SYSTEM CENTURY® DIGITAL TRUNK FRAME

DESCRIPTION AND USE

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1. INTRODUCTION

1.01 This section provides a description of the digital trunk frame (DTF) and its use in a SYSTEM CENTURY Digital Central Office.

2. RELATED INFORMATION

2.01 General.

A Sales and Instructional Literature Index of latest available publications can be obtained from your Stromberg-Carlson sales representative or from Publications Services, Stromberg-Carlson Corporation, 400 Rinehart Road, Lake Mary, Florida 32746.

2.02 Related Sections.

The following sections are recommended for use with this document. To determine the actual section numbers of sections marked with an asterisk (*), refer to the *Index of Related Sections* provided with your set of Stromberg-Carlson Practices (SCPs).

*23-YYY-02	DCO Central Office Switching Systems, General Description
24-025-02	Remote Line Switch, General Description

3. GENERAL

3.01 The digital trunk frame (DTF) provides T1 carrier compatible interface circuits between a host DCO® system and remote line switch (RLS) systems. It also provides digital trunk interface (DTI) operation. The DTF is compatible with any new or existing DCO system. To accommodate a DTF, existing DCO systems must be upgraded with additional software and hardware. It can be dedicated to RLS systems or digital trunks, or a combination of RLS systems and digital trunks. For information on the RLS refer to the section titled *Remote Line Switch, General Description.*

4. EQUIPMENT CONFIGURATION

4.01 The DTF contains 6 cells (fig. 1). Each cell can be equipped with a DS1 module (DS1M) consisting of up to 8 T1 interface (TIF) PWBAs; redundant X and Y pairs of T1 interface control (TIC) PWBAs; redundant X and Y pairs of message assembler host (MAH) PWBAs, required for RLS applications, and re-

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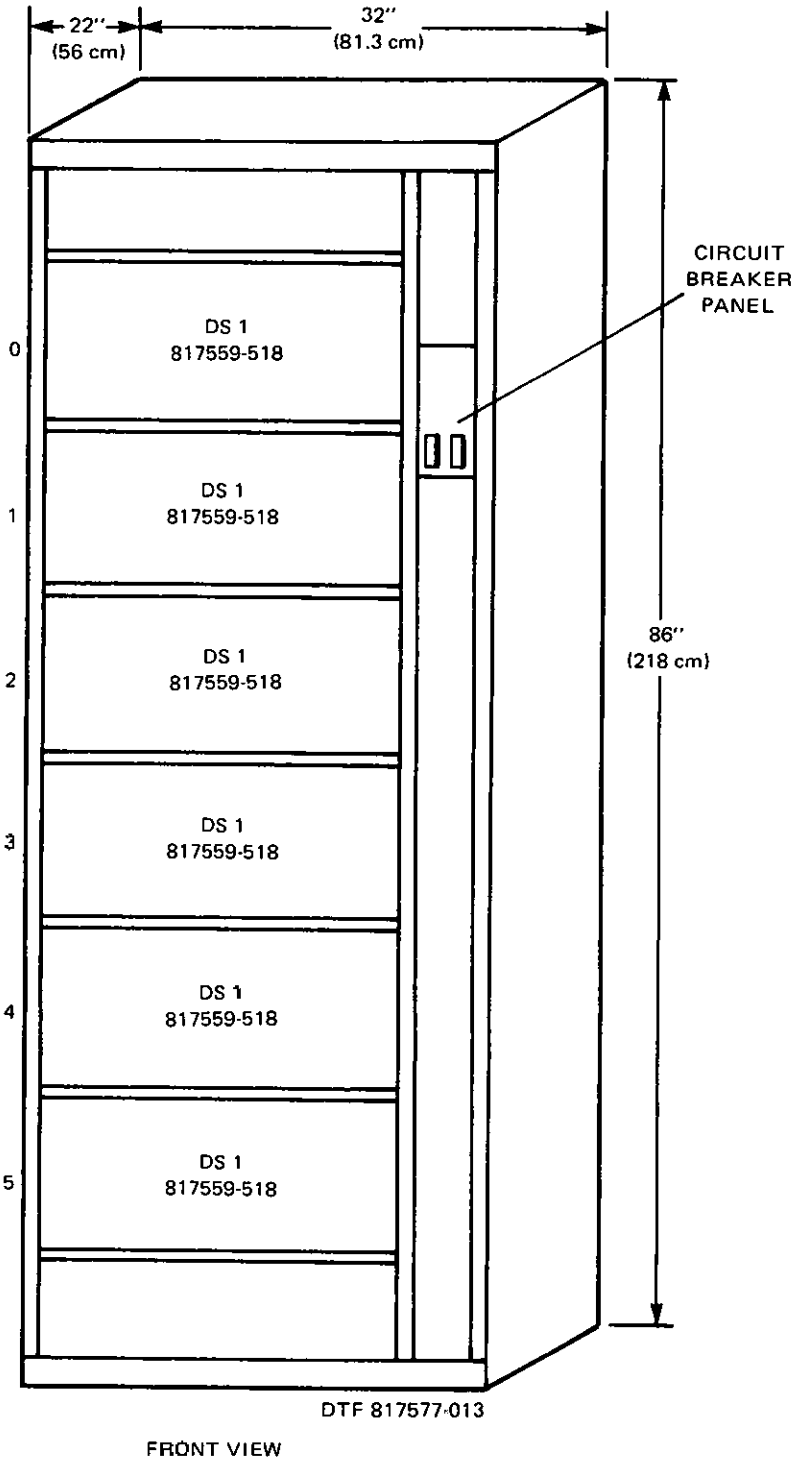

Figure 1. Digital Trunk Frame

dundant X and Y power supply PWBAs. Figure 2 shows the PWBA layout in a DS1M cell. Figure 3 shows a typical digital trunk frame application in a DCO system.

5. DS1 MODULE (DS1M)

5.01 DS1M Functions.

a. Provides an interface between a 24 channel T1 carrier span and a 30 time-slot port group highway in the host office.

b. Converts non-return-to-zero (NRZ) to bipolar and bipolar to NRZ at the 1.544 Mbs rate.

c. Synchronization recovery.

d. A 1.544 MHZ synthesizer for deriving transmit carrier timing from the DCO system clock.

e. A buffering function for messages between the DCO systems communications buffer controller (CBC) and a remote line switch.

f. An "All-Ones" pattern to the T1 span line when the DS1M is placed in the loop-back test mode.

g. Span and control equipment alarm sensing and reporting.

5.02 T1 Interface PWBA (TIF).

Each TIF contains a transmit and a receive section. The transmit section receives data from the port group highway, and, if serving an RLS message span, controls messages from the message assembler host (MAH). The TIF converts the data to bipolar format, adds synchronization, and transmits the data over the T1 span. The receive section receives data from the T1 span, regenerates the timing, synchronizes the data, converts the data to NRZ and PGH format and applies the data to the PGH and the message assembler host (if serving an RLS message span). Also handled by the TIF are span related alarm sending and reporting functions that include slipped frame and missed frame status, and reports of the T1 bit error rate.

5.03 T1 Interface Control PWBAs (TIC).

The TIC PWBAs handle all common equipment and local and remote carrier group alarms, alarm restoral, common fuse alarms, power supply fuse alarms, port group highway error counter, redundant equipment switchover, and self testing functions.

5.04 Message Assembler Host PWBAs.

Redundant (X and Y) message assemblers are equipped in a DS1M cell when message spans to an RLS are connected to TIFs in the cell. A minimum of two (up to 8) spans are required to an RLS. The first two spans to an RLS are message spans. Channel "0" on each message span is used for control messages, the remaining 23 channels on each message span are voice channels. One message assembler consists of two PWBAs designated in the host office as MAH I and MAH II. Each redundant MAH can communicate over either message channel to an RLS. Each MAH can connect to 8 message spans serving 4 RLSs (2 spans per RLS). An MAH can be programmed to provide access to message channels on the spans they serve or be electrically isolated, under software control, from those message channels. Where more than one RLS is served by message spans from a DS1M cell, each MAH, X and Y, is assigned to serve one-half the RLSs assigned to the cell, thus both MAHs are normally on line. Up to 4 RLSs can be served by message spans from one DS1M cell. The MAHs at the host office are slaves on a synchronous data link control (SDLC) loop with the communications buffer controller (CBC), in the DCO system, acting as the master.

6. SPAN LINE MAINTENANCE

a. Fault isolation for the voice spans includes automatically or manually initiated loop back of the transmit-out port to the receive-in port. This loop-back capability permits isolation of a fault to the DS1 module or the span line with its office and intermediate repeaters. Only the DS1 module is tested, not the span line. Span line testing and maintenance information is supplied by the span equipment manufacturer.

b. Carrier group alarms (CGA) are detected on the TIC2 PWBA. Remote CGAs are detected by looking for bit 2=0 for all channels. If this condition exists for .464 seconds an alarm is given for the associated TIF. A local CGA is given if frame synchronization is lost for a period of 2.44 seconds.

c. Slipped frame faults will rarely occur because both transmit and receive timing are derived from the host office clock. Frame slips that do occur are reported to the host maintenance processor (MP). The MP maintains a count of the frame slips for each span and takes corrective action when a specific threshold is exceeded.

PWBA NUMBER	CIRCUIT TITLE		
			1
			2
			3
			4
			5
			6
			7
			8
			9
			10
			11
817564-026	POWER SUPPLY	X	12
			13
			14
			15
817562-526	T1 INTERFACE CONTROL 2	X	16
			17
			18
			19
817561-526	T1 INTERFACE CONTROL 1	X	20
			21
			22
			23
817563-526	MESSAGE ASSEMBLER II	X (NOTE 1)	24
			25
			26
			27
817552-	MESSAGE ASSEMBLER I	X (NOTE 1&2)	28
			29
			30
			31
			32
			33
			34
817560-	T1 INTERFACE	(NOTE 3)	35
			36
			37
817560-	T1 INTERFACE	(NOTE 3)	38
			39
			40
817560-	T1 INTERFACE	(NOTE 3)	41
			42
			43
817560-	T1 INTERFACE	(NOTE 3)	44
			45
			46
817560-	T1 INTERFACE	(NOTE 3)	47
			48
			49
817560-	T1 INTERFACE	(NOTE 3)	50
			51
			52
817560-	T1 INTERFACE	(NOTE 3)	53
			54
			55
817560-	T1 INTERFACE	(NOTE 3)	56
			57
			58
			59
			60
			61
			62
			63
			64
			65
			66
			67
			68
			69
817563-526	MESSAGE ASSEMBLER II	Y (NOTE 1)	70
			71
			72
			73
817552-	MESSAGE ASSEMBLER I	Y (NOTE 1&2)	74
			75
			76
			77
817562-526	T1 INTERFACE CONTROL 2	Y	78
			79
			80
			81
817561-526	T1 INTERFACE CONTROL 1	Y	82
			83
			84
			85
			86
			87
			88
			89
			90
			91
			92
			93
			94
			95
817564-026	POWER SUPPLY	Y	96

DS1 817559-518

NOTES.
1. ONLY REQUIRED WHEN T1 INTERFACE CIRCUITS ARE ASSIGNED TO SERVE AS RLS MSG LINES.

2 817552-526 EQUIPPED TO SERVE 1 RLS.
817552-546 EQUIPPED TO SERVE 2 RLS's
817552-566 EQUIPPED TO SERVE 3 RLS's.
817552-586 EQUIPPED TO SERVE 4 RLS's.

NOTE. ALL DIP SWITCHES ON ALL ABOVE PWBAs MUST BE SET TO "OFF" POSITION.

3. EQUIPPED AS FOLLOWS FOR RLS MSG SPANS.

ASSOCIATED RLS	1 ST	2 ND	3 RD	4 TH
POS EQUIPPED	35, 38	41, 44	47, 50	53, 56

817560-536 USED WHEN CABLE TO CROSS-CONNECT IS 0 - 150 FEET LONG.
817560-546 USED WHEN CABLE IS 150 - 450 FEET LONG.
817560-556 USED WHEN CABLE IS 450 - 655 FEET LONG.

CP 9274B

Figure 2. DS1M Cell, PWBA Arrangement

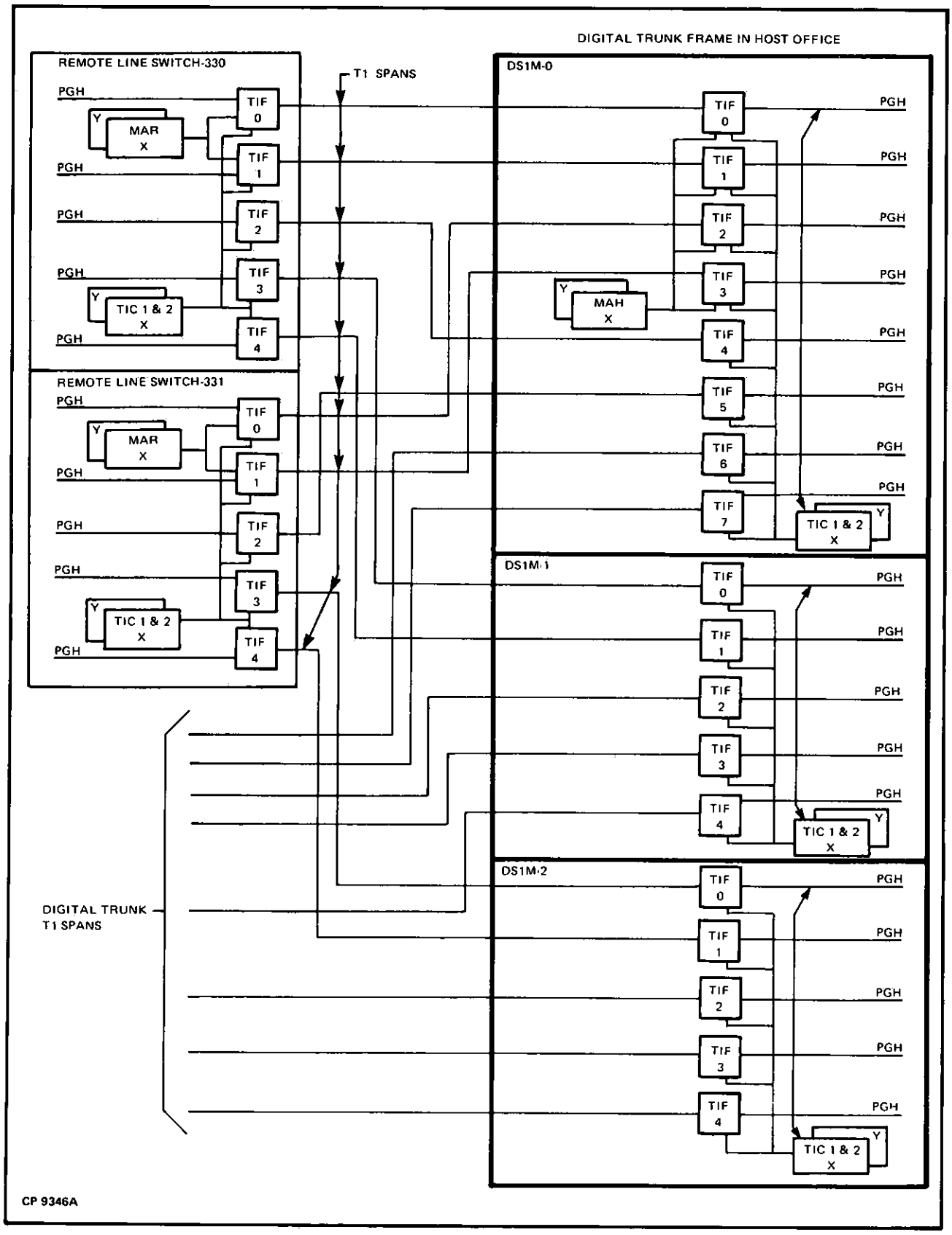

Figure 3. Typical Digital Trunk Frame Application in a DCO System

d. Bipolar violations are counted in the DS1 module and are reported to the MP when a threshold is exceeded.

e. Framing loss (misframe) is reported separately for each occurrence and compared against a threshold in the MP. Misframes detected on either of the first two spans to an RLS, which contain message channels, are reported by way of the other channel, regardless of which channel is active.

f. Span lines taken out of service due to faults have a fault level assignment administrable by the telephone company. Loss of one of the two message spans to an RLS should be considered more serious than the loss of a voice span. Two inoperable spans to the same RLS should be considered more serious than the loss of one span to each of several RLSs.

7. VISUAL INDICATORS AND SWITCHES

7.01 General.

In addition to printouts on the maintenance console for DS1M alarm and fault conditions, visual indicators and switches are provided on the front edge of various PWBAs in the DS1M cell to aid in locating the cause of the alarm and restoring the system to service.

7.02 T1 Interface PWBA.

Four red lamps are mounted on the front edge of each TIF PWBA. All lamps are normally dark. The lamps, when lighted, top to bottom indicate:

a. +5 FUSE.

b. -5 FUSE.

c. SERV, loss of carrier synchronization.

d. LCL LPBK TIF is in local loopback mode.

7.03 T1 Interface Control 1 PWBA.

Three lamps are mounted on the TIC-1 PWBA, one green and two red (fig. 4). The lamps, when lighted top to bottom indicate:

a. ON LINE, associated TIC-1 and 2, X or Y, are on-line.

b. TERM ALM, TIC-1 terminator PWBA is defective or unplugged.

c. +5 volts, loss of voltage.

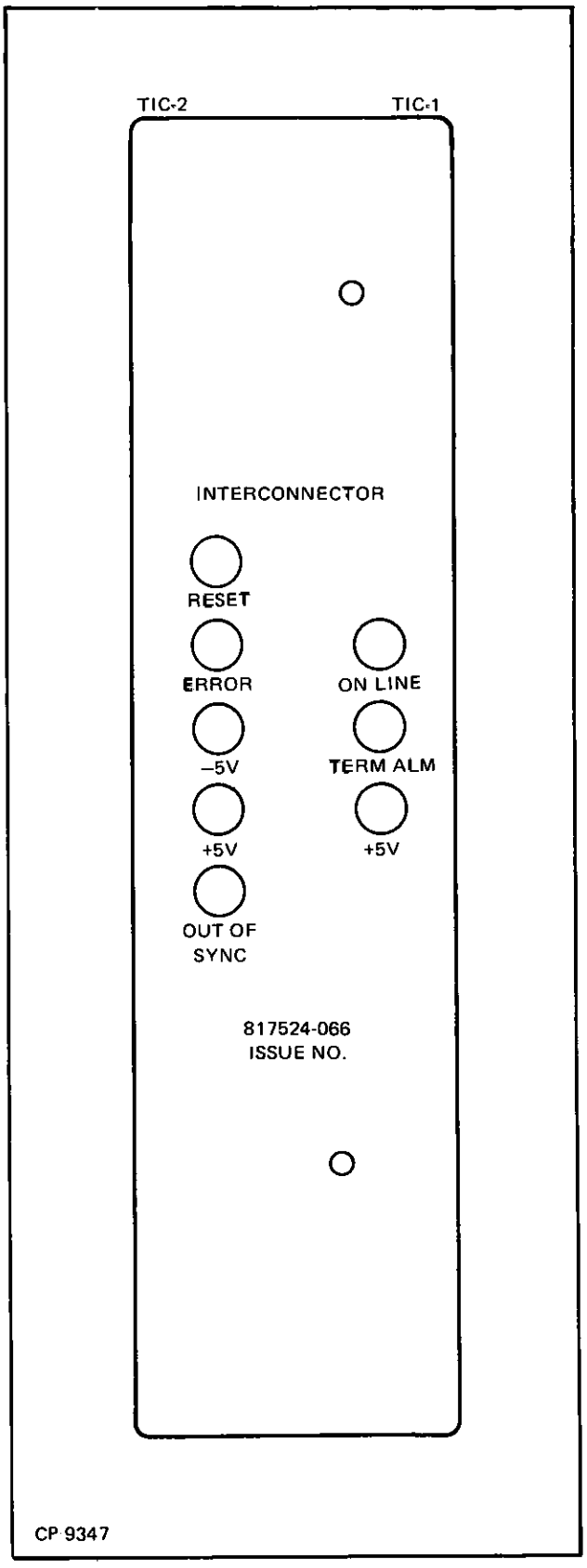

Figure 4. Interconnector Cover, TIC-1 and 2 PWBAs

7.04 T1 Interface Control 2 PWBA.

A pushbutton and four red lamps are mounted on the TIC-2 PWBA (fig. 4). The pushbutton is used to manually reset alarms and reboot the TIC processor. All lamps are normally dark. The lamps, when lighted, top to bottom indicate:

a. ERROR, lights indicating one of the following:

1. Mismatch between TIC-1 and TIC-2 PGH counters.
2. 4 ms clock failure.
3. Loss of phase lock between the 1.544 and 2.048 clocks.
4. Watchdog timeout.
5. Checksum failure.
6. TIC-1 terminator PWBA is defective or unplugged.

b. −5 volts, loss of voltage.

c. +5 volts, loss of voltage.

d. OUT OF SYNC, lights with RESET lamp to indicate loss of clock phase lock.

7.05 Message Assembler Host 1 PWBA.

A pushbutton, one green and two red lamps are mounted on the MAH-1 PWBA (fig. 5). The pushbutton is operated to reset the MAH-1 processor when the PWBA is initially installed or when the system must be restarted. The lamps, when lighted, top to bottom indicate:

a. ON LINE, MAH is on-line.

b. −5V Fuse ALARM.

c. +5V Fuse ALARM.

NOTE. The MAH1 PWBA is equipped with a dip switch pack mounted on the body of the board. Verify that all switches in the pack are set to "OFF" position when replacing this PWBA.

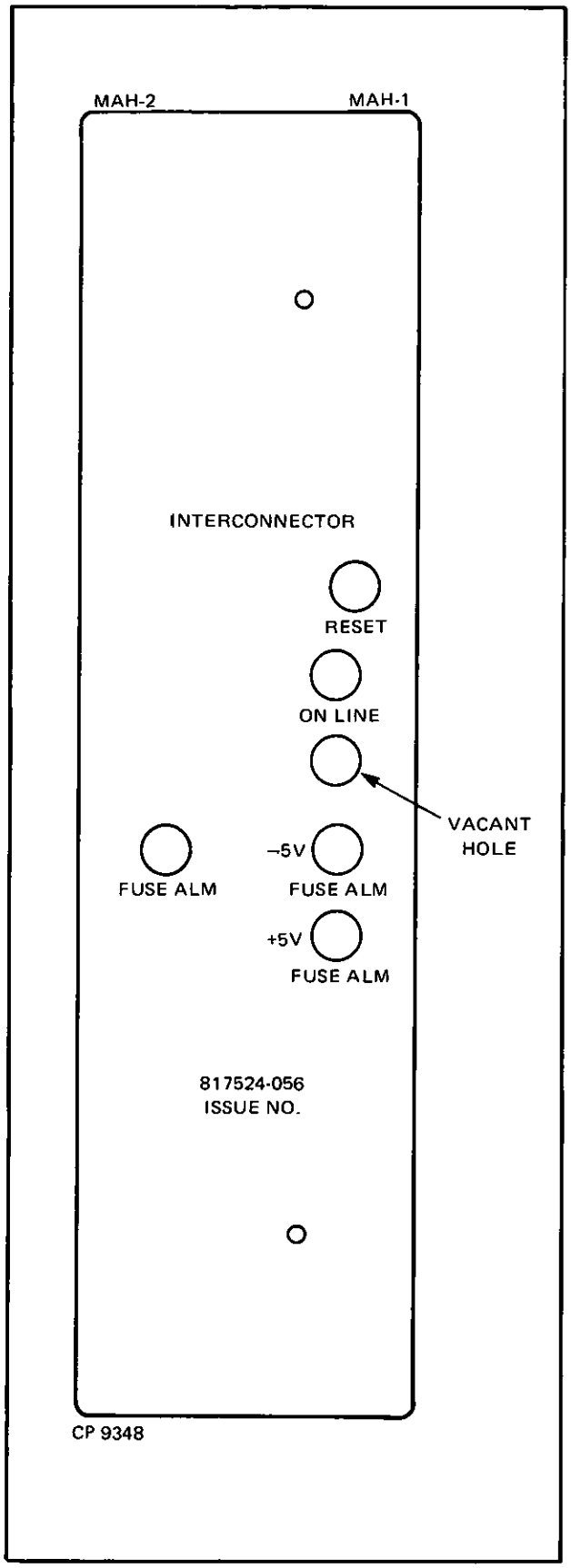

Figure 5. Interconnector Cover, MAH-1 and 2 PWBAs

7.06 Message Assembler Host 2 PWBA.

One red lamp is mounted on the MAH-2 PWBA (fig. 5). Designated "FUSE ALM", when lighted it indicates a blown fuse mounted on the PWBA.

7.07 Power Supply PWBA.

A pushbutton and two lamps are mounted on each power supply PWBA X and Y. The pushbutton is operated to reset the power supply when the power supply has been replaced or power has been removed from cell. The lamps when lighted are:

a. Green – on-line.

b. Red – failure.