AC, POS, and NEG lamps are lit on each of the two common modules.

(2) Observe that each ALARM lamp on the positive and negative fuse panels (fig. 3-5) is out (no fuse indicator flag is shown).

(3) Repeat steps (1) and (2) at panels on black side of equipment cabinet.

c. Alarm Test Procedure. Perform the alarm test on each of the four fuse panels in the facility, as follows:

(1) At one of the fuse panels (fig. 3-5), depress ALARM-PUSH TO TEST switch-indicator.

(2) Observe that ALARM lamp lights and local and remote power alarm circuits actuate, indicating normal operation of the circuits.

(3) Repeat steps (1) and (2) to check alarm circuits in remaining three fuse panels.

Section III. THEORY OF OPERATION

3-8. Scope of Facility Description

The red/black isolation facility basically consists of two functional systems. As shown in the facility block diagram (fig. 3-3), one system consists of a group of individual isolation switches which provides an active filter for signals passing between the red and black areas at the site. The other system provides operating power to the isolation switches and also actuates a local and remote power alarm signal whenever the output voltage of a power supply unit is above or below the set alarm level or a fuse blows. This section provides a block diagram description of the power system of the red/black isolation facility. This section also contains a block diagram description of two components in the red/black isolation facility: the isolation switch and the power supply module in the redundant power supply unit.

3-9. Power System, Block Diagram Description

The power system (fig. 6-2) converts primary ac power into +7- and -7-volt dc operating power and routes the positive and negative power through the common modules and fuse panels to each of the isolation switches in the red/black isolation facility. This system also provides fuse protection for the isolation switches. If a fuse blows, a power supply fails, or the dc operating voltages are below or above the present values, the applicable condition is sensed by failure detection circuits, and alarm circuits are actuated. The power system consists of the six modules in the redundant power supply unit, the positive fuse panel, and the negative fuse panel. Two identical power systems are used in the red/black isolation facility: one to power the isolation switch modules on the red side of the facility cabinet, the other to power the modules on the black side.

a. Redundant Power Supplies.

(1) The power system contains four identical power supply modules which provide +7- and -7-volt operating power for the facility. Figure 3-6, which is a simplified version of part of figure 6-1, illustrates how the power supplies are connected in a redundant configuration. The output of each power supply is floating. Grounding one side of the output on the receptacle of each module makes a + or - supply, depending on the position of the module in the shelf. Consequently, each power supply furnishes either +7 volts or -7 volts dc with reference to signal ground.

(2) The positive output of the positive power supply (position 1) is fed through isolation diode CR7 in common module (position 3)

to the positive fuse panel. Similarly, the positive output of positive power supply (position 5) is fed through isolation diode CR7 in common module (position 4) to the positive fuse panel. The output current from each power supply passes through both diodes CR7 in a forward direction, and both currents combine to form a positive bus for the positive fuse panel. The isolation diodes prevent circulating currents between the power supplies in the event one power supply output voltage differs from the other. In this manner, circuit power on the positive bus remains unaffected even if one of the power supplies fails. Diode CR6 in each common module operate in an identical manner with respect to the negative power supplies at positions 2 and 6.

(3) Zener diode CR8 in each common module is provided for protection of the isolators against higher voltages. In normal operation, the zener diode is not actuated. In case the power supply voltage rises above 10 volts de, because of failure in the power supply, the zener diode operates and keeps the bus voltage at 10 volts. Diode CR8 in common module (position 3) protects the +6 volt dc bus, and diode CR8 in common module (position 4) protects the -6-volt dc bus.

b. Power Distribution. Two identical fuse panels (fig. 6-2) provide fuse protection for the positive and negative busses. Since both panels are identical, the discussion is limited to the positive fuse panel. This panel contains as many as 40 fuses (only one typical fuse shown in fig. 6-2). Each fuse used protects the circuit to three isolation switches, as shown on the illustration. If a malfunction in an isolation switch causes the fuse to blow, spring-loaded fuse F1 opens and automatically connects the bus voltage to the alarm relay in the fuse panel. The energized alarm relay actuates the local and remote alarm circuits in the common module. Any fuse, when blown, will actuate the fuse alarm circuit. A detailed description of the fuse alarm circuit is given in *c* below.

c. Power Alarms. The power system contains circuits which provide local and remote alarms whenever a malfunction occurs in the system. Alarm circuits are actuated when one or more of the power supply modules fails, when one or more output voltages from the power supply modules is above or below a preset limit, or when a fuse opens in the positive or negative fuse panel. Relay K3 in common module (position 3) is in the energized state during normal (nonalarm) conditions (fig. 6-2.) The local alarm circuit is thus open during normal conditions, and +6 volts is applied to the remote alarm circuit. When an alarm occurs, relay K3 deenergizes, and a ground is applied to both the local and remote alarm circuit. The following paragraphs describe, in detail, how the alarm circuits control relay K3 in common module (position 3) during normal (nonalarm) conditions and how the circuits operate for each alarm condition.

(1) *Normal (nonalarm) operation*. Eight relays are used in the alarm circuits, three in each of the two common modules and one in each of the fuse panels (fig. 6-2). Table 3-4 lists the status of each relay during normal operation. Basically, relay K3 in common module (position 3) and relay K3 in common module (position 4) must be energized in the no-alarm condition.

(*a*) *Relay K3, common module (position 3*). This relay remains energized if the positive bus voltage is applied to one side of the coil and the negative bus voltage is applied to the other side of the coil. Positive voltage is applied through normally closed contacts of relays K1 and K2 in the module. Negative voltage is applied from the -6-colt dc bus, through the contacts of normally de-energized relay K1 in the positive fuse panel and(through the contacts of normally energized relay K3 in common module (position 4). Thus a current loop is completed from the positive bus, through relay K3, back to the negative bus.

(b) Relay K3, common module (position 4). Positive voltage is applied to this relay in the same manner as described for relay K3 in common module (position 3). Negative voltage is applied from the -6-volt dc bus through the contacts of normally de-energized relay K1 in the negative fuse panel. Thus a current loop is also completed from the positive bus, through relay K3, to the negative bus.

Table 3-4. Red/Black Isolation Facility Power Alarm System, Status of Relays During Nonalarm Conditions

Component	Relay	Status
Common module (position 3) ...	K1	Deenergized
Common module (position 4) ...	K2	Deenergized
	K3	Energized
Common module (position 4) ...	K1	Deenergized
	K2	Deenergized
	K3	Energized
Positive fuse panel..................	K1	Deenergized

(2) *Alarm operation for incorrect power supply voltage*.

(*a*) Relays K1 and K2 in common module (position 3) provided the following alarm functions: K1 (energized), lower negative output of power supply (position 2) or higher positive output of power supply (position 1); K2 (energized), lower positive output of power supply (position 1) or higher negative output of power supply (position 2). Similarly, relays K1 and K2 in common module (position 4) provide alarm functions for negative power supply (position 6) and positive power supply (position 5). In the following discussion, only one of the common modules is considered, and only one of the circuits in the module is described in detail since both of the circuits function in the same manner.

(*b*) The output of the negative and positive power supplies (fig. 6-2) are applied to sensitive control R5 in common module (position 3). This resistor is adjusted to provide a control voltage to the base of transistor switch Q1 which maintains the transistor in the cut-off state. With switch Q1 open, no current flows through relay K1 since the relay is in series with the transistor switch. Positive power is therefore applied to relay K3. If the negative power supply output drops or fails, or if the positive power supply voltage rises, the positive voltage is applied to the base of switch Q1, causing Q1 to saturate. Relay K1 energizes, breaks the circuit between the positive bus and relay K3, and relay K3 de-energizes to actuate the alarm circuits. Since the contacts of relays K1 and K2 are connected in series, an alarm signal will be actuated if either one of the relays becomes energized.

(3) Alarm operation for open fuse.

(*a*) If a fuse fails in either fuse panel, a spring contact which forms an integral part of the fuse makes contact with a blown fuse alarm bus. As shown in figure 6-2, if fuse F1 (typical) in the positive fuse panel fails, the positive voltage is applied through bridge CR1 through CR4 to alarm relay K1. A bridge rectifier is used in the panel because the panel can be used to protect either the positive or negative bus. The bridge is used to ensure that current of proper polarity is applied to the coil of relay K1.

(*b*) With the circuit of relay K1 closed, the relay energizes. This action opens the circuit between the negative voltage bus and the closed contacts of relay K3 (relay in energized position) in common module (position 4). Negative power is thus removed from relay K3 in common module (position 3), the relay deenergizes, and the alarm circuits are actuated. At the same time, positive voltage is applied through the contacts of low energized relay K1 in the positive fuse panel to ALARM lamp DS1 on the front of the fuse panel to indicate that one of the fuses has opened.

(*c*) If one of the fuses in the negative fuse panel opens, alarm relay K1 operates in this panel in the same manner as described for the positive fuse panel. This action opens the circuit between the negative voltage bus and relay K3 in common module (position 4). This relay K3 therefore deenergizes, opens the circuit between the negative bus and alarm relay K3 in common module (position 3), and an alarm signal is produced as described previously.

(*d*) Each fuse panel contains an alarm test circuit. The ALARM-PUSH TO TEST switch indicator S1 (part of the alarm indicator) is connected between the power bus and the blown fuse bus. When the switch is depressed, voltage is applied through bridge CR1 through (CR4 to relay K1 on the fuse panel, simulating a blown fuse. The alarm operation is the same as described in (*b*) and (*c*) above.

3-10. Component Descriptions

a. Isolation Switch. The isolation switch provides the security requirements for polar signals passing between the red and black areas of the site. The isolation switch also reshapes the waveform of those polar signals which may have deteriorated during transmission. The isolation switch consists of three assemblies packaged together into a single housing: an input module, a photon-coupled isolator, and an output module. Figure 3-7 illustrates one of the two functional applications of the isolator, I that of passing a polar signal from the black side of the red/black isolation cabinet through the cabinet shield to the red side. Functionally the signal path in the opposite function is identical to that shown in figure 3-7, except that the words red and black should be transposed wherever they appear on the figure. Functional descriptions of the three assemblies of the isolation switch are given in the following paragraphs. See figure 3-7 when following the discussion.

(1) *Input module*. The input module is a sealed, replaceable electronic subassembly. The end of the module has two connectors; one for operating voltages (not shown on the block diagram), another for the polar input signal. Directly behind the connectors inside the module is a ground plane -which provides a low-impedance path to ground for the undesired ambient RF signals. Polar input signals with positive and negative amplitudes in excess of 0.5 volt are amplified and shaped by a molded electronic subassembly within the input module and are then fed to the photon-coupled isolator. Signals with positive and negative amplitudes less than 0.3 volt are rejected by the electronic subassembly. Unwanted low frequency signals are attenuated by the electronic circuits in the module.

(2) *Photon-coupled isolator*. The photoncoupled isolator is a signal coupling device consisting of a solid-state, gallium-arsenide infrared emitter and an infrared-sensitive silicon photodetector, separated l)y a short shielded light path. The coupling device is inside a hermetically sealed stainless steel housing. Polar signals from the input module switch the emitter on and off to produce pulses of infrared radiation. This radiation is transmitted over the short, shielded light path to the photodetector which causes the output module to switch. The low parasitic capacitance of the photon-coupled isolator further reduces the possibility of coupling the unwanted signals through the isolator.

(3) *Output module*. The output module is also a sealed, replaceable electronic subassembly similar in construction to the input module. This module amplifies and shapes the detected output signal from the photonouplled1 isolator. An RF ground plane in the module also prevents the transmission of unwanted signals, and the electronic circuits in the module suppress unwanted low-frequency signals. The resultant output signal from the output module is a reshaped polar signal with a nominal amplitude of 6.0 volts, matching the security requirements for unwanted signal attenuation.

b. 7-Volt Dc Power Supply .Module. The 7-volt dc power supply (figs. 3-8 and 6-12) provides a highly regulated dc output voltage to the common module in the redundant power supply unit. The power supply module consists of a mail power supply, a voltage regulator and associated comparison bridge, a current limiter, and auxiliary power supplies.

(1) *Main power supply with voltage regulator and comparison bridge*.

(*a*) The main de power output is produced by a full-wave rectifier, consisting of diodes CR204 and CR205, which is applied through a series regulator consisting of power transistors Q101 and Q102 to the output terminals of the power supply. The series regulator, which is connected in series with the external load, maintains a constant output by varying its resistance. If the output voltage tends to increase, the resistance of the series regulator increases, causing an increased voltage drop across the series regulator and reducing the voltage at the power supply output to its original value. If the output voltage tends to decrease, the resistance of the series regulator decreases, thus increasing the voltage at the power supply output.

(*b*) Variation1s of series regulator resistance is accomplished b)y applying the output voltage to a comparison bridge which produces an error signal when the output voltage changes. The error signal is amplified by Q207, Q208, and Q202 is applied to base driver Q203. The base driver controls the amount of conduction of series regulator Q101 and Q102, causing the voltage drop across the series regulator to increase or decrease to compensate for any output voltage variations.

(*c*) The comparison bridge consists of zener diode CR212 (E_r), reference resistor R224 (R_R), the output load (E_0), and the voltage output control resistance R226 (R_{vc}). As shown in figure 2-8, a reference voltage (E_r), established by the zener action of (R212) in series with the reference resistance (R_R), is continuously compared with the output voltage (E_0) in series with the voltage control resistance (R_{vc}). At balance, a constant bridge current (I_b) flows through the bridge, keeping the error signal at bridge terminals A and B at approximately 0 volt. When the load current changes, the voltage across the external load will tend to change the constant bridge current through the load and R_{vc} and thereby produce an error signal at bridge terminals A and B. This error signal then regulates the output voltage as described in (*a*) above.

(2) *Current limiter*. Differential amplifiers Q205 and Q206 and current overload amplifier Q204 comprise the current-limiting circuit. The base of Q206 is held at a voltage determined by the setting of current-limiting potentiometer R221, and the base of Q205 senses the voltage across current-sensing resistor R219. If an overcurrent condition exists, the voltage drop across resistor R219 will exceed the voltage setting of R221. When this occurs, Q206 will be driven toward cutoff and Q205 will conduct. With Q206 at cutoff and Q205 conducting, amplifier Q204, which was at cutoff, will now conduct. When Q204 conducts, error amplifier Q202 and base drive amplifier Q203 conduct more heavily; this increased conduction tends to drive series regulators Q101 and Q102 toward cutoff, reducing the output current.

c. Auxiliary Power Supplies. Within the 7-volt power supply module (fig. 3-8) there are three auxiliary power supplies: amplifier power supply, base drive amplifier power supply, and bias power supply. These supplies provide operating voltages to circuits within the module. The amplifier power supply consists of full-wave rectifiers CR201 and CR202 and filter capacitor C201. Series regulator Q201 and zener diodes CR209 and CR210 provide regulated voltage for error amplifiers Q202, Q207, and Q208, current limiter Q204, differential amplifier Q205 and Q206, and the comparison bridge. The base drive amplifier power supply consists of half-wave rectifier CR203 and filter capacitor C202; it provides +10.5 volts dc to operate base drive amplifier Q203. The bias power supply consists of full-wave rectifiers CR206 and CR207 and filter capacitor C204. This power supply produces the -27.2-volt de bias voltage for series regulators Q101 and Q102.

Section IV. MAINTENANCE

3-11. Scope of Maintenance

This section provides instructions for performing preventive and corrective maintenance of the red/black isolation facility. Preventive maintenance includes visual inspection of the equipment and voltage and resistance checks of the redundant power supply unit. Corrective maintenance includes troubleshooting, repair, and adjustment of the red/black isolation facility components. Parts location illustrations are provided to facilitate maintenance.

3-12. Maintenance Aids

Maintenance aids used for checking, troubleshooting, repair, and adjustment of the red/black isolation facility are listed in table 3-5.

Table 3-5. Red/Black Isolation Facility, Maintenance Aids

Name	*Use*
Multimeter, Simpson model 260.	Measurement of ac and dc voltages, de current, and resistance.
Oscilloscope, Tektronix model 585A.	Check signal waveforms.
AC/DC differential voltmeter, Fluke model 803B.	Precision measurement of ac and dc voltages.
Diode substitution module (Philco-Ford dwg. No. 368-43417 (para 2-11*b* and *c*).	Paralleling diodes in common module.
Power supply extender circuit card assembly (Philco-Ford dwg No. 368-43259).	Provides accessibility to test points on modules in the redundant power supply unit.

a. The purpose of the diode substitution module listed in the table is to parallel the isolation diodes (CRG-CR7) of one of the common modules during preventive or corrective maintenance, thus ensuring a complete circuit through the common module regardless of whether one or more isolation diodes are open In the module.

b. The power supply extender circuit card assembly listed in the table provides a convenient method of testing modules during preventive or corrective maintenance procedures. Therefore, use the card extender whenever a voltage or resistance measurement must be made on the modules contained in the redundant power supply unit.

3-13. Preventive Maintenance

a. Visual Inspection. Perform visual inspection of red/black isolation facility equipment cabinet (fig. 3-1) once a week, as follows:

(1) Open cabinet doors and check to see that power supply unit, fuse panels, and other components are securely mounted in place. Make sure that all hardware is tight.

(2) Check to see that all isolation switches are securely mounted to partition in cabinet. Make sure that cover plates are securely mounted in unused holes in partition.

(3) Verify that input and output modules of each isolation switch are properly, inserted into housing.

(4) Check to see that wiring is neat and orderly and without excessive slack.

(5) Make sure that all pins are firmly inserted in the taper pin block.

(6) Check to see that all markings are clean and legible.

(7) Inspect cabinet for dirt and foreign matter; clean if necessary.

(8) Check to see that doors close firmly and that rfi gaskets around doors provide good connection between cabinet and door. Close cabinet door.

b. Redundant Power Supply Unit Voltage and Resistance Checks. Perform voltage and(resistance checks of the redundant power supply unit (fig. 3-4) once a month, as follows:

NOTE

Do not remove any module of the redundant power supply unit before performing voltage checks of both common modules.

(1) Voltage checks.

(*a*) Using the ac/dc differential voltmeter, perform voltage checks on common module (position 3) at test points given in table 3-6. If voltage readings vary from those given in the table, proceed as directed in paragraph 3-13*a*(3) (troubleshooting) or paragraph 3-13*b* (adjustment) as applicable.

(*b*) Repeat step (*a*) for common module (position 3).

Table 3-6. Common Module Voltage Readings

Test Points	*Voltage*
POS IN and GRD	+7 ± 0.1 vdc
NEG TN .and GRD	-7 ± 0.1 vdc
+6 and GRD	+6.2 ± 0.05 vdc
-6 and GRD	-6.2 ± 0.05 vdc

(2) *Resistance checks*. Resistance checks of the redundant power supply consists of measuring the forward and reverse resistance of the common module isolation diodes.

NOTE

Do not perform isolation diode resistance checks before performing voltage checks in (1) above.

(*a*) *Common module (position 3).*

1. Plug diode substitution module in test points TP1, TP.3, TP2, and TP5, of common module (position 4). (The diode substitution module plugs in the four test points simultaneously.)

2. Remove common module (position 3) from redundant power supply.

3. Using the Simpson multimeter, model 260, set on the R x 1 scale, perform resistance checks at the test points given in table 3-7. If diode is faulty, replace common module with an operational unit and repair faulty unit.

(*b*) *Common module (position 4)*.

1. Plug diode substitution module in test points of common module (position 3).

2. Remove common module (position 4).

3. Repeat step (*a*)3 above.

Table 3-7. Resistance Test of Isolation Diodes in Common Module

Test point	*Diode*	*Current direction*	*Resistance*
NEG IN and -6	CR-6	Forward	13 ± 3 ohms
		Reverse	>500 ohms
POS IN and +6	CR-7	Forward	13 ± 3 ohms
			>500 ohms

3-14. Corrective Maintenance

a. Troubleshooting

(1) *General*. The most probable cause of trouble is the loss of a signal as the result of a defective isolation switch or the loss of a group of three signals as the result of a blown fuse on one of the fuse panels. A trouble will normally manifest itself as a malfunction as

sociated with some other subsystem at the AUTODIN site or the loss of a signal between an equipment in the red area and another equipment in the black area. Troubleshooting information in this section is limited to detection of a malfunction within the red/black isolation facility. Before using this information, it is necessary to first establish that the trouble is definitely due to a malfunction in the red/black isolation facility rather than a malfunction elsewhere in the site. For this troubleshooting information, refer to the system manual, TM 11-5895-391-15.

(2) *Facility troubleshooting*

(*a*) Procedures for locating troubles within the red/black isolation facility are given in table 3-8. Before proceeding with the troubleshooting, make sure that all taper pins are securely inserted in the taper pin blocks on the red and black sides of the equipment cabinet. Check the redundant power supply units on the red and black sides of the panel to see that all panel indicators are illuminated. If one of the power supply modules is defective, the red/black isolation facility will still operate normally because the redundant arrangement ensures that operating power will still be fed to the isolation switches. If any indicator is not illuminated, troubleshooting must be performed on the redundant power supply unit.

***Warning*: If necessary to work on an ac terminal containing primary voltage, use insulated tools** .

Table 3-8. Red/Black Isolation Facility, Troubleshooting Procedures

Symptom	Probable trouble	Corrective measure
Loss of signal through one red/black isolation switch.	(1) Defective input or output module in isolation switch.	(1) Replace isolation switch input or output module, or both. Refer to paragraph 3-14*c*(1).
	(2) Defective photon-coupled isolator in isolation switch.	(2) Replace isolation switch. Refer to paragraph 3-14*c*(1).
	(3) Defective wiring in equipment cabinet or between cabinet and associated distribution frame.	(3) Perform continuity check using multimeter. Refer to cabling diagram, figure 6-4.
Loss of signals through 3 isolation switches; ALARM indicator illuminated on positive or negative fuse panel.	Open fuse...	Check positive or negative fuse panel for flag indicator showing a blown fuse. Replace fuse (fig. 3-11).
Loss of signals through all isolation switches.	Loss of all primary ac power to facility.	Check that AC indicators on both common modules are illuminated. If not, ac power is not being applied to redundant power sup. ply units. Check ac distribution and/or cabling. (Refer to applicable site supplement manual.)
All isolation switches operate normally; one or more DC ON indicators on redundant power supply unit are not illuminated, but AC indicators are illuminated.	Malfunction in redundant power supply unit.	Perform troubleshooting of redundant power supply module. Refer to table 3-9.

(*b*) When performing troubleshooting within the facility, connect one input of the dual-trace oscilloscope to the input module of the isolation switch and the other input of the oscilloscope to the output module. These connections are made to the taper pin block at the bottom of the cabinet. Figure 3-9 illustrates the connections between a typical isolation switch module and the taper pin block. Figure 6-4, the cabling diagram of the red/black isolation facility, shows the interconnections between the input and output modules of each isolation switch and the corresponding pins on the taper pin block.

(*c*) The oscilloscope must be set up to simultaneously show the input and output waveforms. If a low-level timing or data signal is not present at the input of the isolation switch which is suspected to be defective, a test signal must be patched from Data Analysis Center Model DAC-7. While observing the oscilloscope, move the input and output cables and gently rock the isolation switch modules A change in waveform indicates that a cable, cable connector, or isolation switch module is loose. If no change in waveform is observed, the input module, or output module, or both should be replaced (*c* below). If module replacement does not eliminate the trouble, the complete red/black isolation switch should be replaced.

(*d*) If a loss of signals occurs through three of the isolation switches, check the positive and negative fuse panels for an open fuse. Figure 3-11 illustrates the isolation switch fuse assignments. For example, if isolation switches 25, 33, and 41 are down, check fuse 9, the associated fuse, on all four fuse panels.

(*e*) If a loss of signals through all of the isolation switches is noted, the associated fuses in the ac branching cabinet for the primary ac power circuits should be checked. Figure 3-10 is a simplified schematic diagram which facilitates troubleshooting by showing the distribution of ac power within the red/ black isolation facility cabinet.

(*f*) Any fault which occurs in the ac or dc power distribution circuits of the facility will produce an alarm. The theory of the alarm circuits is given in paragraph 3-9*c*. To facilitate troubleshooting, simplified schematic diagrams of alarm relay K3 in common module (position 3) and alarm relay K3 in common module (position 4) are provided in figure 3-12.

(3) *Redundant power supply unit troubleshooting*. Procedures for troubleshooting the redundant power supply unit are given in table 3-9. Modules in the power supply unit are designated by their position in the unit, position 1 on the left through position 6 on the right.

Note. **Perform the tests in paragraph 3-13*b* before removing any module for troubleshooting.**

Table 3-9. Red/Black Isolation Facility, Redundant Power Supply Unit, Troubleshooting Procedures
(fig. 6-13)

Symptom	Probable trouble	Corrective measure
A. Same voltage level between: TP4 and TP2, TP5 TP4 and TP1, TP3	Shorted isolation diode: CR6 CR7	Perform resistance check (para. 3-13*b*(2)).
B. Incorrect voltage levels .	(1) Power supply output voltage improperly adjusted.	Adjust power supply output voltage (para. 3-14*b*).
	(2) Trouble in power supply.	(a) Insert diode substitution module in common module 3 or 4 as follows: Position 4 if removing power supply (position 1 or 2) Position 3 if removing power supply (position 5 or 6) (b) Replace power supply.
C. No voltage on TP1 (POS IN) or TP6 (NEG IN) of common modules 3 or 4.	(1) Blown fuse F101 in power supply module.	(a) Perform B(2)(a) above. (b) Replace fuse.
	(2) Trouble in power supply.	Perform B (2) (a) and: (b) above.
D. AC INDICATOR of common module not illuminated but correct dc voltages measured on test points on common module.	Defective AC lamp (DS1) in common module.	Replace DS1.

Table 3-9. Red/Black Isolation Facility, Redundant Power Supply Unit, Troubleshooting Procedures (fig. 6-13)-Continued

Probable trouble	Corrective measure	Symptom
E. DC ON indicator of power supply module not illuminated but correct de voltage measured on associated test point (NEG IN or POS IN) of common module.	Defective DC on lamp (DS101).	(*a*) Perform B(2)(*a*). (*b*) Remove power supply unit and replace DS101.
F. The POS or NEG lamp on one of the common modules not illuminated.	Defective POS (DS3) or NEG (DS2) lamp.	Replace lamp DS3 of DS2.

(4) *Power supply module troubleshooting.* Modules will be removed from facility for repair, troubleshooting, and adjustment of the current-limiting resistor (R221), and an operational module inserted in its place. Information helpful in troubleshooting may be found in the block diagram discussion of the unit (para 3-9), the schematic diagram (fig. 6-13), and the parts location illustration (fig. 3-13).

Note. External provisions have not been provided for adjusting R221.

(5) *Fuse panel troubleshooting*. Procedures for troubleshooting the positive or negative fuse panel are given in table 3-10. The alarm test procedure given in paragraph 3-28 can be performed at any fuse panel to check the alarm circuit. For schematic diagram, see figure 6-14.

Table 3-10. Red/Black Isolation Facility, Fuse Panel, Troubleshooting Procedures

Symptom	Probable trouble	Corrective measure
Alarm lamp (DS1) not illuminated when push-to-test switch (S1) is closed.	(1) DS1 defective. (2) Relay (K1) defective.	(1) Replace. (2) Remove panel; replace K1.
Alarm lamp (DS1) not illuminated when fuse is blown.	(1) Same as (1) and (2) above.	Replace.
	(2) Blown fuse not contacting alarm bus.	(3) Clean alarm bus with approved cleaner.
Alarm lamp (DS1) illuminated when fuse is not blown.	(1) Short between power and alarm bus.	(1) Remove panel and visually inspect for short circuit. Clear short circuit.
	(2) DS1 defective .	(2) Replace.

b. Adjustment of Power Supplies. Procedures for adjusting the output of the power supply modules in the redundant power supply unit are given in the following paragraphs. Positive power supply (position 1) and negative power supply (position 2) are monitored by using the front panel pin jacks on common module (position 3.) Positive power supply (position 5) and negative power supply (position 6) are monitored at common module (position 4). (Module positions in the redundant power supply units are designated 1 through 6 from left to right.)

Note. Perform test in paragraph 3-13*b*. before adjusting power supplies.

(1) *Power supply (position 1) and power supply (position 2).* Adjust the power supplies at these positions as follows:

(*a*) Connect differential voltmeter to +6 and GRD pin jacks on common module (position 3).

(*b*) Pull out power supply (position 5) until DC ON indicator goes out.

(*c*) Observe voltmeter; continue with adjustment procedure if voltmeter does not indicate +6.2 +0.05 volts dc.

(*d*) Insert power supply (position 5) and remove power supply module (position 1).

(*e*) Adjust resistor R226 at rear of power supply module. See figure 3-13 for location of resistor.

(*f*) Replace power supply module in position 1 and pull out power supply (position 5).

(*g*) Observe voltmeter; if voltmeter does not indicate +6.2 ± 0.05 volts dc, repeat steps *c* through *g* until correct indication is obtained.

(*h*) Replace all modules in redundant power supply unit.

(*i*) Connect differential voltmeter to -6 and GRD pin jacks on common module (position 3).

(*j*) Pull out power supply (position 6) until DC ON indicator goes out.

(*k*) Observer voltmeter; continue with adjustment procedure if voltmeter does not indicate -6.2 ± 0.05 volts dc.

(*l*) Insert power supply (position 6) and remove power supply module (position 2).

(*m*) Adjust resistor R226 at rear of power supply module. See figure 3-13 for location of resistor.

(*n*) Replace power supply module in position 2 and pull out power supply (position 6).

(*o*) Observe voltmeter; if voltmeter does not indicate -6.2 ±0.05 volts dc, repeat steps (*k*) through (*o*) until correct indication is obtained.

(*p*) Replace all modules in redundant power supply unit.

(2) *Power supply (position 5) and power supply (position 6).* Power supplies at these positions are adjusted in the same manner as power supplies at positions 1 and 2. Proceed as follows:

(*a*) Connect digital differential voltmeter to +6 and GRD pin jacks on common module (position 4).

(*b*) Pull out power supply (position 1) until indicator goes out.

(*c*) Observe voltmeter; continue with adjustment procedure if voltmeter does not indicate +6.2 ±0.05 volts dc.

(*d*) Insert power supply (position 1) and remove power supply module (position 5).

(*e*) Adjust resistor R226 at rear of power supply module. See figure 3-13 for location of resistor.

(*f*) Replace power supply module in position 5 and pull out power supply (position 1).

(*g*) Observe voltmeter; if voltmeter does not indicate +6.2 ±0.05 volts dc, repeat steps (*c*) through (*g*) until correct indication is obtained.

(*h*) Replace all modules in redundant power supply unit.

(*i*) Connect differential voltmeter to -6 and GRD pin jacks on common module (position 4).

(j) Pull out power supply (position 2) until indicator goes out.

(*k*) Observe voltmeter; continue with adjustment procedure if voltmeter does not indicate -6.2 ±0.05 volts dc.

(*l*) Insert power supply (position 2) and remove power supply module (position 6).

(*m*) Adjust resistor R226 at rear of power supply module. See figure 3-13 for location of resistor.

(*n*) Replace power supply module in position 6 and pull out power supply (position 2).

(*o*) Observe voltmeter; if voltmeter does not indicate -6.2 ± 0.05 volts dc, repeat steps (*k*) through (*o*) until correct indication is obtained.

(*p*) Replace all modules in redundant power supply unit.

(*c*) *Repair.* Modules will be removed from facility for repair and an operational module inserted in its place.

(1) *Replacement of isolation switch*. Replace the complete isolation switch as follows:

(*a*) Disconnect signal and power cable connectors from input and output modules.

(*b*) Remove mounting hardware securing isolation switch to cabinet partition. Do not discard hardware or gasket. Remove isolation switch from partition.

(*c*) Install replacement isolation switch in partition, making sure that mounting plate of switch is positioned on the same side of partition as the removed isolation switch and that the rfi gasket from the removed switch is used for the new switch.

(*d*) Secure isolation switch to partition using hardware previously removed.

(*e*) Connect signal and power cable connectors to input and output modules.

(2) *Removal of isolation switch modules*. Remove input or output module from isolation switch as follows:

(*a*) Disconnect signal and power cable connectors from module.

(*b*) Place thumb and index finger slightly beyond dimples on top and bottom edges of outside cover.

(*c*) Firmly squeeze fingers together, deflecting top and bottom surfaces to disengage can and cover dimples.

(*d*) Rock cover up and down slightly to dislocate dimples and at same time draw module out of isolation switch.

(3) *Replacement of isolation switch modules*. When replacing a module, insert the input module in the end of the case assembly marked INPUT, and insert the output module in the end marked OUTPUT. Replace the input or output module as follows:

Note. If the modules are mistakenly interchanged, no damage to the switch will result, but the switch will not function.

(*a*) Place module in position with printing in normal readable position.

(*b*) Position module at end of case until top and bottom dimples of outside cover are against case dimples.

(*c*) Rock cover up and down slightly to permit internal connectors to engage case connectors.

***Caution*: Do not exert excessive pressure on outside cover as cover may snap.**

(*d*) Exert pressure straight back until outside cover dimples snap over case dimples. Check to see that outside cover rests against case dimples.

(*e*) Connect signal and power cables to module.

d. Parts Location Diagrams. Parts location diagrams of the 7-volt dc power supply module, the common module, and the fuse panel are shown in figures 3-13 through 3-15.

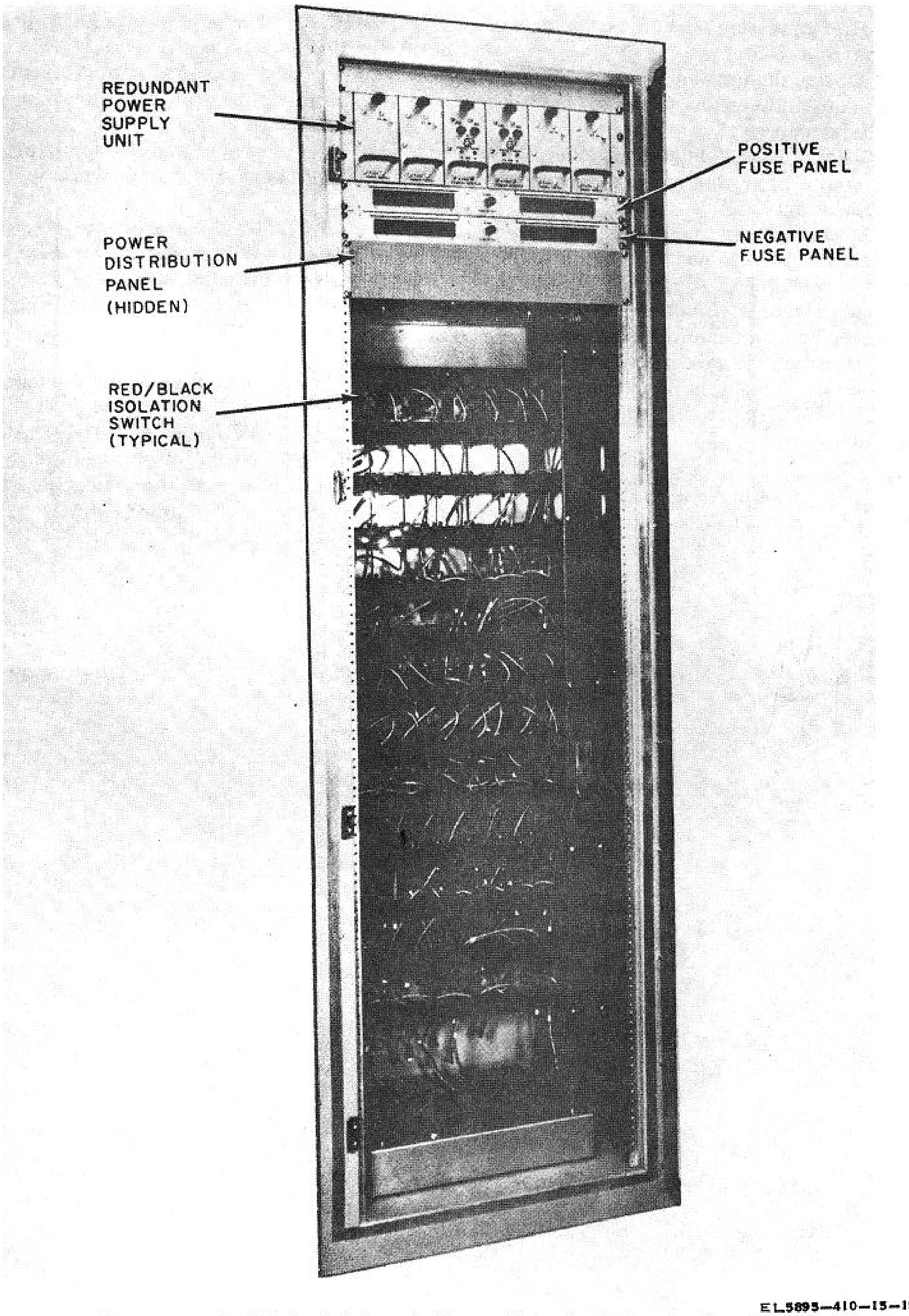


Figure 3-1. Red/black isolation facility cabinet (typical), showing locations of assemblies.

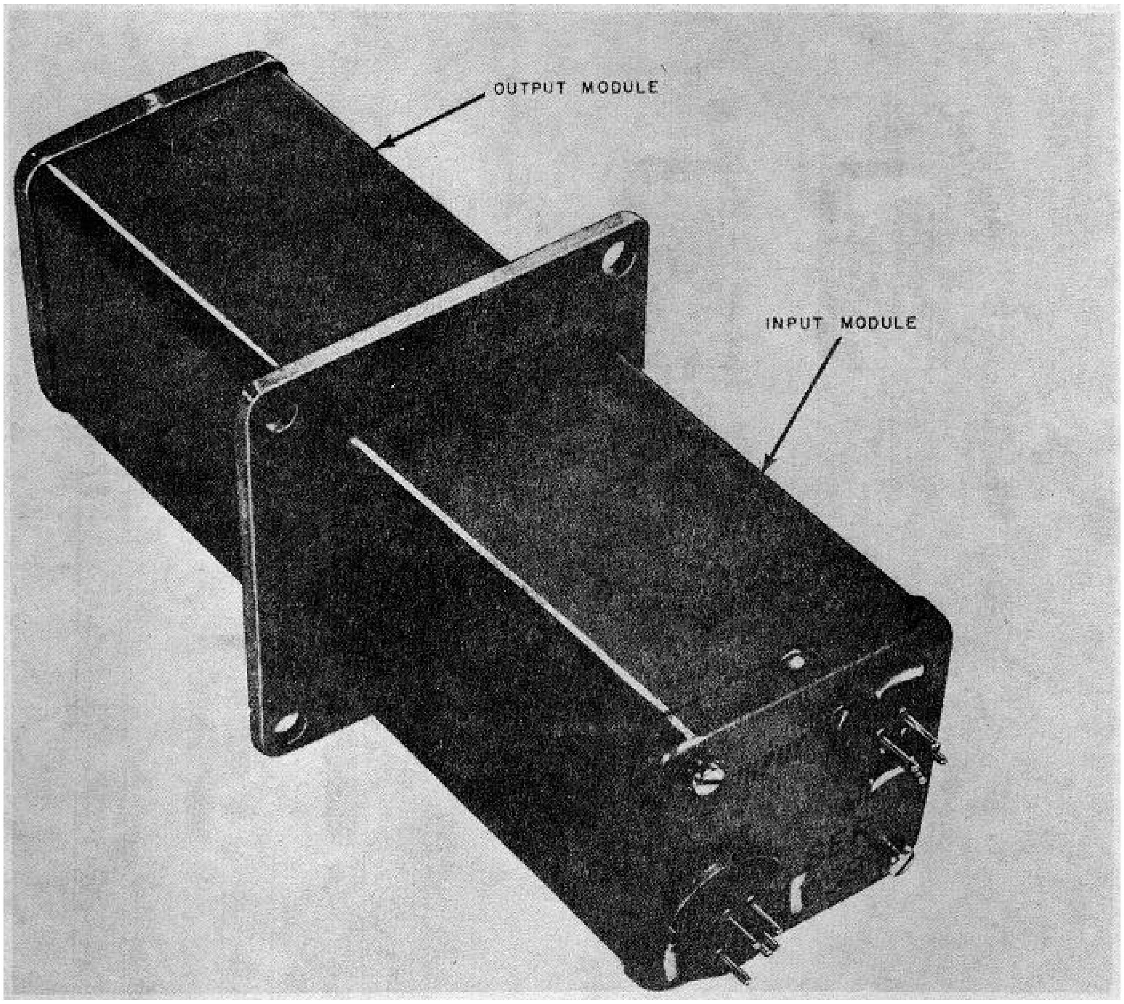


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Figure 3-2. Red/black isolation switch.

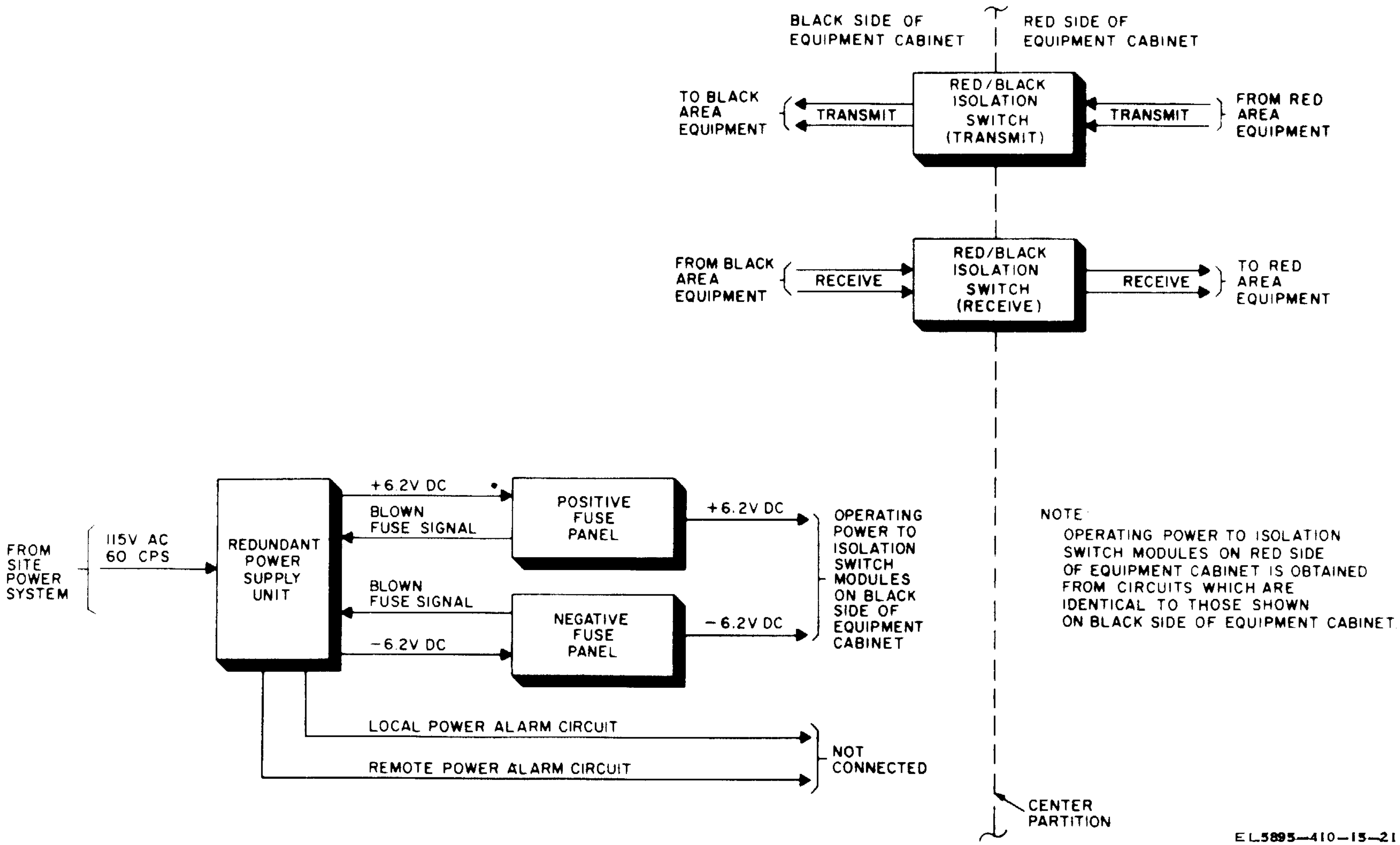


Figure 3-3. Red/black isolation facility, functional block diagram.

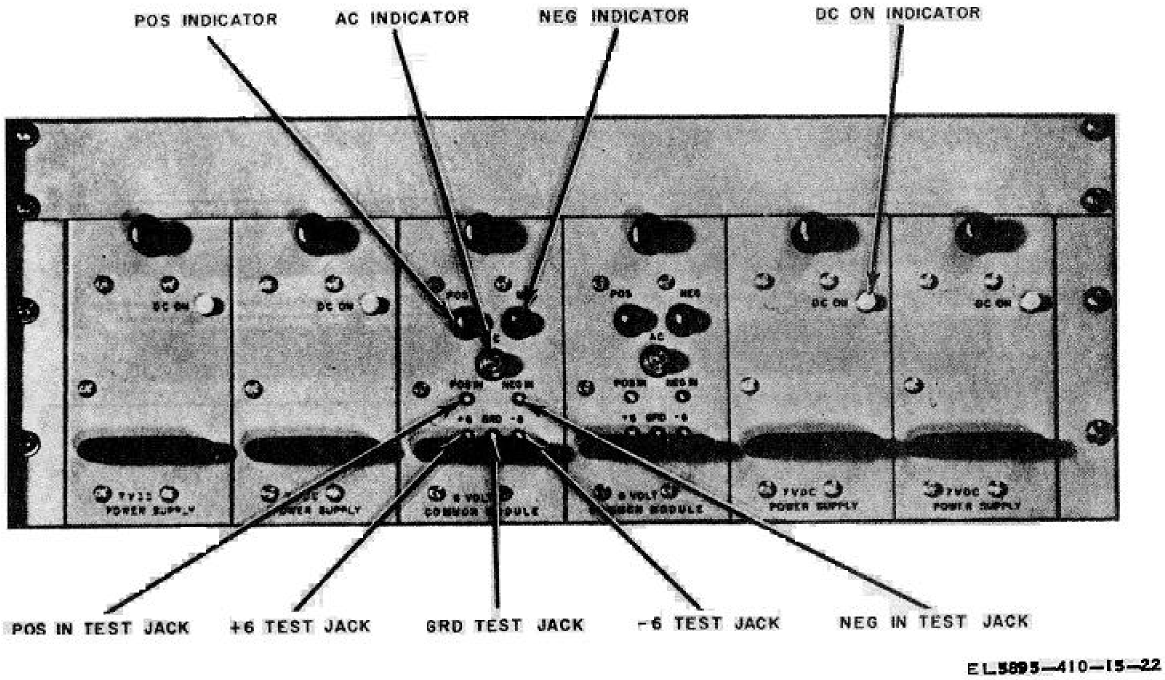


Figure 3-4. Red/black isolation facility, redundant power supply unit, operator's controls and indicators.

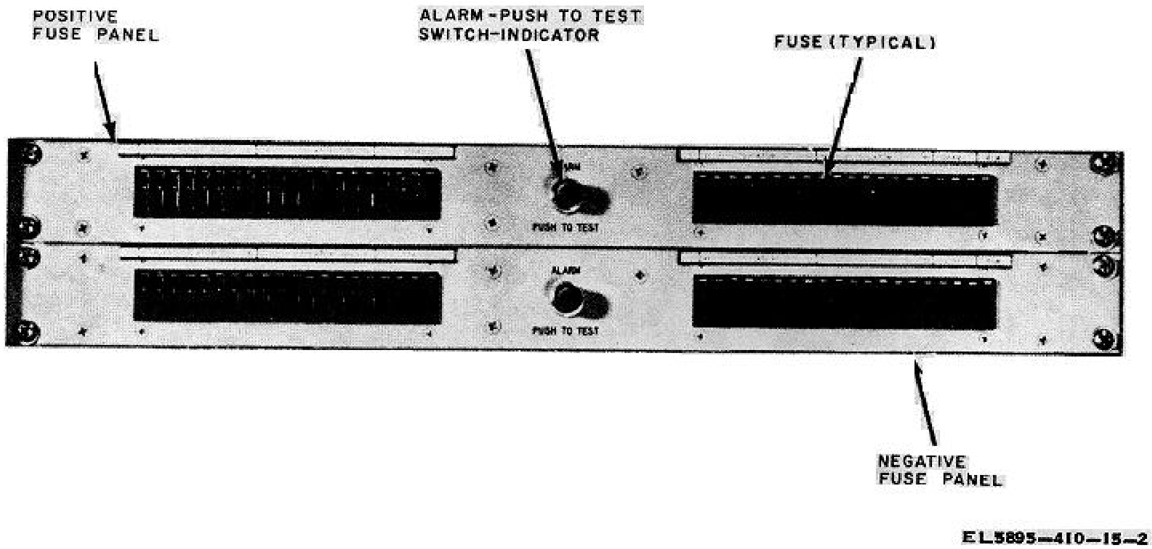


Figure 3-5. Red/black isolation facility, fuse panel, operator's controls and indicators.

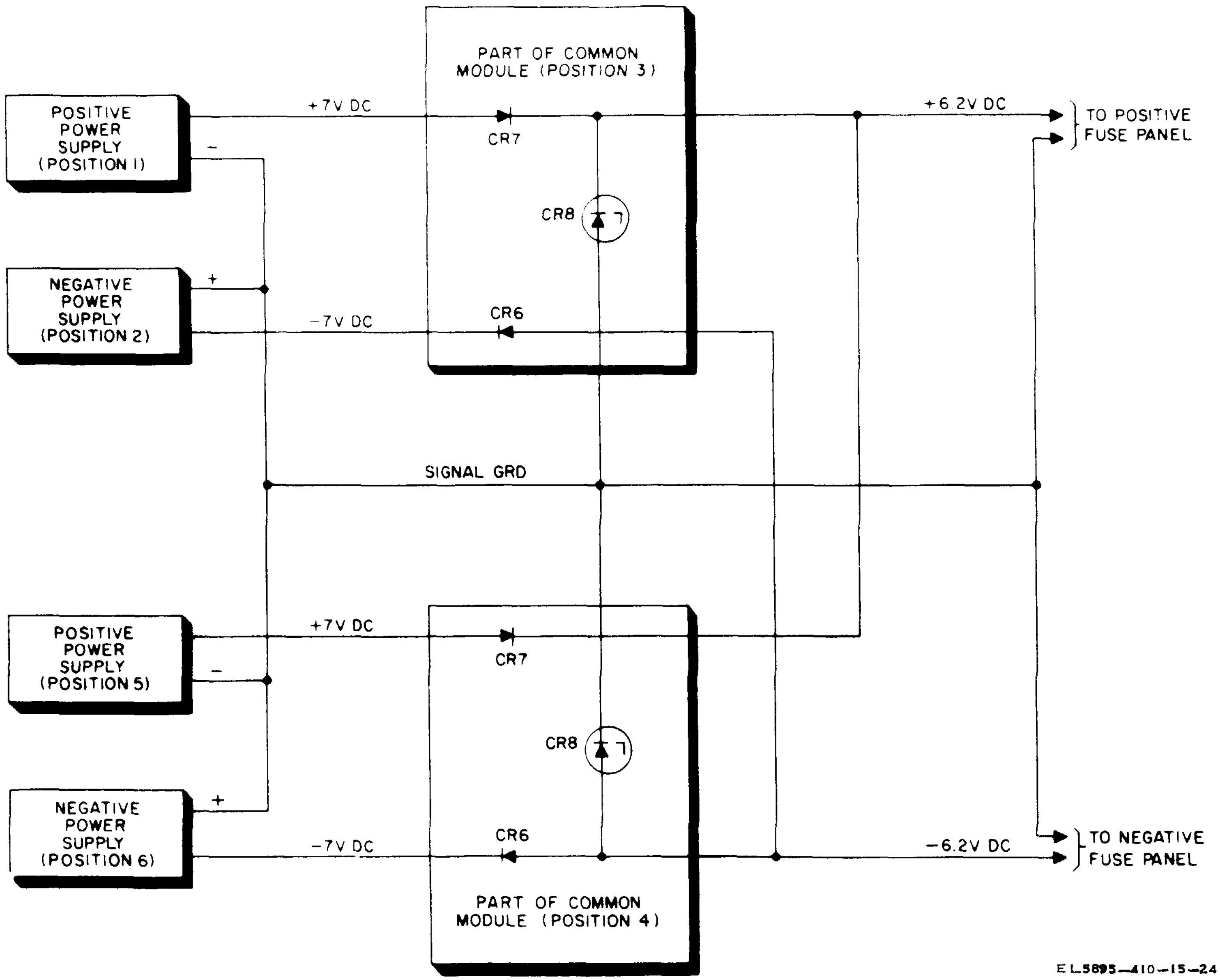


Figure 3-6. Red/black isolation facility, redundant power supply, functional block diagram.

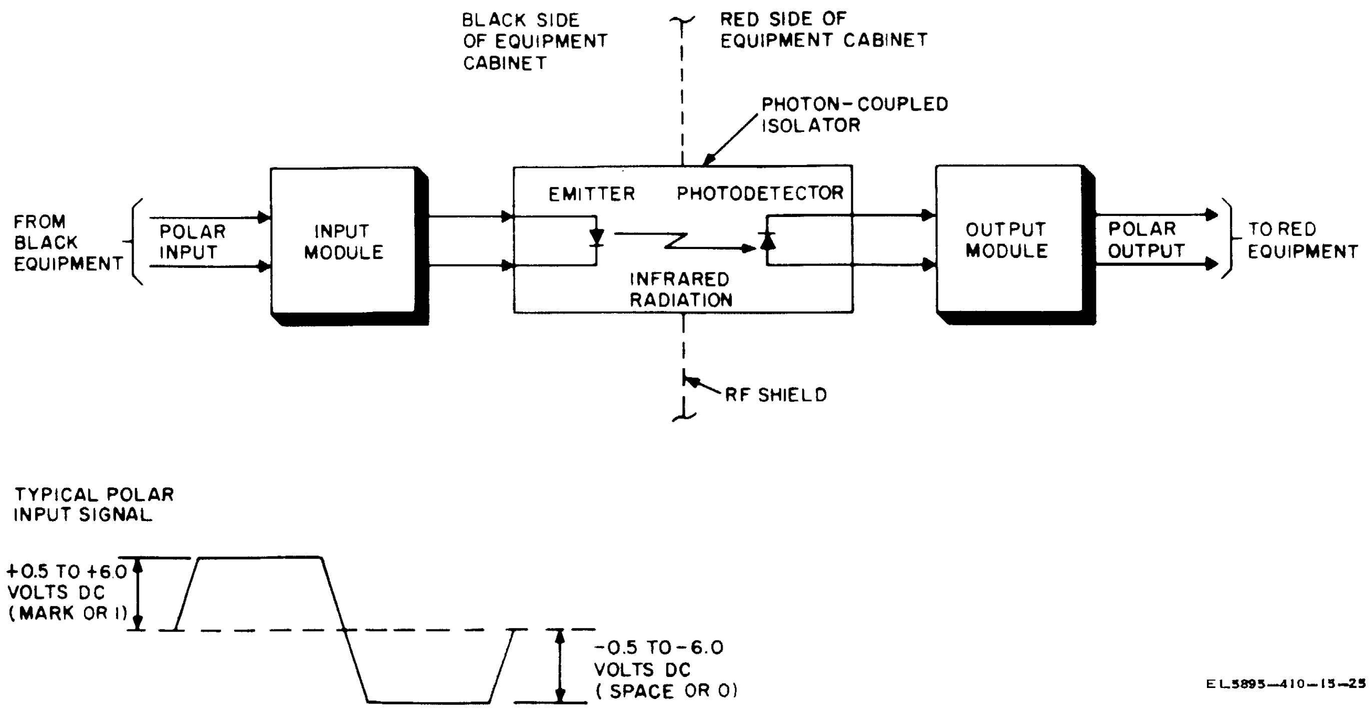


Figure 3-7. Red/black isolation switch, functional block diagram.

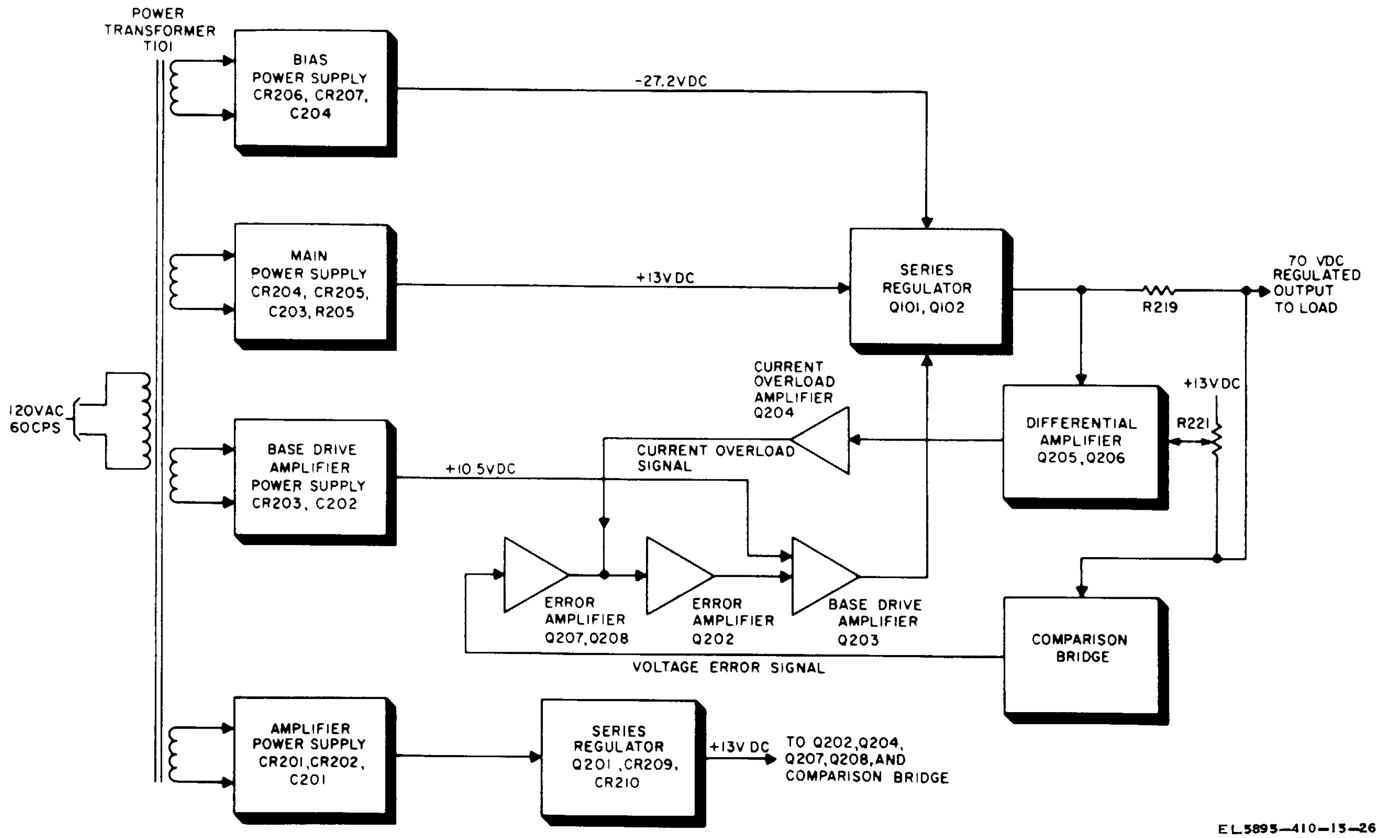
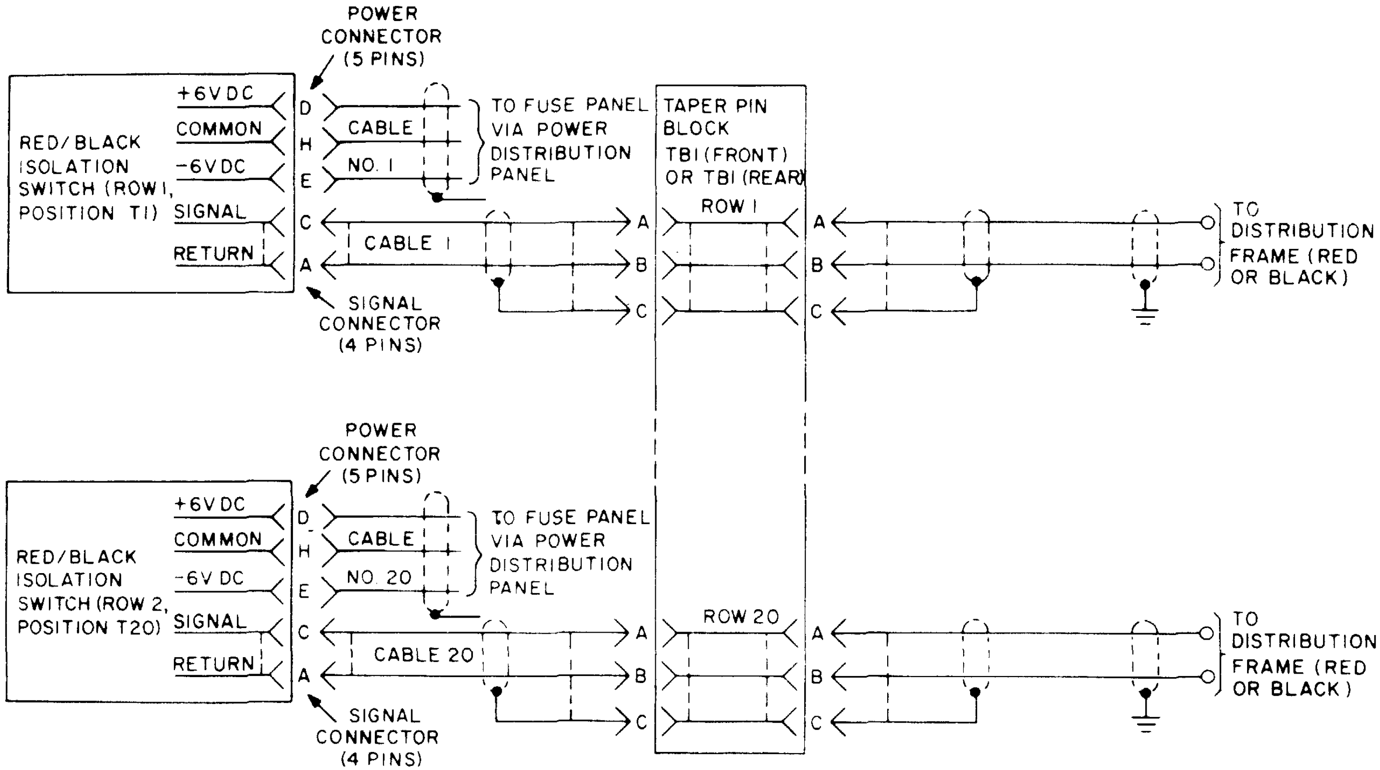


Figure 3-8. 7-Volt dc power supply module, functional block diagram.



NOTES:

1. CABLE NUMBER CORRESPONDS TO NUMBERED POSITION OF ISOLATION SWITCH.
2. EACH TAPER PIN BLOCK INTERCONNECTS 20 ISOLATION SWITCHES TO DISTRIBUTION FRAME.
3. SEE CABLING DIAGRAM OF RED/BLACK ISOLATION FACILITY FOR DETAILED INTERCONNECTIONS BETWEEN ISOLATION SWITCHES, TAPER PIN BLOCKS, AND DISTRIBUTION FRAMES.

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Figure 3-9. Connections between typical isolation switch module and taper pin block.

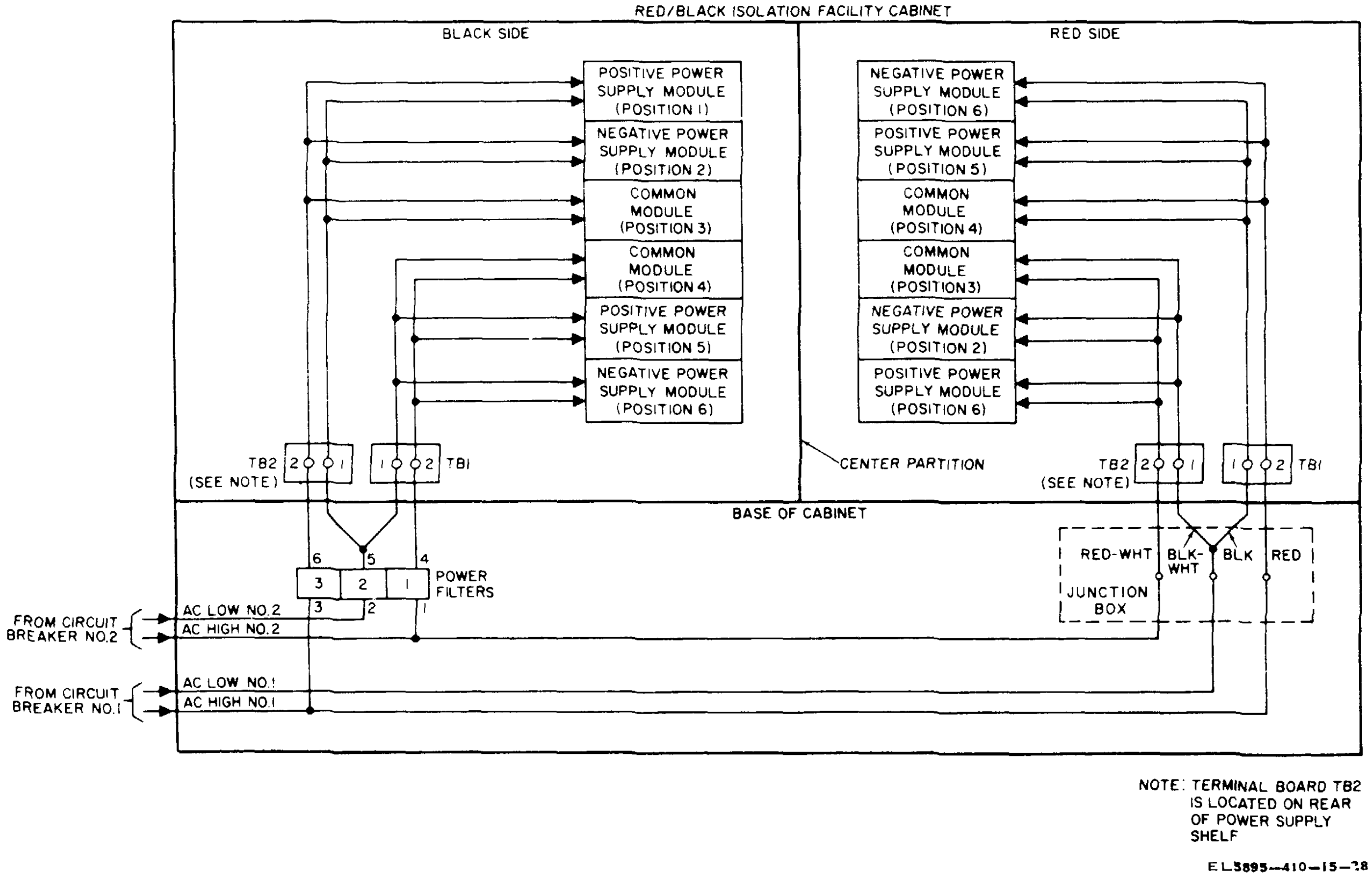
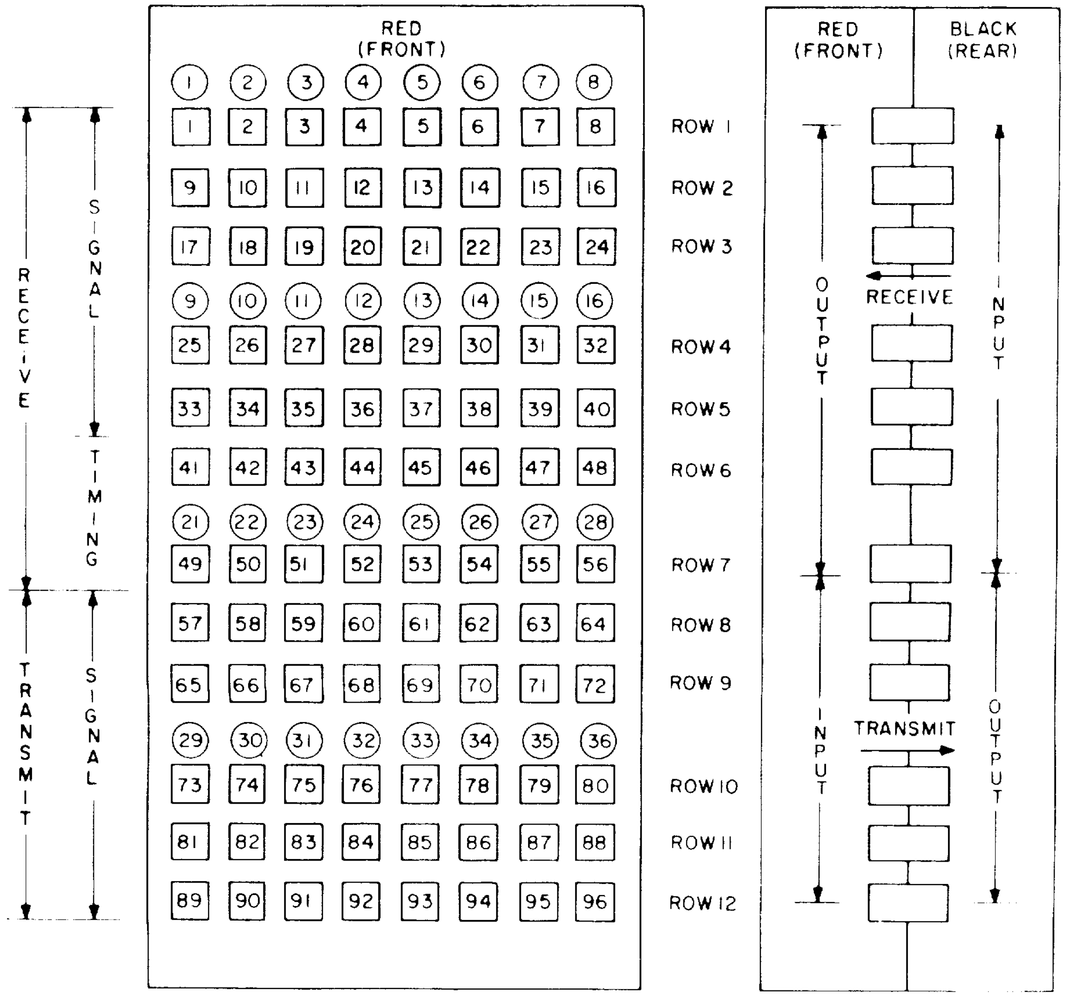


Figure 3-10. Red/black isolation facility, ac power supply distribution, simplified schematic diagram



NOTES

1. NUMBER IN BOX INDICATES POSITION OF ISOLATION SWITCH IN CABINET (T1, T2 ETC)
2. NUMBER IN CIRCLE INDICATES FUSE NUMBER IN POSITIVE AND NEGATIVE FUSE PANEL ASSOCIATED WITH EACH GROUP OF THREE ISOLATION SWITCHES

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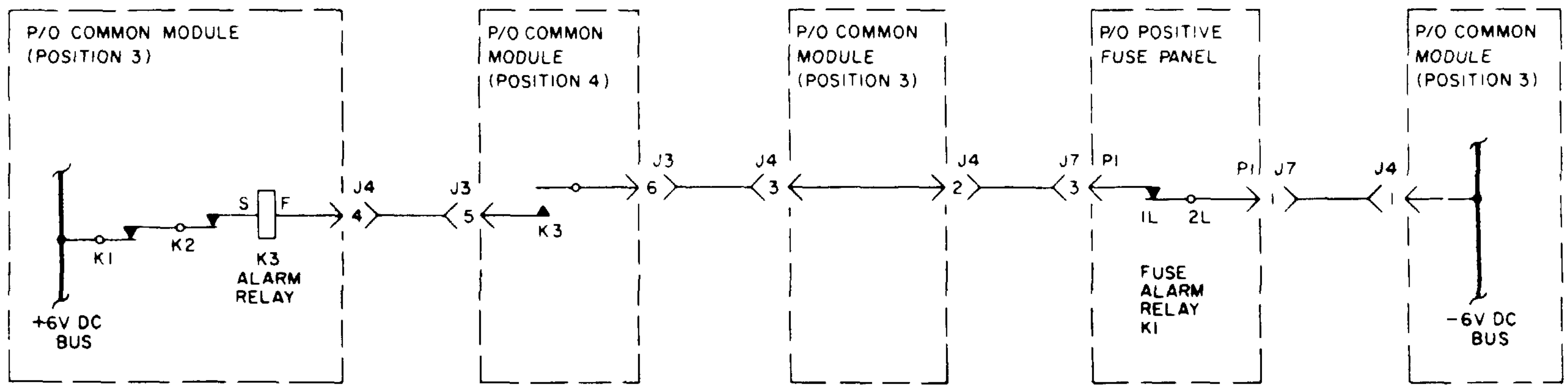
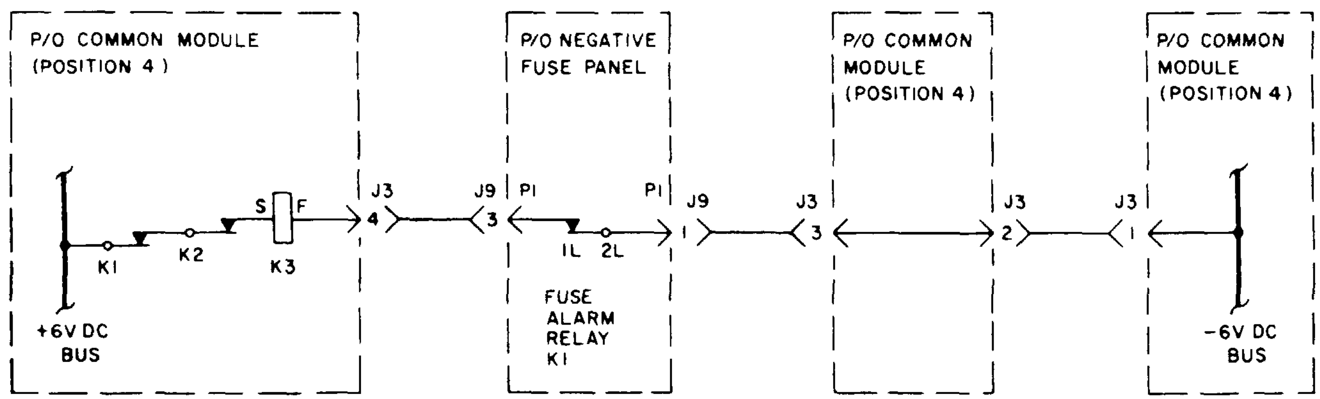
Figure 3-11. Red/black isolation facility, fuse protection, functional block diagram.



A. CONTROL CIRCUIT FOR ALARM RELAY K3 IN COMMON MODULE (POSITION 3)



B. CONTROL CIRCUIT FOR RELAY K3 IN COMMON MODULE (POSITION 4)

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Figure 3-12. Red/black isolation facility, alarm relay circuit, simplified schematic diagram.

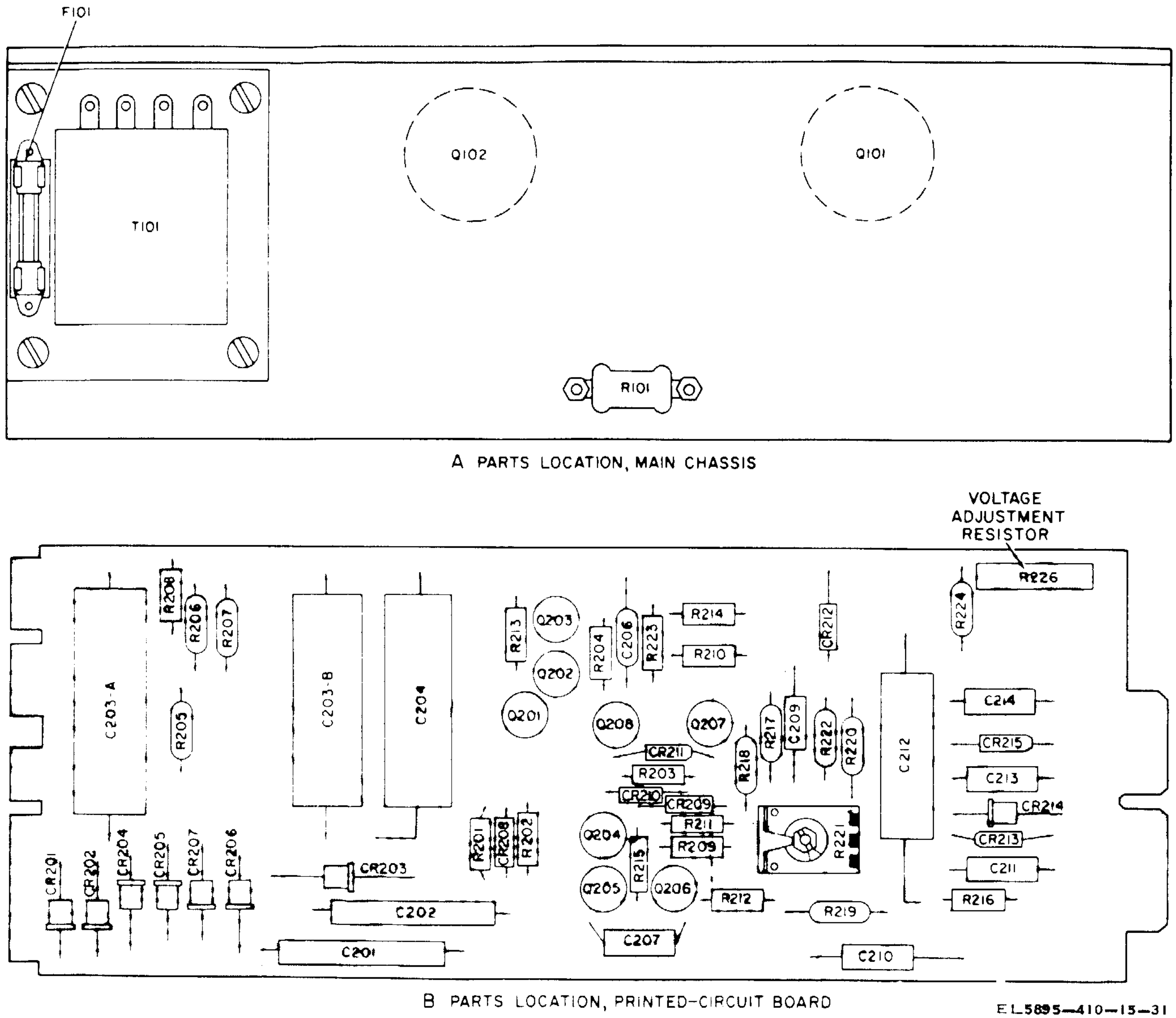

Figure 3-13. Red/black isolation facility, power supply module, parts location diagram.

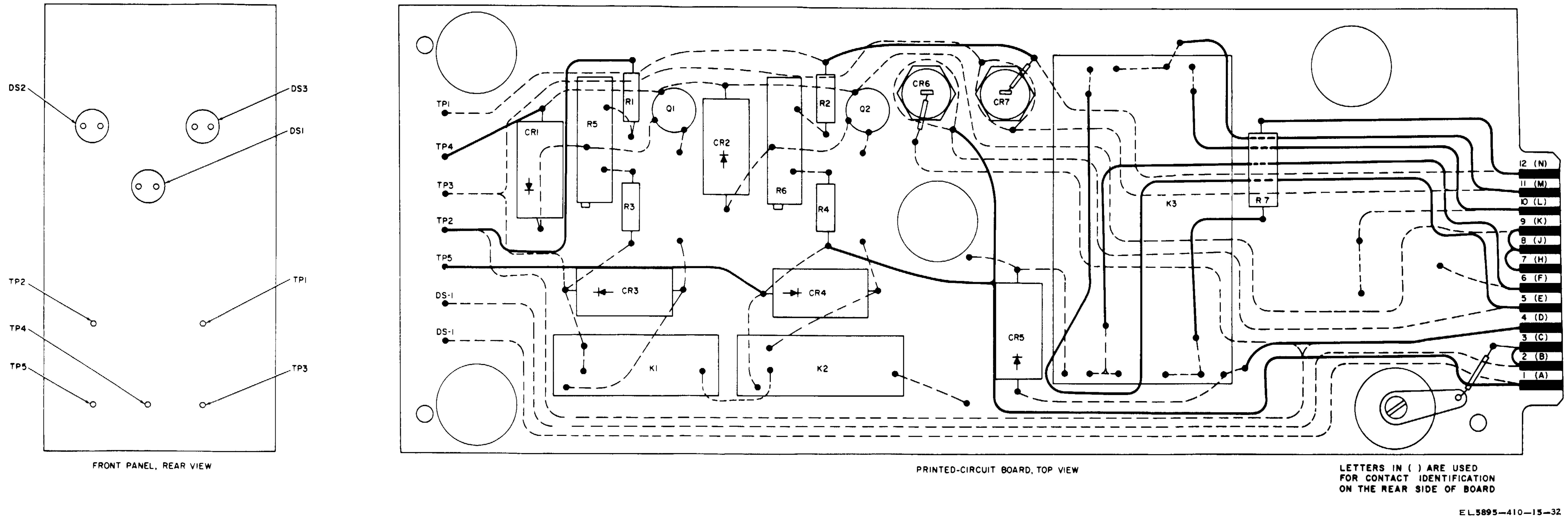

Figure 3-14. Red/black isolation facility, 6-volt common module, parts location diagram.

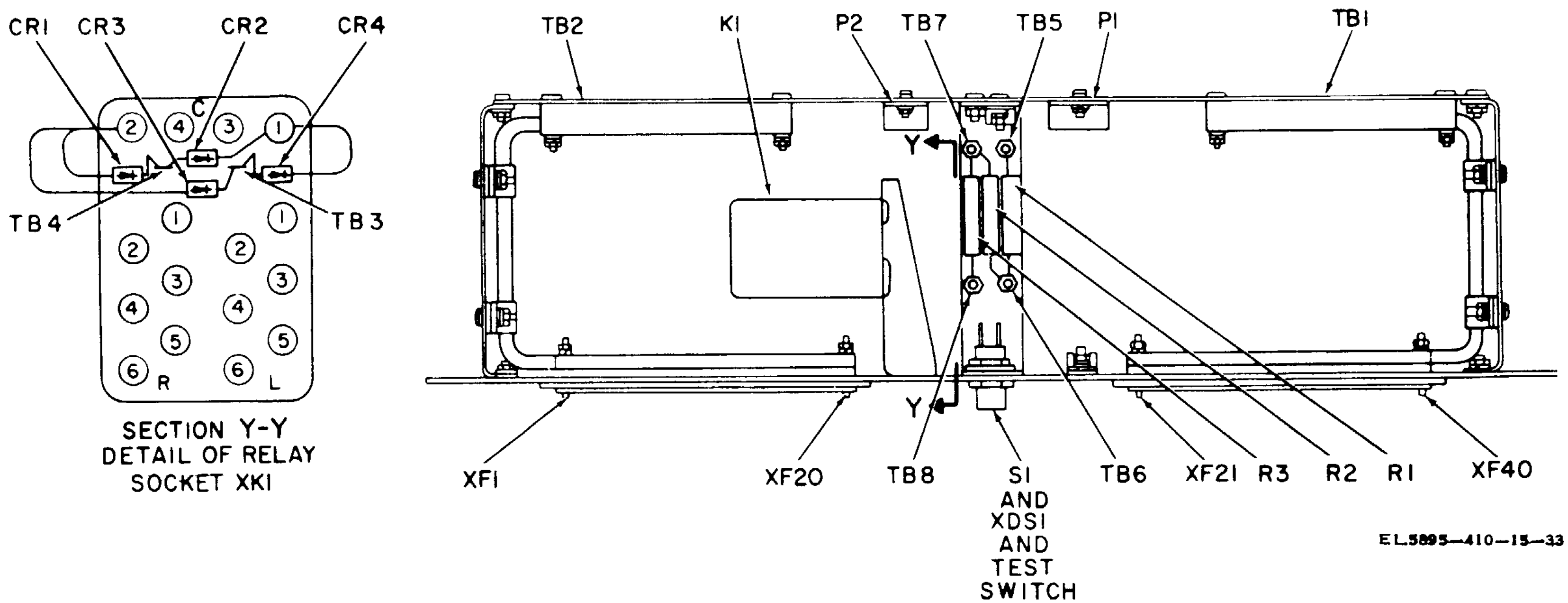

Figure 3-15. Red/black isolation facility, fuse panel, parts location diagram.

CHAPTER 4

AUDIO ISOLATION FACILITY

4-1. General

This chapter describes the audio isolation facility (fig. 4-1) and provides instructions for performing maintenance and troubleshooting.

4-2. Purpose and Use

The audio isolation facility provides negligible attenuation to audio signals in the 50- to 3500cps range and maximum attenuation to rf signals. The audio isolation facility is installed between the transit and receive lines of the red and black AUTOVON equipment to prevent unwanted rf signals at the red AUTOVON equipment from appearing at the black AUTOVON equipment.

4-3. Description of Equipment

a. The audio isolation facility is contained in a standard-size equipment cabinet (fig. 4-1). The cabinet can contain a maximum of 6 filter box assemblies, and each assembly can contain a maximum of 18 radio interference filters. Each filter box assembly is completely rfi tight. The rear cover plate is attached with an rfi gasket. Any hole in the front panel not equipped with a filter is closed by a cover plate and rfi gasket. Ducts are provided between the rear of the filter box assemblies and the base plate of the cabinet for connection with the floor duct. This cable duct is used for the cables from the equipment in the black area to the filters.

b. The radio interference filter (fig. 4-2) is the main functional component of the audio isolation facility. The front end of the filter has a threaded mounting neck which is inserted into a corresponding hole on the front panel of the filter box assembly and then is secured by mounting hardware. The leads from equipment in the red area are connected to terminals on the threaded mounting neck. The leads from the equipment in the black area terminate on the lugs on the end of the filter opposite the mounting stud.

4-4. System Application

As shown in figure 4-3, the audio isolation facility provides RF filters to prevent unwanted RF signals which may be present at the red AUTOVON equipment from appearing at the l)lack AUTOVON equipment. Each transmit and receive line which routes audio signals between the red and black AUTOVON equipment passes through a radio interference filter. This filter passes audio signals in the 50- to 3500-cps range with negligible attenuation. RF signals (14 kc and higher) which may be present on the transmit or receive line are attenuated by the filter.

4-5. Technical Characteristics

The audio isolation facility contains only passive components. Except for removing any unwanted RF signals from the lines, the audio isolation facility does not affect the technical characteristics of the signals. Table 4-1 lists the physical characteristics of the audio isolation facility components and the electrical characteristics of the radio interference filter.

Table 4-1. Audio Isolation Facility, Technical Characteristics

Characteristic	Value
Equipment cabinet	
Height	77 1/8 in.
Width	21 1/16 in.
Depth	24 1/8 in.
Number of filter box assemblies 4.	
Filter box assembly	
Height	10 1/4 in.
Width	19 in.
Depth	11 1/4 in.
Number of radio interference filters	18 (max.)

Table 4-1. Audio Isolation Facility Technical Characteristics-Continued

Characteristic	Value
Radio interference filter	
Height	2 1/2 in.
Width	2 11/2 in.
Depth	7 1/2 in.
Input impedance	600 ohms.
Output impedance	600 ohms.
Audio frequency range	50 to 3500 cps.
Audio insertion loss	1 db
RF insertion loss	100 db, 14 kc to 1 mc.

4-6. Operation

The audio isolation facility is a passive device which performs its function without the need of an operator in attendance. The audio isolation facility contains no controls or indicators.

4-7. Theory of Operation

The theory of operation of the audio isolation facility is completely described in the system application discussion, paragraph 4-4. The only functional component in the audio isolation facility is the radio interference filter, which is also described in paragraph 4-4. Since the filter is a nonrepairable component, a detailed circuit description is not provided.

4-8. Maintenance

a. Preventive maintenance. Preventive maintenance of the audio isolation facility includes visual inspection and cleaning of the cabinet and its components. Proceed as follows:

(1) Open doors, and check to see that each filter box assembly is securely mounted to the frame in the bay.

(2) Insure that all radio interference filters are securely mounted in panel of filter box assembly and that hex nuts are tight.

(3) Insure that all unused filter mounting holes are properly closed with spacers and rfi gaskets. See figure 4-4 for details of rfi gasket installation.

(4) Check to see that back plate of each filter box assembly is not loose.

(5) Check to see that wiring is neat and orderly and without excessive slack.

(6) Make sure that all markings are clean and legible.

(7) Check to see that doors operate easily and that hinges are not loose.

(8) Inspect cabinet for dirt and foreign matter; clean if necessary.

b. Troubleshooting.

(1) The most probable cause of trouble is the loss of a particular signal within the facility as the result of a defective radio interference filter. This trouble will normally manifest itself as a malfunction associated with the AUTOVON control and interface facility. Refer to TM 11-5895-415-15 for troubleshooting procedures. If the trouble is definitely at the audio isolation facility, either a radio interference filter is defective or the wiring between the AUTOVON equipment and the audio isolation facility cabinet is defective.

(2) To check the wiring, a Simpson model 260 multimeter is used to measure point-to-point continuity. See figure 6-5 for cabling data for the audio isolation facility. If the point-to-point wiring is correct, then the radio interference filter should be replaced.

c. Replacement of Radio Interference Filter. To replace a defective radio interference filter, proceed as follows:

(1) Remove back plate from filter box assembly. Do not discard hardware.

(2) Mark and unsolder all leads, front and rear, from the radio interference filter to be replaced.

(3) Remove locknut from threaded mounting neck on filter. Do not discard locknut. Pull out defective filter from rear of filter box assembly.

(4) Insert new filter in rear of filter box assembly, and work threaded neck through hole on front panel. Reassemble locknut to threaded neck and tighten securely.

(5) Solder all wires to the same terminals from which they were removed in step (2).

(6) Insure that rfi gasket is properly positioned on the back plate, and then mount it on filter box assembly.

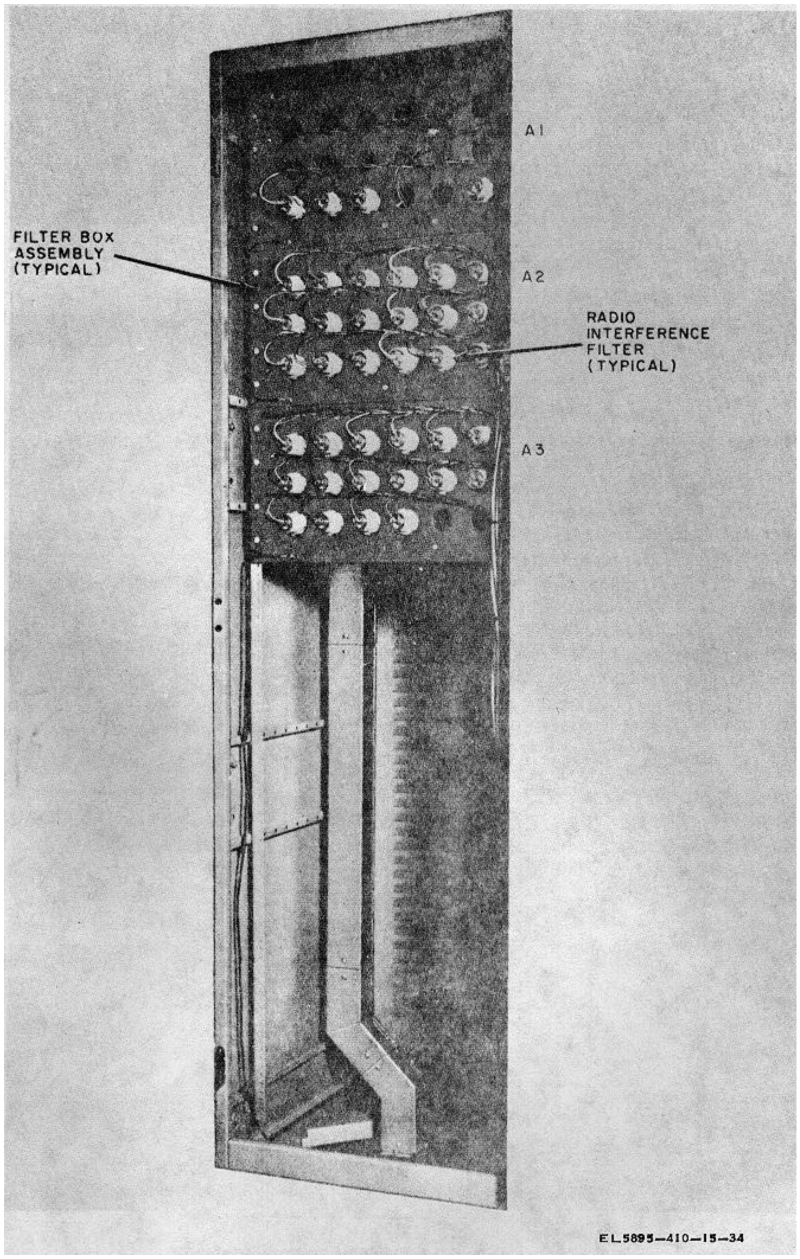

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Figure 4-1. Audio isolation facility cabinet (typical), showing locations of assemblies.

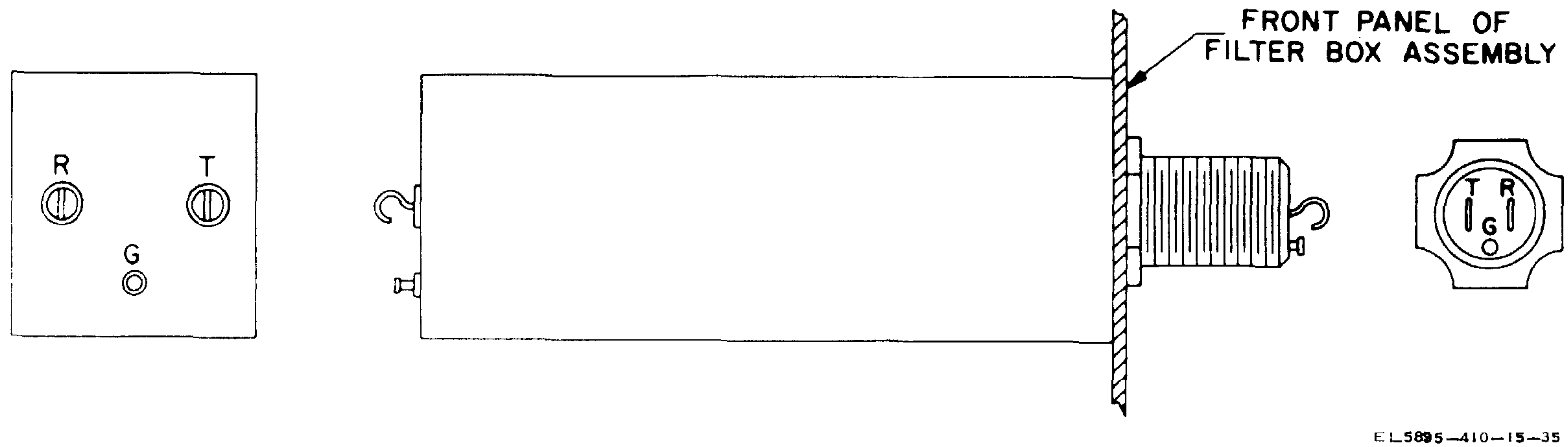


Figure 4-2. Radio interference filter

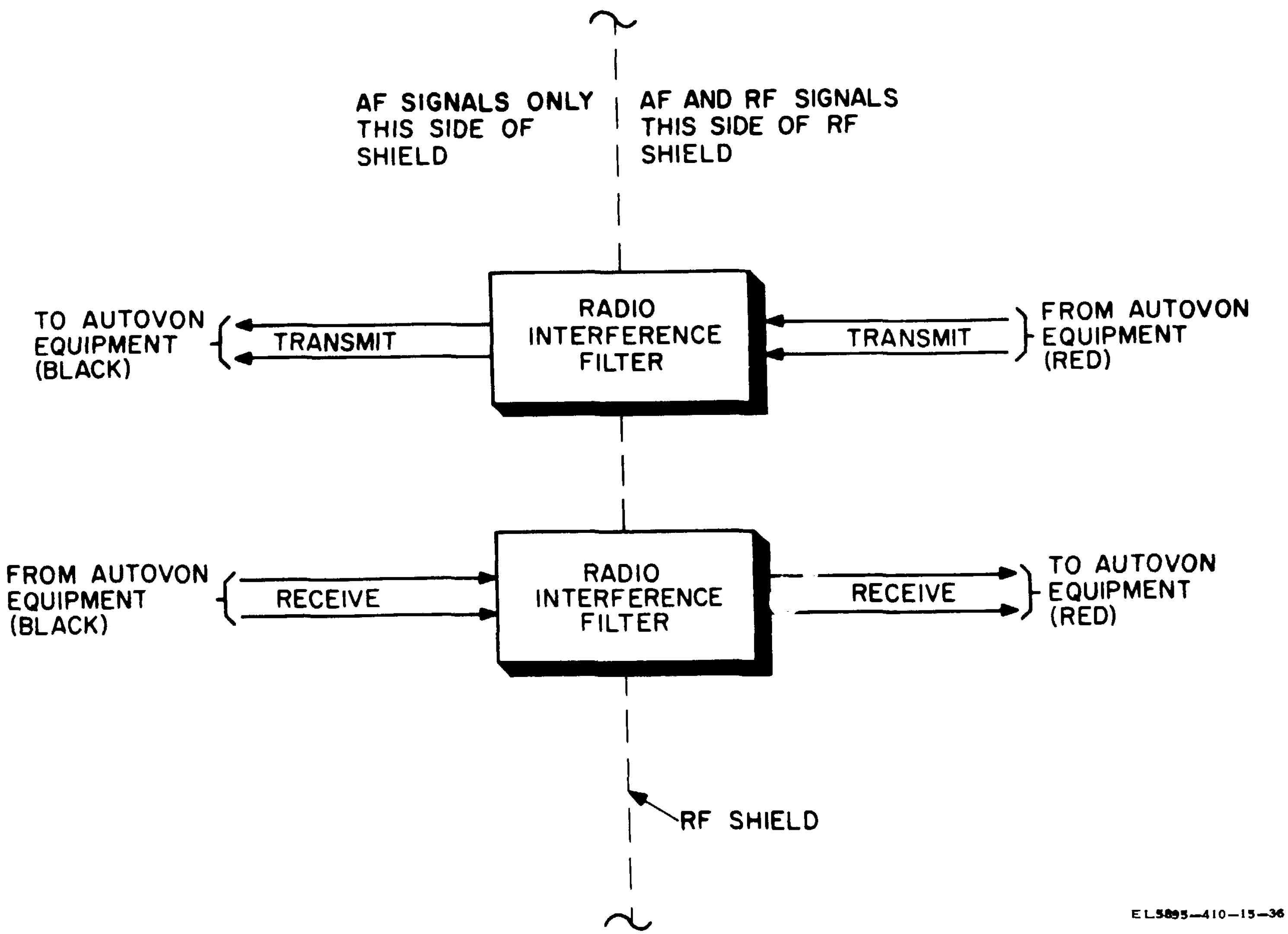


Figure 4-3. Audio isolation facility, functional block diagram.

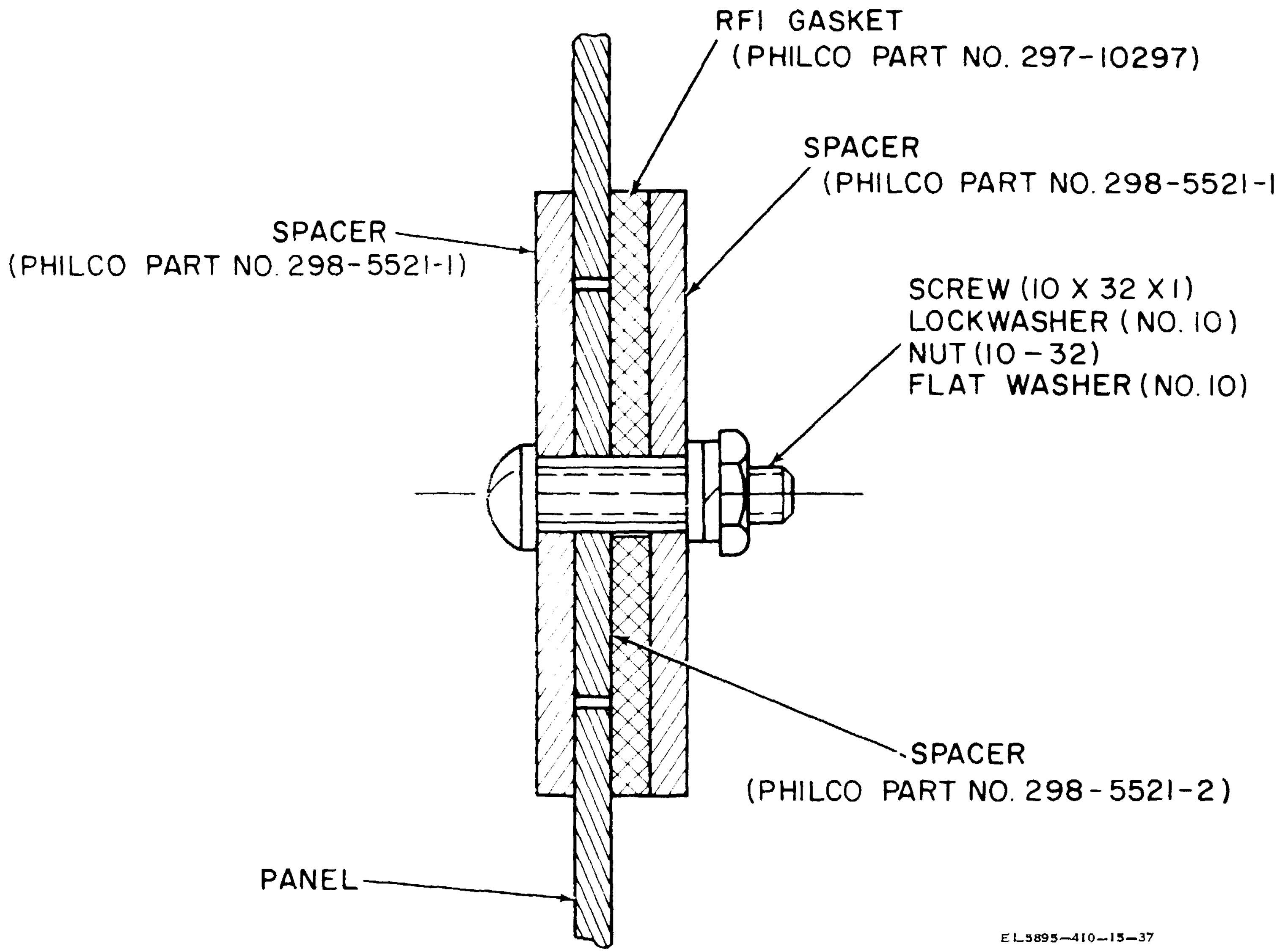


Figure 4-4. Details of rfi gasket installation.

CHAPTER 5

SHIELD POINT ISOLATION FACILITY

5-1. General

This chapter describes the shield point isolation facility (fig. 5-1) and provides instructions for performing maintenance and troubleshooting.

5-2. Purpose and Use

The shield point isolation facility provides radio frequency interference (rfi) filters on all lines leaving the AUTODIN center.

5-3. Description of Equipment

a. The shield point isolation facility is contained in one or more standard-size equipment cabinets (fig. 5-1). Each cabinet contains up to a maximum of 200 radio interference filters. Two partitions which run the full height of the cabinet divide the cabinet into three chambers. Each partition contains 100 holes in which the radio interference filters may be mounted. Small cover plates are installed over the holes which do not contain filters. The inner chamber of the cabinet is, therefore, completely shielded. Cables from the equipment enter the cabinet through the cabinet base and fan out inside the inner chamber to the various filters. Cables from the external lines are routed to the filters through the two outer unshielded partitions of the cabinet.

b. The exact number of cabinets and filters depends upon the specific requirements of the individual AUTODIN site. For additional information, refer to the system manual, TM 11-5895-391-15.

5-4. System Application

As shown in figure 5-2, the shield point isolation facility provides RF filters which prevent unwanted RF signals which may be present on the lines inside the AUTODIN center from appearing outside the shielded enclosure. Each line, audio or dc, which penetrates the shielded enclosure, connects through a filter. The filter passes de and audio signals in the 50- to 3500cps range with negligible attenuation. RF signals (14 kc and higher) which may be present on the lines are attenuated by the filter.

5-5. Technical Characteristics

The shield point isolation facility contains only passive components. Except for removing any unwanted RF signals from the lines, the facility does not affect the technical characteristics of the signals. The equipment cabinet which contains the facility components is 76 inches high, 36 inches wide, and 20 inches deep.

5-6. Operation

The shield point isolation facility is a passive device which performs its function without the need of an operator in attendance. The facility contains no controls or indicators.

5-7. Theory of Operation

The theory of operation of the facility is completely described in the system application discussion, paragraph 5-4. The only functional component in the shield point isolation facility is the radio interference filter, which is also described in paragraph 5-4. Since the filter is a nonrepairable component, a detailed circuit description is not provided.

5-8. Maintenance

a. *Preventive Maintenance*. Preventive maintenance of the shield point isolation facility includes visual inspection and cleaning of the cabinet and its components. Proceed as follows:

(1) Remove covers from cabinet, and check to see that each radio frequency filter is

securely mounted to panel and that hex nut is tight.

(2) Ensure that all unused filter mounting holes in partially equipped cabinets are properly closed with spacers and rfi gaskets. See figure 5-3 for details of rfi filter installation.

(3) Check to see that wiring is neat and orderly and without excessive slack.

(4) Make sure that all markings are clean and legible.

(5) Check to see that cabinets with no filters installed have the cable entrance holes in the line side chambers closed off. The filter mounting holes are to be left open.

(6) Inspect the cabinet for dirt and foreign matter; clean if necessary.

(7) Replace covers on cabinet and make sure that they are securely mounted.

b. Troubleshooting.

(1) The most probable cause of trouble is the loss of a particular signal within the shield point isolation facility as the result of a defective radio interference filter. This trouble will normally manifest itself as a malfunction associated with an audio dc signal or control circuit. For overall site troubleshooting procedures, refer to the system manual, TM 11-5895-391-15. If the trouble is definitely at the facility, either a radio interference filter is defective or the wiring between the facility cabinet ;and the line or equipment is defective.

(2) To check the wiring, a Simpson model 260 multimeter is used to measure point-to-point continuity. See figure 6-6 for cabling data for the facility. If the point-to-point wiring is correct, then the radio interference filter should be replaced.

c. Replacement of Radio Interference Filter. To replace a defective radio interference filter, proceed as follows:

(1) Remove covers from equipment cabinet. I)o not discard hardware.

(2) Mark and unsolder all, leads, front and rear, front the radio interference filter to be replaced.

(3) Remove locknut from threaded mounting neck on filter. Pull out defective filter from panel cabinet. Do not discard locknut or rfi gasket.

(4) Place gasket on threaded neck or filter and insert in panel. Reassemble locknut to threaded neck and tighten securely.

(5) Solder all wires to the same terminals from which they were removed in step (2).

(6) Replace covers on equipment cabinet.

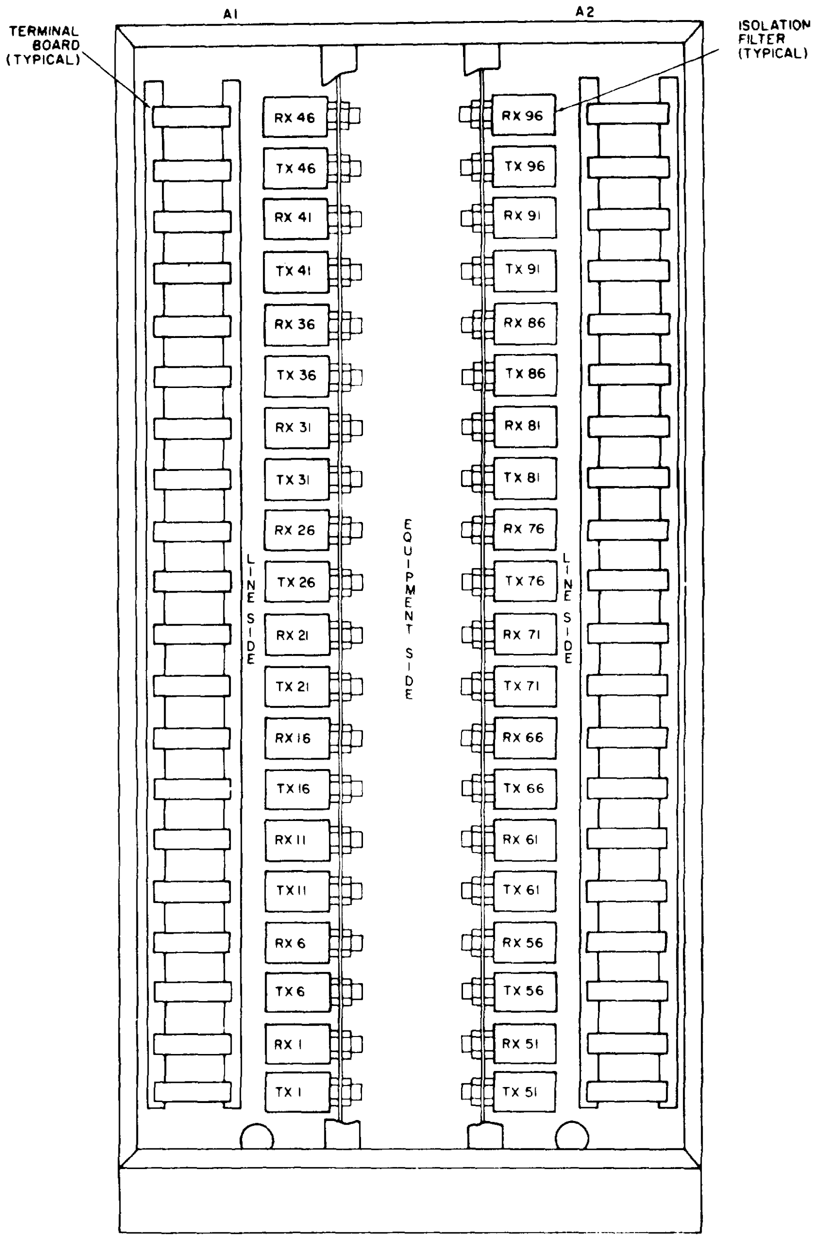


Figure 5-1. Shield point isolation facility cabinet (typical), showing locations of assemblies

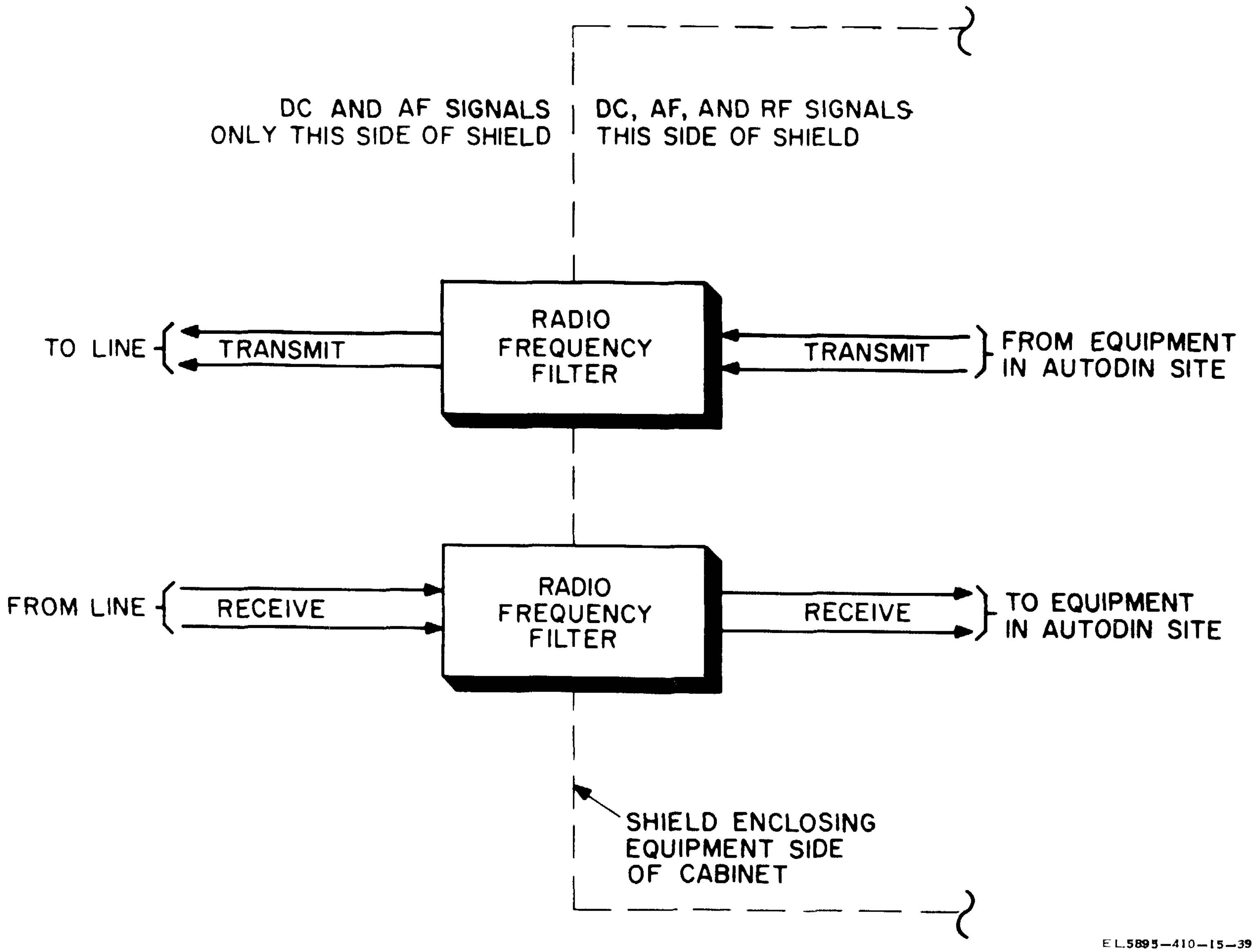


Figure 5-2. Shield point isolation facility, Functional block diagram.

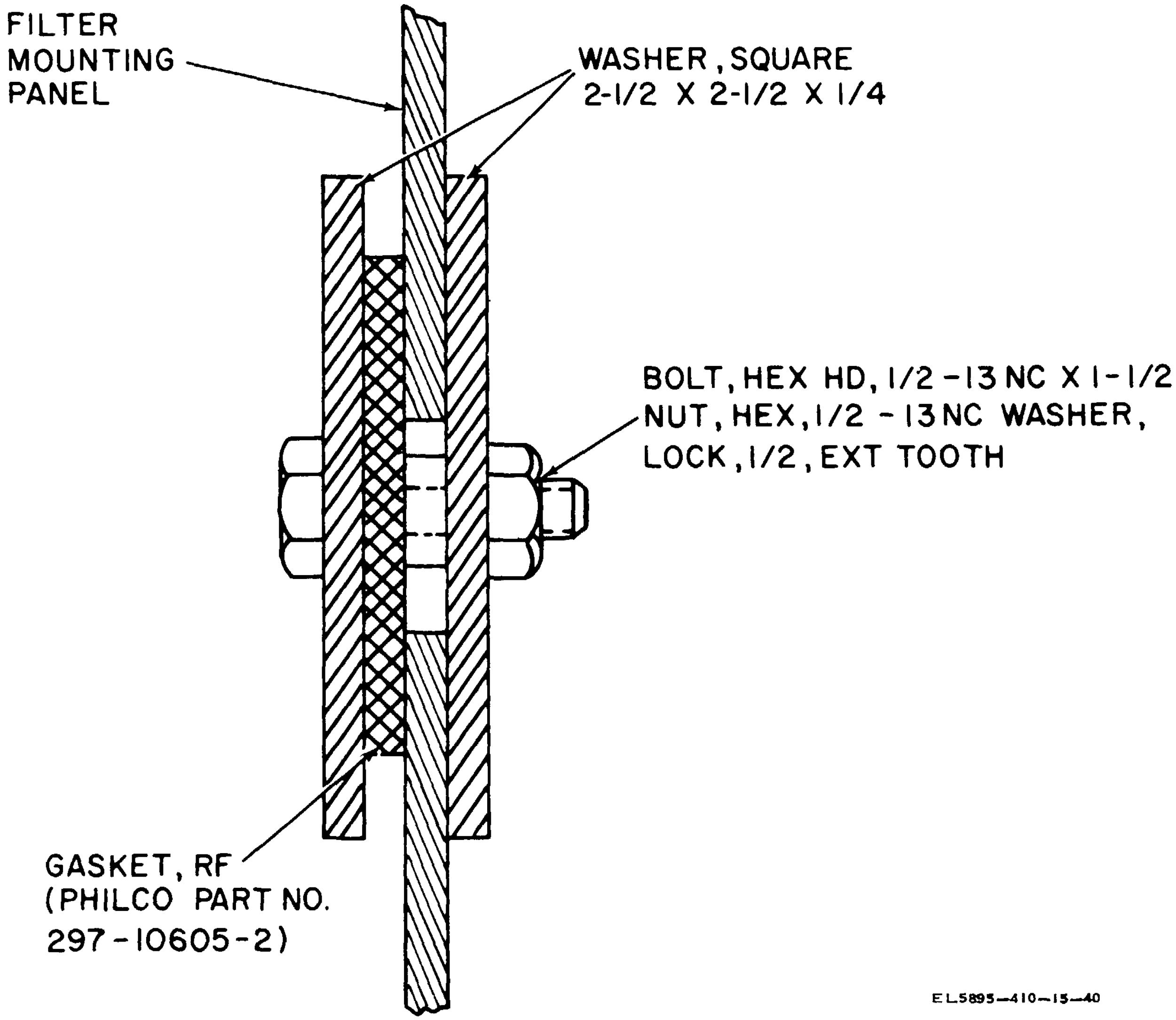


Figure 5-3. Details of rfi gasket installation.

CHAPTER 6

ILLUSTRATIONS AND DRAWINGS

6-1. General

This chapter contains additional illustrations which support the text of this manual and cabling and schematic diagrams of the equipment. Figures 6-1 and 6-2 support the text of chapters 2 and 3.

6-2. Cabling Data

The cabling data (fig. 6-3 through 6-6) provide, in tabular form, interconnections between each facility cabinet and associated equipment at the site, and interconnections between the assemblies which are mounted in the cabinet.

The applicable installation drawing (black en trance distribution frame, red distribution frame, etc.) must be consulted for the appropriate frame, panel number, and cable number to insert in all columns marked (1) on figures 6-3 through 6-6.

6-3. Schematic Diagrams

Schematic diagrams of each repairable assembly used in the equipment are shown in figures 6-7 through 6-14. Schematic diagrams of the red/black isolation switch and the radio interference filter are not furnished because these components, when defective, are replaced rather than repaired.

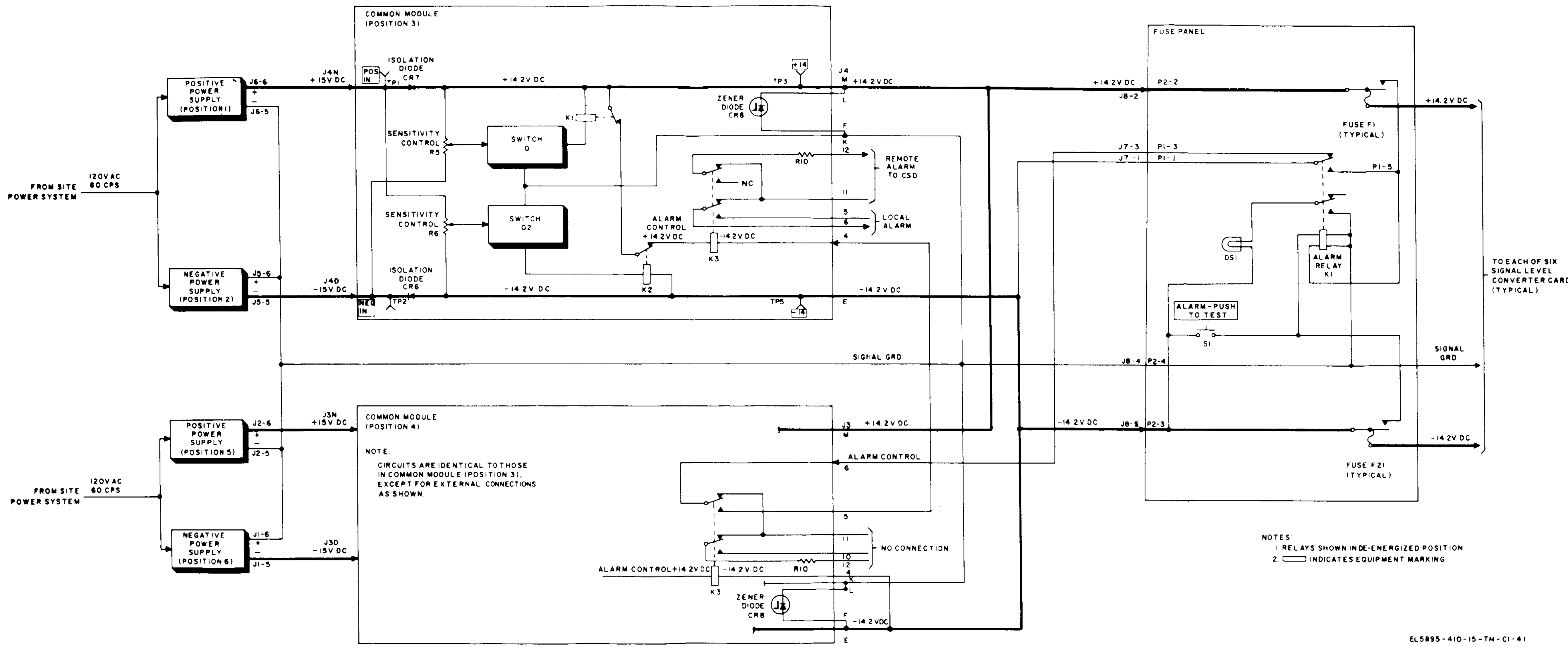


Figure 6-1. Signal level converter facility, power system, functional block diagram.

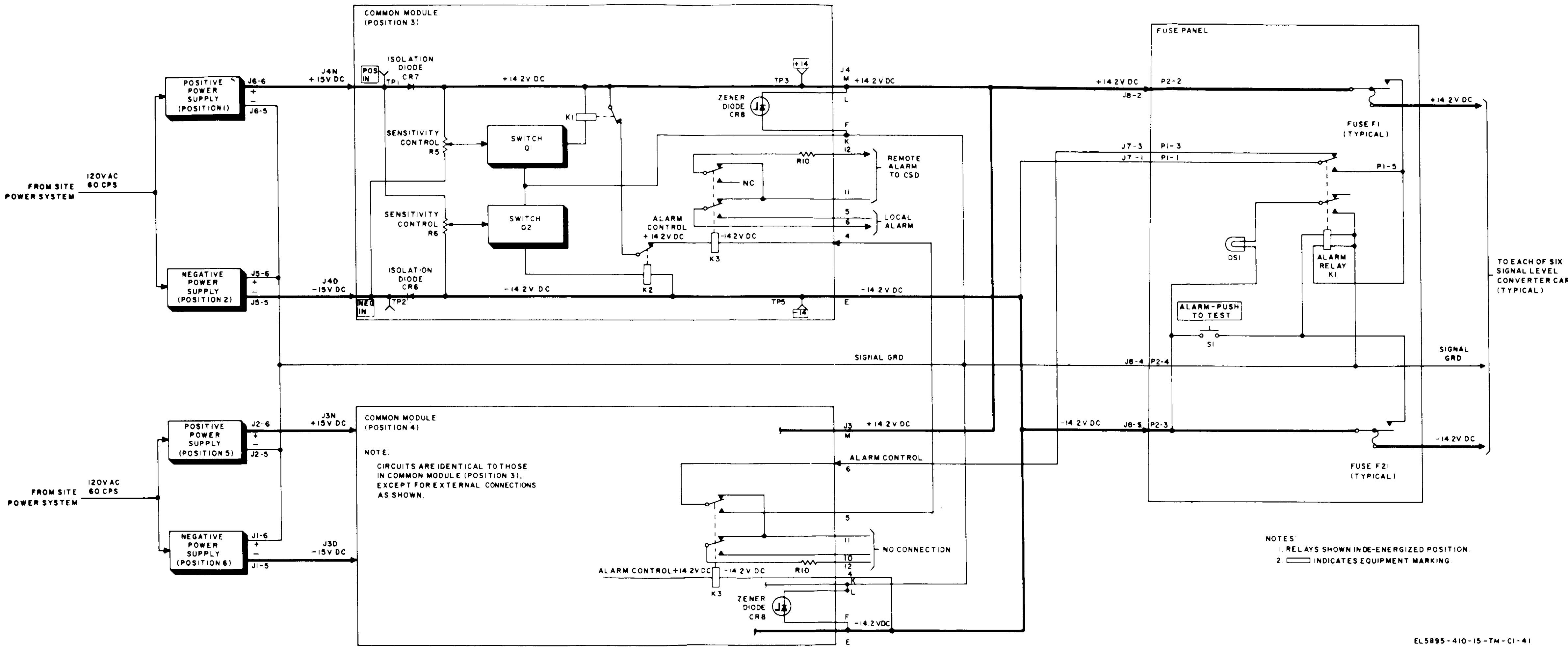
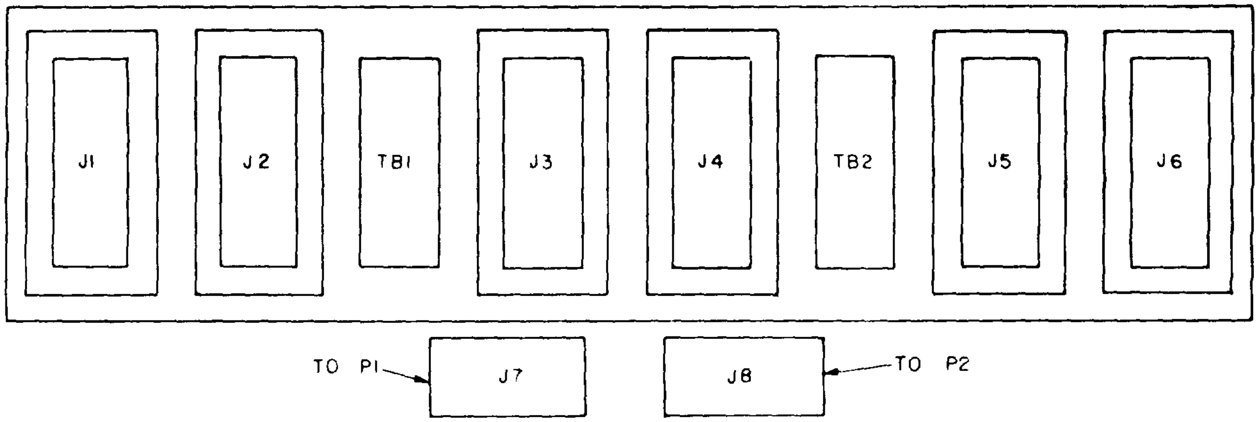
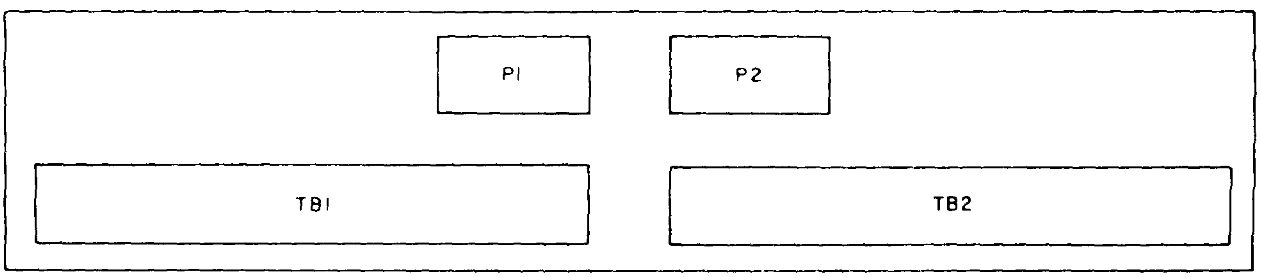


Figure 6-2. Red/black isolation facility, power system, functional block diagram.

REDUNDANT POWER SUPPLY SHELF (All), REAR VIEW
PHYSICAL LOCATIONS OF JACKS AND TERMINAL BOARDS



FUSE PANEL SHELF (A3), REAR VIEW
PHYSICAL LOCATIONS OF JACKS AND TERMINAL BOARDS



DC/DC SIGNAL CONVERTER SHELF (A5 - A20), REAR VIEW
PHYSICAL LOCATIONS OF JACKS

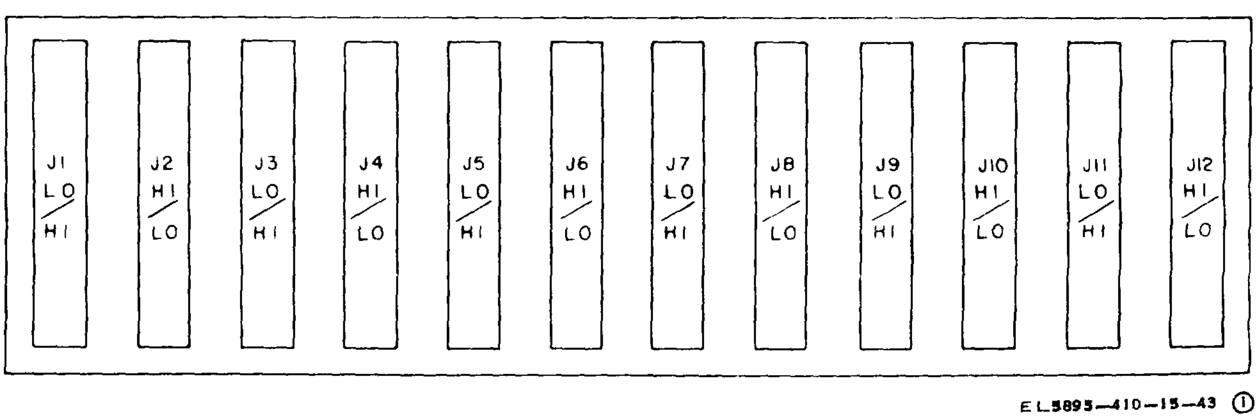


Figure 6-3. Signal level converter facility, cabling data (sheet 1 of 7). 6-7

A-C INPUT POWER CONNECTIONS TO POWER SUPPLY SHELF A1

FROM		TO		
UNIT	WIRE TYPE	UNIT	TERMINAL BOARD	
			NO.	PIN
120 vac Primary Power source	#12 white #12 black #12 green	Power supply shelf A1	TB-1 TB-1 TB-1	1 2 3

CONNECTIONS BETWEEN POWER SUPPLY SHELVES A1 AND A2*

FROM			TO		
UNIT	TERM BD		UNIT	TERM BD	
	NO.	PIN		NO.	PIN
Power supply shelf A1	TB-1 TB-1 TB-1	1 2 3	Power supply shelf A2	TB-1 TB-1 TB-1	1 2 3

*Used only at sites where two power supply shelves are required.

EL5895-410-15-43 (2)

Figure 6-3. Signal level converter facility, cabling data (sheet 2 of 7).

REDUNDANT POWER SUPPLY SHELF INTERCONNECTIONS A1*

FROM	TO	FROM	TO	FROM	TO
J1-1	J2-1	TB1-3	TB2-3	J3-5	J4-4
J2-1	J3-A	TB2-3	J4-C	J3-6	J4-3
J3-A	TB1-1	J4-C	J5-3	J3-8	TB 1-5
TBl-1	TB2-1	J5-3	J6-3	TB 1-5	TB2-5
TB2-1	J4-A	J 1-5	J3-D	TB2-5	J4-8
J4-A	J5-1	J1-6	J2-5	J3-F	J3-E
J5-1	J6-1	J2-5	J3-L	J3-E	J4-E
J 1-2	J2-2	J3-L	J3-K	J4-E	J 8-3
J2-2	J3-B	J3-K	TB 1-4	J3-M	J4-M
J3-B	TB 1-2	TB1-4	TB2-4	J4-M	J4-L
TB1-2	TB2-2	TB2-4	J4-F	J4-L	J8-2
TB2-2	J4-B	J4-F	J4-H	J4-1	J7-3
J4-B	J5-2	J4-H	J5-6	J4-2	J7-1
J5-2	J6-2	J5-6	J6-5	J4-7	SH
J 1-3	J2-3	J2-6	J3-N	J4-D	J5-5
J2-3	J3-C	J3-1	J3-2	J4-K	J8-4
J3-C	TB 1-3	J3-3	J3-4	J4-N	J6-6

*** Power supply shelves A1 and A2 connections are similar.**

E L.5895-410-15-43 (3)

Figure 6-3. Signal level converter facility, cabling data (sheet 3 of 7).

POWER SUPPLY TO FUSE PANEL CONNECTIONS (TYPICAL)

FROM		TO	
UNIT	CONNECTOR	UNIT	CONNECTOR
Power supply shelf A1/A2	J7 J8	Fuse panel A3/A4 (See fig. 6-9	P1 P2

INTRARACK WIRING DETAILS BETWEEN FUSE PANEL
AND DC/DC CONVERTER SHELF A5 (TYPICAL)

FROM				CABLE		TO		
UNIT	TERMINAL BOARD					UNIT	TERMINAL BOARD	
	NO.	FUSE NO.	ROW	NO.	TYPE		NO.	PIN
Fuse panel A3 (See fig. 6-9)	2 2 2 1	1 1 1 21	1 2 3 3	A	3 wire	Dc/dc con-verter shelf A5	- J12 J12 J12	- E A L
	2 2 2 1	2 2 2 22	1 2 3 3	B	3 wire		- J1 J1 J1	- 5 1 10

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Figure 6-3. Signal level converter facility, cabling data (sheet 4 of 7).

SIGNAL WIRING REQUIREMENTS BETWEEN DC/DC CONVERTER SHELFA5 AND DISTRIBUTION FRAMES (TYPICAL)

FROM			CABLE		TO			
Unit	Terminal Board					Panel		
	No.	Pin	No. (1)	Pair	Unit	No.	Row	Pin
Dc/dc converter shelf A5	J12	H, F	A	1	Black entrance distribution frame No. (1)	(1)	A	3,4
	J11	H, F		2			A	1,2
	J10	H, F		3			B	3,4
	J9	H, F		4			B	1,2
	J8	H, F		5			C	3,4
	J7	H, F		6			C	1,2
	J6	H, F	B	1	Black entrance distribution frame No. (1)	(1)	D	3,4
	J5	H, F		2			D	1,2
	J4	H, F		3			E	3,4
	J3	H, F		4			E	1,2
	J2	H, F		5			F	3,4
	J1	H, F		6			F	1,2
	J12	B, E	C	1	Entrance distribution frame No. (1)	(1)	A	59, 60
	J11	J, E		2			A	49, 50
	J10	B, E		3			B	59, 60
	J9	J, E		4			B	49, 50
	J8	B, E		5			C	59, 60
	J7	J, E		6			C	49, 50
	J6	B, E	D	1	Entrance distribution frame No. (1)	(1)	D	59, 60
	J5	J, E		2			D	49, 50
	J4	B, E		3			E	59, 60
	J3	J, E		4			E	49, 50
	J2	B, E		5			F	59, 60
	J1	J, E		6			F	49, 50

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Figure 6-3. Signal level converter facility, cabling data (sheet 5 of 7).

HIGH LEVEL BATTERY WIRING CONNECTIONS
(TYPICAL FOR NEUTRAL OPERATION)

FROM			CABLE		TO		
Unit	Term BD No.	Term BD Pin	No.	Pair	Unit	Mark Bat. (Fuse Out)	Bat. Com (Sig Grd)
Dc/dc converter shelf A5	J1	B,E	A	1	High level battery facility fuse panel	A	B
	J3	B,E	B	1		A	B
	J5	B,E	C	1		A	B
	J7	B,E	D	1		A	B
	J9	B,E	E	1		A	B
	J11	B,E	F	1		A	B

(TYPICAL FOR POLAR OPERATION)

FROM			CABLE		TO			
Unit	Term BD No.	Term BD Pin *	No.	Cond	Unit	Mark Bat. (Fuse Out)	Space Bat (Fuse Out)	Bat. Com (Sig Grd)
Dc/dc converter shelf A5	J1	B,D,E	A	3	High level battery facility fuse panel	A	A	B
	J3	B,D,E	B	3		A	A	B
	J5	B,D,E	C	3		A	A	B
	J7	B,D,E	D	3		A	A	B
	J9	B,D,E	E	3		A	A	B
	J11	B,D,E	F	3		A	A	B

* See note 9, figure 6-100

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Figure 6-3. Signal level converter facility, cabling data (sheet 6 of 7).

ALARM CONNECTION DETAILS

CONDITIONS	CIRCUIT DESCRIPTION	CONNECT FROM	CONNECT TO	NOTES
Single pwr supply shelf & fuse panel per cabinet	Local ALM lamp	Lamp lead 1	J4, pin 6	
		Lamp lead 2	J4, pin 10	
	Local ALM lamp pwr	LCL ALM pwr pos.	J4, pin 10	
		LCL ALM pwr common	J4, pin 11	
	Remote ALM output	J4, pin 12	Remote ALM pos input	
		J4, pin 11	Remote ALM common input	
Two ea pwr supply shelves & fuse panels per cabinet	Local ALM lamp	Lamp lead #1	J4, pin 6	Top pwr supply shelf only
		Lamp lead #2	J4, pin 10	
	Local ALM lamp pwr	LCL ALM pwr pos	J4, pin 10	Top pwr supply shelf only
		LCL ALM pwr common	J4, pin 11	
	Remote ALM output	J4, pin 12	Remote ALM pos input	Top pwr supply shelf only
		J4, pin 11	Remote ALM common input	
	Common module interconnects (jumpers)	J3, pin 1, top shelf	J4, pin 5, lower shelf	Remove jumper between pins 1 & 2 of J3 on top pwr supply shelf
		J3, pin top shelf	J4, pin 6, lower shelf	

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Figure 6-3. Signal level converter facility, cabling data (sheet 7 of 7).

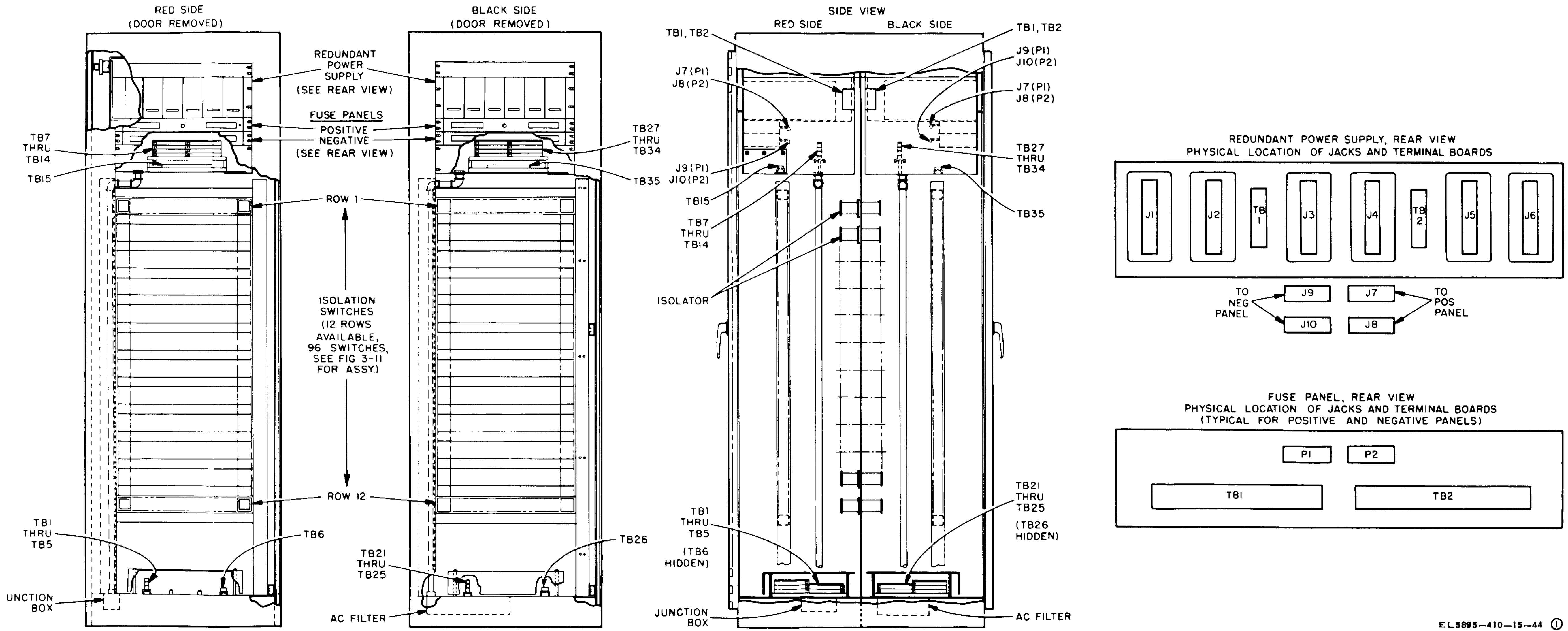

Figure 6-4. Red/black isolation facility, cabling data (sheet 1 of 17)

A-C POWER CONNECTIONS (SEE FIG. 3-10)

From		Cable		To	
UNIT	TERMINAL	NUMBER (1)	PAIR	UNIT	TERMINAL
Red/black isolation facility 5201 junction box	Red wire	AC	Black #12 conductor	AC branching cabinet	High (circuit 1)
	Black and black/white wire	AD	White #12 conductor		Low (circuit 1)
	Ground screw	AE	Green #12 conductor		AC ground
Red/black isolation facility 5201 ac filter	1	AF	Black #12 conductor		High (circuit 2)
	2	AG	White #12 conductor		Low (circuit 2)
Red/black isolation facility 5201 junction box	Red wire	AH	Black #12 conductor	Red/black isolation facility 5201 ac filter	3
	Red/white wire	AJ	White #12 conductor		1
Red side of cabinet	TB1-2 TB2-2 TB1-1, TB2-1	Red Red/white Black, black/ white		Junction	Red Red/white Black, black/ white
Black side of cabinet	TB1-2 TB2-2 TB1-1, TB2-1	Red Red/white Black, black/ white		Filter	4 6 5

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Figure 6-4. Red/black isolation facility, cabling data (sheet 2 of 17).

GROUND WIRING

From			Cable		To
Unit	Terminal				Terminal
	Block	Number	Number (1)	Pair	
Red/black isolation facility 5201 front side	TB6-	5	AA	One number 12 conductor	Red 1/0 AWG ground bus
Red/black isolation facility 5201 rear side	TB26-	5	AB	One number 12 conductor	Red 1/0 AWG ground bus

MISCELLANEOUS WIRING

Cable no.	From	To	Cable No.	From	To
9	J4-6	TB15-7	13	TB15-4	TB6-4
9	J4-10	TB15-8	14	TB15-5	TB6-5
9	J4-9	TB15-6	15	TB15-8	TB6-8
10	J4-10	TB15-12	15	TB15-7	TB6-7
10	J4-11	TB15-11	15	TB15-6	TB6-6
10	J4-12	TB15-10	16	TB15-10	TB6-10
10	SH	TB15-9	16	TB15-11	TB6-11
11	TB8A-20	TB15-1	16	TB15-12	TB6-12
11	TB10A-20	TB15-2	16	TB15-9	TB6-9
11	TB14A-20	TB15-3			
12	TB15-1	TB6-1			
12	TB15-2	TB6-2			
12	TB15-3	TB6-3			

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Figure 6-4. Red/black isolation facility, cabling data (sheet 3 of 17).

REDUNDANT POWER SUPPLY SHELF INTERCONNECTIONS

Cable No.	From	To	Cable No.	From	To
1	J1-1	J2-1	29	J2-5	J3-L
2	J2-1	J3-A	30	J4-H	J5-6
3	J3-A	TBl-1	31	J5-6	J6-5
4	TBl-1	TB2-1	32	J2-6	J3-N
5	TB2-1	J4-A	33	J4-N	J6-6
6	J4-A	J5-1	34	J1-5	J3-D
7	J5-1	J6-1	35	J4-D	J5-5
8	J1-2	J2-2	36	J3-E	J4-E
9	J2-2	J3-B	37	J3-M	J4-M
10	J3-B	TB1-2	38	J3-5	J4-4
11	TB1-2	TB2-2	39	J3-6	J4-3
12	TB2-2	J4-B	45S	J3-7	No term.
13	J4-B	J5-2	46	TB1-1	A
14	J5-2	J6-2	47	TB1-2	A
15	J1-3	J2-3	48	TB1-3	A
16	J2-3	J3-C	49	TB2-1	A
17	J3-C	TB1-3	50	TB2-2	A
18	TB1-3	TB2-3	51	TB2-3	A
19	TB2-3	J4-C	52W	J4-10	B
20	J4-C	J5-3	52B	J4-6	B
21	J5-3	J6-3	52S	J4-9	B
22	TB1-5	J3-8	53R	J4-12	B
23	TB1-5	TB2-5	53W	J4-10	B
24	TB2-5	J4-8	53B	J4-11	B
25	J3-K	TB1-4	53S	No term.	B
26	TB1-4	TB2-4	54	TB1-4	B
27	TB2-4	J4-F	55	TB1-5	B
28	J1-6	J2-5	56	TB1-4	TB2-4
			57	TB1-5	TB2-5

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Figure 6-4. Red/black isolation facility, cabling data (sheet 4 of 17).

POWER SUPPLY SHELF TO FUSE PANEL WIRING DETAILS

Cable No.	From	To
40R	J4-L	J8-2
40W	J4-E	J8-3
40B	J4-K	J8-4
40S	J4-9	J8-1
41W	J4-2	J7-3
41B	J4-1	J7-1
41S	J4-7	No term.
42W	J4-L	J8-2
42B	J4-K	J8-4
42S	J4-9	J8-1
43W	J3-F	J10-3
43B	J3-H	J10-4
43S	J3-9	J10-1
44W	J4-2	J7-3
44B	J4-1	J7-1
44S	J4-7	No term.
45W	J3-4	J9-3
45B	J3-3	J9-1

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Figure 6-4. Red/black isolation facility, cabling data (sheet 5 of 17).

FUSE PANELS TO POWER DISTRIBUTION BLOCKS-WIRING DETAIILS

Cable No.	From positive fuse panel	To power distr blocks	Cable No.	From negative fuse panel	To power distr blocks
1	TB2C-20	TB7A-1	41	TB2C-20	TB11A-1
	TB2B-20	TB9A-1		-	-
	TB2A-20	TB13A-1		-	-
2	TB2A-19	TB13A-2	42	TB2C-19	TB11A-2
3	TB2A-18	TB13A-3	43	TB2C-18	TB11A-3
4	TB2A-17	TB13A-4	44	TB2C-17	TB11A-4
5	TB2A-16	TB13A-5	45	TB2C-16	TB11A-5
6	TB2A-15	TB13A-6	46	TB2C-15	TB11A-6
7	TB2A-14	TB13A-7	47	TB2C-14	TB11A-7
8	TB2A-13	TB13A-8	48	TB2C-13	TB11A-8
9	TB2A-12	TB13A-9	49	TB2C-12	TB11A-9
10	TB2A-11	TB13A-10	50	TB2C-11	TB11A-10
11	TB2A-10	TB13A-11	51	TB2C-10	TB11A-11
12	TB2A-9	TB13A-12	52	TB2C-9	TB11A-12
13	TB2A-8	TB13A-13	53	TB2C-8	TB11A-13
14	TB2A-7	TB13A-14	54	TB2C-7	TB11A-14
15	TB2A-6	TB13A-15	55	TB2C-6	TB11A-15
16	TB2A-5	TB13A-16	56	TB2C-5	TB11A-16
21	TB1C-20	TB8A-1	61	TB1C-20	TB12A-1
	TB1B-20	TB10A-1		-	-
	TB1A-20	TB14A-1		-	-
22	TB1A-19	TB14A-2	62	TB1C-19	TB12A-2
23	TB1A-18	TB14A-3	63	TB1C-18	TB12A-3
24	TB1A-17	TB14A-4	64	TB1C-17	TB12A-4
25	TB1A-16	TB14A-5	65	TB1C-16	TB12A-5
26	TBlA-15	TB14A-6	66	TB1C-15	TB12A-6
27	TB1A-14	TB14A-7	67	TB1C-14	TB12A-7
28	TBlA-13	TB14A-8	68	TB1C-13	TB12A-8
29	TBlA-12	TB14A-9	69	TB1C-12	TB12A-9
30	TBlA-11	TB14A-10	70	TB1C-11	TB12A-10
31	TB1A-10	TB14A-11	71	TB1C-10	TB12A-11
32	TBlA-9	TB14A-12	72	TB1C-9	TB12A-12
33	TB1A-8	TB14A-13	73	TB1C-8	TB12A-13
34	TB1A-7	TB14A-14	74	TB1C-7	TB12A-14
35	TB1A-6	TB14A-15	75	TB1C-6	TB12A-15
36	TB1A-5	TB14A-16	76	TB1C-5	TB12A-16

Note 1: Wiring for TB27, 29, and 33 is identical to TB7, 9, and 13; TB31 wiring is same as TB11.

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Figure 6-4. Red/black isolation facility, cabling data (sheet 6 of 17).

FUSE PANELS TO POWER DISTRIBUTION BLOCKS- WIRING DETAILS (cont)

Note 2: Wiring for TB28, 30,and 34 is identical to TB8, 10,and 14; TB32 is same as TB12.
3: Terminal blocks 1-16 are installed in front of the cabinet. Terminal blocks 21-26 are installed in rear.
4: On all taper pin blocks, A is the top row, B is the middle row, and C is the bottom row.
5: TB1 and TB2 are the taper pin blocks on the rear of the fuse panel.

POWER DISTRIBUTION TERMINAL BLOCKS TO ISOLATORS - POWER CABLING

Cable No.	From	To	Cable No.	From	To
1	TB7A-1	T1-D	17	TB7C-1	T17-D
	TB9A-1	T1-H		TB9C-1	T17-H
	TB11A-1	T1-E		TB11C-1	T17-E
	TB13A-1			TB13C-1	
2	TB7A-2	T2-D	18	TB7C-2	T18-D
	TB9A-2	T2-H		TB9C-2	T18-H
	TB11A-2	T2-E		TB11C-2	T18-E
	TB13A-2			TB13C-2	
3	TB13A-3	T3	19	TB13C-3	T19
4	TB13A-4	T4	20	TB13C-4	T20
5	TB13A-5	T5	21	TB13C-5	T21
6	TB13A-6	T6	22	TB13C-6	T22
7	TB13A-7	T7	23	TB13C-7	T23
8	TB13A-8	T8	24	TB13C-8	T24
9	TB7B-1	T9-D	25	TB7A-9	T25-D
	TB9B-1	T9-H		TB9A-9	T25-H
	TB11B-1	T9-E		TB11A-9	T25-E
	TB13B-1			TB13A-9	
10	TB7B-2	T10-D	26	TB7A-19	T26-D
	TB9B-2	T10-H		TB9A-10	T26-H
	TB11B-2	T10-E		TB11A-10	T26-E
	TB13B-2			TB13A-10	
11	TB13B-3	T11	27	TB13A-11	T27
12	TB13B-4	T12	28	TB13A-12	T28
13	TB13B-5	T13	29	TB13A-13	T29
14	TB13B-6	T14	30	TB13A-14	T30
15	TB13B-7	T15	31	TB13A-15	T31
16	TB13B-8	T16	32	TB13A-16	T32

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Figure 6-4. Red/black isolation facility, cabling data (sheet 7 of 17).

POWER DISTRIBUTION TERMINAL BLOCKS TO ISOLATORS - POWER CABLING (cont)

Cable No.	From	To	Cable No.	From	To
33	TB7B-9	T33-D	55	TB14A-7	T55
	TB9B-9	T33-H	56	TB14A-8	T56
	TB11B-9	T33-E	57	TB8B-1	T57-D
	TB13B-9			TB10B-1	T57-H
34	TB7B-10	T34-D		TB12B-1	T57-E
	TB9B-10	T34-H		TB14B-1	
	TB11B-10	T34-E	58	TB8B-2	T58-D
	TB13B-10			TB10B-2	T58-H
35	TB13B-11	T35		TB12B-2	T58-E
36	TB13B-12	T36		TB14B-2	
37	TB13B-13	T37	59	TB14B-3	T59
38	TB13B-14	T38	60	TB14B-4	T60
39	TB13B-15	T39	61	TB14B-5	T61
40	TB13B-16	T40	62	TB14B-6	T62
41	TB7C-9	T41-D	63	TB14B-7	T63
	TB9C-9	T41-H	64	TB14B-8	T64
	TB11C-9	T41-E	65	TB8C-1	T65-D
	TB13C-9			TB10C-1	T65-H
42	TB7C-10	T42-D		TB12C-1	T65-E
	TB9C-10	T42-H		TB14C-1	
	TB11C-10	T42-E	66	TB8C-2	T66-D
	TB13C-10			TB10C-2	T66-H
43	TB13C-11	T43		TB12C-2	T66-E
44	TB13C-12	T44		TB14C-2	
45	TB13C-13	T45	67	TB14C-3	T67
46	TB13C-14	T46	68	TB14C-4	T68
47	TB13C-15	T47	69	TB14C-5	T69
48	TB13C-16	T48	70	TB14C-6	T70
49	TB8A-1	T49-D	71	TB14C-7	T71
	TB10A-1	T49-H	72	TB14C-8	T72
	TB12A-1	T49-E	73	TB8A-9	T73-D
	TB14A-1			TB10A-9	T73-H
50	TB8A-2	T50-D		TB12A-9	T73-E
	TB10A-2	T50-H		TB14A-9	
	TB12A-2	T50-E	74	TB8A-10	T74-D
	TB14A-2			TB10A-10	T74-H
51	TB14A-3	T51		TB12A-10	T74-E
52	TB14A-4	T52		TB14A-10	
53	TB14A-5	T53	75	TB14A-11	T75
54	TB14A-6	T54	76	TB14A-12	T76

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Figure 6-4. Red/black isolation facility, cabling data (sheet 8 of 17).

POWER DISTRIBUTION TERMINAL BLOCKS TO ISOLATORS - POWER CABLING (cont)

Cable No.	From	To	Cable No.	From	To
77	TB14A-13	T77	89	TB8C-9	T89-D
78	TB14A-14	T78		TB10C-9	T89-H
79	TB14A-15	T79		TB12C-9	T89-E
80	TB14A-16	T80		TB14C-9	
81	TB8B-9	T81-D	90	TB8C-10	T90-D
	TB10B-9	T81-H		TB10C-10	T90-H
	TB12B-9	T81-E		TB12C-10	T90-E
	TB14B-9			TB14C-10	
82	TB8B-10	TB2-D	91	TB14C-11	T91
	TB10B-10	TB2-H	92	TB14C-12	T92
	TB12B-10	TB2-E	93	TB14C-13	T93
	TB14B-10		94	TB14C-14	T94
83	TB14B-11	T83	95	TB14C-15	T95
84	TB14B-12	T84	96	TB14C-16	T96
85	TB14B-13	T85			
86	TB14B-14	T86			
87	TB14B-15	T87			
88	TB14B-16	T88			

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Figure 6-4. Red/black isolation facility, cabling data (sheet 9 of 17).

ISOLATORS TO TAPER PIN BLOCKS -SIGNAL CABLING (SEE FIG. 3-9)

Cable No.	From	To	Cable No.	From	To
1	TBlA-1	T1-C	35	TB2A-15	T35-C
	TB1B-1	T1-A		TB2B-15	T35-A
	TB1C-1	Shield		TB2C-15	Shield
2	TB1-2	T2	36	TB2-16	T36
3	TB1-3	T3	37	TB2-17	T37
4	TB1-4	T4	38	TB2-18	T38
5	TB1-5	T5	39	TB2-19	T39
6	TB1-6	T6	40	TB2-20	T40
7	TB1-7	T7	41	TB3-1	T41
8	TB1-8	T8	42	TB3-2	T42
9	TB1-9	T9	43	TB3-3	T43
10	TB1-10	T10	44	TB3-4	T44
11	TB1-11	T11	45	TB3-5	T45
12	TB1-12	T12	46	TB3-6	T46
13	TB1-13	T13	47	TB3-7	T47
14	TB1-14	T14	48	TB3-8	T48
15	TB1-15	T15	49	TB3-9	T49
16	TB1-16	T16	50	TB3-10	T50
17	TB1-17	T17	51	TB3-11	T51
18	TB1-18	T18	52	TB3-12	T52
19	TB1-19	T19	53	TB3-13	T53
20	TB1-20	T20	54	TB3-14	T54
21	TB2-1	T21	55	TB3-15	T55
22	TB2-2	T22	56	TB3-16	T56
23	TB2-3	T23	57	TB3-17	T57
24	TB2-4	T24	58	TB3-18	T58
25	TB2-5	T25	59	TB3-19	T59
26	TB2-6	T26	60	TB3-20	T60
27	TB2-7	T27	61	TB4-1	T61
28	TB2-8	T28	62	TB4-2	T62
29	TB2-9	T29	63	TB4-3	T63
30	TB2-10	T30	64	TB4-4	T64
31	TB2-11	T31	65	TB4-5	T65
32	TB2-12	T32	66	TB4-6	T66
33	TB2-13	T33	67	TB4-7	T67
34	TB2-14	T34	68	TB4-8	T68

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Figure 6-4. Red/black isolation facility, cabling data (sheet 10 of 17).

ISOLATORS TO TAPER PIN BLOCKS-SIGNAL CABLING (cont)

Cable No.	From	To	Cable No.	From	To
69	TB4A-9 TB4B-9 TB4C-9	T69-C T69-A Shield	83	TB5A-3 TB5B-3 TB5C-3	T83-C T83-A Shield
70	TB4-10	T70	84	TB5-4	T84
71	TB4-11	T71	85	TB5-5	T85
72	TB4-12	T72	86	TB5-6	T86
73	TB4-13	T73	87	TB5-7	T87
74	TB4-14	T74	88	TB5-8	T88
75	TB4-15	T75	89	TB5-9	T89
76	TB4-16	T76	90	TB5-10	T90
77	TB4-17	T77	91	TB5-11	T91
78	TB4-18	T78	92	TB5-12	T92
79	TB4-19	T79	93	TB5-13	T93
80	TB4-20	T80	94	TB5-14	T94
81	TB5-1	T81	95	TB5-15	T95
82	TB5-2	T82	96	TB5-16	T96

Note 1: TB numbers listed for front only. Harness for rear uses TB21, 22, 23, 24, and 25.
2: T numbers listed are for placement in center panel.
3: All isolator to taper pin block cables consist of three wires. The top entry of each column lists the termination's for the individual wires and is representative of all cables in the column.

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Figure 6-4. Red/black isolation facility, cabling data (sheet 11 of 17).

CABLING TO RED DISTRIBUTION FRAME

From					Cable		To		
Unit	R/B isolator		Terminal		Number	Pair	Unit	Terminal	
	Number	Row	Block	Row and pin				Panel	Pin
Red/ black isolation facility 5201 front side red	1	1	TB1-	A1,B1	A	1	Red distri- bution frame 7600	(1)	A-5,6
	2	1	TB1-	A2,B2	A	2			B-5,6
	3	1	TB1-	A3,B3	A	3			C-5,6
	4	1	TB1-	A4,B4	A	4			D-5,6
	5	1	TB1-	A5,B5	A	5			E-5,6
	6	1	TB1-	A6,B6	A	6			F-5,6
	7	1	TB1-	A7,B7	A	7			G-5,6
	8	1	TB1-	A8,B8	A	8			H-5,6
	9	2	TB1-	A9,B9	B	1			H-5,6
	10	2	TB1-	A10,B10	B	2			K-5,6
	11	2	TB1-	A11,B11	B	3			L-5,6
	12	2	TB1-	A12,B12	B	4			M-5,6
	13	2	TB1-	A13,B13	B	5		(1)	A-5,6
	14	2	TB1-	A14,B14	B	6			B-5,6
	15	2	TB1-	A15,B15	B	7			C-5,6
	16	2	TB1-	A16,B16	B	8			D-5;6
	17	3	TB1-	A17,B17	C	1			E-5,6
	18	3	TB1-	A18,B18	C	2			F-5,6
	19	3	TB1-	A19,B19	C	3			G-5,6
	20	3	TB1-	A20,B20	C	4			H-5,6
	21	3	TB2-	A1,B1	C	5			J-5,6
	22	3	TB2-	A2,B2	C	6			K-5,6
	23	3	TB2-	A3,B3	C	7			L-5,6
	24	3	TB2-	A4,B4	C	8			M-5,6
	25	4	TB2-	A5,B5	D	1		(1)	A-7,8
	26	4	TB2-	A6,B6	D	2			B-7,8
	27	4	TB2-	A7,B7	D	3			C-7,8
	28	4	TB2-	A8,B8	D	4			D-7,8
	29	4	TB2-	A9,B9	D	5			E-7,8
	30	4	TB2-	A10,B10	D	6			F-7,8
	31	4	TB2-	A11,B11	D	7			G-7,8
	32	4	TB2-	A12,B12	D	8			H-7,8

Figure 6-4. Red/black isolation facility, cabling data (sheet 12 of 17).

EL5895-410-15-44 (12)

CABLING TO RED DISTRIBUTION FRAME (cont)

From					Cable		To		
Unit	R/B isolator		Terminal		Number	Pair	Unit	Terminal	
	Number	Row	Block	Row and pin				Panel	Pin
Red/ black isolation facility 5201 front side red	33	5	TB2-	A13,B13	E	1	Red distri- bution frame 7600	(1)	J-7,8
	34	5	TB2-	A14,B14	E	2			K-7,8
	35	5	TB2-	A15,B15	E	3			L-7,8
	36	5	TB2-	A16,B16	E	4			M-7,8
	37	5	TB2-	A17,B17	E	5			A-7,8
	38	5	TB2-	A18,B18	E	6			B-7,8
	39	5	TB2-	A19,B19	E	7			C-7,8
	40	5	TB2-	A20,B20	E	8			D-7,8
	41	6	TB3-	A1,B1	F	1		(1)	A-9,10
	42	6	TB3-	A2,B2	F	2			B-9,10
	43	6	TB3-	A3,B3	F	3			C-9,10
	44	6	TB3-	A4,B4	F	4			D-9,10
	45	6	TB3-	A5,B5	F	5			E-9,10
	46	6	TB3-	A6,B6	F	6			F-9,10
	47	6	TB3-	A7,B7	F	7			G-9,10
	48	6	TB3-	A8,B8	F	8			H-9,10
	49	7	TB3-	A9,B9	G	1			J-9,10
	50	7	TB3-	A10,B10	G	2			K-9,10
	51	7	TB3-	A11,B11	G	3			L-9,10
	52	7	TB3-	A12,B12	G	4			M-9,10
	53	7	TB3-	A13,B13	G	5		(1)	A-9,10
	54	7	TB3-	A14,B14	G	6			B-9,10
	55	7	TB3-	A15,B15	G	7			C-9,10
	56	7	TB3-	A16,B16	G	8			D-9,10
	57	8	TB3-	A17,B17	H	1		(1)	A-1,2
	58	8	TB3-	A18,B18	H	2			B-1,2
	59	8	TB3-	A19,B19	H	3			C-1,2
	60	8	TB3-	A20,A20	H	4			D-1,2
	61	8	TB4-	A1,B1	H	5			E-1,2
	62	8	TB4-	A2,B2	H	6			F-1,2
	63	8	TB4-	A3,B3	H	7			G-1,2
	64	8	TB4-	A4,B4	H	8			H-1,2

Figure 6-4. Red/black isolation facility, cabling data (sheet 13 of 17).

EL5895-410-15-44 (13)

CABLING TO RED DISTRIBUTION FRAME (cont)

From					Cable		To		
Unit	R/B isolator		Terminal		Number	Pair	Unit	Terminal	
	Number	Row	Block	Row and pin				Panel	Pin
Red/ black isolation facility 5201 front side red	33	5	TB2-	A13, B13	E	1	Red distri- bution frame 7600	(1)	J-7, 8
	34	5	TB2-	A14, B14	E	2			K-7, 8
	35	5	TB2-	A15, B15	E	3			L-7, 8
	36	5	TB2-	A16, B16	E	4			M-7, 8
	37	5	TB2-	A17, B17	E	5			A-7, 8
	38	5	TB2-	A18, B18	E	6			B-7, 8
	39	5	TB2-	A19, B19	E	7			C-7, 8
	40	5	TB2-	A20, B20	E	8			D-7, 8
	41	6	TB3-	A1, B1	F	1		(1)	A-9, 10
	42	6	TB3-	A2, B2	F	2			B-9, 10
	43	6	TB3-	A3, B3	F	3			C-9, 10
	44	6	TB3-	A4, B4	F	4			D-9, 10
	45	6	TB3-	A5, B5	F	5			E-9, 10
	46	6	TB3-	A6, B6	F	6			F-9, 10
	47	6	TB3-	A7, B7	F	7			G-9, 10
	48	6	TB3-	A8, B8	F	8			H-9, 10
	49	7	TB3-	A9, B9	G	1			J-9, 10
	50	7	TB3-	A10, B10	G	2			K-9, 10
	51	7	TB3-	A11, B11	G	3			L-9, 10
	52	7	TB3-	A12, B12	G	4			M-9, 10
	53	7	TB3-	A13, B13	G	5		(1)	A-9, 10
	54	7	TB3-	A14, B14	G	6			B-9, 10
	55	7	TB3-	A15, B15	G	7			C-9, 10
	56	7	TB3-	A16, B16	G	8			D-9, 10
	57	8	TB3-	A17, B17	H	1		(1)	A-1, 2
	58	8	TB3-	A18, B18	H	2			B-1, 2
	59	8	TB3-	A19, B19	H	3			C-1, 2
	60	8	TB3-	A20, A20	H	4			D-1, 2
	61	8	TB4-	A1, B1	H	5			E-1, 2
	62	8	TB4-	A2, B2	H	6			F-1, 2
	63	8	TB4-	A3, B3	H	7			G-1, 2
	64	8	TB4-	A4, B4	H	8			H-1, 2

Figure 6-4. Red/black isolation facility, cabling data (street 14 of 17).

EL5895-410-15-44 (14)

CABLING TO BLACK DISTRIBUTION FRAME

From					Cable		To		
Unit	R/B isolator		Terminal		Number (1)	Pair	Unit	Terminal	
	Number	Row	Block	Row and pin				Panel	Pin
Red/ black isolation facility 5201 rear side black	1	1	TB21-	A1,B1	N	1	Black distri- bution frame 7701	(1)	A-63,64
	2	1	TB21-	A2,B2	N	2			B-63,64
	3	1	TB21-	A3,B3	N	3			C-63,64
	4	1	TB21-	A4,B4	N	4			D-63,-64
	5	1	TB21-	A5,B5	N	5			E-63,64
	6	1	TB21-	A6,B6	N	6			F-63,64
	7	1	TB21-	A7,B7	N	7			G-63,64
	8	1	TB21-	A8,B8	N	8			H-63,64
	9	2	TB21-	A9,B9	O	1			J-63,64
	10	2	TB21-	A10,B10	O	2			K-63,64
	11	2	TB21-	A11,B11	O	3			L-63,64
	12	2	TB21-	A12,B12	O	4			M-63,64
	13	2	TB21-	A13,B13	O	5		(1)	A-63,64
	14	2	TB21-	A14,B14	O	6			B-63,64
	15	2	TB21-	A15,B15	O	7			C-63,64
	16	2	TB21-	A16,B16	O	8			D-63,64
	17	3	TB21-	A17,B17	P	1			E-63,64
	18	3	TB21-	A18,B18	P	2			F-63,64
	19	3	TB21-	A19,B19	P	3			G-63,64
	20	3	TB21-	A20,B20	P	4			H-63,64
	21	3	TB22-	A1,B1	P	5			J-63,64
	22	3	TB22-	A2,B2	P	6			K-63,64
	23	3	TB22-	A3,B3	P	7			L-63,64
	24	3	TB22-	A4,B4	P	8			M-63,64
	25	4	TB22-	A5,B5	Q	1		(1)	A-65,66
	26	4	TB22-	A6,B6	Q	2			B-65,66
	27	4	TB22-	A7,B7	Q	3			C-65,66
	28	4	TB22-	A8,B8	Q	4			D-65,66
	29	4	TB22-	A9,B9	Q	5			E-65,66
	30	4	TB22-	A10, B10	Q	6			F-65,66
	31	4	TB22-	A11,B11	Q	7			G-65,66
	32	4	TB22-	A12,B12	Q	8			H-65,66

Figure 6-4. Red/black isolation facility, cabling data (sheet 15 of 17).

EL5895-410-15-44 (15)

CABLING TO BLACK DISTRIBUTION FRAME (cont)

From					Cable		To		
Unit	R/B isolator		Terminal		Number (1)	Pair	Unit	Terminal	
	Number	Row	Block	Row and pin				Panel	Pin
Red/ black isolation facility 5201 rear side black	33	5	TB22-	A13,B13	R	1	Black distri- bution frame 7701	(1)	J-65,66
	34	5	TB22-	A14,B14	R	2			K-65,66
	35	5	TB22-	A15,B15	R	3			L-65,66
	36	5	TB22-	A16,B16	R	4			M-65,66
	37	5	TB22-	A17,B17	R	5		(1)	A-65,66
	38	5	TB22-	A18,B18	R	6			B-65,66
	39	5	TB22-	A19,B19	R	7			C-65,66
	40	5	TB22-	A20,B20	R	8			D-65,66
	41	6	TB23-	A1,B1	S	1		(1)	A-67,68
	42	6	TB23-	A2,B2	S	2			B-67,68
	43	6	TB23-	A3,B3	S	3			C-67,68
	44	6	TB23-	A4,B4	S	4			D-67,68
	45	6	TB23-	A5,B5	S	5			E-67,58
	46	6	TB23-	A6,B6	S	6			F-67,68
	47	6	TB23-	A7,B7	S	7			G-67,68
	48	6	TB23-	A8,B8	S	8			H-67,68
	49	7	TB23-	A9,B9	T	1			J-67,68
	50	7	TB23-	A10,B10	T	2			K-67,68
	51	7	TB23-	A11,B11	T	3			L-67,68
	52	7	TB23-	A12,B12	T	4			M-67,68
	53	7	TB23-	A13,B13	T	5		(1)	A-67,68
	54	7	TB23-	A14,B14	T	6			B-67,68
	55	7	TB23-	A15,B15	T	7			C-67,68
	56	7	TB23-	A16,B16	T	8			D-67,68
	57	8	TB23-	A17,B17	U	1		(1)	A-59,60
	58	8	TB23-	A18,B18	U	2			B-59,60
	59	8	TB23-	A19,B19	U	3			C-59,60
	60	8	TB23-	A20,B20	U	4			D-59,60
	61	8	TB24-	A1,B1	U	5			E-59,60
	62	8	TB24-	A2,B2	U	6			F-59,60
	63	8	TB24-	A3,B3	U	7			G-59,60
	64	8	TB24-	A4,B4	U	8			H-59,60

Figure 6-4. Red/black isolation facility, cabling data (sheet 16 of 17).

EL5895-410-15-44 (16)

CABLING TO BLACK DISTRIBUTION FRAME (cont)

From					Cable		To		
Unit	R/B isolator		Terminal		Number (1)	Pair	Unit	Terminal	
	Number	Row	Block	Row and pin				Panel	Pin
Red/ black isolation facility 5201 rear side black	65	9	TB24-	A5,B5	V	1	Black distri- bution frame 7701	(1)	J-59,60
	66	9	TB24-	A6,B6	V	2			K-59,60
	67	9	TB24-	A7,B7	V	3			L-59,60
	68	9	TB24-	A8,B8	V	4			M-59,60
	69	9	TB24-	A9,B9	V	5		(1)	A-59,60
	70	9	TB24-	A10,B10	V	6			B-59,60
	71	9	TB24-	A11,B11	V	7			C-59,60
	72	9	TB24-	A12,B12	V	8			D-59,60
	73	10	TB24-	A13,B13	W	1			E-59,60
	74	10	TB24-	A14,B14	W	2			F-59,60
	75	10	TB24-	A15,B15	W	3			G-59,60
	76	10	TB24-	A16,B16	W	4			H-59,60
	77	10	TB24-	A17,B17	W	5			J-59,60
	78	10	TB24-	A18,B18	W	6			K-59,60
	79	10	TB24-	A19,B19	W	7			L-59,60
	80	10	TB24-	A20,B20	W	8			M-59,60
	81	11	TB25-	A1,B1	X	1		(1)	A-61,62
	82	11	TB25-	A2,B2	X	2			B-61,62
	83	11	TB25-	A3,B3	X	3			C-61,62
	84	11	TB25-	A4,B4	X	4			D-61,62
	85	11	TB25-	A5,B5	X	5			E-61,62
	86	11	TB25-	A6,B6	X	6			F-61,62
	87	11	TB25-	A7,B7	X	7			G-61,62
	88	11	TB25-	A8,B8	X	8			H-61,62
	89	12	TB25-	A9,B9	Y	1			J-61,62
	90	12	TB25-	A10,B10	Y	2			K-61,62
	91	12	TB25-	A11,B11	Y	3			L-61,62
	92	12	TB25-	A12,B12	Y	4			M-61,62
	93	12	TB25-	A13,B13	Y	5		(1)	A-61,62
	94	12	TB25-	A14,B14	Y	6			B-61,62
	95	12	TB25-	A15,B15	Y	7			C-61,62
	96	12	TB25-	A16,B16	Y	8			D-61,62

Figure 6-4. Red/black isolation facility, cabling data (sheet 17 of 17).

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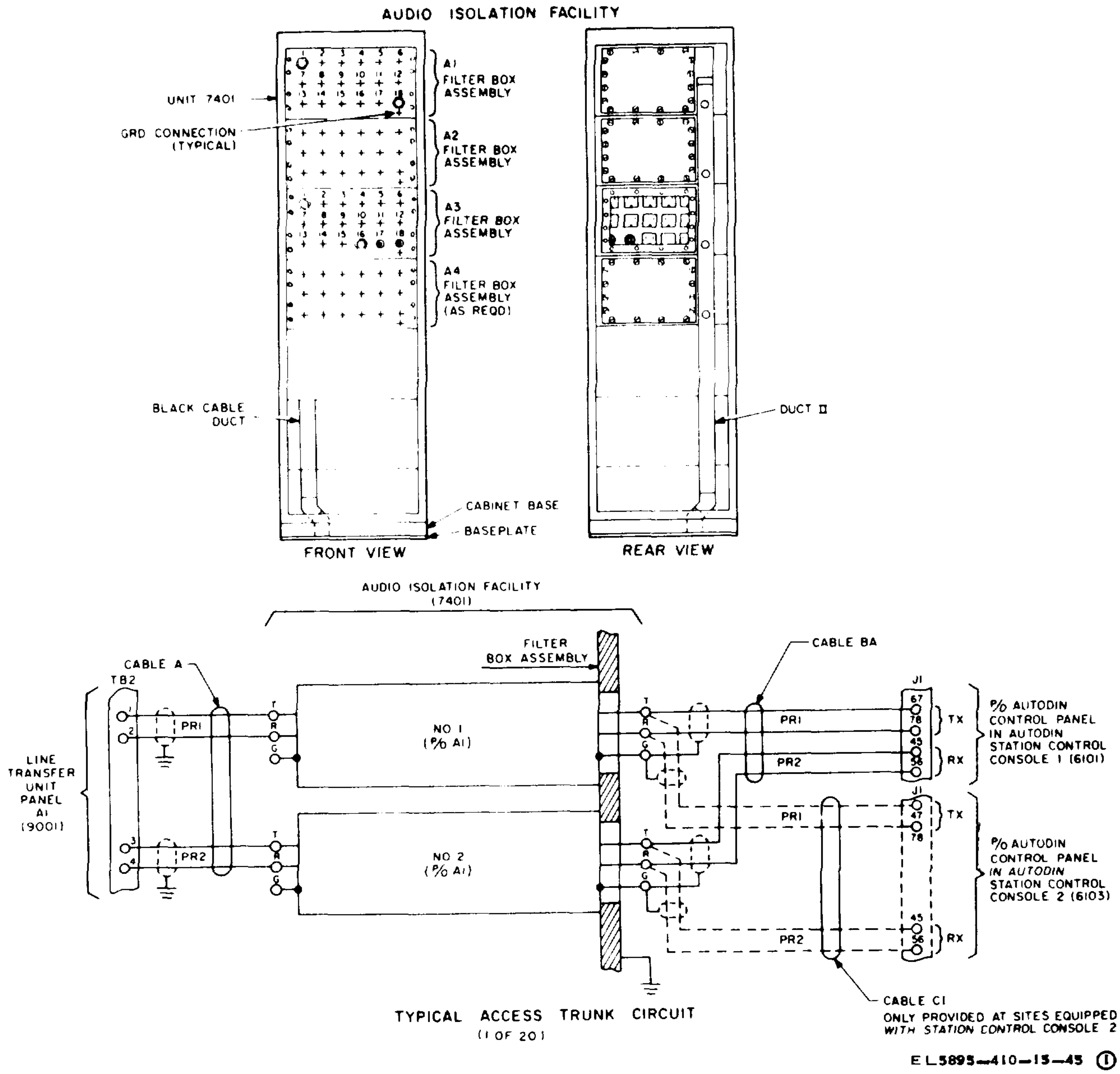

Figure 6-5. Audio isolation facility, cabling data (sheet 1 of 7).

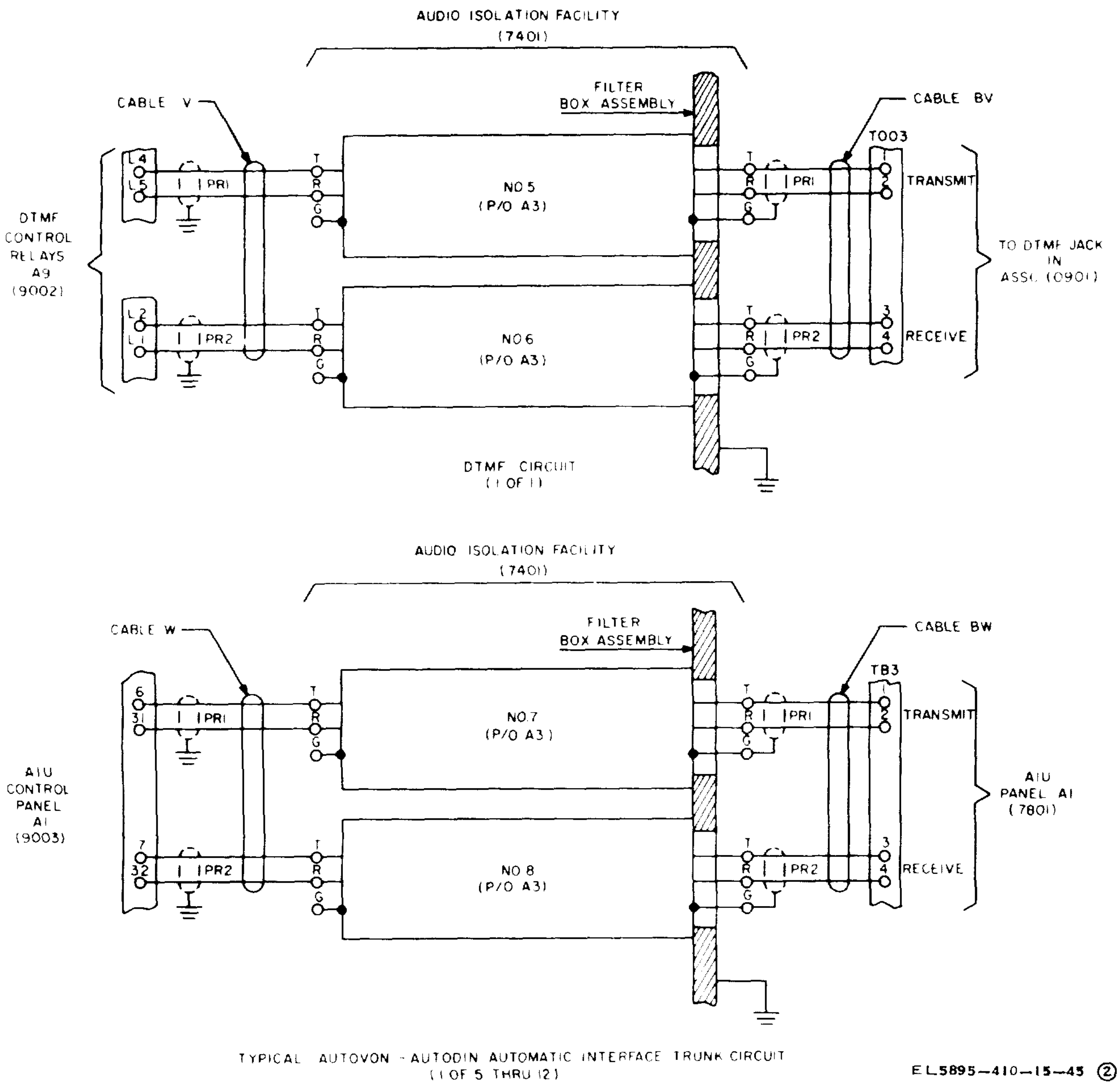

Figure 6-5. Audio isolation facility, cabling data (sheet 2 of 7).

CONNECTIONS FOR CABLES A THROUGH AH

From			Cable		To		
Unit	Terminal		Number	Pair	Unit	Panel	
	Filter number	Pin				Number	Terminal
A1 filter box assembly rear side 7401	1	T, R	A	1	Line transfer unit 9001	A1	TB2-1, 2
	2	T, R	A	2		A1	TB2-3, 4
	3	T, R	B	1		A2	TB2-1, 2
	4	T, R	B	2		A2	TB2-3, 4
	5	T, R	C	1		A3	TB2-1, 2
	6	T, R	C	2		A3	TB2-3, 4
	7	T, R	D	1		A4	TB2-1, 2
	8	T, R	D	2		A4	TB2-3, 4
	9	T, R	E	1		A5	TB2-1, 2
	10	T, R	E	2		A5	TB2-3, 4
	11	T, R	F	1		A6	TB2-1, 2
	12	T, R	F	2		A6	TB2-3, 4
	13	T, R	G	1		A7	TB2-1, 2
	14	T, R	G	2		A7	TB2-3, 4
	15	T, R	H	1		A8	TB2-1, 2
	16	T, R	H	2		A8	TB2-3, 4
	17	T, R	I	1		A9	TB2-1, 2
	18	T, R	I	2		A9	TB2-3, 4
A2 filter box assembly rear side 7401	1	T, R	K	1		A10	TB2-1, 2
	2	T, R	K	2		A10	TB2-3, 4
	3	T, R	L	1		A11	TB2-1, 2
	4	T, R	L	2		A11	TB2-3, 4
	5	T, R	M	1		A12	TB2-1, 2
	6	T, R	M	2		A12	TB2-3, 4
	7	T, R	N	1	Line transfer unit 9002	A1	TB2-1, 2
	8	T, R	N	2		A1	TB2-3, 4
	9	T, R	O	1		A2	TB2-1, 2
	10	T, R	O	2		A2	TB2-3, 4
	11	T, R	P	1		A3	TB2-1, 2
	12	T, R	P	2		A3	TB2-3, 4
	13	T, R	Q	1		A4	TB2-1, 2
	14	T, R	Q	2		A4	TB2-3, 4
	15	T, R	R	1		A5	TB2-1, 2
	16	T, R	R	2		A5	TB2-3, 4
	17	T, R	S	1		A6	TB2-1, 2
	18	T, R	S	2		A6	TB2-3, 4

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Figure 6-5. Audio isolation facility, cabling data (sheet 3 of 7).

CONNECTIONS FOR CABLES A THROUGH AH (cont)

From			Cable		To		
Unit	Terminal		Number (1)	Pair	Unit	Panel	
	Filter number	Pin				Number	Terminal
A3 filter box assembly rear side 7401	1	T,R	T	1	Line transfer unit 9002	A7	TB2-1,2
	2	T,R	T	2		A7	TB2-3,4
	3	T,R	U	1		A8	TB2-1,2
	4	T,R	U	2		A8	TB2-3,4
	5	T,R	V	1	DTMF control relays 9002	A9	L-4,3
	6	T,R	V	2		A9	L-2,1
	7	T,R	W	1	AUTOVON interface unit	A1	P2-6,31
	8	T,R	W	2		A1	P2-7,32
	9	T,R	X	1		A2	P2-6,31
	10	T,R	X	2		A2	P2-7,32
	11	T,R	Y	1		A3	P2-6,31
	12	T,R	Y	2		A3	P2-7,32
	13	T,R	Z	1		A4	P2-6,31
	14	T,R	Z	2		A4	P2-7,32
	15	T,R	AA	1		A5	P2-6,31
	16	T,R	AA	2		A5	P2-7,32
	17	T,R	AB	1		A6	P2-6,31
	18	T,R	AB	2		A6	P2-7,32
A4 filter box assembly rear side 7401	1	T,R	AC	1		A7	P2-6,31
	2	T,R	AC	2		A7	P2-7,32
	3	T,R	AD	1		A8	P2-6,31
	4	T,R	AD	2		A8	P2-7,32
	5	T,R	AE	1		A9	P2-6,31
	6	T,R	AE	2		A9	P2-7,32
	7	T,R	AF	1		A10	P2-6,31
	8	T,R	AF	2		A10	P2-7,32
	9	T,R	AG	1		A11	P2-6,31
	10	T,R	AG	2		A11	P2-7,32
	11	T,R	AH	1		A12	P2-6,31
	12	T,R	AH	2		A12	P2-7,32

EL5895-410-15-45 (4)

Figure 6-5. Audio isolation facility, cabling data (sheet 4 of 7).

CONNECTIONS FOR CABLES BA THROUGH DC

From			Cable		To		
Unit	Terminal: Filter number	Terminal: Pin	Number (1)	Pair	Unit	Panel: Number	Panel: Terminal
A1 filter box assembly front side 7401	1	T, R	BA	1	Cables BA through BU to AUTOVON control panel 6101	A3	J1-67,78
	2	T, R	CI	2		A3	J1-45,56
	3	T, R	BB	1		A3	J1-68,79
	4	T, R	CK	2		A3	J1-46,57
	5	T, R	BC	1		A3	J1-69,80
	6	T, R	CL	2		A3	J1-47,58
	7	T, R	BD	1		A3	J1-70-81
	8	T, R	CM	2		A3	J1-48,59
	9	T, R	BE	1		A3	J1-71,82
	10	T, R	CN	2		A3	J1-49,60
	11	T, R	BF	1		A3	J1-72,83
	12	T, R	CO	2		A3	J1-50,61
	13	T, R	BG	1		A3	J1-73,84
	14	T, R	CP	2		A3	J1-51,62
	15	T, R	BH	1		A3	J1-74,85
	16	T, R	CQ	2		A3	J1-52,63
	17	T, R	BI	1	At sites with monitor test console number 2, cables CI through DC are connected to AUTOVON control panel 6103	A3	J1-75,86
	18	T, R	CR	2		A3	J1-53,64
A2 filter box assembly front side 7401	1	T, R	BK	1		A3	J1-76,87
	2	T, R	CS	2		A3	J1-54,65
	3	T, R	BL	1		A3	J2-67,78
	4	T, R	CT	2		A3	J2-45,56
	5	T, R	BM	1		A3	J2-68,79
	6	T, R	CU	2		A3	J2-46,57
	7	T, R	BN	1		A3	J2-69,80
	8	T, R	CV	2		A3	J2-47,58
	9	T, R	BO	1		A3	J2-70,81
	10	T, R	CW	2		A3	J2-48,59
	11	T, R	BP	1		A3	J2-71,82
	12	T, R	CX	2		A3	J2-49,60
	13	T, R	BQ	1		A3	J2-72,83
	14	T, R	CY	2		A3	J2-50,61
	15	T, R	BR	1		A3	J2-73,84
	16	T, R	CZ	2		A3	J2-51,62
	17	T, R	BS	1		A3	J2-74,85
	18	T, R	DA	2		A3	J2-52,63

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Figure 6-5. Audio isolation facility, cabling data (sheet 5 of 7).

CONNECTIONS FOR CABLES BA THROUGH DC (cont)

From			Cable		To		
Unit	Terminal		Number (1)	Pair	Unit	Panel	
	Filter number	Pin				Number	Terminal
A3 filter box assembly front side 7401	1	T,R	BT	1		A3	J2-75,86
	2	T,R	DB	2		A3	J2-53,64
	3	T,R	BU	1		A3	J2-76,87
	4	T,R	DC	2		A3	J2-54,65
	5	T,R	BV	1	DTMF 0901		T003-1,2
	6	T,R	BV	2			T003-3,4
	7	T,R	BW	1	AUTOVON interface unit 7801	A1	TB3-1,2
	8	T,R	BW	2		A1	TB3-3,4
	9	T,R	BX	1		A2	TB3-1,2
	10	T,R	BX	2		A2	TB3-3,4
	11	T,R	BY	1		A3	TB3-1,2
	12	T,R	BY	2		A3	TB3-3,4
	13	T,R	BZ	1		A4	TB3-1,2
	14	T,R	BZ	2		A4	TB3-3,4
	15	T,R	CA	1		A5	TB3-1,2
	16	T,R	CA	2		A5	TB3-3,4
	17	T,R	CB	1		A6	TB3-1,2
	18	T,R	CB	2		A6	TB3-3,4
A4 filter box assembly front side 7401	1	T,R	CC	1		A7	TB3-1,2
	2	T,R	CC	2		A7	TB3-3,4
	3	T,R	CD	1		A8	TB3-1,2
	4	T,R	CD	2		A8	TB3-3,4
	5	T,R	CE	1		A9	TB3-1,2
	6	T,R	CE	2		A9	TB3-3,4
	7	T,R	CF	1		A10	TB3-1,2
	8	T,R	CF	2		A10	TB3-3,4
	9	T,R	CG	1		A11	TB3-1,2
	10	T,R	CG	2		A11	TB3-3,4
	11	T,R	CH	1		A12	TB3-1,2
	12	T,R	CH	2		A12	TB3-3,4

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Figure 6-5. Audio isolation facility, cabling data (sheet 6 of 7).

CONNECTION FOR CABLE DD

From	Cable number (1)	To
Audio isolation facility front side 7401	DD	Red I/O AWO ground bus

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Figure 6-5. Audio isolation facility, cabling data (sheet 7 of 7).

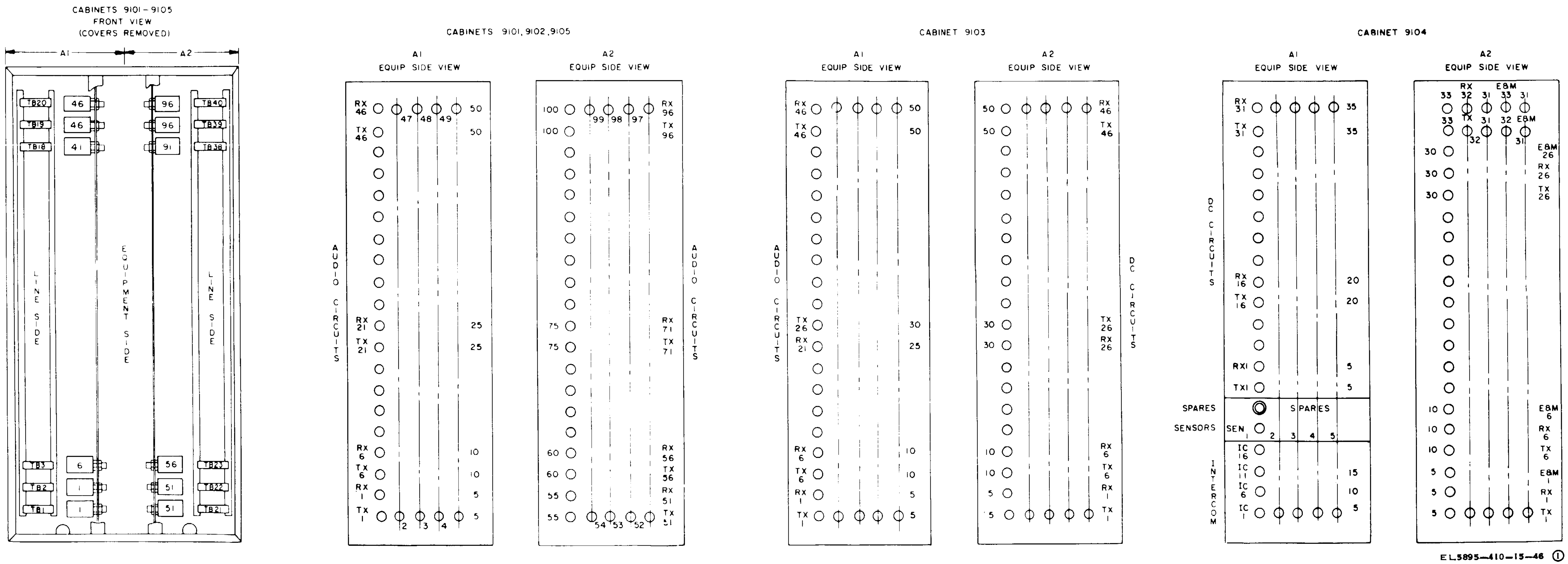

Figure 6-6. Shield point isolation facility, cabling data (sheet 1 of 4).

AF AUDIO ISOLATOR CONNECTIONS TO ENTRANCE DISTRIBUTION FRAME (AF)

From				Cable			To		
Audio isolation equipment							Entrance distribution frame (AF)		
Cabinet	Section	Circuit	Filters	Number (1)	Type	Pairs	Panel	Row	Pins
9101	A1	TX	1-24 25-27	BA	27PR	1-24 25-27	A1	A-F G	1-8 1-6
			28 29-48 49,50	BB	27PR	1 2-21 22-23	 A2	G H-M A	7&8 1-8 1-4
		RX	1-24 25-27	BC	27PR	1-24 25-27	A1	A-F G	9-16 9-14
			28 29-48 49,50	BD	27PR	1 2-21 22&23	 A2	G H-M A	15&16 9-16 9-12
	A2	TX	51,52 53-76 77	BE	27PR	1&2 3-26 27		A B-G H	5-8 1-8 1&2
			78-80 81-96 97-100	BF	27PR	1-3 4-19 20-24	 A3	H J-M A	3-8 1-8 1-8
		RX	51,52 53-76 77	BG	27PR	1-2 3-26 27	A2	A B-G H	13-16 9-16 9&10
			78-80 81-96 97-100	BH	27PR	1-3 4-19 20-24		H J-M A	11-16 9-16 9-16
9102	A1	TX	1-8 9	BJ	27PR	1-8 9	A3	B&C D	1-8 1&2
		RX	1-8	BL	27PR	1-8	A3	B&C	9-16

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Figure 6-6. Shield point isolation facility, cabling data (sheet 2 of 4).

AUTOVON AUDIO ISOLATOR CONNECTIONS TO ENTRANCE DISTRIBUTION FRAME (AF)

From				Cable			To		
Isolation equipment							Entrance distribution frame (AF)		
Cabinet	Section	Circuit	Filters	Number (1)	Type	Pairs	Panel	Row	Pins
9104	A2	TX RX E&M	1-5 1-5 1-5	CA	27PR	1-5 6-10 11-15	A6	A	1-10 11-20 21-30
		TX RX EM	6-10 6-10 6-17			16-20 21-25 26,27		B	1-10 11-20 21-24
		EM	8-10	CB	27PR	1-3			25-30
		TX RX EM	11-15 11-15 11-15			4-8 9-13 14-18		C	1-10 11-20 21-30
		TX RX	16-20 16-19			19-23 24-27		D	1-10 11-18
		RX EM	20 16-20	CC	27PR	1 2-6			19-20 21-30
		TX RX EM	21-25 21-25 21-25			7-11 12-16 17-21		E	1-10 11-20 21-30
		TX RX	26-30 26			22-26 27		F	1-10 11,12
		RX E&M	27-30 26-30	CD	9PER	1-4 5-9			13-20 21-30
		TX RX EM	31-33 31-33 31-33	CE	9PR	1-3 4-6 7-9		G	1-6 11-16 21-26

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Figure 6-6. Shield point isolation facility, cabling data (sheet 3 of 4).

SENSOR ISOLATOR CONNECTIONS TO BLACK DISTRIBUTION FRAME

From			Cable			To			
Isolation equipment						Black distribution frame			
Cabinet	Section	Sensor filter	Number	Type	Pairs	Cabinet	Panel	Row	Pins
9104	A1	1-5	DA	6PR	1-5	7703	A-3	A-E	69&70

DC ISOLATOR CONNECTIONS TO ENTRANCE DISTRIBUTION FRAME (AF)

From				Cable			To		
Cabinet	Section	Circuit	Filters	Number	Type	Pairs	Panel	Row	Pins
9104	A1	TX	1-24	EA	27PR	1-24	A1	A-F	1-8
			25-27			25-27		G	1-6
		RX	1-24	EC		1-24		A-F	9-16
			25-27		27PR	25-27		G	9-14

Figure 6-6. Shield point isolation facility, cabling data (sheet 4 of 4).

EL589S-410-I5-46 (4)

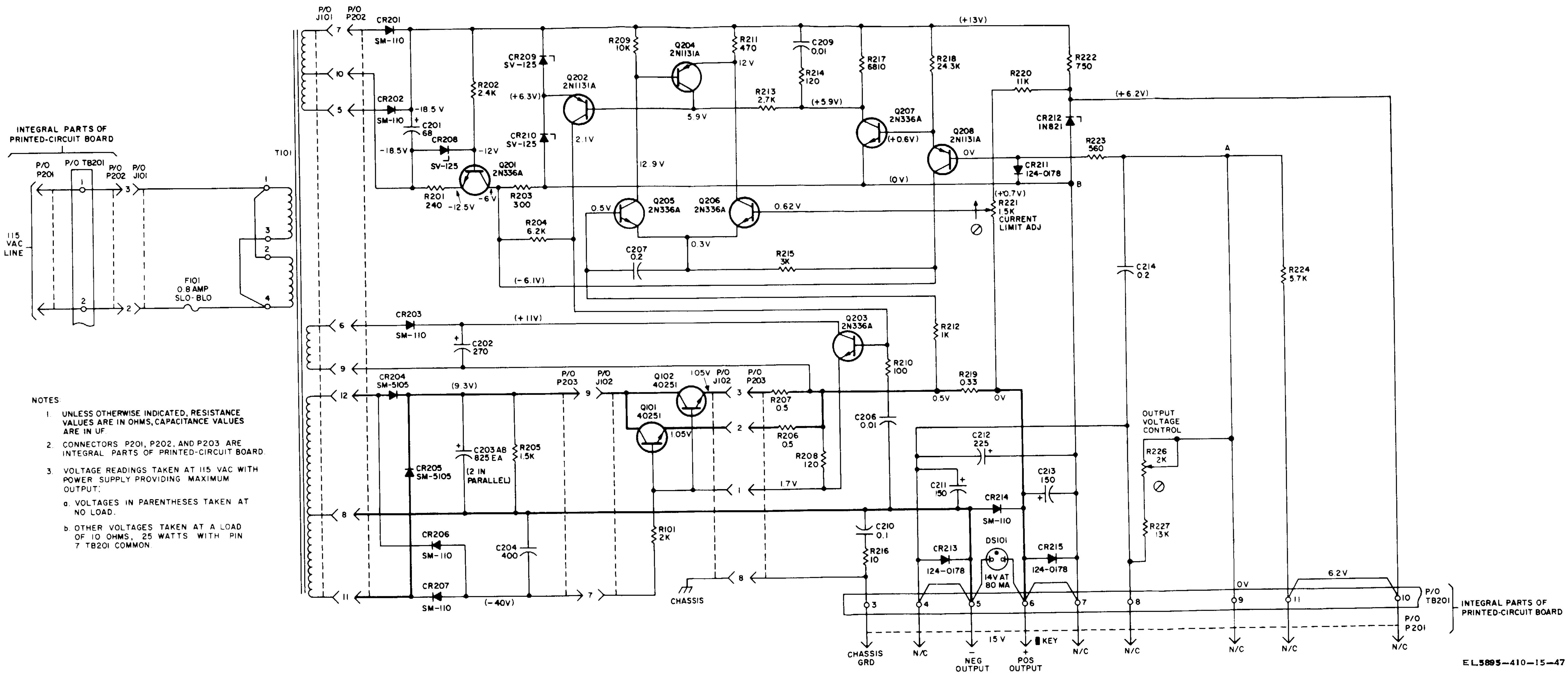


Figure 6-7. Signal level converter facility, redundant power supply unit, 14-volt common module, schematic diagram.

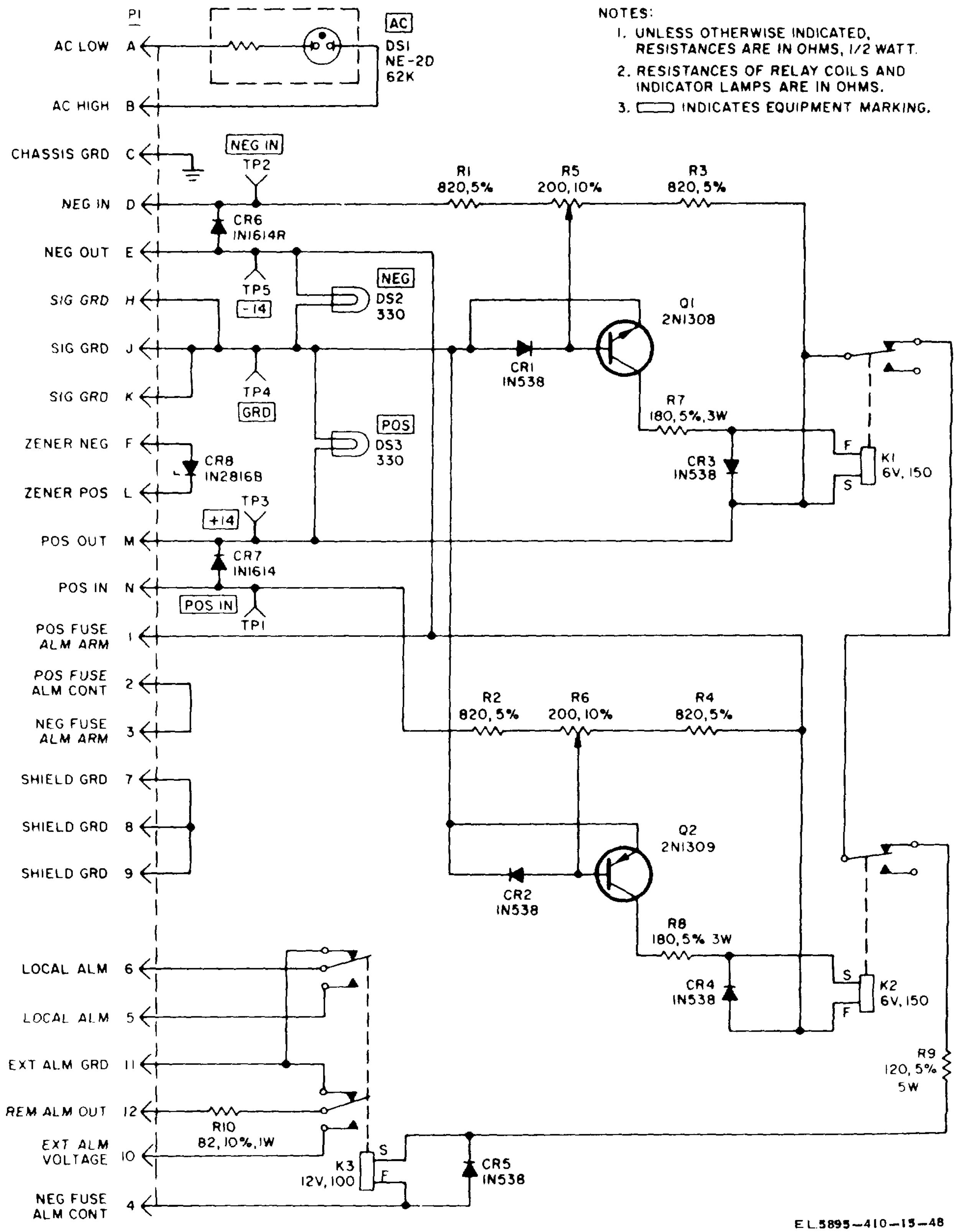


Figure 6-8. Signal level converter facility, redundant power supply unit, 14-volt common module, schematic diagram.

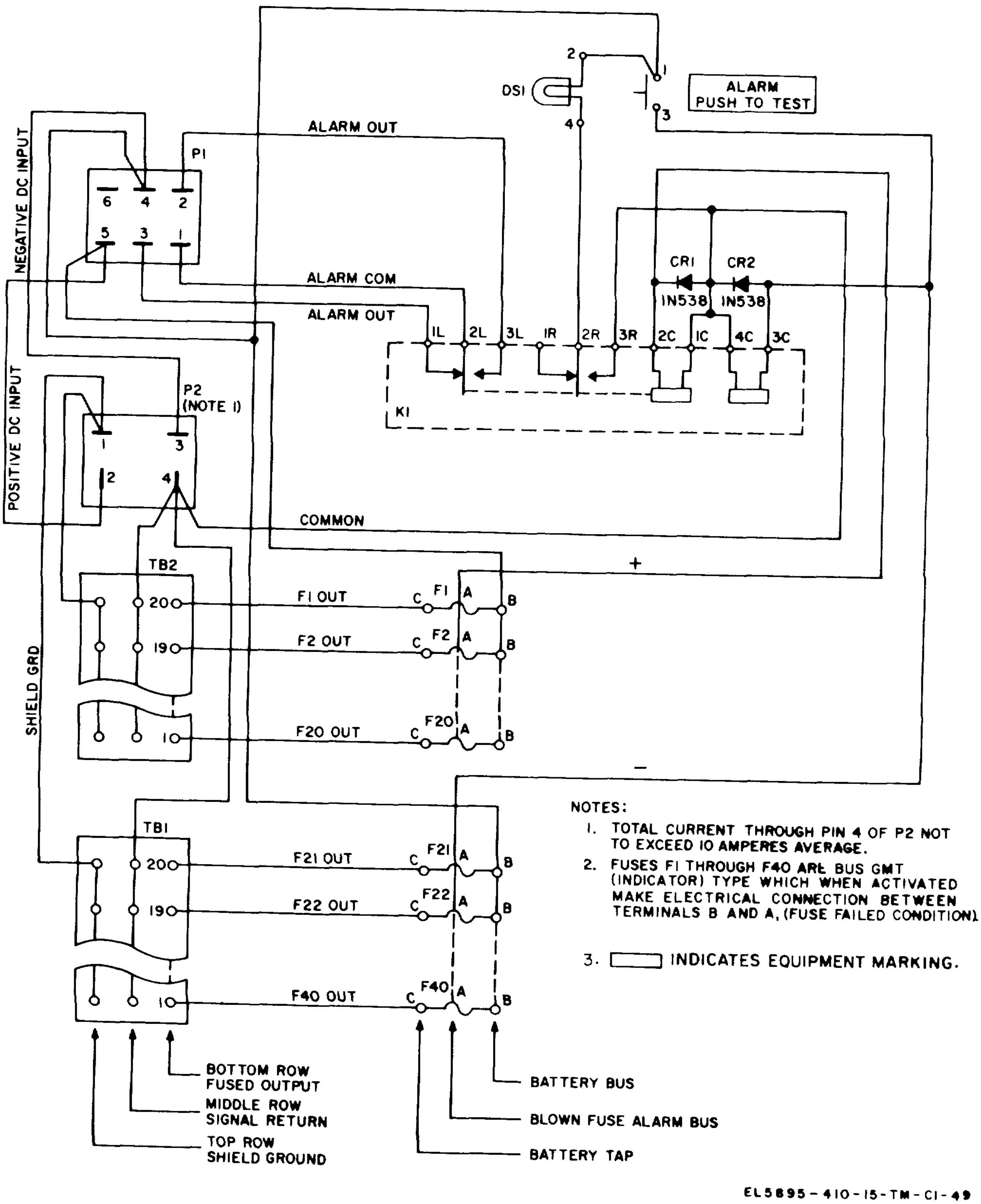
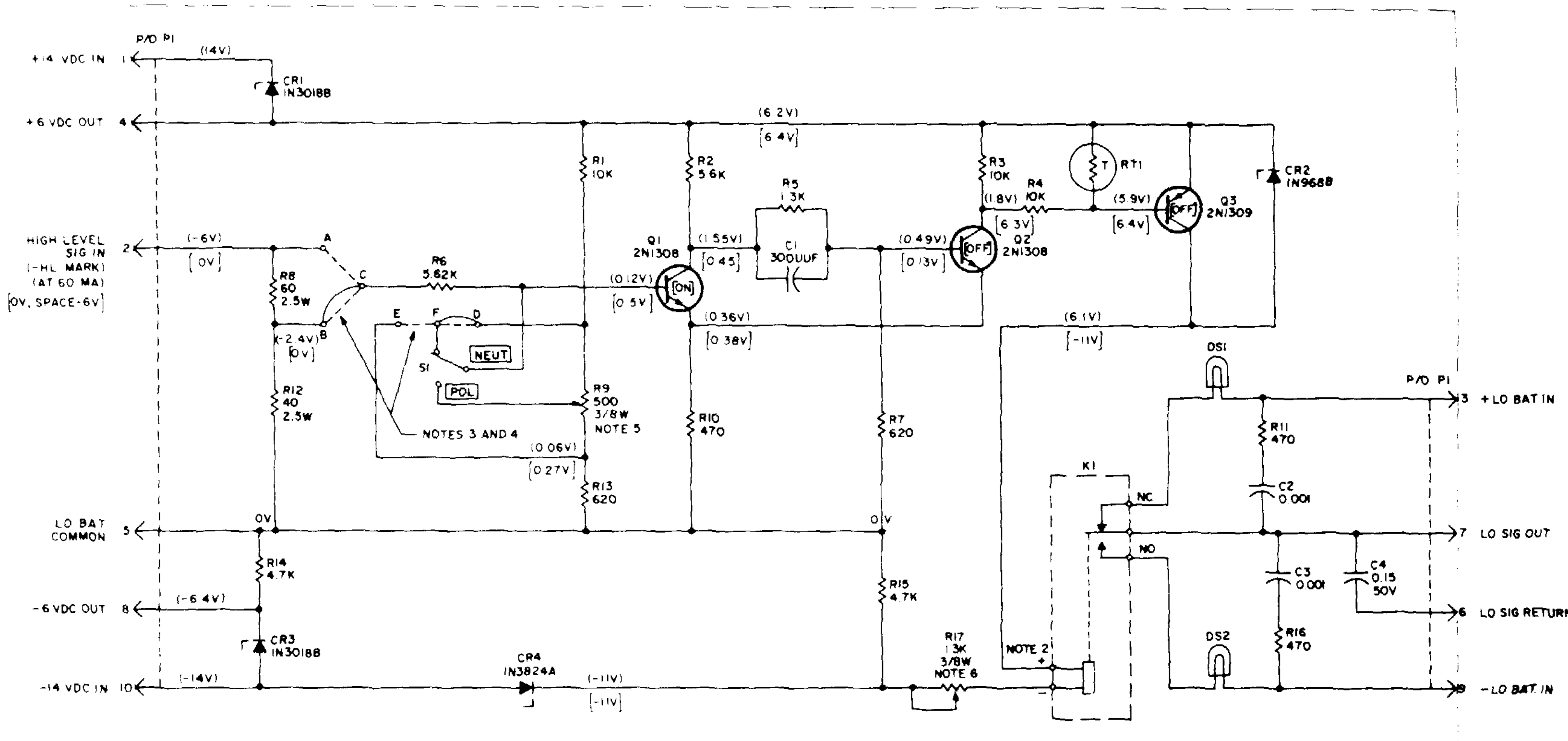


Figure 6-9. Signal level converter facility, fuse panel, schematic diagram.



NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, 1/2 WATT, CAPACITANCES ARE IN UF
2. [ ] INDICATES EQUIPMENT MARKINGS.
3. INPUT CURRENT STRAPPING OPTIONS:
   A. FOR 20/30 MA OPERATION, STRAP TERMINAL A TO TERMINAL C
   B. FOR 60 MA OPERATION, STRAP TERMINAL B TO TERMINAL C.
4. NEUTRAL MODE STRAPPING OPTIONS:
   A. FOR NEGATIVE MARK OPERATION, STRAP TERMINAL D TO TERMINAL F.
   B. FOR POSITIVE MARK OPERATION, STRAP TERMINAL E TO TERMINAL F
5. RESISTOR R9 ADJUSTS BALANCE OF SCHMITT TRIGGER Q1 AND Q2 FOR POLAR INPUT SIGNALS. PROPER ADJUSTMENT ALLOWS OUTPUT CIRCUIT TO REMAIN IN ITS LAST SWITCHED STATE.
6. RESISTOR R17 ADJUSTS OUTPUT BIAS DISTORTION.
7. [ ] INDICATES SPACE
8. ( ) INDICATES MARK
9. PC CONNECTORS HAVE THEIR CONTACTS (1&A, 2&B, 3&C, ETC.) INTERNALLY CONNECTED ANY CONNECTION TO PIN 1 WILL ALSO APPEAR AT PIN A, ETC

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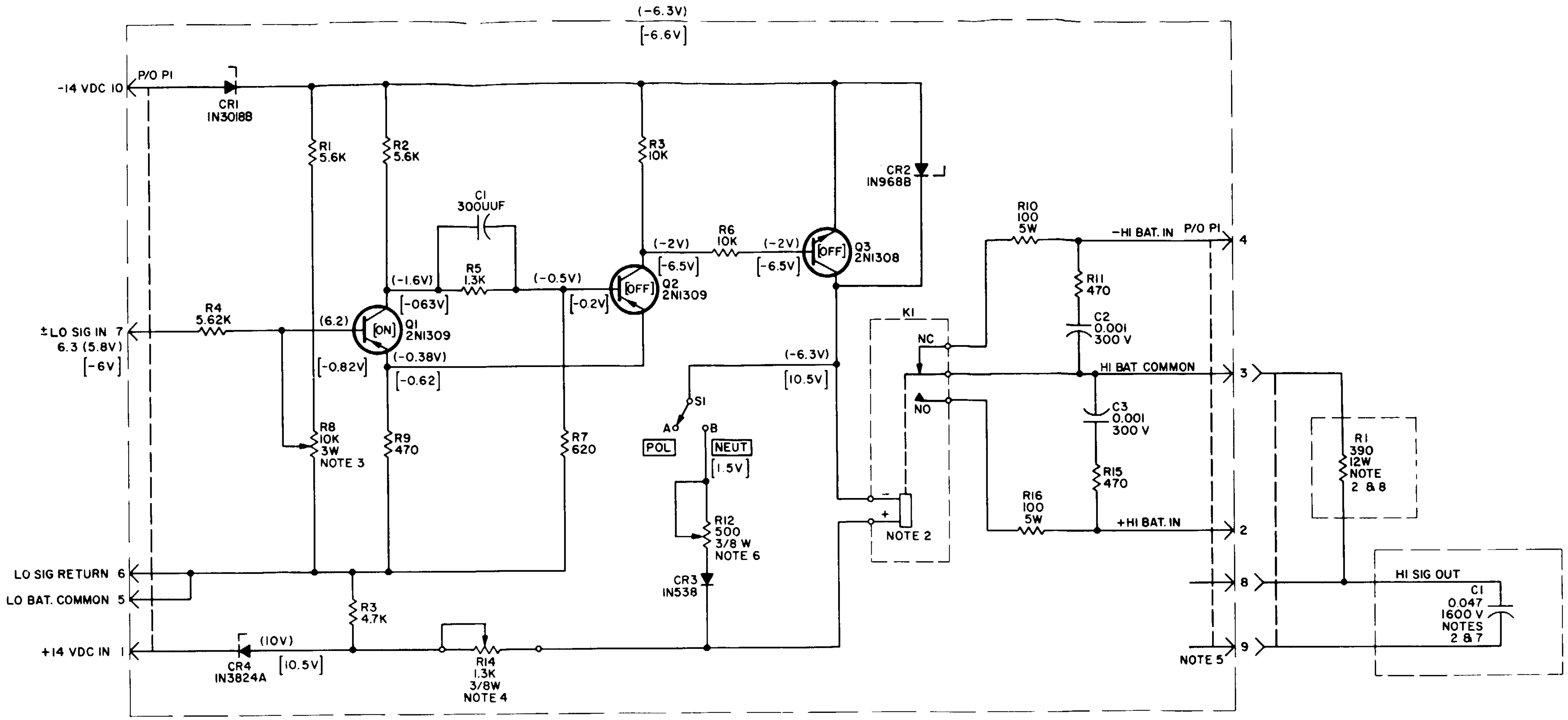
Figure 6-10. Signal level converter facility, hi/lo signal converter card, schematic diagram.



NOTES:

1. UNLESS OTHERWISE INDICATED, RESISTANCES ARE IN OHMS, 1/2 WATT, CAPACITANCES ARE IN UF.
2. C1-C6 AND R1-R6 ARE ASSOCIATED WITH THE CORRESPONDING LO/HI CONVERTER MODULES 2-6.
3. RESISTOR R8 ADJUSTS BALANCE OF SCHMITT TRIGGER Q1 AND Q2. PROPER ADJUSTMENT ALLOWS OUTPUT CIRCUIT TO REMAIN IN ITS LAST SWITCHED STATE.
4. RESISTOR R14 ADJUSTS BIAS DISTORTION.
5. FOR POLAR OPERATION, CONNECT PIN P1-9 (SHAPING) TO HI BAT. COMMON.
6. RESISTOR R12 ADJUSTS RELAY BIAS REQUIRED TO COMPENSATE FOR OUTPUT BIAS DISTORTION WHEN CHANGING FROM POLAR TO NEUTRAL OUTPUT MODES OF OPERATION.
7. SHAPING CAPACITOR C1 THRU C6 IS LOCATED ON SEPARATE BOARD MOUNTED BETWEEN PC CONNECTORS AT REAR OF SHELF.
8. RESISTOR R1 THRU R6. FORM PART OF POLAR SHAPING NETWORK; RESISTORS ARE MOUNTED BETWEEN PC CONNECTORS AT REAR OF SHELF.
9. ▭ INDICATES EQUIPMENT MARKING.
10. [ ] INDICATES SPACE.
11. ( ) INDICATES MARK.
12. PC CONNECTORS HAVE THEIR CONTACTS (1&A, 2&B, 3&C ETC.) CONNECTED INTERNALLY. ANY CONNECTION TO PIN 1 WILL ALSO APPEAR AT PIN A, ETC.

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Figure 6-11. Signal level converter facility, lo/hi signal converter card, schematic diagram.

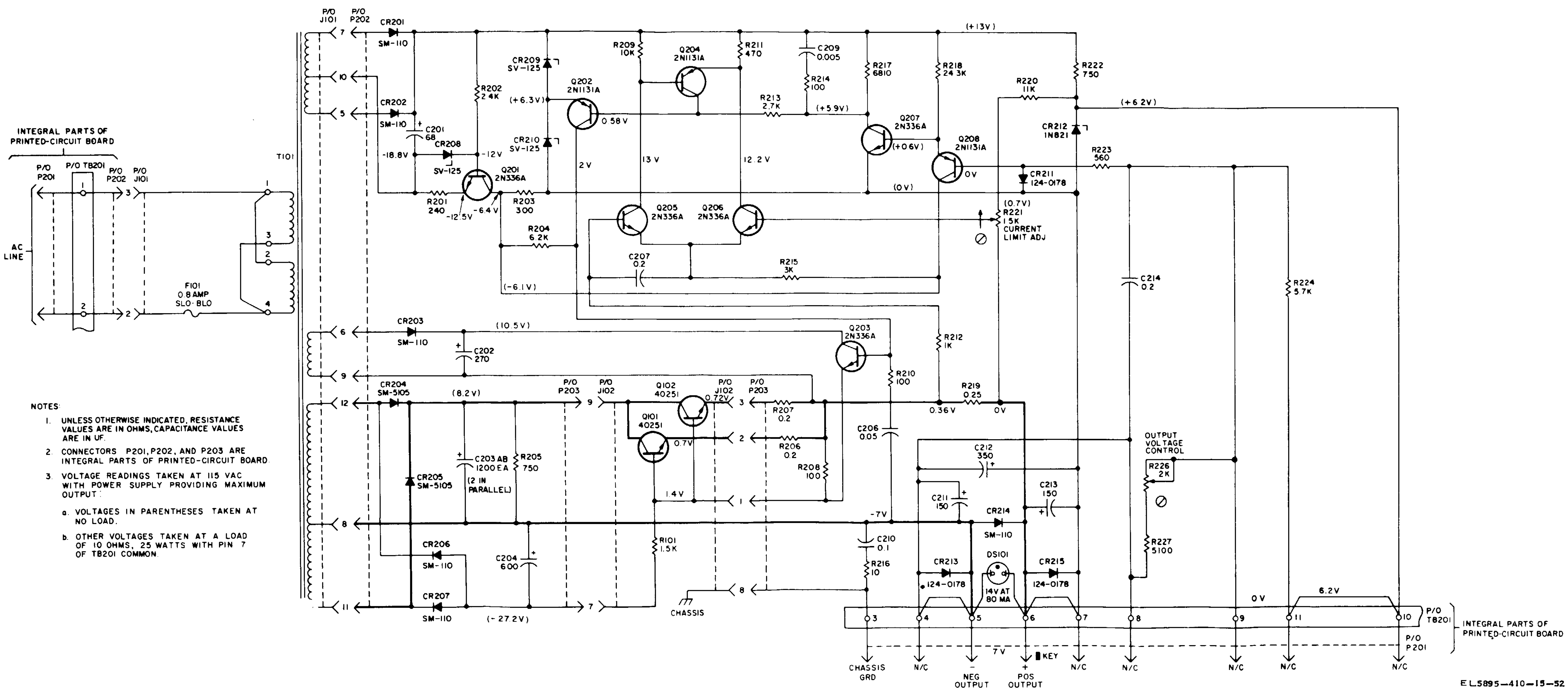


Figure 6-12. Red/black isolation facility, redundant power supply unit, 7-volt dc power supply module, schematic diagram.

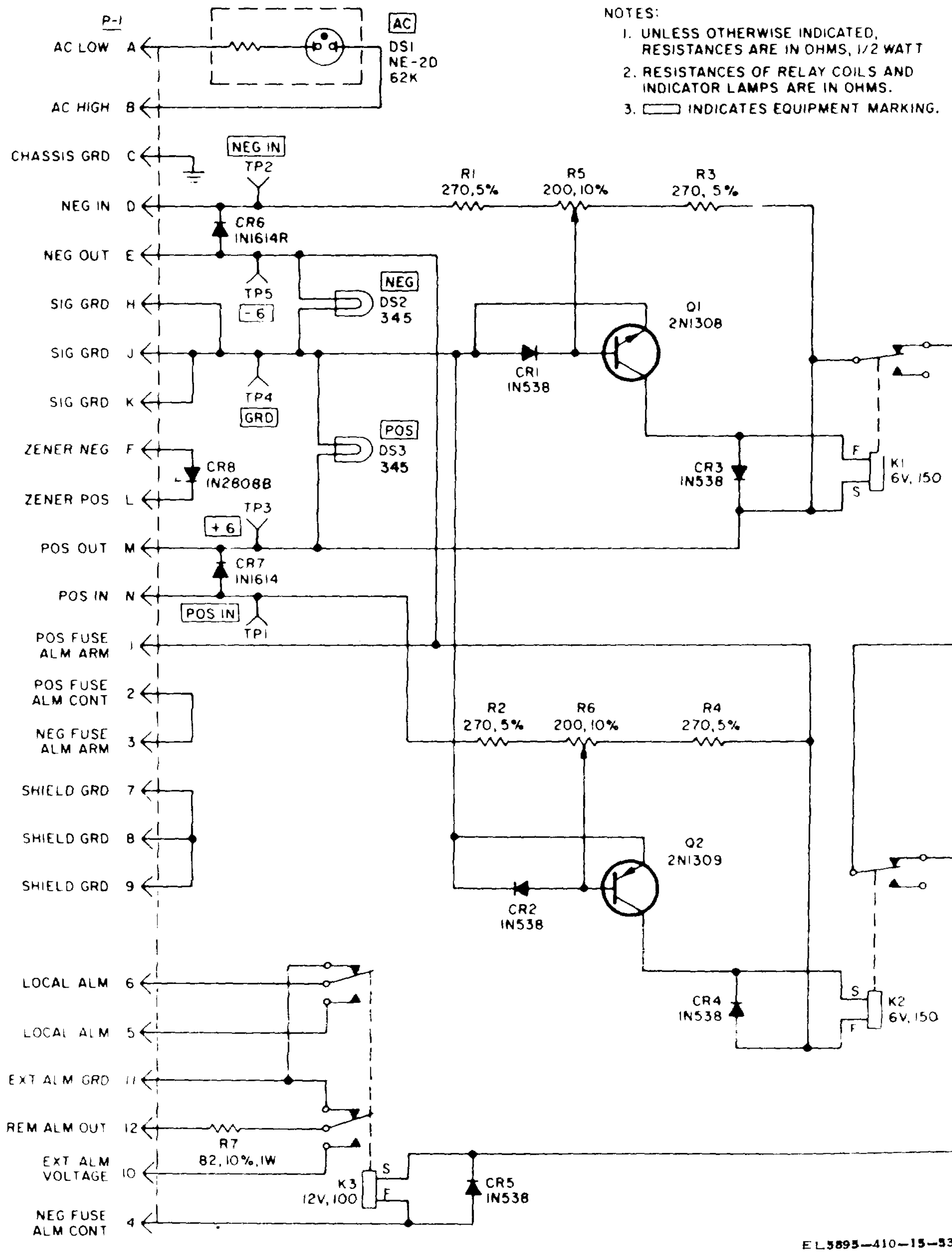
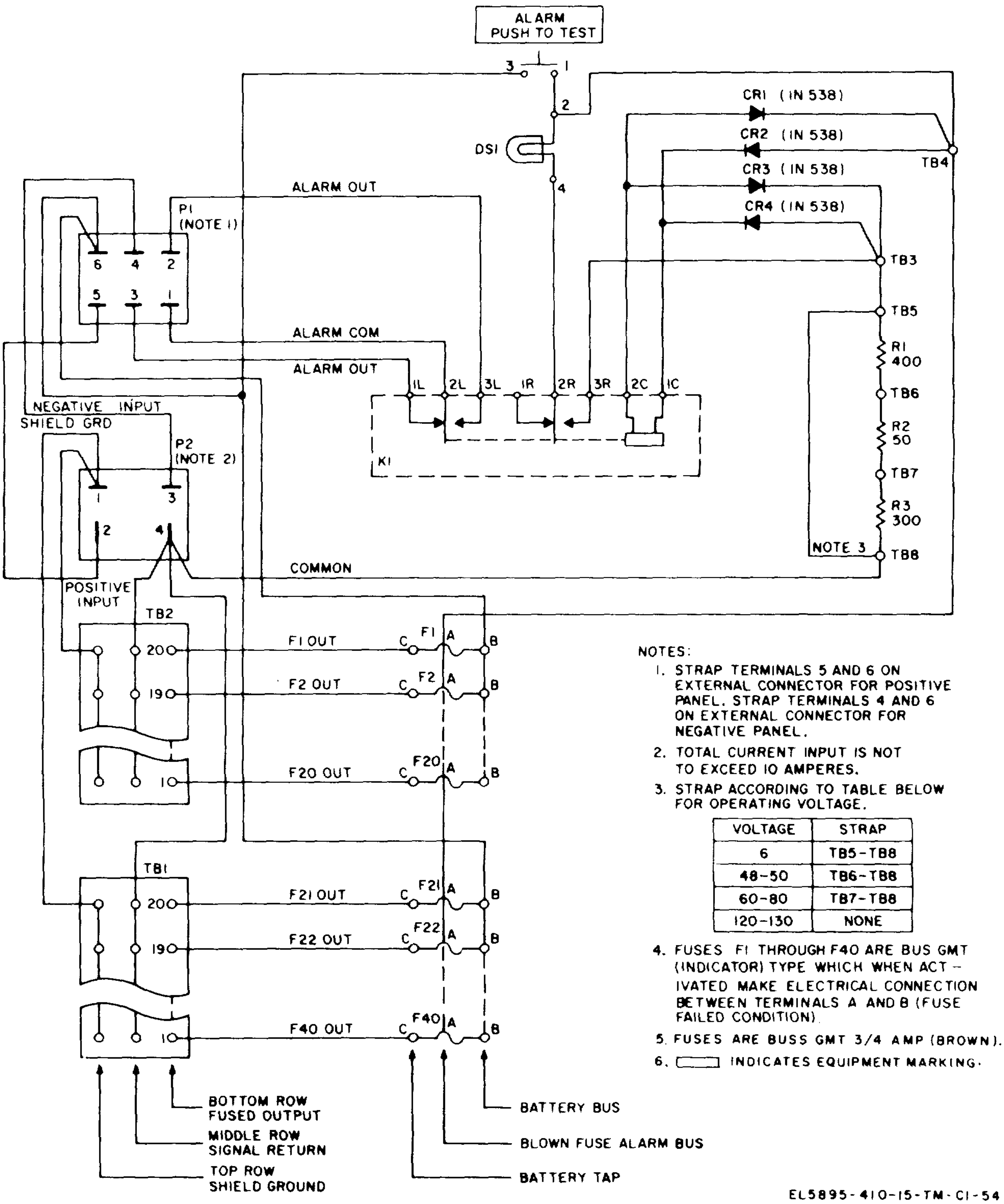


Figure 6-13. Red/black isolation facility, redundant power supply unit, 6-volt common module, schematic diagram.



NOTES:
1. STRAP TERMINALS 5 AND 6 ON EXTERNAL CONNECTOR FOR POSITIVE PANEL. STRAP TERMINALS 4 AND 6 ON EXTERNAL CONNECTOR FOR NEGATIVE PANEL.
2. TOTAL CURRENT INPUT IS NOT TO EXCEED 10 AMPERES.
3. STRAP ACCORDING TO TABLE BELOW FOR OPERATING VOLTAGE.

VOLTAGE	STRAP
6	TB5-TB8
48-50	TB6-TB8
60-80	TB7-TB8
120-130	NONE

4. FUSES F1 THROUGH F40 ARE BUS GMT (INDICATOR) TYPE WHICH WHEN ACTIVATED MAKE ELECTRICAL CONNECTION BETWEEN TERMINALS A AND B (FUSE FAILED CONDITION).
5. FUSES ARE BUSS GMT 3/4 AMP (BROWN).
6. ▭ INDICATES EQUIPMENT MARKING.

Figure 6-14. Red/black isolation facility, fuse panel, schematic diagram.

APPENDIX

REFERENCES

AFM 66-1	Maintenance Management (Air Force).
Commercial Literature	Test Equipment for Automatic Digital Message Switching Centers AN/FYQ-42(V)1 Through AN/FYQ-42(V)12 and AN/FYQ-42(V)T1.
DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (types 7, 8, and 9), Supply Bulletins, and Lubrication Orders.
DA Pam 310-7	U. S. Army Equipment Index of Modification Work Orders.
NAVSANDA Publication 2002	Navy Stock List of Forms and Publications Cognizance Symbol I.
NW 00-15PA-1	Soldering for Electric and Electronic Applications.
TB SIG 222	Solder and Soldering.
TB SIG 364	Field Instructions for Painting and Preserving Electronics Command Equipment.
TM 11-5895-391-15/NAVSHIPS 0967-301-5010/TO 31S5-2FYQ42-1	Operator, Organizational, DS, GS, and Depot Maintenance Manual, Automatic Digital Message Switching Centers AN/FYQ-42(V)1 Through AN/FYQ-42(V)12 and AN/FYQ-42(V)T1.
TM 11-5895-415-15/NAVSHIPS 0967-301-5140/T0 31S5-2FYA-11	Operator, Organizational, DS, GS, and Depot Maintenance Manual, Interconnecting Units, Autodin-Autovon AN/FYA-32, AN/FYA-33, AN/FYA-53, AN/FYA-54, ON-41/FYA-19, ON-52/FYA-T1, and ON-53/FYA-T1.
TM 38-750	Army Equipment Record Procedures.
TO 00-25-234	General Shop Practice Requirements for the Repair, Maintenance and Tests of Electronic Equipment.
TO 0-1-O1N	Numerical Index and Requirements Tables, Numerical Index, Alphabetical Indexes and Cross Reference Table Technical Orders (ADP Category 00).
TO 31-1-75	Maintenance Engineering Standard General Maintenance Practices.

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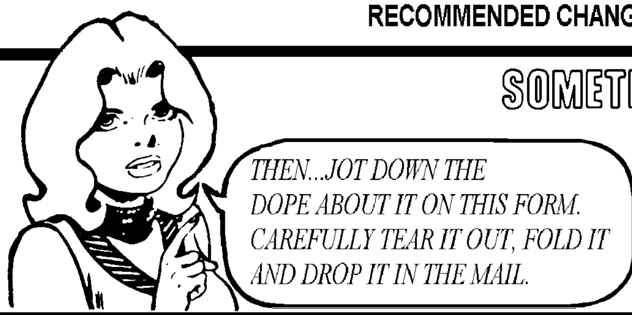

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Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 decagram = 10 grams = .35 ounce
1 hectogram = 10 decagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	Newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	Newton-meters	1.356	metric tons	short tons	1.102
pound-inches	Newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C

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