

0 1 2 3 4 5 6 7 8 9

DWG ISS	CD ISS	DATE ISSD	DRN	APP
1	1	4-26-93		

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SUPPORTING INFORMATION			
SYSTEM USED ON	DESIGN CONTROL	CATEGORY	NO.
5ESS	IH	MODULAR FUSE/FILTER UNIT (MFRU)	J5D003FJ-1

SHEET INDEX NOTES

- ONLY THE LATEST ISSUE, OR ISSUES IF CONCURRENT, ARE SHOWN IN THE INDEX.
- FOR REISSUES, A CHANGED OR NEW SHEET IS ASSIGNED THE SAME ISSUE NUMBER AS SHEET 1.
- THE ISSUE NUMBER OF SHEET 1 IS RECOGNIZED AS THE ISSUE NUMBER OF THE WHOLE DRAWING.

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BT13

**5ESS<sup>®</sup> SWITCHING EQUIPMENT  
MODULAR FUSE FILTER UNIT  
CIRCUIT**

DWG SIZE <b>C2</b>	ISSUE <b>1</b>
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SHEET A1  
36 SHEETS

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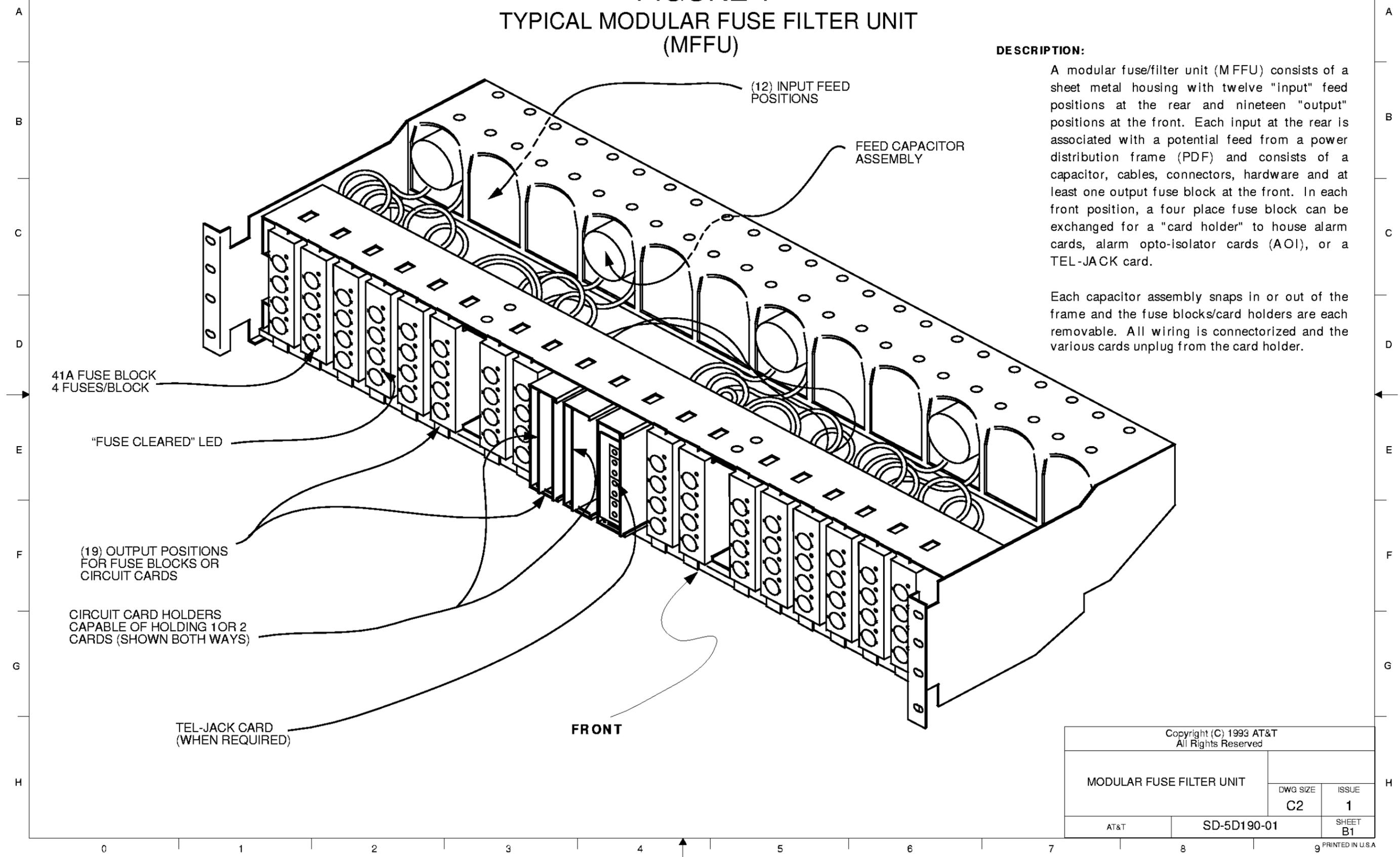
0 1 2 3 4 5 6 7 8 9

**FIGURE 1**  
**TYPICAL MODULAR FUSE FILTER UNIT**  
**(MFFU)**

**DESCRIPTION:**

A modular fuse/filter unit (MFFU) consists of a sheet metal housing with twelve "input" feed positions at the rear and nineteen "output" positions at the front. Each input at the rear is associated with a potential feed from a power distribution frame (PDF) and consists of a capacitor, cables, connectors, hardware and at least one output fuse block at the front. In each front position, a four place fuse block can be exchanged for a "card holder" to house alarm cards, alarm opto-isolator cards (AOI), or a TEL-JACK card.

Each capacitor assembly snaps in or out of the frame and the fuse blocks/card holders are each removable. All wiring is connectorized and the various cards unplug from the card holder.



41A FUSE BLOCK  
 4 FUSES/BLOCK

"FUSE CLEARED" LED

(19) OUTPUT POSITIONS  
 FOR FUSE BLOCKS OR  
 CIRCUIT CARDS

CIRCUIT CARD HOLDERS  
 CAPABLE OF HOLDING 1 OR 2  
 CARDS (SHOWN BOTH WAYS)

TEL-JACK CARD  
 (WHEN REQUIRED)

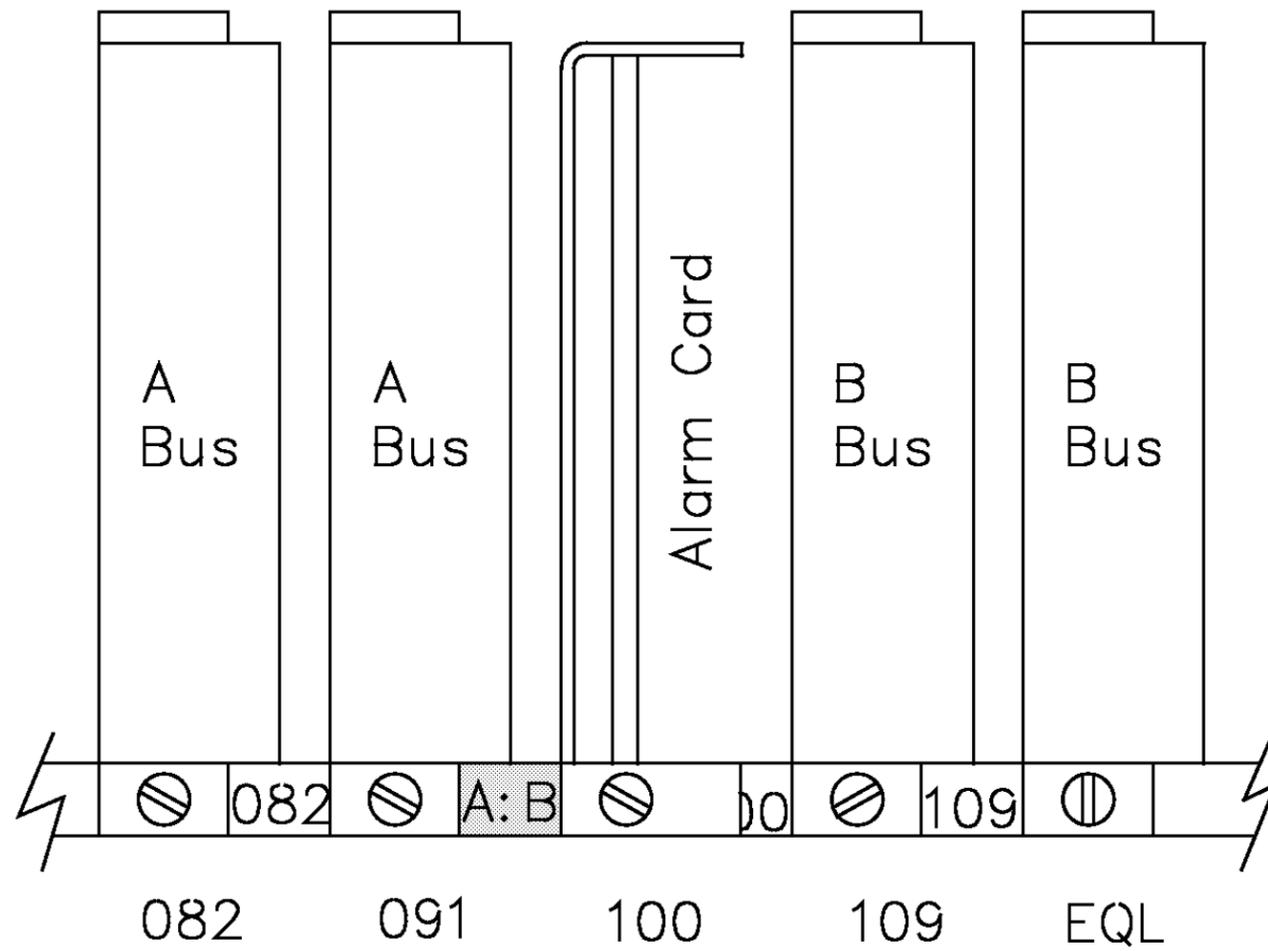
**FRONT**

(12) INPUT FEED  
 POSITIONS

FEED CAPACITOR  
 ASSEMBLY

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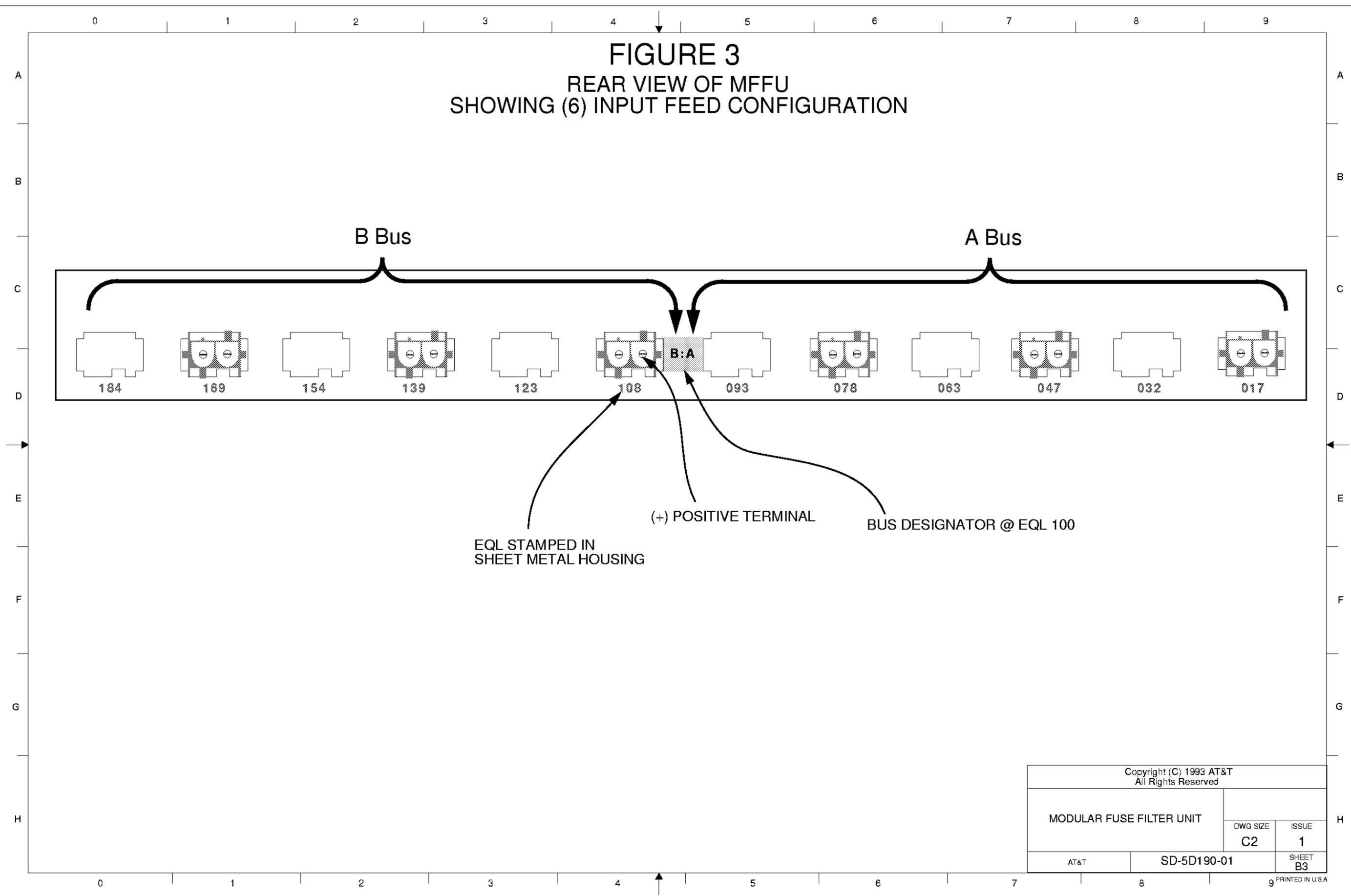
# FIGURE 2 BUS DESIGNATOR



Example of A:B Bus Designator @ EQL 095

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		ISSUE
C2		1
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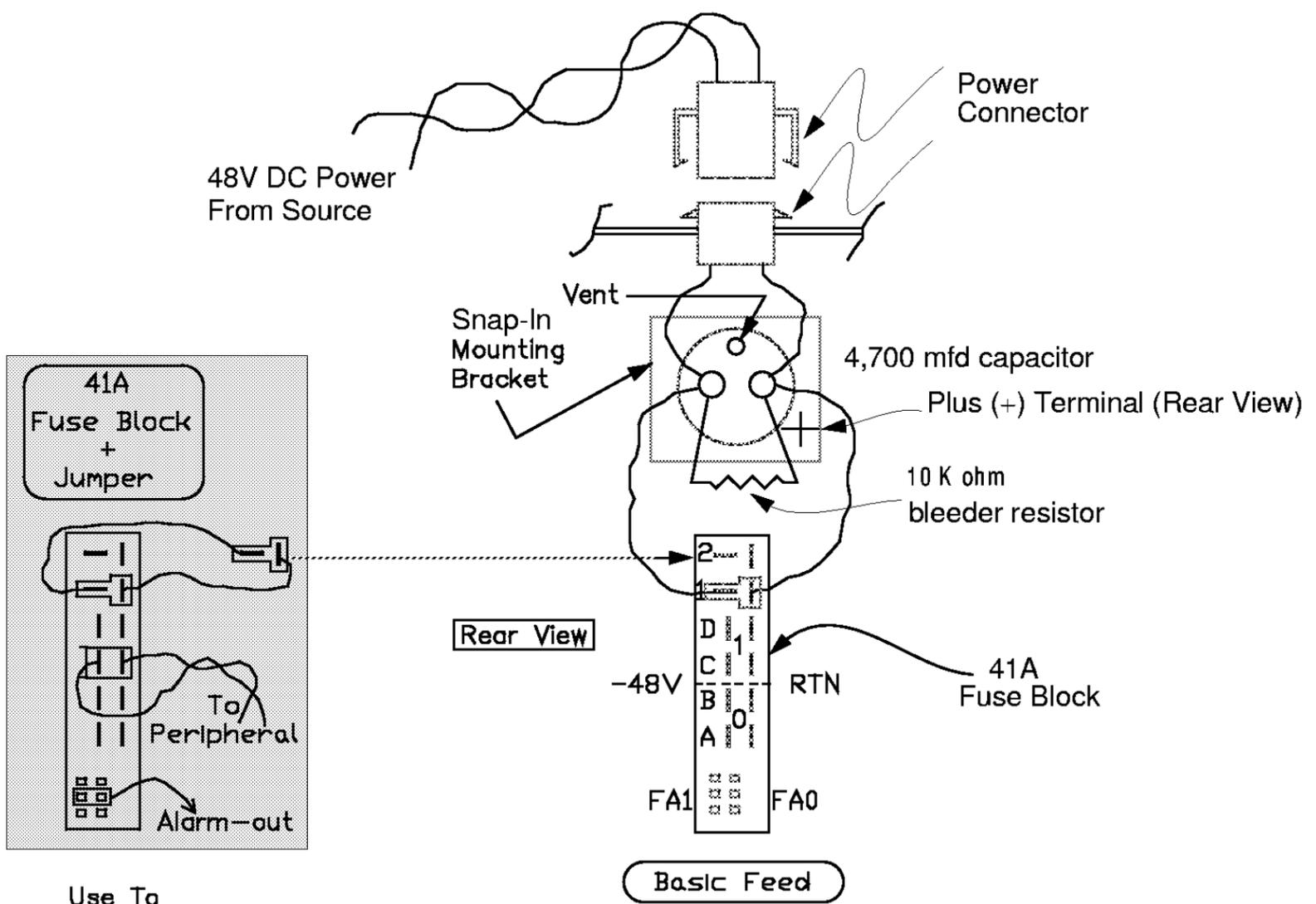
**FIGURE 3**  
**REAR VIEW OF MFFU**  
**SHOWING (6) INPUT FEED CONFIGURATION**



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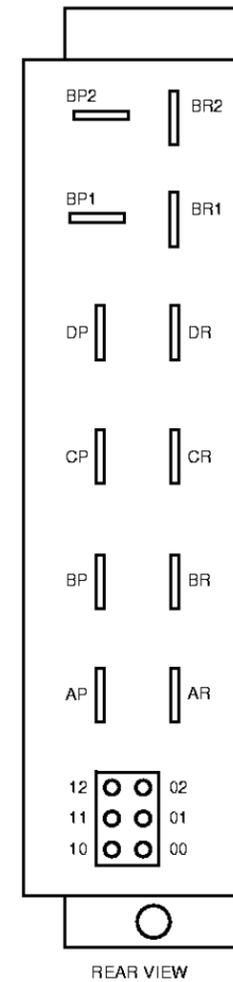
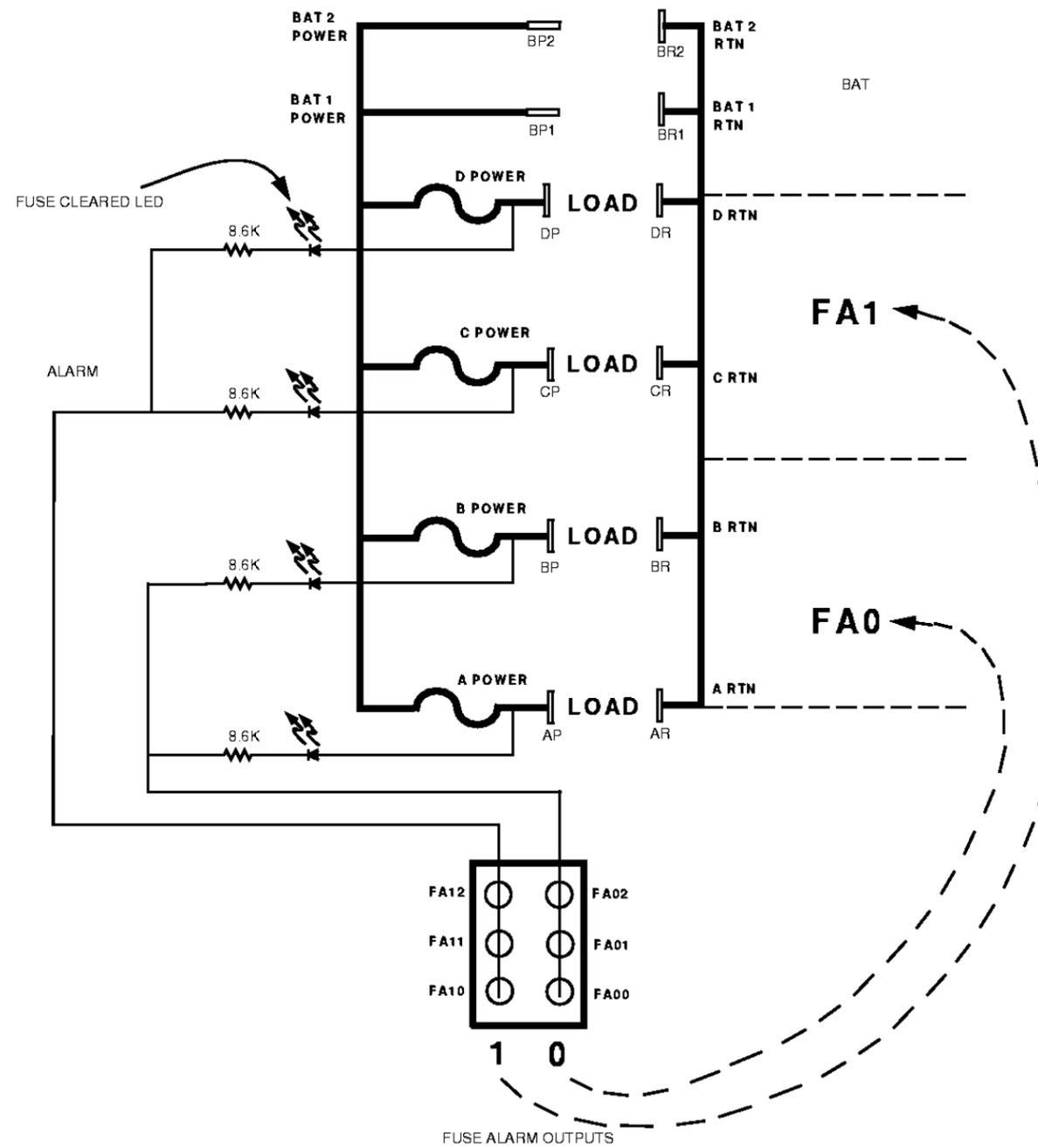
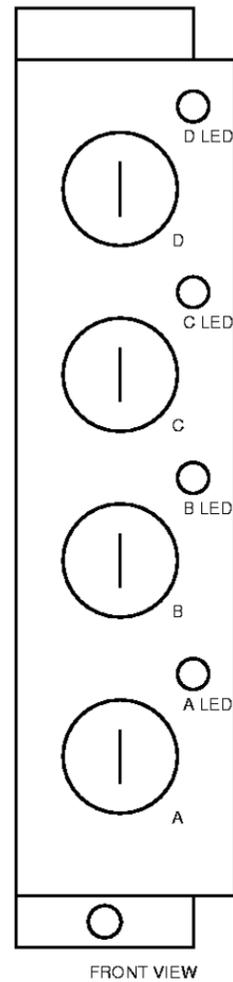
# FIGURE 4

## BASIC FEED & EXTENDED FEED



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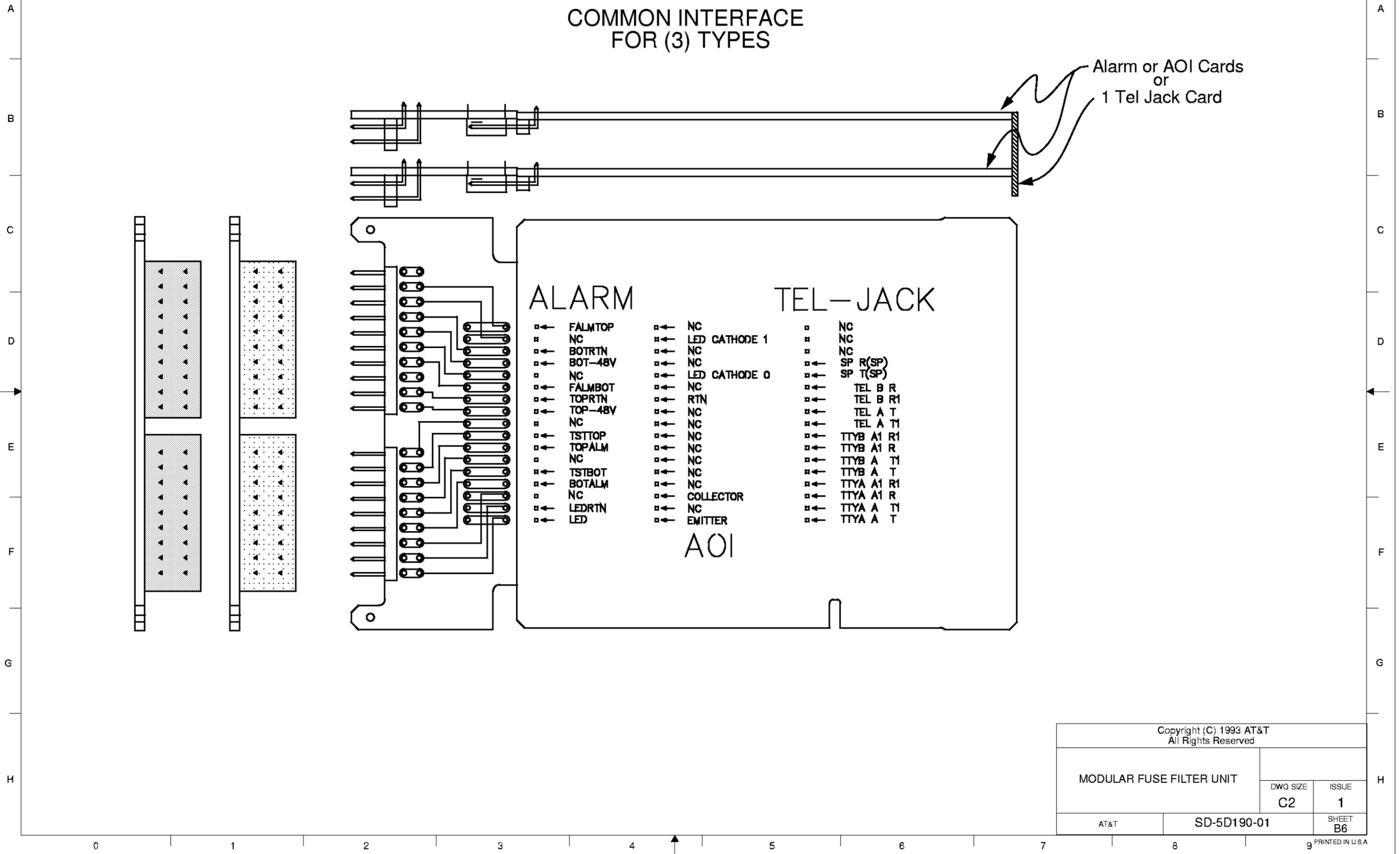
# FIGURE 5 41A FUSE BLOCK



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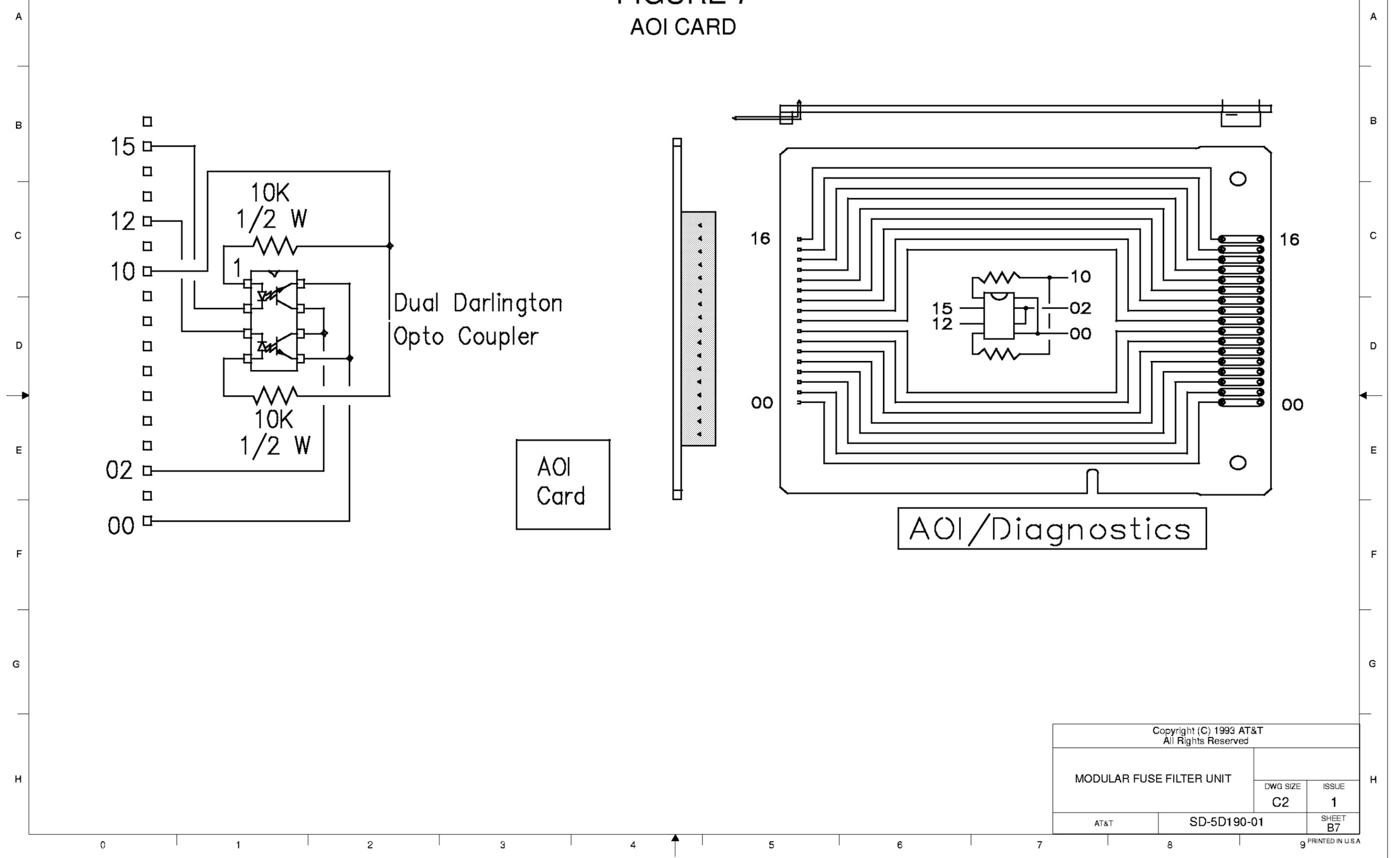
**FIGURE 6**  
COMMON INTERFACE  
FOR (3) TYPES

Alarm or AOI Cards  
or  
1 Tel Jack Card



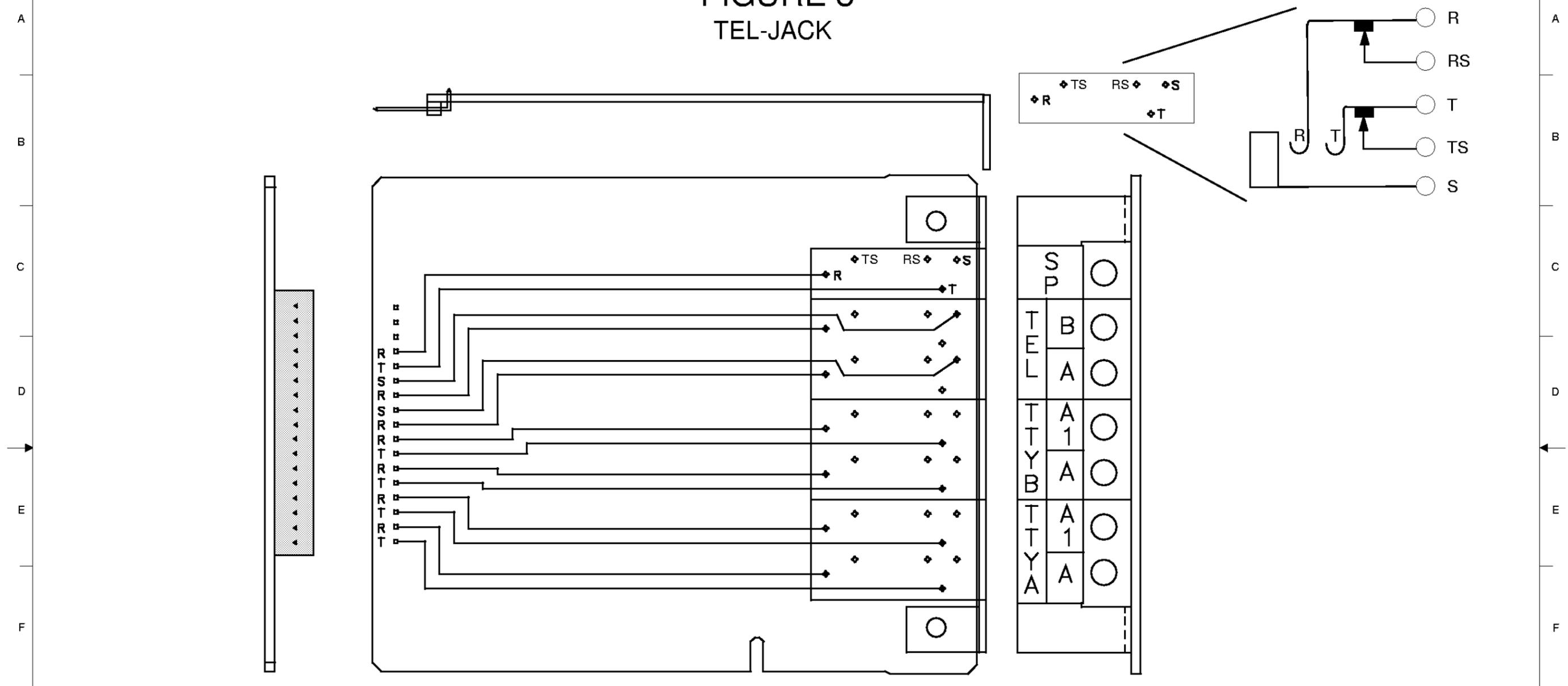
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MODULAR FUSE FILTER UNIT		
DWG SIZE	ISSUE	
C2	1	
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FIGURE 7  
AOI CARD

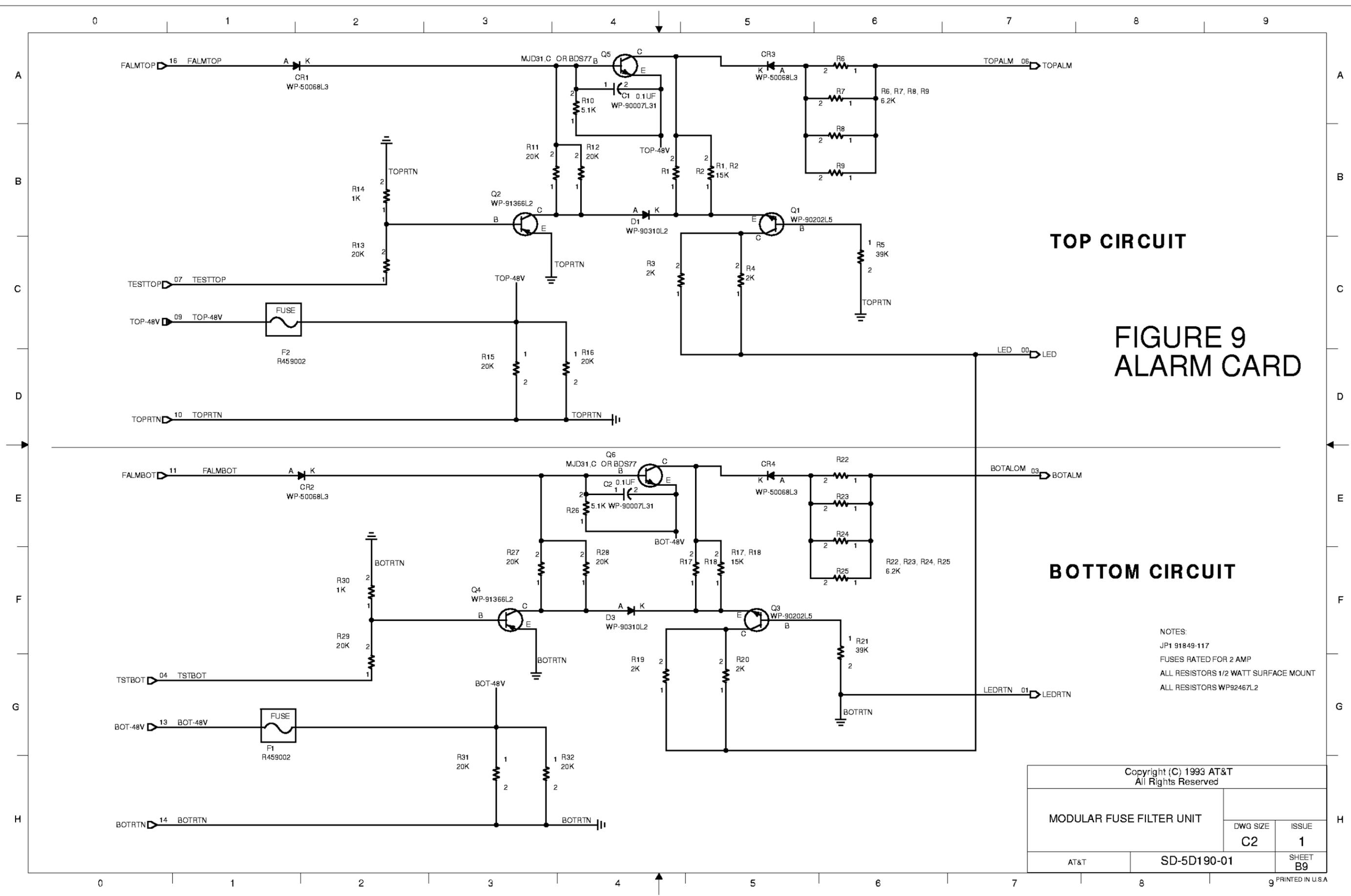


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FIGURE 8  
TEL-JACK



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C2	1	
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**TOP CIRCUIT**

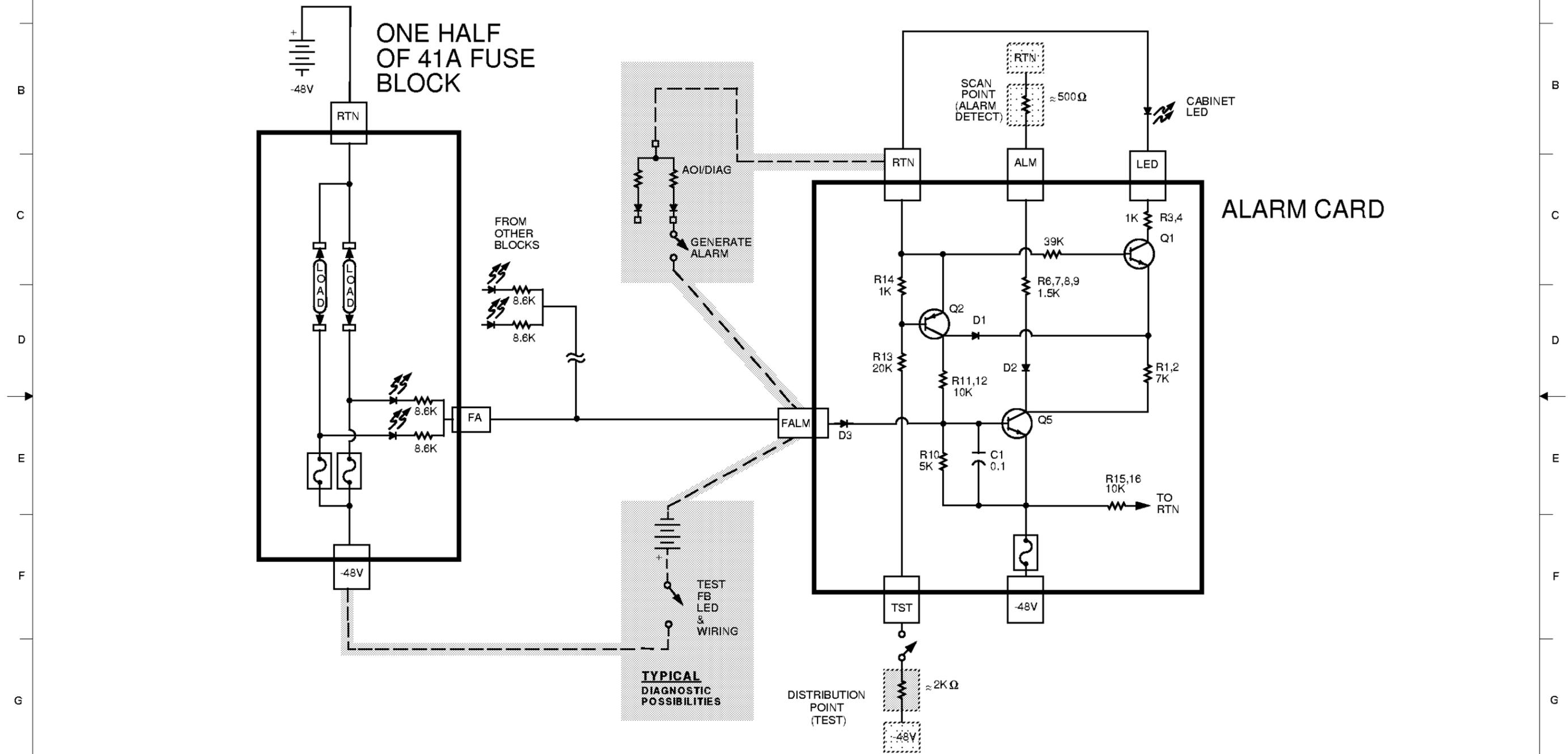
**FIGURE 9  
ALARM CARD**

**BOTTOM CIRCUIT**

NOTES:  
 JP1 91849-117  
 FUSES RATED FOR 2 AMP  
 ALL RESISTORS 1/2 WATT SURFACE MOUNT  
 ALL RESISTORS WP92467L2

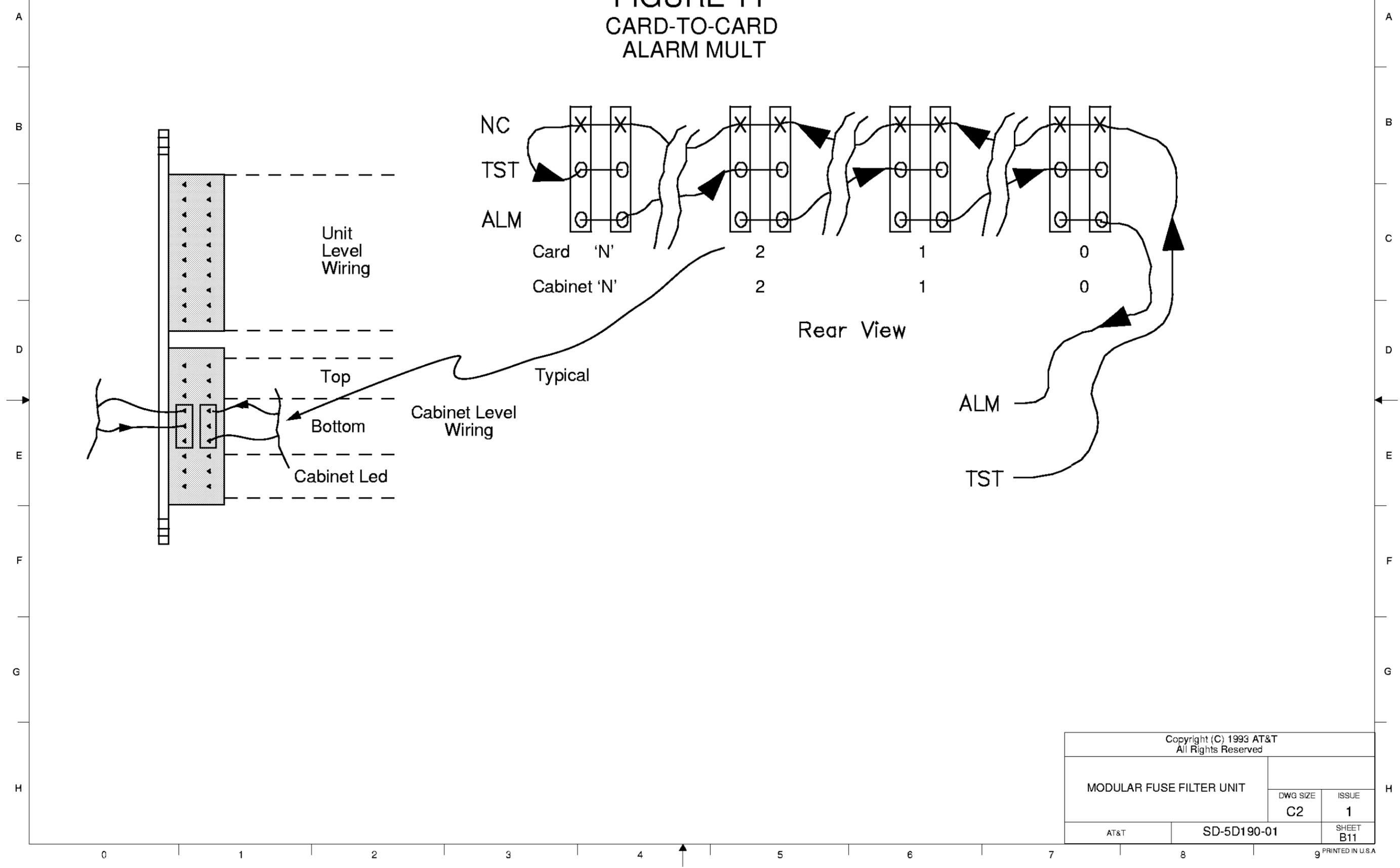
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**FIGURE 10**  
**ALARM OVERVIEW**



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MODULAR FUSE FILTER UNIT		
DWG SIZE	ISSUE	
C2	1	
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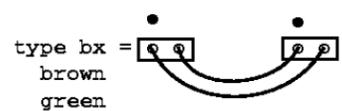
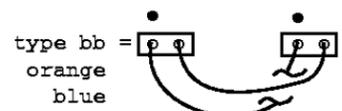
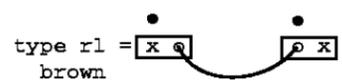
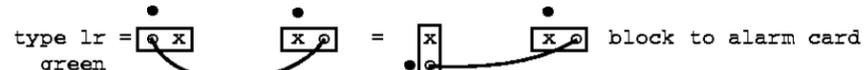
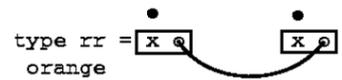
**FIGURE 11**  
**CARD-TO-CARD**  
**ALARM MULT**



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DWG SIZE	ISSUE	
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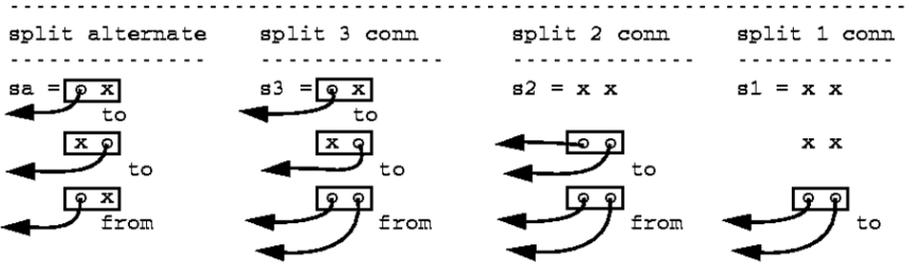
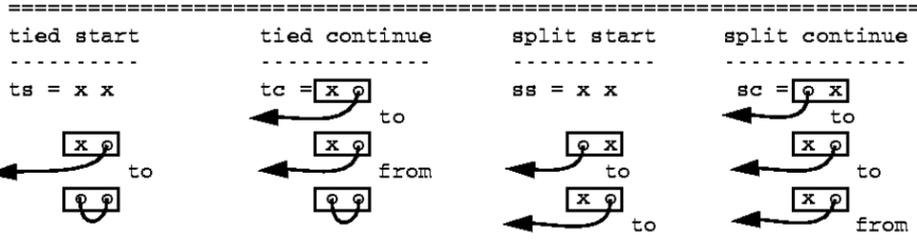
# FIGURE 12

## Cable Types:

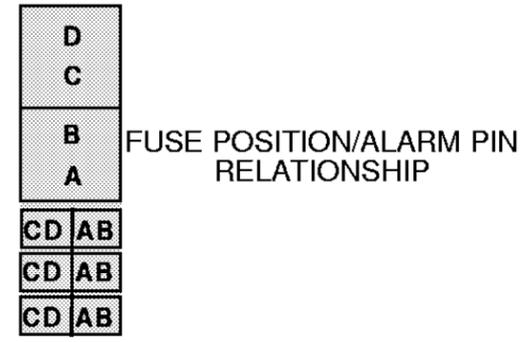
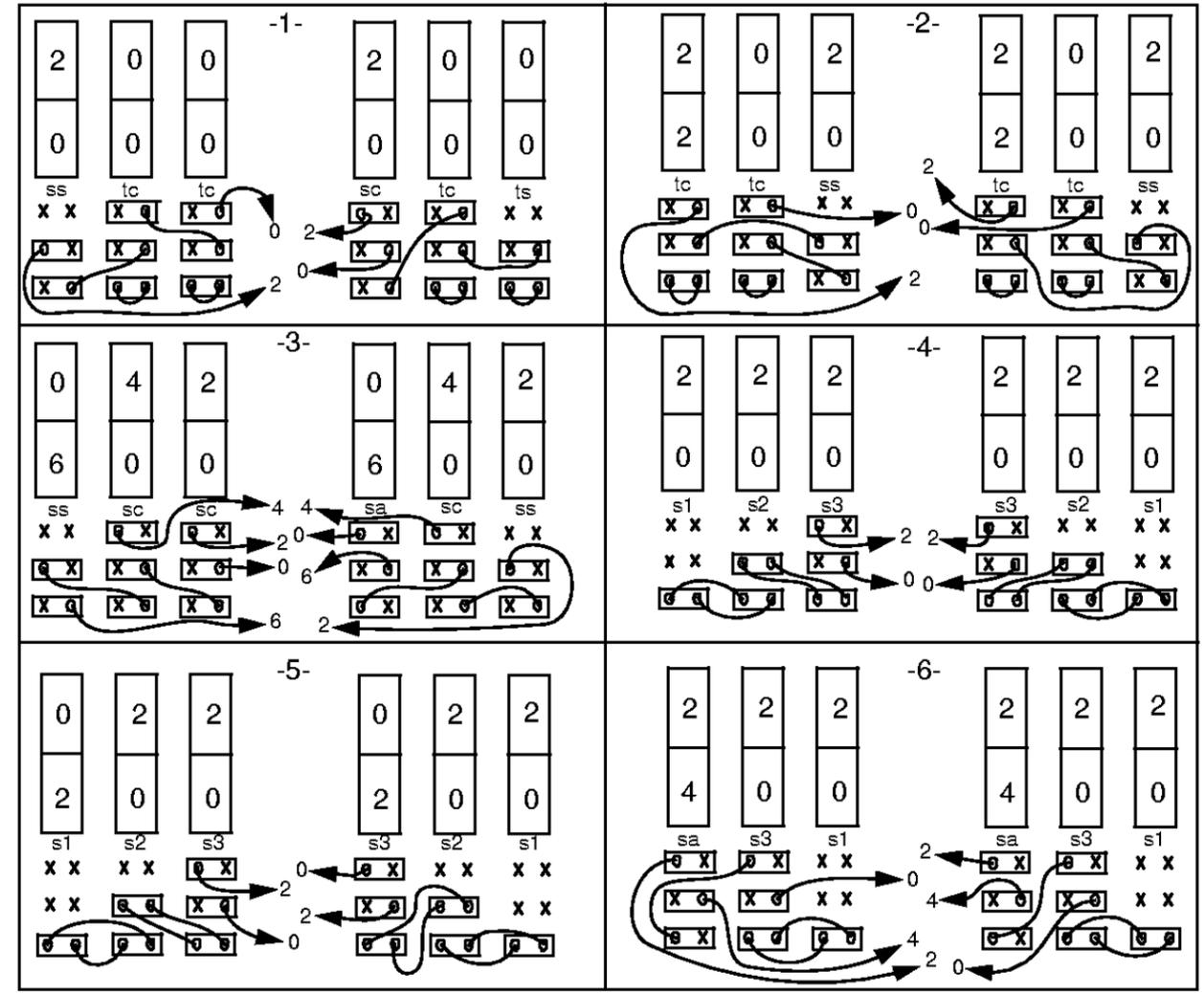


## REAR VIEW

## Wiring Patterns:



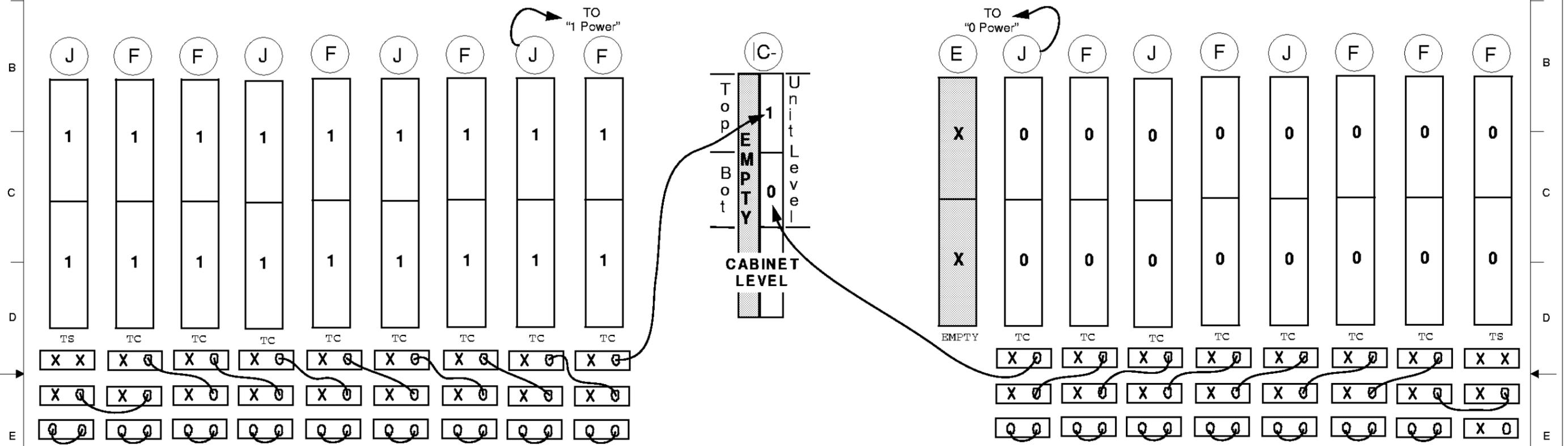
## Some Possible Wiring Combinations:



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# FIGURE 13

## RELATIONSHIP OF HARDWARE AND WIRING TO CONFIGURATION CODE



```

JFFJFFJFF|C-EJFJFFJFFF  ROW 1
111111111---X00000000  ROW 2
111111111---X00000000  ROW 3
-----T--1-----  ROW 4
-----0--B-----  ROW 5
    
```

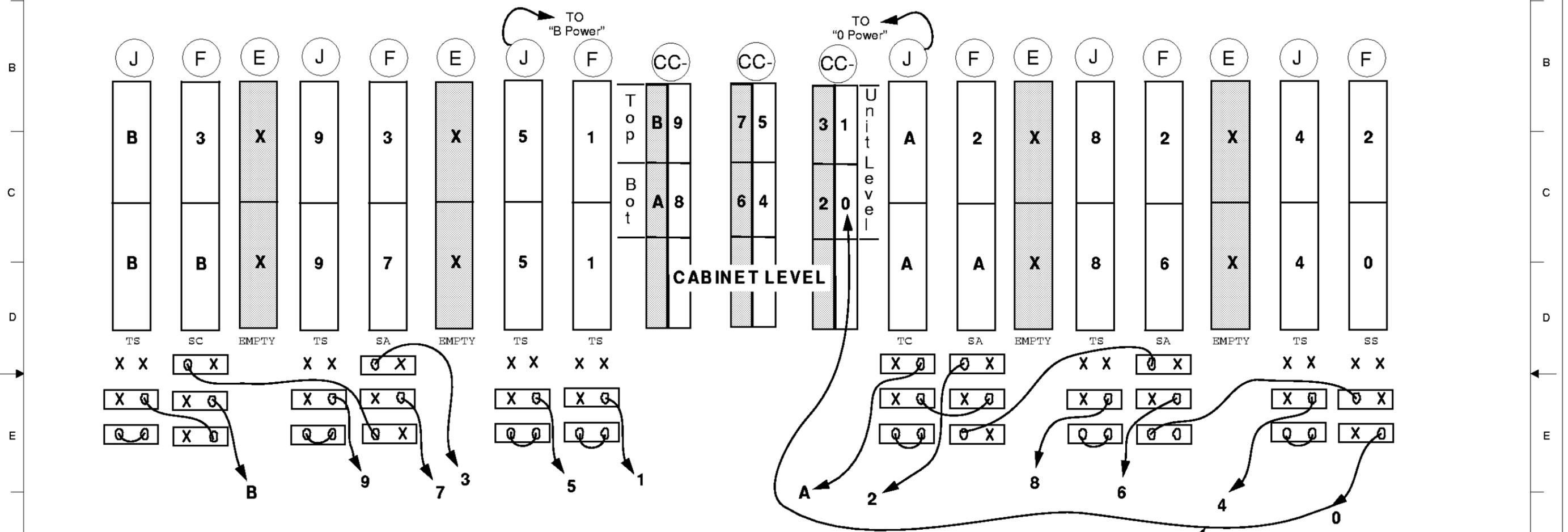
CONFIGURATION CODE

### REAR VIEW

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# FIGURE 14

## RELATIONSHIP OF HARDWARE AND WIRING TO CONFIGURATION CODE



JFEJFEJFCC-CC-CC-JFEJFEJF ROW 1  
 B3X93X51-----A2X82X42 ROW 2  
 BBX97X51-----AAX86X40 ROW 3  
 -----T-B9-75-31----- ROW 4  
 -----A8-64-20-B----- ROW 5

CONFIGURATION CODE

### REAR VIEW

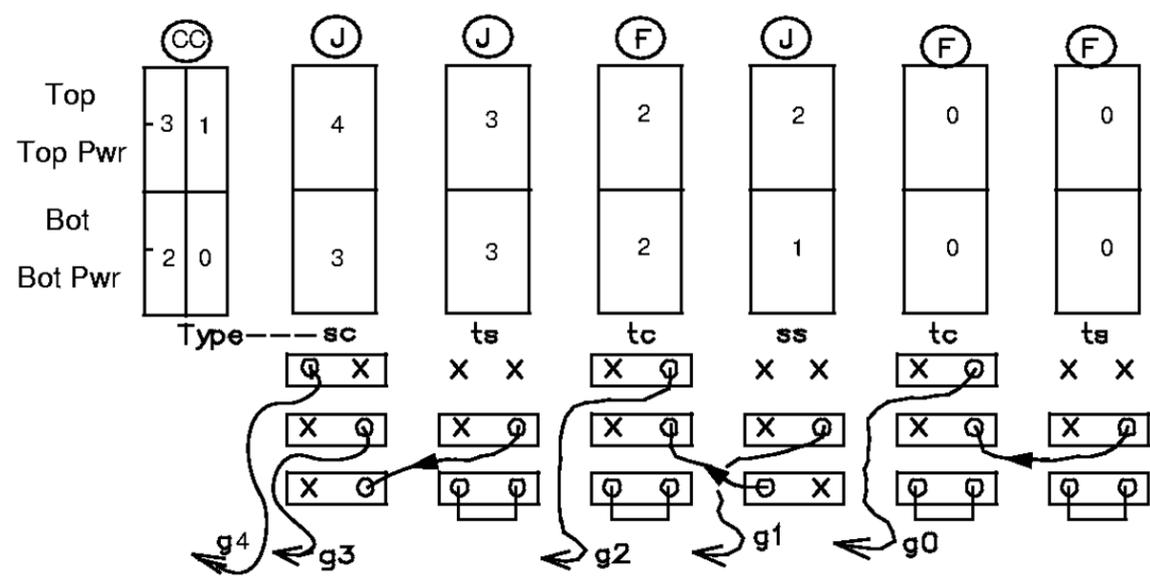
TYPICAL  
 UNIT LEVEL  
 WIRING TO  
 ALARM CARDS

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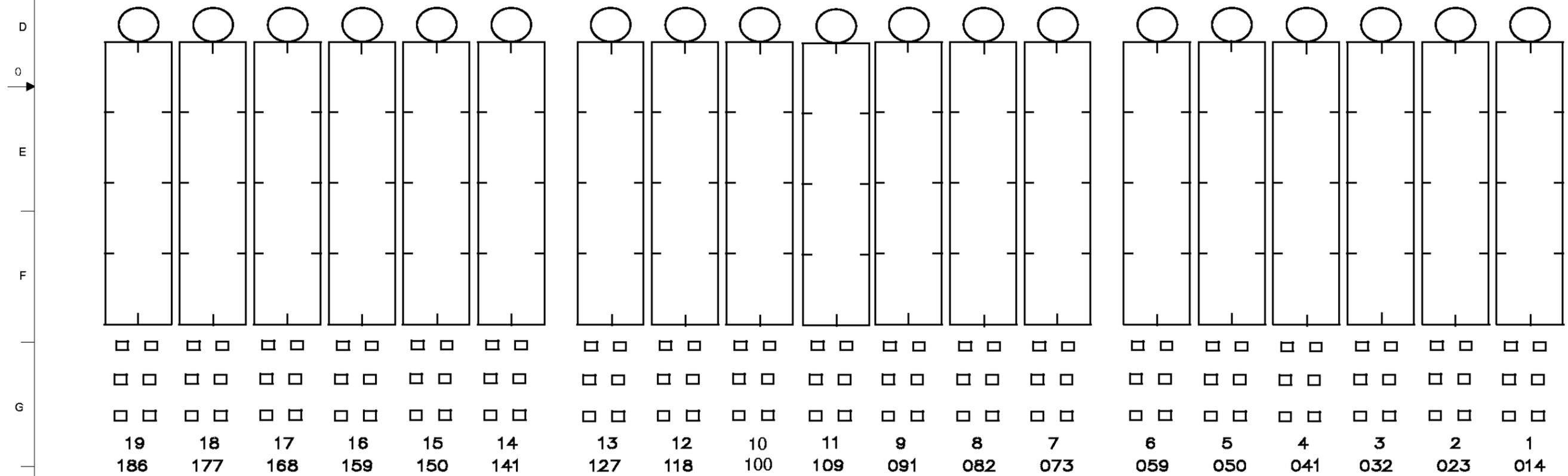
# FIGURE 15 CONFIGURATION TEMPLATE

Fuse Block Alarm-out Mult  
Rear View

Example Showing One Card Holder/w  
Two Cards and Four Alarm-out Types  
(ts, tc, ss, sc) With (5) Alarm Groups  
(g0-g4) = (0-4)



Configuration Template - Rear View



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MODULAR FUSE FILTER UNIT

DWG SIZE	ISSUE
C2	1

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**Circuit Notes:**

101. All fuse blocks will accommodate WP-91768 Fast Acting (Normal Blow) or WP-92458 Very Fast Acting (Fast Blow) fuses. Fuse selection must comply with 5ESS power consultant recommendations and must be listed below.

102. =====  
 \*\*\* Fuses \*\*\*  
 =====

ORDER	COMCODE	SPEC	RATING	TYPE
bulk	406 663 971	WP-91768-L104	0.50 Amp	fast acting
single	406 747 501	WP-91768-L104	0.50 Amp	fast acting
bulk	406 599 308	WP-92458-L2	1.25 Amp	very fast acting
single	406 747 519	WP-92458-L2	1.25 Amp	very fast acting
bulk	406 708 545	WP-91768-L107	2.00 Amp	fast acting
single	406 747 527	WP-91768-L107	2.00 Amp	fast acting
bulk	406 693 895	WP-91768-L108	3.00 Amp	fast acting
single	406 747 535	WP-91768-L108	3.00 Amp	fast acting
bulk	406 693 887	WP-91768-L110	5.00 Amp	fast acting
single	406 747 543	WP-91768-L110	5.00 Amp	fast acting
bulk	406 693 903	WP-91768-L112	7.00 Amp	fast acting
single	406 747 550	WP-91768-L112	7.00 Amp	fast acting
bulk	406 599 324	WP-92458-L11	10.0 Amp	very fast acting
single	406 747 568	WP-92458-L11	10.0 Amp	very fast acting
bulk	406 599 332	WP-92458-L12	12.0 Amp	very fast acting
single	406 747 576	WP-92458-L12	12.0 Amp	very fast acting
*****				
* SPECIAL APPLICATION FUSES - these require approval from the *				
* 5ESS power consultant and impact 5ESS Power Distribution *				
*****				
bulk	406 599 357	WP-92458-L13	15.0 AMP	very fast acting
single	406 808 469	WP-92458-L13	15.0 AMP	very fast acting
bulk	406 759 050	WP-92458-L14	20.0 AMP	very fast acting
single	406 808 477	WP-92458-L14	20.0 AMP	very fast acting

103. The MFFU has been designed for the 5ESS nominal -48 DC system voltage and conforms to ETSI voltage requirements.

104. The following circuit limitations apply:

1. The maximum current available through each feed is limited by the capacity of the 5ESS power distribution facility but must not exceed 20 amps.
2. A 0 to 14,000 ohm load must be present - under fault or no fault conditions - at each output of a fuse block in order to activate the block's LED and, in turn, generate an alarm signal.
3. No more than six alarm cards can be used because of worst-case amperage limitations of the cabinet LED.

**Equipment Notes:**

201. CAUTION:

In certain sections of this document and the associated J5D003-FJ document, reference is made to "NON-BELLCORE" applications. These references are intended to convey deviations from standards generally governed by BELLCORE specifications or informal practices. THESE OPTIONS SHOULD ONLY BE EXERCISED WHEN IT IS CERTAIN THAT SUCH DEVIATIONS ARE LOCALLY ACCEPTED. The purpose of the deviations is to accommodate Global Manufacturing/Design requirements.

202. Unless stated otherwise, all electrical terminals are made from non-brass alloys of copper such as phosphorus bronze.

203. The following data defines a MFFU's unit level configuration:

1. sheet metal housing
2. cabinet mounting hardware
3. number of feeds
4. number of blocks per feed
5. number of alarm groups
6. front and rear bus designations
7. unit level wiring
8. AOI and/or TELJACK options

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C2	1	
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**Information Notes (cont):**

314. =====  
**"A" & "B" BUS DESIGNATION**  
 =====

315. When the MFFU's cabinet is installed, the MFFU must clearly show:

1. where a bus split between input FEEDS is required
2. where a bus split between fuse BLOCKS is required

316. The feed split must be evident when viewed from the rear. The fuse block split must be evident when viewed from the front.

This suggests semi-permanent bus designators such as a contrasting label or a rubber stamp mark placed between fuse blocks at the front. The same designators could be used between input connectors at the rear split. There is room for 0.180 inch high characters between blocks on the lower support of the unit's housing.

317. This scheme allows clear identification of buses with provisions for easy modifications in the field. It also provides for bus splits such as "A:B:A" or "B:A" but must comply with SESS power consultant recommendations.

318. Note that if an "A:B" bus designator (for example) is called for on the front shelf, the corresponding "B:A" designator \*MUST\* be called for on the rear.

319. The designators separating the buses should take one of the forms shown below:

- 1) = A:A      "A" bus only
- 2) = B:B      "B" bus only
- 3) = A:B
- 4) = B:A

320. The feed positions and corresponding EQLs are specified in Chart #1 along with the bus designation EQLs. An A:A or B:B designator should be near the center EQL.

321. Note that there is NO ROOM for a bus designator immediately to the right (front view) of an alarm card holder. Also, when a bus designator is applied to the front, it will cover the eql marking associated with the position to the left of the designator.

**Information Notes (cont):**

322. =====  
**Fuse Blocks & Card Holders**  
 =====

323. There must be at least two feeds per unit. Thus, there must be at least two fuse blocks in the front section of the unit. This leaves seventeen optional positions. Normally, at least one position in the MFFU front section is committed to a card holder. Each card holder has two card slots. The primary purpose of the card holder is to carry alarm cards but it will also accommodate an AOI card or TEL-JACK card. A holder has a capacity of one TEL-JACK card alone or a combination of one or two AOI/alarm cards. Each alarm card contains two alarm circuits.

324. The nineteen fuse block/card holder positions available at the front of the unit are numbered from 1 to 19 whether occupied or not.

325. The distance between fuse blocks is 1 1/8 inch, ie: (9) eighths. The card holder slots are plus/minus 1/4 inch - (2) eighths - from the base position of the card holder. For example - a center position card holder at position 10 (EQL 100) would house cards at EQL 98 & EQL 102.

326. EQL Chart #2 - Front's Output & Bus Designation EQLs

Front View										* = support brace									
Block	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9
0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1
1	2	3	4	5	5	7	8	9	0	0	0	1	2	4	5	5	6	7	8
4	3	2	1	0	9	3	2	1	0	9	8	7	1	0	9	8	7	6	
^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^	^
0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1
1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	
8	7	6	5	4	3	2	1	0	9	8	7	6	5	4	3	2	1	0	9
	Bus Designation EQL									Center = 100 = 1									
	Block Position EQL*****STAMPED ON FRONT OF SHELF																		

(Note: The EQL is marked between blocks and applies to the block to the LEFT of the marking. Position 19 at 186 is not marked.)

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**Information Notes (cont):**

336. These cable types allow an unlimited combination of alarm group arrangements. These are rear views with the location of the "1" numeral orientation mark indicated by a "." character. The inter-connecting wires are shown as "-----" and are color coded for identification. The "x" denotes the "empty" position. Type "ll" connects pins on the "left" to the next "left" pin and so on.

```

type ll =  .  .
           o x  o x  =  x  o x  block to alarm card
           blue  -----  .o-----
    
```

```

type rr =  .  .
           x o  x o
           orange -----
    
```

```

type lr =  .  .
           o x  x o  =  x  x o  block to alarm card
           green  -----  .o-----
    
```

```

type rl =  .  .
           x o  o x
           brown  -----
    
```

```

type jj =  o o  jumper
           .  .
    
```

```

type bb =  .  .
           o o  o o
           orange | ----- |
           blue   -----
    
```

```

type bx =  .  .
           o o  o o
           brown  | ----- |
           green  -----
    
```

337. While the four output fuses share a common "RTN" bus internally, for alarm purposes, they are split logically into group "0" (fuses A & B) and group "1" (fuses C & D).

338. In the most common configuration, a non-split block, a jumper will occupy the lowest position. This jumper does not need orientation marking. The jumper will logically tie the block's two fuse alarm groups into one larger four fuse group and identify it as such.

339. The objective of the alarm-out block-to-block wiring is to join (mult) the alarm group in one block to the corresponding group in the next block until the final block is, in turn, wired to the alarm card input. There can only be one group per alarm card input.

340. All possible alarm group configurations can be satisfied with eight basic arrangements of the fuse block alarm-out connectors. All other possible orientations duplicate the basic types or simply don't make sense.

341. The connectors either start a group or they continue one. Two arrangements deal with non-split (tied) blocks and the balance deal with split blocks.

342. The eight recommended fuse block alarm-out connector arrangement types (ts, tc, AND ss, sc, sa, s3, s2, s1) are shown in the following notes:

**Information Notes (cont):**

343. \*\*\* Example of Tied Block (e/w jumper) \*\*\*\*\*

```

-column-      x = no wire
 1  0          o = wire
=====
to <-----' next      -row 2-      rear view wiring side
  x  o
from <-----' last    -row 1-      tc = TIED CONTINUE
  o  o
  ----' jumper        -row 0-
    
```

344. The idea behind the wiring patterns is to follow the 5ESS convention where signals go "...FROM - ie: in at the bottom and/or right" and "...TO - ie: out at the top and/or left" - as viewed from the rear. The "<---" symbol represents one wire while "<<---" denotes a connector with two active wires.

```

=====
tied start      tied continue      split start      split continue
-----
ts = x x        tc = x o           ss = x x         sc = o x
               <-----' to         <----' to
               x o                 o x
               <-----' to         <-----' to
               o o                 x o
               .  .               <-----' to         <-----' from
               .  .

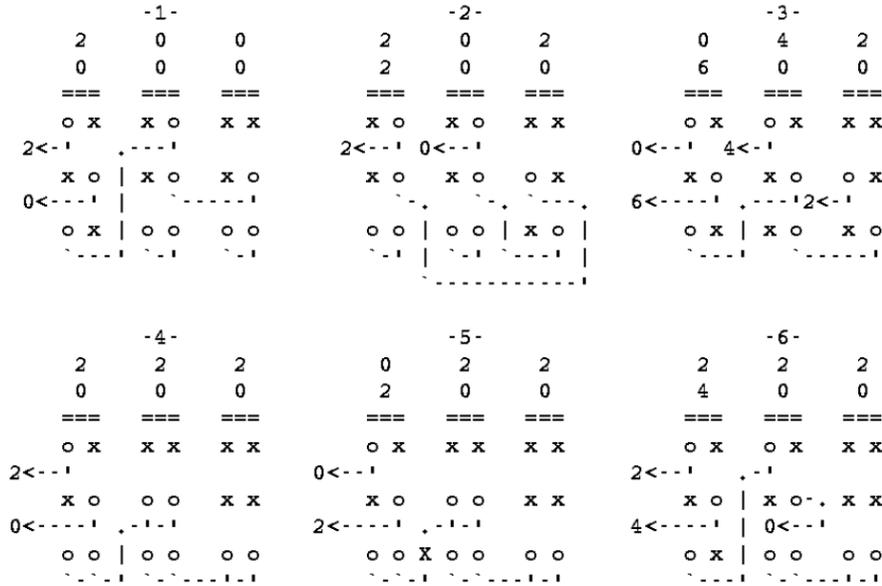
-----
split alternate  split 3 conn      split 2 conn     split 1 conn
-----
sa = o x        s3 = o x           s2 = x x         s1 = x x
<----' to      <----' to
  x o          x o
<-----' to   <-----' to       <<----' to
  o x          o o               o o
<----' from   <<----' from       <<----' from       <<----' to
    
```

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**Information Notes (cont):**

345. Examples:

In the following examples, the alarm group(s) are shown above the "===" symbol. If both numbers are the same, it denotes a "tied" block. A "2" above a "0" denotes a split block with alarm group "2" assigned to fuses "C&D" which are above group "0" assigned to fuses "A&B" and so on.



**Information Notes (cont):**

346. =====  
**9824-AH Interface Card**  
 =====

All connections to the various MFFU cards will pass through the 9824-AH Interface Card. The 9824-AH provides the means to remove the 9824-AD, AF, AE (Alarm, AOI, TEL JACK) cards from the MFFU frame without disturbing their associated wiring.

The pinout relationship between the cards is shown below:

9824-AH	9824-AD	9824-AF	9824-AE
out pins	in pin	ALARM function	AOI function
120-020	--	NC	NC
119-019	16	FALMTOP	NC
118-018	15	NC	LED CATH 1
117-017	14	BOTRTN	NC
116-016	13	BOT-48V	NC
115-015	12	NC	LED CATH 0
114-014	11	FALMBOT	NC
113-013	--	NC	NC
112-012	10	TOPRTN	RTN
111-011	09	TOP-48V	NC
gap	110-010	--	--
gap	109-009	--	--
108-008	08	TOPNC	NC
107-007	07	TSTTOP	NC
106-006	06	TOPALM	NC
105-005	05	BOTNC	NC
104-004	04	TSTBOT	NC
103-003	03	BOTALM	NC
102-002	02	NC	COLLECTOR
101-001	01	LEDRTN	NC
100-000	00	LED	EMITTER

| | connectors shown staggered for  
 | illustration only, NC = No Connect

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**Information Notes (cont):**

347. =====  
 9824-AD Alarm Card  
 =====

348. The alarm-out wiring from a fuse block will always terminate at a fuse alarm card (FAC). A single FAC would be located in the right slot (viewed from the rear) of the card holder and would be referenced as the "first card". The next card would be placed in the "second" slot. Each card will have a unique EQL relative to the base cardholder eql.

349. There are two independent alarm circuits (FACKTS) on each card. The circuit nearest the bottom of the fuse alarm card is referred to as the "bottom" circuit. It would be the one wired if only one circuit was required. The card's target input/output header pins are referenced by their EQL, pin-number .

350. The i/o header is divided into two logical sections by a gap. The upper section is associated with UNIT LEVEL wiring and the lower section with FRAME (CABINET) LEVEL wiring. The header is arranged in two columns and twenty one rows numbered "0 - 20". The pins in each ROW are electrically tied together.

351. Alarm card connectors incorporate single row "1 x 2" and "1 x 3" housings and "empty" holes may be filled with a dummy terminal to increase the connector's retention. The connectors can be stacked side-by-side or top-to-bottom. The connector body will be marked with a "1" numeral to designate the 5ESS convention for bottom pin cavity orientation.

352. Because of the card's pin arrangement,...

**...the alarm card's i/o connectors  
 MUST be oriented VERTICALLY.**

353. UNIT LEVEL connectors...

One of the two or three available wire holes in the UNIT LEVEL alarm card connectors will \*ALWAYS\* be empty. The empty position forms a visual "key" for proper orientation. It will always be at the top. The empty position may be filled with a dummy terminal to increase the connector's retention and stability. The "wire" destined for the target pin of the header is at the bottom of the connector with the "key" oriented at the top and the "1" marking at the bottom.

354. FRAME LEVEL connectors...

The FRAME LEVEL connectors will be marked with position information on their left sides - as viewed from the rear. This marking will share the same surface as the "1" marking and forms the visual orientation "key". They are all three row connectors and will contain two or three wires

With the EQL marking on the left, as viewed from the rear, the bottom position of the connector is destined for the target pin of the header.

**Information Notes (cont):**

355. Arrangement of the alarm card i/o header - rear view, wiring side.

pin X = no connection to alarm card circuits  
 --- = pin-to-pin electrical connection  
 pin 0 = connected to alarm card circuits

pin no.	name	pin	level	Description
120/020	NC	X---X	unit in	"1x2" from fuse block ALARM-OUT
119/019	FALMTOP	0---0		to "top" circuit
118/018	NC	X---X	unit	
117/017	TOPRTN	0---0	power in	"1x3" from other block POWER
116/016	TOP-48V	0---0		to "top" circuit
115/015	NC	X---X	unit in	"1x2" from fuse block ALARM-OUT
114/014	FALMBOT	0---0		to "bottom" circuit
113/013	NC	X---X	unit	
112/012	BOTRTN	0---0	power in	"1x3" from fuse block POWER
111/011	BOT-48v	0---0		to "bottom" circuit
110/010	gap			
109/009	gap			
108/008	NC	X---X		
107/007	TSTTOP	0---0	frame out	"1x3" for "top" circuit
106/006	TOPALM	0---0		alarm i/o
105/005	NC	X---X		
104/004	TSTBOT	0---0	frame out	"1x3" for "bottom" circuit
103/003	BOTALM	0---0		alarm i/o
102/002	NC	X---X		
101/001	LEDRTN	0---0	frame out	"1x3" for frame (cabinet) "LED"
100/000	LED	0---0		

1 0  
 column

Note A - Both power connectors MUST be present (even if only one circuit is utilized) because power connected to the "bottom" circuit is internally routed to the "top" circuit and vice versa. The purpose of cross-powering is to assure that POWER TO A CIRCUIT COMES FROM AN ACTIVE FEED \*NOT\* ASSOCIATED WITH THE FEED THE CIRCUIT IS MONITORING.

Note B - Power to the "bottom" circuit should come from the end of the closest feed on the right side of the card holders - as viewed from the rear - that conforms to the provisions of Note A. This will be the open "T" connector of the feed's last block.

Note C - Power to the "top" circuit must come from a separate feed than that to the "bottom" circuit. It should be from the end of the closest feed on the left side of the card holders that conforms to the provisions of Note A.

Note D - Power to a second or any number of additional cards can either be extended from the first card or from separate feeds. When more than one bus is present, the power should come from the separate buses.

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**Information Notes (cont):**

Note E - Multiple cards have groups (circuits) assigned from bottom to top and right to left - as viewed from the rear. Thus, all even numbered groups are assigned to the bottom circuits and all odd numbered groups to the top. This assignment pattern is fixed and independent of the fuse block alarm group assignment pattern.

Note F - To simplify conformance to the provisions of Note A, fuse block assignment to even numbered alarm groups would start at the right - as viewed from the rear - while odd numbered groups would start (when possible) with blocks to the left of the alarm cards.

356. Once a block level alarm-out mult of a group is terminated at an alarm card input within a cabinet; the card's output can then be multed, in turn, to subsequent cards in adjacent cabinets until it is routed to the appropriate detection circuit.

**Information Notes (cont):**

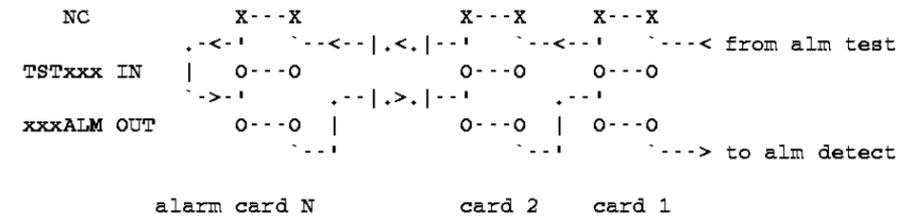
357. =====  
Alarm Mult  
=====

358. The inter-cabinet alarm mult is a simple series loop with the origin at a "no-connect (NC)" pin of an alarm card circuit and the termination at the corresponding "alarm out". The alarm wiring alternates between an output alarm pin (xxxALM) and an input test pin (TSTxxx) as it passes from card to card (cabinet to cabinet).

This scheme allows testing of the wiring \*AND\* the alarm circuitry. It also provides the means to easily expand the wiring in growth situations.

359.

TOP or BOT Alarm Mult - rear view, wiring side



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**Information Notes (cont):**

360. =====  
 Remote Applications  
 =====

361. An AOI card provides dual opto-isolator circuits required to interface an alarm card's two outputs in remote applications.

362. Also required in these remote applications is a means to power the alarm status units (ASU) directly from the battery plant. This will be accomplished with an ASU power distribution assembly which serves as a junction for the 16 ga wire which mults between cabinets and the smaller wire that is routed to the ASU and AOI. It is mounted external to the MFU.

363. Alarm Opto-Isolator Card (AOI)

9824-AF

Rear View

9824-AH interface pins -----	9824-AF AOI function -----
120-020	NC
119-019	NC
118-018	LED CATH 1
117-017	NC
116-016	NC
115-015	LED CATH 0
114-014	NC
113-013	NC
112-012	RTN
111-011	NC
110-010	gap
109-009	gap
108-008	NC
107-007	NC
106-006	NC
105-005	NC
104-004	NC
103-003	NC
102-002	COLLECTOR
101-001	NC
100-000	EMITTER

1X3 connectors

**Information Notes (cont):**

364.

\*\*\* Alarm card to AOI wiring \*\*\*

9824-AH out pins -----	9824-AD ALARM function -----	9824-AF AOI function -----
120-020	NC	NC
119-019	FALMTOP	NC
118-018	NC	LED CATH 1
117-017	TOPRTN	NC
116-016	TOP-48V	NC
115-015	NC	LED CATH 0
114-014	FALMBOT	NC
113-013	NC	NC
112-012	BOTRTN--- ( ) -- ( ) -	RTN
111-011	BOT-48V	NC
gap 110-010	---	---
gap 109-009	---	---
108-008	TOPNC	NC
107-007	TSTTOP	NC
106-006	TOPALM-----	NC
105-005	BOTNC	NC
104-004	TSTBOT	NC
103-003	BOTALM-----	NC
102-002	NC	COLLECTOR--->
101-001	LEDRTN	NC to alarm detection
100-000	LED	EMITTER----->

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**Information Notes (cont):**

365. =====  
 Diagnostics  
 =====

366. NOTE: WHEN ALARM CARDS ARE SEATED IN THEIR INTERFACE CONNECTORS \*AND\* A FUSE IS REMOVED OR CLEARED, "PHANTOM" VOLTAGES FROM THE ASSOCIATED ALARM CARD WILL BE PRESENT AT THE BACKPLANE OR OTHER POINTS IN THE FRAME. THE CARD(S) CAN BE TEMPORARILY PULLED OUT OF THEIR CARD HOLDERS JUST ENOUGH TO DISENGAGE THE PINS AND REMOVE THESE VOLTAGES IF THEY LEAD TO TROUBLESHOOTING DELAYS. BECAUSE OF INHERENT CURRENT LIMITING, THERE WILL BE NO DANGER IF THE CARDS ARE LEFT IN PLACE.

367. The AOI card was designed to also serve as a diagnostic tool when plugged into an alarm card's position. All alarm card i/o pins are replicated at the front connector of the AOI card where jumpers can be inserted or the alarm card itself can be re-inserted and made accessible. The AOI components will not interfere with the alarm card functions in this configuration but the resistors on it can be used to generate alarms through the alarm card without actually involving a fuse block.

The 9824-AH interface card is common to all three MFFU cards - ALARM, AOI, and TEL-JACK. The pin assignment of the ALARM card at the interface is the basis for the diagnostic procedures.

9824 - AD	9824 - AF
ALARM	AOI
pin function	function
-----	-----
16 FALMTOP	NC
15 NC	LED CATH 1
14 BOTRTN	NC
13 BOT-48V	NC
12 NC	LED CATH 0
11 FALMBOT	NC
10 TOPRTN	RTN
9 TOP-48V	NC
8 TOPNC	NC
7 TSTTOP	NC
6 TOPALM	NC
5 BOTNC	NC
4 TSTBOT	NC
3 BOTALM	NC
2 NC	COLLECTOR
1 LEDRTN	NC
0 LED	EMITTER

**Information Notes (cont):**

369. Several diagnostics are possible - such as checking the state of the ALARM card's on-board fuses. The cases described below are representative.

370. Case 0 ----- All alarms associated with a feed must be totally checked to be certain the fuse block's leds would light, an alarm would be sent to the MCC, and the cabinet LED would light. The feed must be out-of-service while the test is conducted.

There is no action required to conduct this test. If the power source circuit protector is open (ie: the feed is dead), the effect is the same as if all the fuses in the blocks on that feed had blown or were pulled. The LEDs associated with a load that is actually connected to the block will light up as long as the alarm card is plugged in. If the alarm card is now pulled, all LEDs will go out and all "-48v" feed voltages at the backplane will be zero.

This works because power to the alarm circuit (one of the two present on a card) comes from a different feed. This is the cross-powered feature of the alarm card's internal wiring. The logical extension of this is that the test provides a means to test the frame at an "A" vs. "B" bus level.

371. Case 1 ----- The alarm mult is OK, an alarm is generated, the location of the cabinet with the fault is unknown.

Unplug a cabinet's alarm card. If the alarm is still active, then the fault is in the upstream half. This works because the alarm mult is a simple series string where unseating the card isolates one half of the mult from the other half. Continue by dividing the remaining halves until the binary search narrows the possibilities. The fault is finally located when a cabinet's LED is observed to be on.

372. Case 2 ----- The BOT alarm mult fails a diagnostic test. An alarm card or the mult wiring is defective. The location is unknown. This is the opposite condition diagnosed in Case 1. There, the mult was functional but the fault's location was unknown. Here, the mult is \*NOT\* OK.

Unplug a cabinet's alarm card and replace it with an AOI/Diagnostic card. Connect TSTBOT and BOTALM pins. This has the effect of bypassing the card's electronics. If mult is now OK, the card is defective. If not OK, connect BOTNC to BOTALM. This has the effect of bypassing the card and the upstream balance of the mult. If mult is now OK, the defect is in the upstream half. Continue by dividing the remaining halves until the binary search narrows the possibilities.

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**Information Notes (cont):**

373. Case 3 ----- The alarm mult is OK, an alarm is generated, the cabinet with the fault is identified by binary search but the cabinet LED is not on.

Unplug the cabinet's alarm card, replace it with an AOI card, and plug the alarm card back into the AOI card. The AOI card now serves as an extender card for the alarm card.

Generate an alarm by connecting each 9824-AH FALM pin to the adjacent NC pin (pin 16 to 15 or 11 to 12). This connects the FALM pin to one of the LED cathodes of the AOI's ic through its external 10k resistor. This simulates a blown fuse in a fuse block. Observe the cabinet LED. If it goes on for only one instance, that ALARM card LED function is defective. If it fails to go on for both cases, the LED and/or wiring is defective or it is possible both LED functions of the card are defective. This can be checked by observing the state of the LED pin.

374. Case 4 ----- The alarm mult is OK but the fuse block's alarm-out mult together with the block's LEDs need to be checked. The load must remain under power while the tests are carried out.

Pull the alarm card associated with the block(s) under test and replace with an AOI card. With the alarm card pulled, the following test will \*NOT\* generate an alarm at the MCC. If an alarm at the MCC \*IS\* desired then the alarm card can be inserted into the AOI card. Apply a positive voltage to a "-48v" pin (eg: 9824-AH pin 09) and a negative voltage to the TOP then the BOT FALM pins (16 then 11). The associated fuse block LEDs should go on.

**Information Notes (cont):**

375. =====  
9824-AE TEL-JACK  
=====

```

-----
| S | ( ) | | |
| P |   | |
|---|   | |
|T|B| ( ) |
|E| |   | |
|L|-|   | |
| |A| ( ) |
|---|   | |
|T|A| ( ) |
|T|1|   | |
|Y|-|   | |
|B|A| ( ) |
|---|   | |
|T|A| ( ) |
|T|1|   | |
|Y|-|   | |
|A|A| ( ) |
-----

```

Front View Of Jacks

9824-AH out pins	9824-AE TEL-JACK function
120-020	NC
119-019	NC
118-018	NC
117-017	NC

116-016	SP R(SP)
115-015	SP T(SP)
114-014	TEL B R
113-013	NC
112-012	TEL B R1
111-011	TEL A T
110-010	gap
109-009	gap
108-008	TEL A T1
107-007	TTYB A1 R1
106-006	TTYB A1 R
105-005	TTYB A T1
104-004	TTYB A T
103-003	TTYA A1 R1
102-002	TTYA A1 R
101-001	TTYA A T1
100-000	TTYA A T

Rear View  
Of Connector

|  
\_ 1 X 17 connector

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**Information Notes (cont):**

376. =====  
Configurations  
=====

377. Hardware and associated wiring can be pre-engineered in the form of fixed configurations or customized by building from primitives found in the list structure of the next section. Fixed configurations are documented in the associated J5D003-FJ drawing.

378. In general, the shelf would be populated with blocks and card holders from left to right (as viewed from the front) in three groups. The left side group of blocks would be separated from the right side blocks by the card holder group located approximately in the center of the sheet metal housing.

379. The card holder group cannot ALWAYS define the division between two buses in the same cabinet but it should be centered to assure access from the rear after peripheral wiring has been installed.

380. The number of feeds on each bus and the number of blocks per feed is selected by the user to satisfy one of two limitations:

- a. A maximum current draw at a given voltage.
- b. The need to isolate loads.

Whatever the motivation, the fuse filter unit's configuration can be specified with the list structure described in the continuation of these notes.

381. =====  
J5D003FJ LIST STRUCTURE  
=====

382. The list structure of the "FJ" modular fuse/filter unit (MFFU) will enable an unlimited number of configurations to be specified by building from a number of primitive elements.

383. The user of the MFFU can specify what is to be assembled in the unit and where to locate it by calling for a specific fixed configuration or, if desired, by calling for primitive elements of the MFFU listed in the user's own documentation.

384. The primitives and their location are specified by "codes" made from ASCII character strings - one for the major hardware components and the other for wiring. A CONFIGURATION TEMPLATE, which is part of this SD, can be used to define the hardware and wiring. From the templates; fuse assignments, the fuse assignment label, wiring, bus splits, and the hardware can all be indirectly specified at a high level making clear the intent while avoiding the need to detail the wiring implementation.

385. The hardware (fuse block, power jumpers, card holders, cards) is fully described by quantity and location in the first instance of the unit's code while the alarm cables and routing are described in the second instance where the rear view hardware code is repeated in reverse order as a reference.

386. The front view hardware code is presented separate from the rear view wiring code to enable a quick visual scan of the components within each configuration.

**Information Notes (cont):**

387. The coding scheme has as its purpose the means to document all the unit's elements in a format that can be transmitted by voice or electronic mail using simple character strings, still be comprehensible by humans, \*AND\* be used as a direct input to a computer algorithm that expands the code to generate a stocklist and identify cables.

388. The following is a brief outline of the MFFU "J" drawing list structure and the format of the code built from the primitives. For more detail on each list, consult the STOCKLIST.

389. Symbol list # Description
- ```

=====
list 1 = sheet metal housing loose parts, unassembled
list 2 = complete sheet metal housing assembly
list 3 = support brackets & screws for cabinet installation

list 4 = feed capacitor, cables, hardware
list 5 = un-assigned

list 6 = complete fuse block: mt'g screw, (4) caps & dummy fuses
f = list 7 = basic single fuse block feed: lists 4, 6
list 8 = un-assigned
j = list 9 = fuse block & jumper, use to add blocks to a basic feed

- = list 10 = card holder, retainer, mounting screw
| = ..... = empty card holder position
e = ..... = empty block/holder position = nothing

c = list 11 = alarm card
-c| = list 12 = holder + 1 alarm card (2 circuits)
-cc = list 13 = holder + 2 alarm cards (4 circuits)

d = list 14 = AOI
-cd = list 15 = holder + 1 AOI + 1 alarm card (2 circuits)
-|d = list 16 = holder + 1 AOI card

-|t = list 17 = 1 TEL-JACK card + holder

A:A = list aa = "A" bus designator
B:B = list bb = "B" " "
A:B = list ab = "A/B" " "
B:A = list ba = "B/A" " "
: = ..... = location of bus split

```

**Sanity checks:**

1. The sum of all (f) .... = number of feeds/cabinet
2. " " " " (j) .... = " " power jumpers/cabinet
3. " " " " (f), (j) = " " fuse blocks/cabinet
4. " " " " (f), (j), (-), (e) MUST = 19/cabinet
5. Two times the number of (c) = max alarm groups/cabinet

|                                                |             |              |
|------------------------------------------------|-------------|--------------|
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Information Notes (cont):

390. \*\*\* UNIT LEVEL HARDWARE CONFIGURATIONS \*\*\*

The following are for illustration only. The configuration list starts numerically with list "100". Always consult J5D003-FJ for up-to-date list configurations.

Table with columns for symbol, list, quantity, and reference info. Includes rows for Front View, list 2 + ..., and list ??? = list 2 + ...

391. \*\*\* UNIT LEVEL WIRING \*\*\*

The following are for illustration only. Always consult J5D003-FJ-1 for up-to-date list configurations.

Table titled 'Rear View EQLs' showing block positions with columns 1-9 and rows 1-8.

Table titled '\*\*\* LIST ?-? ALARM CODE SHOWING EQL ALIGNMENTS FOR REPERENCE \*\*\*' with columns j, f, e, j, f, e, j, f, c, c, c, c, c, j, f, e, j, f, e, j, f.

Information Notes (cont):

392. \*\* FORMAT \*\*

Table with columns for list ?-? alarm code and row descriptions (row 1 to row 5).

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Information Notes (cont):

393. //////////////// J5D003FJ FUSE/FILTER UNIT STOCKLIST ////////////////

394. Notes: 1. See next section for description of "list xn" cables.  
 2. All zinc plated steel parts shall conform to AT&T 289 Zinc Plating, Yellow Chromate to maximize corrosion resistance.

395. list 1 = sheet metal housing loose parts, unassembled =====

| QTY | COMCODE                                                                                                           | CODE | DESCRIPTION                                                                                                                                                                                         |
|-----|-------------------------------------------------------------------------------------------------------------------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | 846 765 139                                                                                                       | ---  | Left side panel                                                                                                                                                                                     |
| 1   | 846 765 147                                                                                                       | ---  | Right side panel                                                                                                                                                                                    |
| 1   | 846 765 154                                                                                                       | ---  | Top plate                                                                                                                                                                                           |
| 1   | 846 765 162                                                                                                       | ---  | Bottom plate                                                                                                                                                                                        |
| 1   | 846 765 188                                                                                                       | ---  | Capacitor tray                                                                                                                                                                                      |
| 1   | 846 765 196                                                                                                       | ---  | Towel bar                                                                                                                                                                                           |
| 2   | 846 769 438                                                                                                       | ---  | support brace                                                                                                                                                                                       |
| 26  | Avdel<br>50 Lackawanna Avenue<br>Parsippany, N.J.<br>07054                                                        |      | BRIV Rivet No. 1821-0507<br>5/32 body, No. 1 oversize mandrel<br>for .161 dia. hole<br>max clinch for .135/.155 thickness<br>zinc finish                                                            |
|     | *** OR ***<br>Cherry C Rivet,<br>Cherry div. of Textron,<br>1224 E. Warner Ave.<br>Santa Ana, California<br>92707 |      | 27S-54 Hollow Steel Pop Rivet,<br>No mandrel,<br>5/32 dia. body,<br>.126-.250 grip range,<br>protruding .312 dia. x .067 head<br>zinc finish                                                        |
|     | ***** NON-BELLCORE *****<br>Avdel                                                                                 |      | AVEX Break-pin rivet No.1624-0514,<br>(Blind rivet)<br>body and mandrel steel zinc plated,<br>5/32" (4mm) dia. body,<br>.315" dia x .047" head,<br>.055"-.197" grip range.<br>(12nc 2522 734 01016) |

396. list 2 = complete, assembled sheet metal housing =====

| QTY | COMCODE     | CODE | DESCRIPTION                                                      |
|-----|-------------|------|------------------------------------------------------------------|
| 1   | 846 765 063 | ---  | fuse/filter housing assembly,<br>all parts assembled from list 1 |

Information Notes (cont):

397. list 3 = support brackets for MFFU when installed in cabinet =====

| QTY | COMCODE     | CODE | DESCRIPTION                                                                  |
|-----|-------------|------|------------------------------------------------------------------------------|
| 2   | 846 784 353 | ---  | fuse/filter support bracket,<br>attach to cabinet frame                      |
| 4   | 846 471 639 | ---  | #12-24 screw, steel, th'd forming,<br>washer hex head, 5/8 long, zinc finish |

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Information Notes (cont):

398. list 4 = feed capacitor assembly =====

| QTY | COMCODE                  | CODE                                                                 | DESCRIPTION                                                                                                                      |
|-----|--------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|
| 1   | 406 560 698              | KS20133 L141                                                         | Capacitor, 4700uf, 75VDC                                                                                                         |
|     | 406 883 439              | ---                                                                  | Capacitor, 4700uf, 75VDC<br>Same as 406 560 698 except "-" marks<br>printed on can's side next to neg term                       |
| 2   | 406 719 237              | McMaster-Carr<br>923 12a 833                                         | screw, headless (set screw)<br>#10(.190)-32 x 1 inch nominal,<br>point style unimportant,<br>internal hex drive, stainless steel |
|     |                          | *** Or CAMCAR Equivalent ***                                         |                                                                                                                                  |
| 2   | 800 812 935              | ---                                                                  | nut, hex -<br>#10(.190)-32 x 1/8 thick nominal,<br>steel, zinc finish                                                            |
| 1   | 846 765 204              | L-567 928                                                            | bracket, plastic capacitor mounting                                                                                              |
| 2   | 406 589 200              | Promptus,<br>104-03-ST-.194-M<br>*** OR FUNCTIONAL<br>*** EQUIVALENT | bushing, mounting bracket<br>.204/.194" ID, .260/.240" length,<br>5/16 inch OD round stock,<br>zinc on steel                     |
| 1   | 997 494 323              | KS-191 51 L2                                                         | resistor, bleeder (10K)                                                                                                          |
| 2   | 406 891 093              | Zierick MFG.<br>#803 -196                                            | FLAT terminal lug with internal tooth<br>lockwasher, tinned phos. bronze,<br>for bleeder resistor                                |
|     | *** OR ***               |                                                                      |                                                                                                                                  |
|     | 402 035 372              | Zierick MFG.<br>#805 -196                                            | BENT terminal lug with internal tooth<br>lockwasher, tinned phos. bronze,<br>for bleeder resistor                                |
|     | ***** NON-BELLCORE ***** |                                                                      |                                                                                                                                  |
|     | ---                      |                                                                      | Solder tag M5, single,<br>flat (0.5mm thick),<br>brass tinned, for bleeder resistor<br>(12nc 2422 015 01004).                    |
| 1   | ---                      | list x2                                                              | capacitor input cable assembly<br>from rear of capacitor tray                                                                    |
| 1   | ---                      | list x3                                                              | capacitor output cable assembly<br>to fuse block input                                                                           |

Information Notes (cont):

List 4 Note:

There are three lugs per capacitor terminal which are part of the two cable and resistor assemblies. These three lugs must be stacked on each capacitor terminal between the capacitor terminal and mounting bracket bushing. The correct orientation is with the resistor's terminals stacked between the cable's lugs. The resistor's terminals have integral internal-tooth lockwasher features to maintain connection pressure. The lugs must be dressed to prevent shorts to the capacitor's aluminum can. The resistor must be dressed close to the capacitor bracket to avoid human contact with hazardous voltages.

The interface between the aluminum capacitor terminal and the adjacent lug must be treated with an oxidation resisting compound and the connections must be tightened to a torque of 20-25 inch-pounds to maintain the connection's integrity.

399. list 5 = not assigned =====

400. list 6 = complete fuse block assembly =====

| QTY | COMCODE                  | CODE  | DESCRIPTION                                                                                                                                       |
|-----|--------------------------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | 106 371 636              | 41A   | fuse block (12nc = 9562 513 45200)                                                                                                                |
| 4   | 106 371 792              | ---   | fuse cap (12nc = 6122 111 10440)                                                                                                                  |
| 4   | 106 375 967              | ---   | dummy fuse (12nc = 6122 100 15400)<br>Note: delete (1) for each fuse<br>assigned. All fuse positions must<br>be filled with a fuse or dummy fuse. |
| 1   | 840 047 393              | ---   | screw, mounting<br>#6-32 x 3/8, thread forming<br>slotted pan head<br>steel, 289A finish                                                          |
|     | ***** NON-BELLCORE ***** |       |                                                                                                                                                   |
|     | 847 000 114              | ----- | screw, mounting<br>Taptite II Thread forming screw,<br>#6-32 x 3/8,<br>pan head, supadriv cross recess #2,<br>steel, electroplated zinc.          |
|     |                          |       | (may be obtained from:<br>Linread Commercial Prods.<br>PO Box 21, 33 Pitsford St.<br>Birmingham B18 6LS England)                                  |

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Information Notes (cont):

401. list 7 = basic single fuse block feed =====

| QTY | COMCODE | CODE   | DESCRIPTION         |
|-----|---------|--------|---------------------|
| 1   | ---     | list 4 | feed capacitor      |
| 1   | ---     | list 6 | fuse block assembly |

402. list 8 = not assigned =====

403. list 9 = fuse block e/w power jumper =====

| QTY | COMCODE | CODE    | DESCRIPTION                 |
|-----|---------|---------|-----------------------------|
| 1   | ---     | list x4 | jumper cable, "T" connector |
| 1   | ---     | list 6  | fuse block assembly         |

404. list 10 = card holder assembly =====

| QTY | COMCODE     | CODE | DESCRIPTION                                                                              |
|-----|-------------|------|------------------------------------------------------------------------------------------|
| 1   | 846 765 170 | ---  | card holder                                                                              |
| 1   | 846 784 346 | ---  | card retainer                                                                            |
| 1   | 840 047 393 | ---  | screw, mounting<br>#6-32 x 3/8, thread forming<br>slotted pan head<br>steel, zinc finish |

\*\*\*\*\* NON-BELLCORE \*\*\*\*\*

847 000 114 ----- screw, mounting  
(may be obtained from: Taptite II Thread forming screw,  
Linread Commercial Prods. #6-32 x 3/8,  
PO Box 21, 33 Pitsford St. pan head, supadriv cross recess #2,  
Birmingham B18 6LS England) steel, electroplated zinc.

405. list 11 = alarm card =====

| QTY | COMCODE     | CODE    | DESCRIPTION           |
|-----|-------------|---------|-----------------------|
| 1   | 105 776 546 | 9824-AD | alarm card, 2 circuit |
| 1   | 105 776 587 | 9824-AH | interface card        |

Information Notes (cont):

406. list 12 = alarm card & holder =====

| QTY | COMCODE | CODE    | DESCRIPTION           |
|-----|---------|---------|-----------------------|
| 1   | ---     | list 10 | card holder assembly  |
| 1   | ---     | list 11 | alarm card, 2 circuit |

407. list 13 = two alarm cards & holder =====

| QTY | COMCODE | CODE    | DESCRIPTION           |
|-----|---------|---------|-----------------------|
| 1   | ---     | list 10 | card holder assembly  |
| 2   | ---     | list 11 | alarm card, 2 circuit |

408. list 14 = AOI =====

| QTY | COMCODE     | CODE    | DESCRIPTION                       |
|-----|-------------|---------|-----------------------------------|
| 1   | 105 776 561 | 9824-AF | alarm opto-isolator<br>card (AOI) |
| 1   | 105 776 587 | 9824-AH | interface card                    |

409. list 15 = alarm card, AOI & holder =====

| QTY | COMCODE | CODE    | DESCRIPTION                                |
|-----|---------|---------|--------------------------------------------|
| 1   | ---     | list 12 | card holder & alarm card assemblies        |
| 1   | ---     | list 14 | alarm opto-isolator (AOI)<br>card assembly |

410. list 16 = AOI & holder =====

| QTY | COMCODE | CODE    | DESCRIPTION                       |
|-----|---------|---------|-----------------------------------|
| 1   | ---     | list 10 | card holder assembly              |
| 1   | ---     | list 14 | alarm opto-isolator<br>card (AOI) |

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Information Notes (cont):

411. list 17 = TEL-JACK & holder =====

| QTY | COMCODE     | CODE    | DESCRIPTION          |
|-----|-------------|---------|----------------------|
| 1   | ---         | list 10 | card holder assembly |
| 1   | 105 776 553 | 9824-AE | Tel-Jack card        |
| 1   | 105 776 587 | 9824-AH | interface card       |

412. =====

The following is a list of parts required to assemble complete cable assemblies for the MFFU. See appropriate ED drawing for a full description.

Approved terminals will be made from non-brass base materials (such as phosphorous bronze) to resist ammonia gas destruction.

NOTE: QTY = \* = various lengths as required

413. list x1 = MFFU input cable from 5ESS power source =====

| QTY | COMCODE     | CODE           | DESCRIPTION                                                                                                                  |
|-----|-------------|----------------|------------------------------------------------------------------------------------------------------------------------------|
| 1   | 405 367 533 | AMP 770 017-1  | connector (plug), power source input side, AMP Universal MATE-N-LOK II                                                       |
| 2   | 405 451 121 | AMP 770 004-4  | terminal (socket) for plug, AMP Universal MATE-N-LOK II, for 10 ga wire, .200 max insulation dia., phos. bronze, duplex gold |
|     | *** OR ***  |                |                                                                                                                              |
|     | ???         | AMP 770 247-4  | same as AMP 770 004-4 except loose piece. 12nc 6122 020 11360                                                                |
| *   | 996 331 559 | KS133 85 L1    | cable, 10 ga stranded, twisted pair, slate & slate-black                                                                     |
| 2   | 996 585 972 | Thomas & Betts | copper terminal, ring 10 gage                                                                                                |

Information Notes (cont):

414. list x2 = MFFU input cable to capacitor =====

| QTY | COMCODE                  | CODE             | DESCRIPTION                                                                                                                          |
|-----|--------------------------|------------------|--------------------------------------------------------------------------------------------------------------------------------------|
| 1   | 405 270 588              | AMP 770 024-1    | connector (cap), snaps in MFFU sheet metal, mates w/ power source input plug, AMP Universal MATE-N-LOK II                            |
| 2   | ???                      | AMP 770 005-4    | for 20-14 ga wire, phos. bronze, .13-.20 insulation dia, terminal (pin) for cap, AMP Universal MATE-N-LOK II, duplex gold            |
|     | ***** NON-BELLCORE ***** |                  |                                                                                                                                      |
|     | 901 065 516              | AMP 770 005-2    | for 20-14 ga wire, brass                                                                                                             |
| 2   | ???                      | AMP 92-7170-11-1 | ring terminal for capacitor, 18-14 ga wire, .10-.14 insulation dia. tin plated phos. bronze (same as AMP 40725 except base material) |
|     | *** OR ***               |                  |                                                                                                                                      |
|     | ---                      | AMP 2 130 106-1  | ring terminal for capacitor, 14-16 ga, W-crimp, copper tinned, (12nc 6122 020 07150).                                                |
|     | ***** NON-BELLCORE ***** |                  |                                                                                                                                      |
|     | 403 580 186              | AMP 407 25       | ring terminal for capacitor, brass                                                                                                   |
| *   | 996 493 334              | KS13385 L1       | slate, 14 ga. wire ref: KS13385 L1, cc 996 384 863, twisted pair                                                                     |
| *   | 401 652 284              | KS13385 L1       | slate/black 14 ga. wire ref: KS13385 L1, cc 996 384 863, twisted pair                                                                |

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Information Notes (cont):

415. list x3 = capacitor output cable to fuse block =====

| QTY                                                                                                               | COMCODE     | CODE          | DESCRIPTION                                                                                                                                           |
|-------------------------------------------------------------------------------------------------------------------|-------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                                                                                                                 | 406 601 054 | AMP 100 099-1 | connector, AMP Positive Lock, "T" housing, 12nc 6122 020 10360                                                                                        |
| 2                                                                                                                 | 406 919 126 | AMP 154 718-4 | for 18-14 ga wire, phos. bronze .095-.125 insulation dia., terminal, AMP Positive Lock, for "T" & parallel housings, tin plated, 12nc 6122 020 10290  |
| ***** NON-BELLCORE *****                                                                                          |             |               |                                                                                                                                                       |
|                                                                                                                   | 406 697 169 | AMP 154 718-3 | for 18-14 ga wire, brass                                                                                                                              |
| 2                                                                                                                 | ???         | ???           | AMP 92-7170-11-1 ring terminal for capacitor, 18-14 ga wire, .10-.14 insulation dia. tin plated phos. bronze (same as AMP 40725 except base material) |
| --- --- --- AMP 2 130 106-1 ring terminal for capacitor, 14-16 ga, W-crimp, copper tinned, (12nc 6122 020 07150). |             |               |                                                                                                                                                       |
| ***** NON-BELLCORE *****                                                                                          |             |               |                                                                                                                                                       |
|                                                                                                                   | 403 580 186 | AMP 407 25    | ring terminal, brass                                                                                                                                  |
| *                                                                                                                 | 996 493 334 | KS13385 L1    | slate, 14 ga. wire<br>ref: KS13385 L1, cc 996 384 863, twisted pair                                                                                   |
| *                                                                                                                 | 401 652 284 | KS13385 L1    | slate/black 14 ga. wire<br>ref: KS13385 L1, cc 996 384 863, twisted pair                                                                              |

416. list x4 = fuse block to fuse block power jumper cable =====

| QTY                      | COMCODE     | CODE          | DESCRIPTION                                                                                                                                        |
|--------------------------|-------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| 2                        | 406 601 054 | AMP 100 099-1 | connector, AMP Positive Lock, "T" housing, 12nc 6122 020 10360                                                                                     |
| 4                        | 406 919 126 | AMP 154 718-4 | for 18-14 ga wire, phos. bronze .095-.125 insulation dia. terminal, tin plated AMP Positive Lock, for "T" & parallel housings, 12nc 6122 020 10290 |
| ***** NON-BELLCORE ***** |             |               |                                                                                                                                                    |
|                          | 406 697 169 | AMP 154 718-3 | for 18-14 ga wire, brass                                                                                                                           |
| *                        | 996 493 334 | KS13385 L1    | slate, 14 ga. wire<br>ref: KS13385 L1, cc 996 384 863, twisted pair                                                                                |
| *** OR ***               |             |               |                                                                                                                                                    |
| *                        | 401 652 284 | KS13385 L1    | slate/black 14 ga. wire<br>ref: KS13385 L1, cc 996 384 863, twisted pair                                                                           |

Information Notes (cont):

417. list x5 = fuse block power output to peripherals =====

| QTY                      | COMCODE     | CODE          | DESCRIPTION                                                                                                                    |
|--------------------------|-------------|---------------|--------------------------------------------------------------------------------------------------------------------------------|
| 1                        | 406 601 062 | AMP 100 100-1 | connector, AMP Positive Lock, "parallel" housing, 12nc 6122 020 10350                                                          |
| 2                        | 406 919 126 | AMP 154 718-4 | for 18-14 ga wire, phos. bronze .095-.125 insulation dia. terminal, tin plated AMP Positive Lock, for "T" & parallel housings, |
| ***** NON-BELLCORE ***** |             |               |                                                                                                                                |
|                          | 406 697 169 | AMP 154 718-3 | for 18-14 ga wire, brass                                                                                                       |
| *                        | 401 327 549 | KS133 85 L1   | cable, 16 gage stranded, twisted pair, red & red-black                                                                         |
| 2                        | 406 918 912 | AMP 417 74    | for 18-14 ga wire, phos. bronze .12-.17 insulation dia. to 1/4 spade lug on back plane, power-in connector,                    |
| ***** NON-BELLCORE ***** |             |               |                                                                                                                                |
|                          | 401 808 654 | AMP 412 74    | for 18-14 ga wire, brass                                                                                                       |

418. list x6 = fuse block power output to peripherals, hi power =====

| QTY                      | COMCODE     | CODE          | DESCRIPTION                                                                                                                                                                                           |
|--------------------------|-------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                        | 406 601 062 | AMP 100 100-1 | connector, AMP Positive Lock, "parallel" housing, 12nc 6122 020 10350                                                                                                                                 |
| 2                        | ???         | ???           | AMP 737 015-5 "9 - 11" ga aprox., phos. bronze hi-power, 4-6mm2 wire 3.4 - 5.1 mm insulation dia, pre-tin terminal, loose piece AMP Positive Lock, for "T" & parallel housings, (12nc 6122 020 10310) |
| ***** NON-BELLCORE ***** |             |               |                                                                                                                                                                                                       |
|                          | 406 601 070 | AMP 170 234-2 | for 12-10 ga wire, brass                                                                                                                                                                              |
| *                        | ---         | ---           | STANDARD --- --- 10 ga. wire, red/red-black pair                                                                                                                                                      |
| 2                        | 406 919 118 | AMP 62428-3   | for 10 ga wire, phos. bronze ??? insulation dia. to hi power-in 1/4 spade lug on back plane                                                                                                           |
| ***** NON-BELLCORE ***** |             |               |                                                                                                                                                                                                       |
|                          | 405 820 750 | AMP 62428-2   | for 10 ga wire, brass                                                                                                                                                                                 |

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**Information Notes (cont):**

419. list xa = 22 ga dummy terminal & wire stub =====  
 Note: This list may consist of a bare terminal, no wire stub.  
 Used to fill empty hole in connector to provide  
 additional retention.

| QTY                      | COMCODE     | CODE          | DESCRIPTION                                                                                                  |
|--------------------------|-------------|---------------|--------------------------------------------------------------------------------------------------------------|
| 1                        | 406 561 886 | AMP 873 09-9  | terminal, high pressure<br>AMP MOD IV, phos bronze<br>for 24-20 ga stranded wire,<br>.069 max insulation dia |
| ***** NON-BELLCORE ***** |             |               |                                                                                                              |
|                          | ---         | AMP 167 418-5 | terminal, high pressure<br>AMP MOD IV, phos bronze<br>for 24-20 ga stranded wire,<br>(12nc 6122 020 09770)   |
| 1                        | ---         | STANDARD ---  | 22 ga stranded wire stub,<br>color optional                                                                  |

**Information Notes (cont):**

420. list x7 = fuse block to alarm card power cable, various lengths =====

| QTY                      | COMCODE     | CODE          | DESCRIPTION                                                                                                                                                 |
|--------------------------|-------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                        | 406 601 054 | AMP 100 099-1 | connector, AMP Positive Lock,<br>"T" housing, 12nc 6122 020 10360                                                                                           |
| 2                        | 406 919 134 | AMP 160 826-4 | terminal, phos. bronze<br>AMP Positive Lock,<br>for "T" & parallel housings,<br>for 22-18 ga wire,<br>.043-.100 insulation dia,<br>tin, 12nc 6122 020 10480 |
| ***** NON-BELLCORE ***** |             |               |                                                                                                                                                             |
|                          | 406 697 177 | AMP 160 826-3 | terminal, brass                                                                                                                                             |
| 1                        | 406 826 198 | AMP 104 858-1 | connector - 1 x 3, marked, "1" ONLY<br>.125 pitch, AMP MOD IV                                                                                               |
| ***** NON-BELLCORE ***** |             |               |                                                                                                                                                             |
|                          | 406 595 066 | AMP 864 01-9  | connector - 1 x 3, unmarked                                                                                                                                 |
|                          | 401 811 914 | AMP 864 02-9  | connector - 1 x 3, marked, "1"+"AMP"<br>(12nc 6122 020 11240)                                                                                               |
| 2                        | 406 561 886 | AMP 873 09-9  | terminal, high pressure<br>AMP MOD IV, phos bronze<br>for 24-20 ga stranded wire,<br>.069 max insulation dia                                                |
| ***** NON-BELLCORE ***** |             |               |                                                                                                                                                             |
|                          | ---         | AMP 167 418-5 | terminal, high pressure<br>AMP MOD IV, phos bronze<br>for 24-20 ga stranded wire,<br>(12nc 6122 020 09770)                                                  |
| *                        | ---         | STANDARD ---  | black 22 ga stranded wire                                                                                                                                   |
| *                        | ---         | STANDARD ---  | red 22 ga stranded wire                                                                                                                                     |
| 1                        | list xa     | -             | 22 ga dummy terminal & wire stub                                                                                                                            |

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Information Notes (cont):

421. list x8 = alarm card power mult cable =====

|                          |             |               |                                                                                                              |
|--------------------------|-------------|---------------|--------------------------------------------------------------------------------------------------------------|
| 1                        | 406 826 198 | AMP 104 858-1 | connector - 1 x 3, marked, "1" ONLY<br>.125 pitch, AMP MOD IV                                                |
| ***** NON-BELLCORE ***** |             |               |                                                                                                              |
|                          | 406 595 066 | AMP 864 01-9  | connector - 1 x 3, unmarked                                                                                  |
|                          | 401 811 914 | AMP 864 02-9  | connector - 1 x 3, marked, "1"+"AMP"<br>(12nc 6122 020 11240)                                                |
| 4                        | 406 561 886 | AMP 873 09-9  | terminal, high pressure<br>AMP MOD IV, phos bronze<br>for 24-20 ga stranded wire,<br>.069 max insulation dia |
| ***** NON-BELLCORE ***** |             |               |                                                                                                              |
|                          | ---         | AMP 167 418-5 | terminal, high pressure<br>AMP MOD IV, phos bronze<br>for 24-20 ga stranded wire,<br>(12nc 6122 020 09770)   |
| *                        | ---         | STANDARD      | black 22 ga stranded wire                                                                                    |
| *                        | ---         | STANDARD      | red 22 ga stranded wire                                                                                      |
| 2                        | list xa     | -             | dummy terminal & wire stub                                                                                   |

422. list x9 = fuse block alarm-out shorting jumper =====

|   |             |        |                                           |
|---|-------------|--------|-------------------------------------------|
| 1 | 102 898 509 | 963E-2 | shorting connector - 1 x 2,<br>.125 pitch |
|---|-------------|--------|-------------------------------------------|

423. list x10 = block/block alarm-out mult cable, various lengths =====

| QTY                      | COMCODE     | CODE          | DESCRIPTION                                                                                                  |
|--------------------------|-------------|---------------|--------------------------------------------------------------------------------------------------------------|
| 2                        | 403 450 653 | AMP 864 02-5  | connector - 1 x 2,<br>.125 pitch,<br>AMP MOD IV<br>with pin 1 marking.<br>(12nc 6122 020 10460) ???          |
| ***** NON-BELLCORE ***** |             |               |                                                                                                              |
|                          | 406 594 994 | AMP 864 01-5  | connector - 1 x 2, unmarked                                                                                  |
| 4                        | 406 561 886 | AMP 873 09-9  | terminal, high pressure<br>AMP MOD IV, phos bronze<br>for 24-20 ga stranded wire,<br>.069 max insulation dia |
| ***** NON-BELLCORE ***** |             |               |                                                                                                              |
|                          | ---         | AMP 167 418-5 | terminal, high pressure<br>AMP MOD IV, phos bronze<br>for 24-20 ga stranded wire,<br>(12nc 6122 020 09770)   |
| *                        | ---         | STANDARD      | green 22 ga stranded wire                                                                                    |
| 2                        | list xa     | -             | 22 ga dummy terminal & wire stub                                                                             |

Information Notes (cont):

424. list x11 = FOR COMMUNICATION MULT (TTY jack)

| QTY | COMCODE     | CODE         | DESCRIPTION                                                                                                  |
|-----|-------------|--------------|--------------------------------------------------------------------------------------------------------------|
| -   | 406 826 214 | AMP 864 02-1 | connector - 1 x 20, marked                                                                                   |
| 14  | 406 561 886 | AMP 873 09-9 | terminal, high pressure<br>AMP MOD IV, phos bronze<br>for 24-20 ga stranded wire,<br>.069 max insulation dia |
| -   | 106 197 775 | 982-SS       | cabinet level connectors                                                                                     |

425. list xx = alarm i/o, misc cables, various lengths & configurations =====

| QTY                      | COMCODE     | CODE          | DESCRIPTION                                                                                                  |
|--------------------------|-------------|---------------|--------------------------------------------------------------------------------------------------------------|
| -                        | 406 826 198 | AMP 104 858-1 | connector - 1 x 3, marked, "1" ONLY<br>.125 pitch, AMP MOD IV                                                |
| ***** NON-BELLCORE ***** |             |               |                                                                                                              |
|                          | 406 595 066 | AMP 864 01-9  | connector - 1 x 3, unmarked                                                                                  |
|                          | 401 811 914 | AMP 864 02-9  | connector - 1 x 3, marked, "1"+"AMP"<br>(12nc 6122 020 11240)                                                |
| -                        | 406 561 886 | AMP 873 09-9  | terminal, high pressure<br>AMP MOD IV, phos bronze<br>for 24-20 ga stranded wire,<br>.069 max insulation dia |
| ***** NON-BELLCORE ***** |             |               |                                                                                                              |
|                          | ---         | AMP 167 418-5 | terminal, high pressure<br>AMP MOD IV, phos bronze<br>for 24-20 ga stranded wire,<br>(12nc 6122 020 09770)   |
| *                        | ---         | STANDARD      | green 22 ga stranded wire                                                                                    |
| -                        | list xa     | -             | dummy terminal & wire stub                                                                                   |
| -                        | 106 197 775 | 982-SS        | cabinet level connectors                                                                                     |

=====  
===== END OF STOCK LIST =====  
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