E&M Voice Card
For
LOOP-AM3440-A/B/C
USER'S MANUAL

LOOP TELECOMMUNICATION INTERNATIONAL, INC.
8F, NO. 8, HSIN ANN RD.
SCIENCE-BASED INDUSTRIAL PARK
HSINCHU, TAIWAN
Tel: +886-3-578-7696
Fax: +886-3-578-7695

8 JUL 2011 Version 5

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D	Bitte führen Sie das Gerät am Ende seiner Lewbensdauer den zue Verfügung stehended Rückgabeund Sammelsystemen zu.
GB	At the end of the product's useful life, please dispose of it at appropriate collection points provided in your country
F	Une fois le produit en fin devie, veuillez le déposer dans un point de recyclage approprié.
ES	Para preservar el medio ambiente, al final dela vida útil de su producto, depositelo en los laguares destinado aello de acuerdo con la legislación vigente.
P	No final de vida útil do producto, por favor coloque no ponto de recolha apropriado.
I	I Onde tutelare l'ambiente, non buttate l'apparecchio trai i normali rifiuti al termine della sua vita utile, ma portatelo presso i punti di raccolta specifici per questi rifiuti previsti dalla normativa vigente.
NL	Wij raden u aan het apparant aan het einde van zijn nuttige levensduur, niet bij hey gewone huisafval te deponeren, maar op de dearvoor bestemde adressen.
DK	Når produktet er udtjent, bor det børtskaffes via de sæ rlige indsamlingssteder i landet.
N	Ved slutten av produktets levetid bør det avhendes på en kommunal miljøstasjon eller leveres til en elektroforhandler.
S	Lämna vänligen in produkten på lämplig återvinningsstation när den är förbrukad.
FIN	Hävitä tuote käytöiän päättyessä viemällä se asianmukaiseen keräyspisteeseen.
PL	Gdy produkt nie nadaje sie juz do dalszego uzytku, nalezy zostawic go w jednym ze specjalnych punktów zajmujacych sie zbiórka zuzytych producktów w wybranych miejscach na terenie kraju.
CZ	Po skončení jeho životnosti odložte prosím výrobek na přislušném sběrném místé zřízeném dle předpisů ve vaší zemi.
SK	Po skončení jeho životnosti odovzdajte prosím zariadenie na príslušnom zbernom mieste podía platných miestnych predpisov a noriem.
SLO	Ko se izdelku izteče življenska doba, ga odnesite na ustrezno zbirno mesto oziroma ga odvrzite v skladu z veljavnimi predpisi.
GR	Στο Τέλος της λειτουργικής Ζωής του προϊόντος παρακαλώ Πετξτε το στα ειδικά σημεία που Παρέχονται οτη χωρα σας.
PRC	當產品使用壽命結束,請在你的國家所提供的適當地點做好回收處理

1. PRODUCT INTRODUCTION

1.1 Description

Loop Telecom's E&M plug-in card is designed for the Loop-AM3440 device. It allows 8 ports of E&M interfaces to be multiplexed to eight 64 Kbps DS0 signals. It can also be used as TO (Transmit Only).

Voice coding can be selected as either A-law or μ-law.

This unit can be used on systems running a 110-220Vac or a -48Vdc power supply.

1.2 Specification

Voice Card (E&M)

Connector	RJ45 x 8
Alarm Conditioning	CGA busy after 2.5 seconds of LOS, LOF
Encoding	A-law or μ-law, user selectable together for all
Impedance	Balanced 600 or 900 ohms
Gain Adjustment (Per-port setting)	-16 to +7 dB / 0.1dB step for transmit (D/A) gain
	-16 to +14 dB / 0.1dB step for receive (A/D) gain
I/O Power Range	A/D Analog input level: -66 dBm (0.00039 Vrms) ~ + 3 dBm (1.09 Vrms)
	D/A Analog output level: -66 dBm (0.00039 Vrms) ~ + 4 dBm (1.22 Vrms)
Gain Variation	± 0.5 dB at 0 dBm0 input
Frequency Response	± 0.5 dB at 0 dBm0 input
Longitudinal Conversion Loss	＞ 46dB
Total Distortion	＞ 35 dB at 0 dBm0 input
Idle Channel Noise	＜ -65 dBm0p
Carrier Connection	Side A (exchange side) and Side B (carrier side) setup by side switch
Wire Mode	2 wire and 4 wire
Signaling	Type 1, Type 2, Type 3, Type 4, and Type 5, Transmit only (programmable)
Modems	Full compatibility with V.90 modems

All in-band signaling tones are carried transparently by the digitizing process.
Customer is responsible for in-band signaling compatibility between a telephone and a switch, or between a PBX and a switch.

1.3 Application Illustration

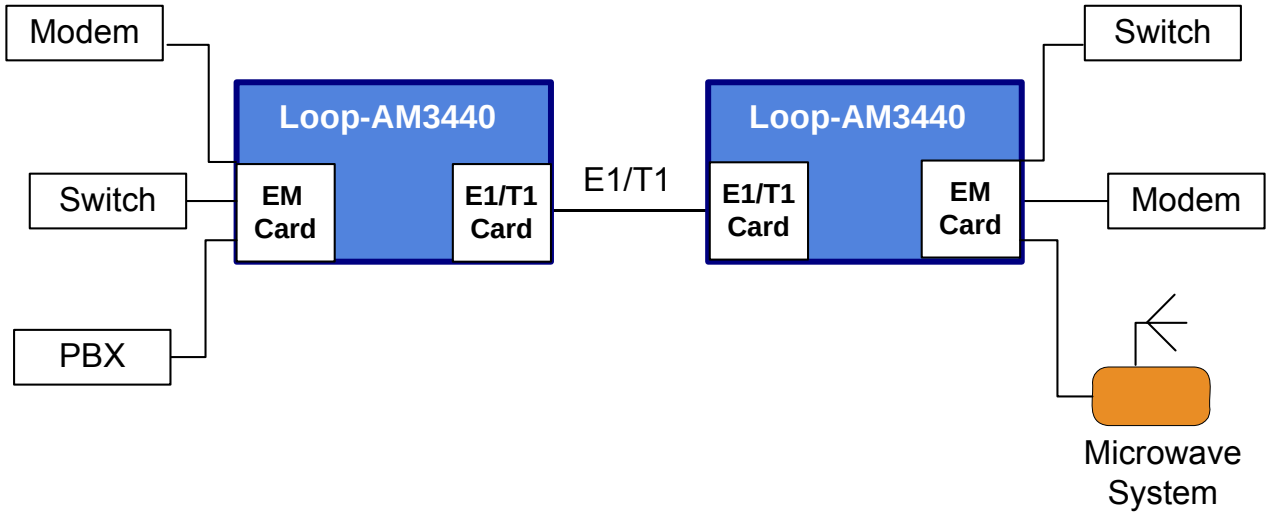


Figure 1-1 Standard E&M interface equipment Link or tandem connection

2. INSTALLATION

2.1 E&M Card: Panel View

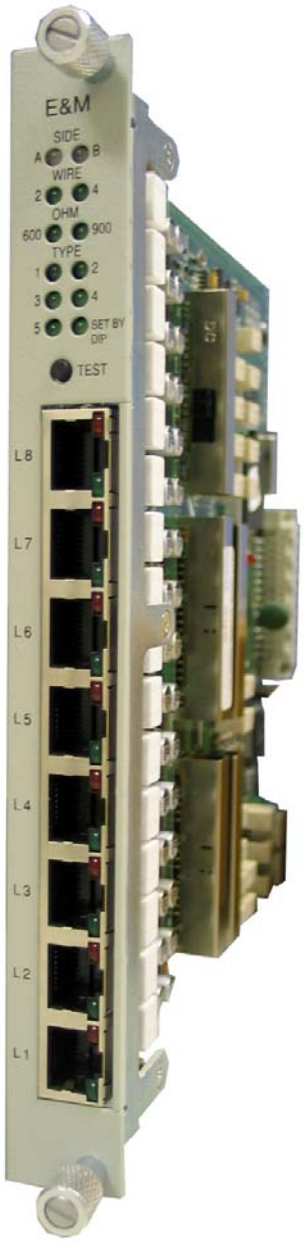


Figure 2-1 E&M Card: Panel View

2.2 E&M Card Pin Definitions

Pin Number	Pin Color	Pin Name
8	Brown	SG
7	White/ Brown	E
6	Green	TIP1
5	White/ Blue	TIP
4	Blue	RING
3	White/ Green	RING1
2	Orange	M
1	White/ Orange	SB

Table 2-1 RJ45 Pin Assignment - E&M Card

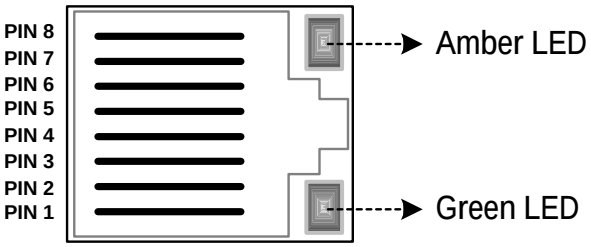


Figure 2-2 RJ45 Connector - E&M Card

2.3 Voice Channel Direction

Table 2-2 Voice Channel Direction

Pin No.	Pin Name	2 Wire	4 Wire	
		A, B Side	A Side	B Side
4, 5	**Ring, Tip**	Transmit, Receive	Transmit	Receive
3, 6	**Ring1, Tip1**	—	Receive	Transmit

2.4 Switch Application

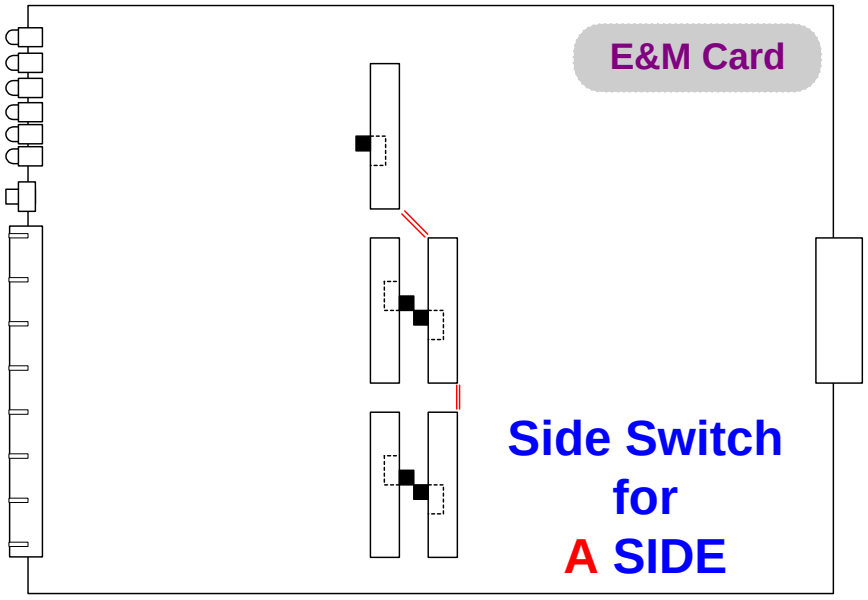


Figure 2-3 Side Switch for A Side

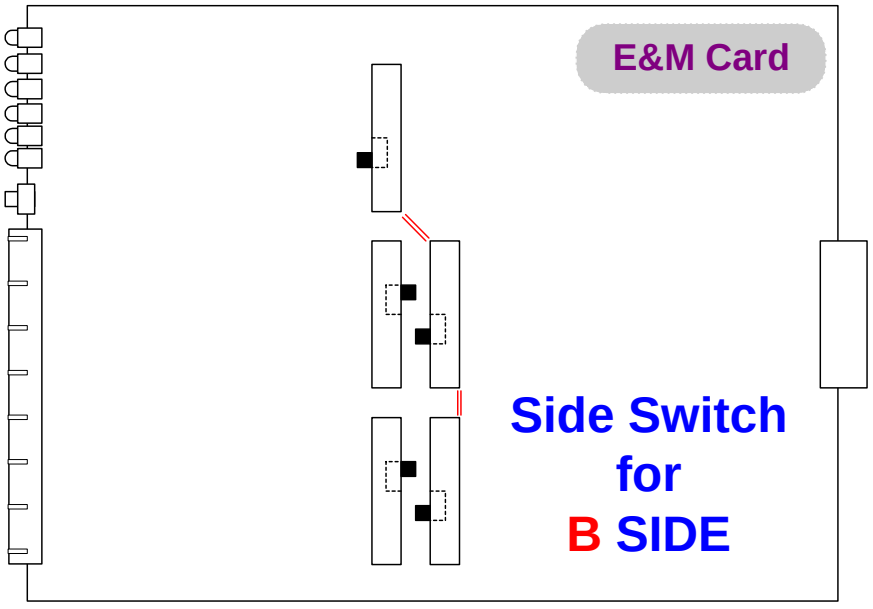
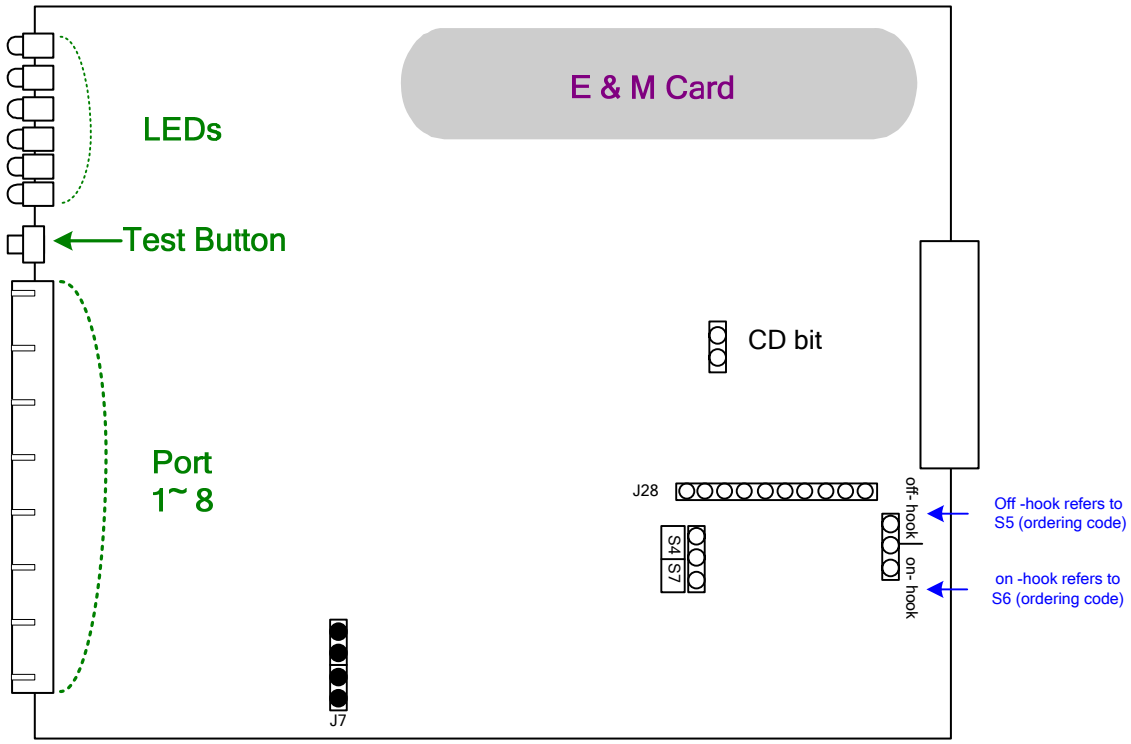


Figure 2-4 Side Switch for B Side

2.5 Jumper Settings

2.5.1 For Special Functions: S4, off-hook(S5), on-hook(S6) in Hardware version I

With Hardware version: H, the location of jumper settings of E&M card is illustrated in the figure below.



1. **S4:** With jumper on, it will disable the function of the test button on the front panel.

Note:

- When S4 jumper on, the on-hook or off-hook jumper function has no effect.
- For the test button function, please refer to Table 2-11: LED for E&M ports

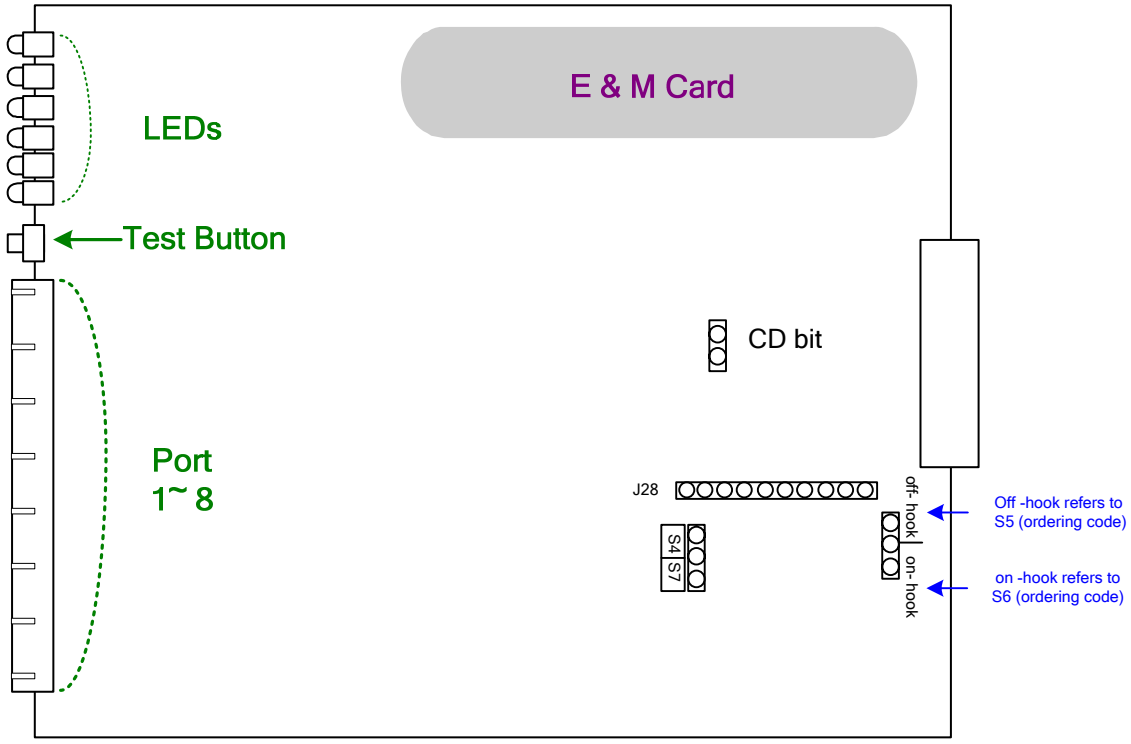
2. **off-hook (S5: ordering code):** When one of the eight ports receives an alarm signal, all the ports are forced to be Active Relay to Close (off-hook). All the LED lights on the RJ45 connector will be green until the alarm is closed.

3. **on-hook (S6: ordering code):** When one of the eight ports receives an alarm signal, all the ports are forced to be All Relay to Open (on-hook). All the LED lights on the RJ45 connector will be off until the alarm is closed.

4. **J7:** Two jumpers on J7 are spare jumps.

2.5.2 For Special Functions: S4, off-hook(S5), on-hook(S6) in Hardware version H

With Hardware version: H, the location of jumper settings of E&M card is illustrated in the figure below.



1. **S4:** With jumper on, it will disable the function of the test button on the front panel.

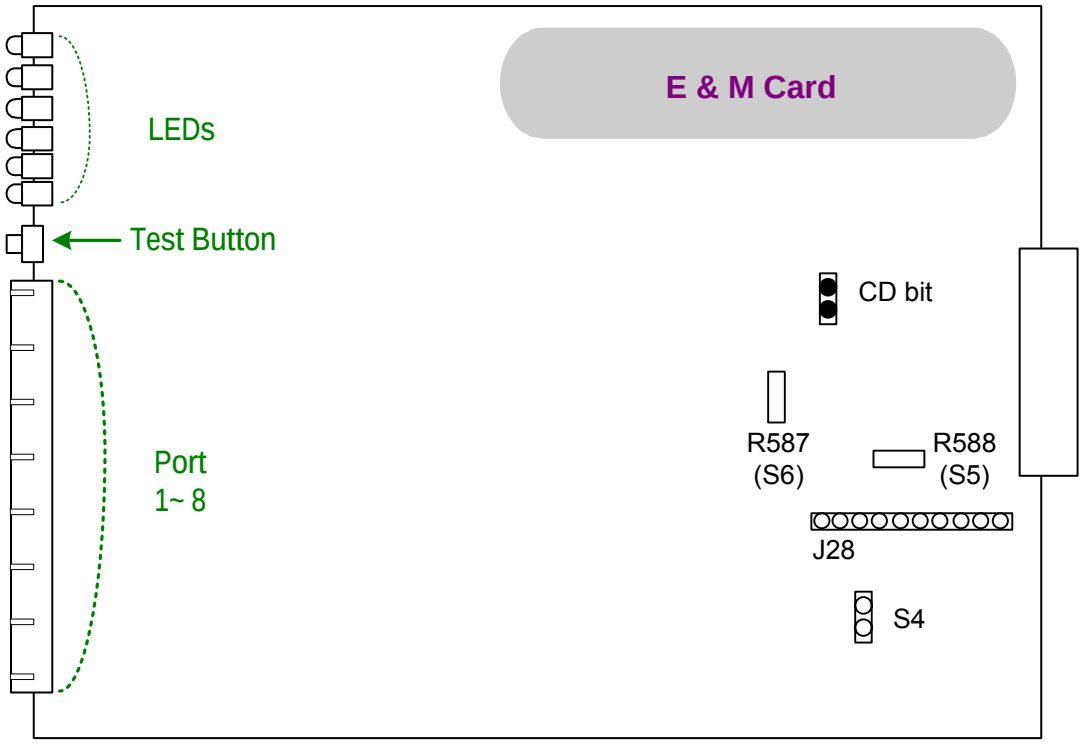
Note:

- When S4 jumper on, the on-hook or off-hook jumper function has no effect.
- For the test button function, please refer to Table 2-11: LED for E&M ports

2. **off-hook (S5: ordering code):** When one of the eight ports receives an alarm signal, all the ports are forced to be Active Relay to Close (off-hook). All the LED lights on the RJ45 connector will be green until the alarm is closed.

3. **on-hook (S6: ordering code):** When one of the eight ports receives an alarm signal, all the ports are forced to be All Relay to Open (on-hook). All the LED lights on the RJ45 connector will be off until the alarm is closed.

2.5.3 For Special Functions: S4, S5, S6 in Hardware version up to G



4. **S4:** Disable the function of the test button on the front panel.

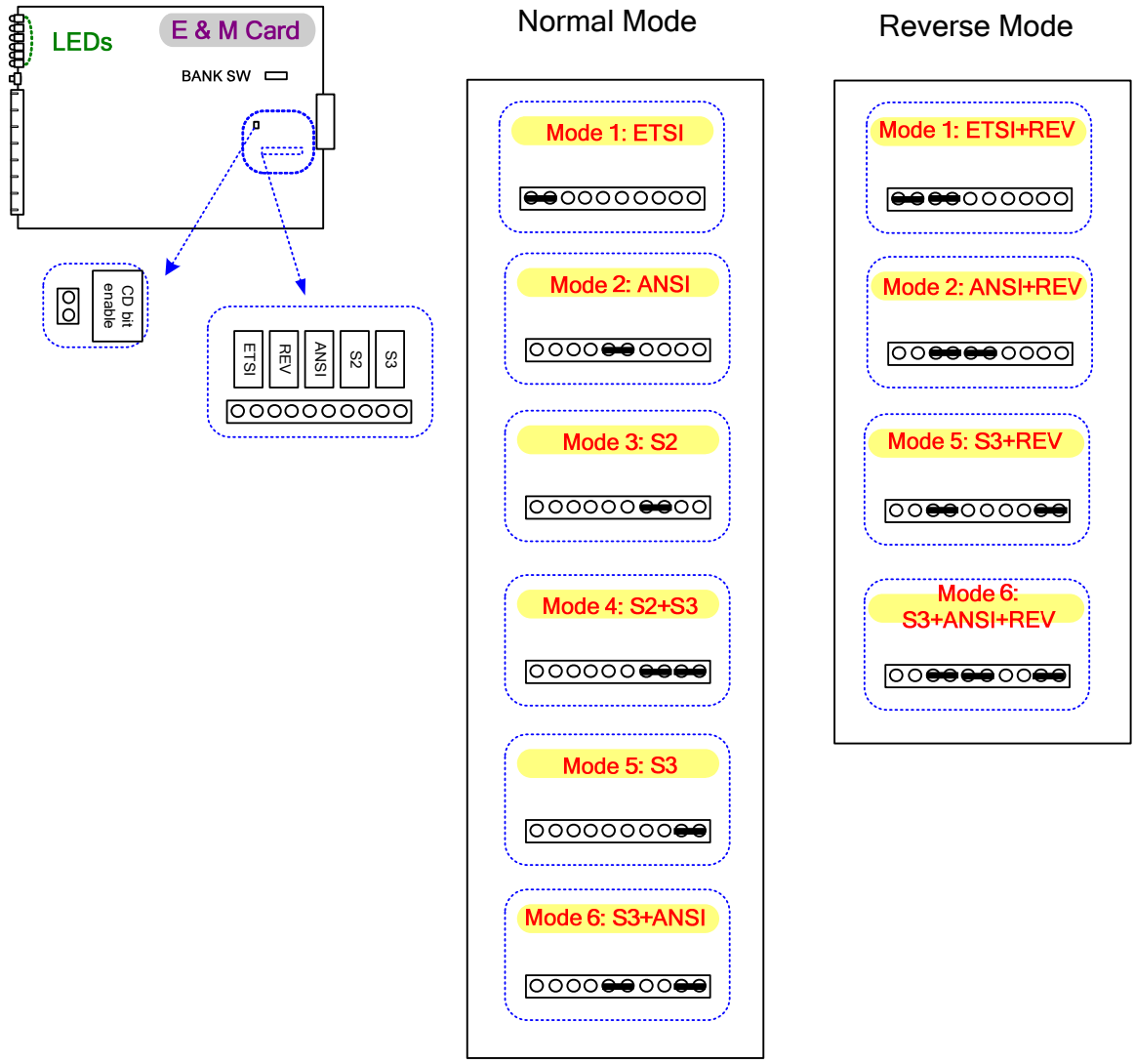
Note: For the test button function, please refer to Table 2-11: LED for E&M ports.

5. **S5:** When one of the eight ports receives an alarm signal, all the ports are forced to be Active Relay to Close (off-hook). All the LED lights on the RJ45 connector will be green until the alarm is closed.

6. **S6:** When one of the eight ports receives an alarm signal, all the ports are forced to be All Relay to Open (on-hook). All the LED lights on the RJ45 connector will be off until the alarm is closed.

2.5.4 For Signaling Bit: ETSI, ANSI, REV, S2, S3:

2.5.4.1 Jumper Location



Note: Jumper location on ETSI is a spare jump.

Figure 2-5 Jumper Location and Setting Signaling Bit Mode (for PCB Version F, G and up)

2.5.4.2 Bit Mode Application: without C/D Bit Jumper

Jumper			TX Bit					RX Bit								
Mode		Jumper	Phone Status	AM3440/9500				Relay Status	AM3440				O9500			
			ON HOOK	A	B	C	D	Relay Open	A	B	C	D	A	B	C	D
			OFF HOOK					Relay Close								
NORMAL	1	**ETSI (Bit default)**	ON	0	0	0	1	Open	0	0	*	*	0	0	*	*
			OFF	1	1	0	1	Close	1	1	*	*	1	1	*	*
	2	**ANSI**	ON	0	0	0	0	Open	0	0	*	*	0	0	*	*
			OFF	1	1	1	1	Close	1	1	*	*	1	1	*	*
	3	**S2**	ON	1	0	0	1	Open	1	1	*	*	1	1	*	*
			OFF	0	0	0	1	Close	0	1	*	*	0	1	*	*
	4	**S2+S3**	ON	1	1	0	1	Open	1	0	*	*	1	0		*
			OFF	0	1	0	1	Close	0	0	*	*	0	0	*	*
	5	**S3**	ON	1	1	0	1	Open	1	1	*	*	1	1	*	*
			OFF	0	1	0	1	Close	0	1	*	*	0	1	*	*
	6	**S3+ANSI**	ON	1	1	0	1	Open	1	1	*	*	1	1	*	*
			OFF	1	0	0	1	Close	1	0	*	*	1	0	*	*
REVERSE	1	**ETSI+REV**	ON	1	1	0	1	Open	1	1	*	*	1	1	*	*
			OFF	0	0	0	1	Close	0	0	*	*	0	0	*	*
	2	**ANSI+REV**	ON	1	1	1	1	Open	1	1	*	*	1	1	*	*
			OFF	0	0	0	0	Close	0	0	*	*	0	0	*	*
	5	**S3+REV**	ON	0	1	0	1	Open	0	1	*	*	0	1	*	*
			OFF	1	1	0	1	Close	1	1	*	*	1	1	*	*
	6	**S3+ANSI+REV**	ON	1	0	0	1	Open	1	0	*	*	1	0	*	*
			OFF	1	1	0	1	Close	1	1	*	*	1	1	*	*
Jumper Error			ON	0	0	0	1	Open	*	*	*	*	*	*	*	*
			OFF	1	1	0	1	Close	*	*	*	*	*	*	*	*

Table 2-3 E&M Card Signaling Bits without C/D Bit Jumper (for PCB Version F, G and up)

Note 1: When there is no jumper in the C/D bit connector, the * symbol represents “don’t care”. This means the value of C/D bit in the RX bit can be either 0 or 1.
Note 2: For the function of each jumper, please refer to “ Bit Mode Description” section.
Note 3: (S/W version = V4.01.01 and up)

2.5.4.3 Bit Mode Application: with C/D Bit Jumper

Jumper			TX Bit					RX Bit								
Mode		Jumper	Phone Status	AM3440/O9500				Relay Status	AM3440				O9500			
			ON HOOK	A	B	C	D	Relay Open	A	B	C	D	A	B	C	D
			OFF HOOK					Relay Close								
NORMAL	1	**ETSI (Bit default)**	ON	0	0	0	1	Open	0	0	0	1	0	0	0	1
			OFF	1	1	0	1	Close	1	1	0	1	1	1	0	1
	2	**ANSI**	ON	0	0	0	0	Open	0	0	*	*	0	0	0	0
			OFF	1	1	1	1	Close	1	1	*	*	1	1	1	1
	3	**S2**	ON	1	0	0	1	Open	1	1	0	1	1	1	0	1
			OFF	0	0	0	1	Close	0	1	0	1	0	1	0	1
	4	**S2+S3**	ON	1	1	0	1	Open	1	0	0	1	1	0	0	1
			OFF	0	1	0	1	Close	0	0	0	1	0	0	0	1
	5	**S3**	ON	1	1	0	1	Open	1	1	0	1	1	1	0	1
			OFF	0	1	0	1	Close	0	1	0	1	0	1	0	1
	6	**S3+ANSI**	ON	1	1	0	1	Open	1	1	0	1	1	1	0	1
			OFF	1	0	0	1	Close	1	0	0	1	1	0	0	1
REVERSE	1	**ETSI+REV**	ON	1	1	0	1	Open	1	1	0	1	1	1	0	1
			OFF	0	0	0	1	Close	0	0	0	1	0	0	0	1
	2	**ANSI+REV**	ON	1	1	1	1	Open	1	1	*	*	1	1	1	1
			OFF	0	0	0	0	Close	0	0	*	*	0	0	0	0
	5	**S3+REV**	ON	0	1	0	1	Open	0	1	0	1	0	1	0	1
			OFF	1	1	0	1	Close	1	1	0	1	1	1	0	1
	6	**S3+ANSI+REV**	ON	1	0	0	1	Open	1	0	0	1	1	0	0	1
			OFF	1	1	0	1	Close	1	1	0	1	1	1	0	1
Jumper Error			ON	0	0	0	0	Open	*	*	*	*	*	*	*	*
			OFF	0	0	0	0	Close	*	*	*	*	*	*	*	*

Table 2-4 E & M Card Signaling Bits with C/D Bit Jumper (for PCB Version F, G and up)

Note 1: With a jumper on C/D bit connector, the value of C/D bit in the RX bit is strictly defined in the table above. (ANSI mode is an exception.)

Note 2: For the function of each jumper, please refer to " Bit Mode Description" section.

Note 3: (S/W version = V4.01.01 and up)

2.5.4.4 Bit Mode Description

1. **Mode 1, ETSI (Please refer to Loop ordering code: E):** For bit setup, ETSI is frequently used. A/B bit status will change simultaneously. C/D bit status will maintain a status of 01 for TX and RX setup. TX Bit at OFF HOOK status should be 1101, and RX Bit is the same.

2. **Mode 2, ANSI (Please refer to Loop ordering code: A):** For bit setup, ANSI is frequently used. A/B bit is equal to C/D bit. Both statuses change simultaneously for TX and RX setup. TX Bit at OFF HOOK status should be 1111, and RX Bit is the same.

3. **Mode 3, S2:** For bit setup, S2 is used to connect to the signaling of Siemens EPBX. TX bit and RX bit status are different, and only A bit status will change. Back to back connection is not allowed for S2. Mode 3 can be used with Mode 4. TX Bit at OFF HOOK status should be 0001, and RX Bit should be 0101.

4. **Mode 4, S2+S3:** Used for back to back connection with Mode 3. TX and RX is a pair. Back to back connection is not allowed for Mode 4. TX Bit at OFF HOOK status should be 0101, and RX Bit should be 0001.

5. **Mode 5, S3:** Used for UK Telco standard to connect to UK EPBX. Only A bit status will change. TX Bit at OFF HOOK status should be 0101, and RX Bit is the same.

6. **Mode 6, S3+ANSI:** Only B bit will change. A/C/D will keep the same status. TX Bit at OFF HOOK status should be 1001, and RX Bit is the same.

7. **REVERSE:** Means opposite in position. The ON HOOK bit for original mode will be OFF HOOK bit for reverse mode. Only mode 1,2,5,6 support REVERSE function.

8. **Jumper Error:** Means the user put the jumper in the wrong position. If such an error occurs, the TX and RX status will appear in the VT-100 screen.

9. ***** = don't care (Value can be 0 or 1)

Note: Mod 3, 4, 5, and 6 are customer's special bits. Please refer to Loop ordering code: **S**.

2.5.5 BANK Switch

Number	Name	Jumper Settings	Function	Default
J12	BANK SW		Enable flash download to work under its default firmware bank	
			Switch the flash download working firmware bank (Bank 1, Bank 2)	

Table 2-5 BANK Switch Setting and Function

2.5.6 E&M Card: PCB version C/E

2.5.6.1 Jumper location and mode

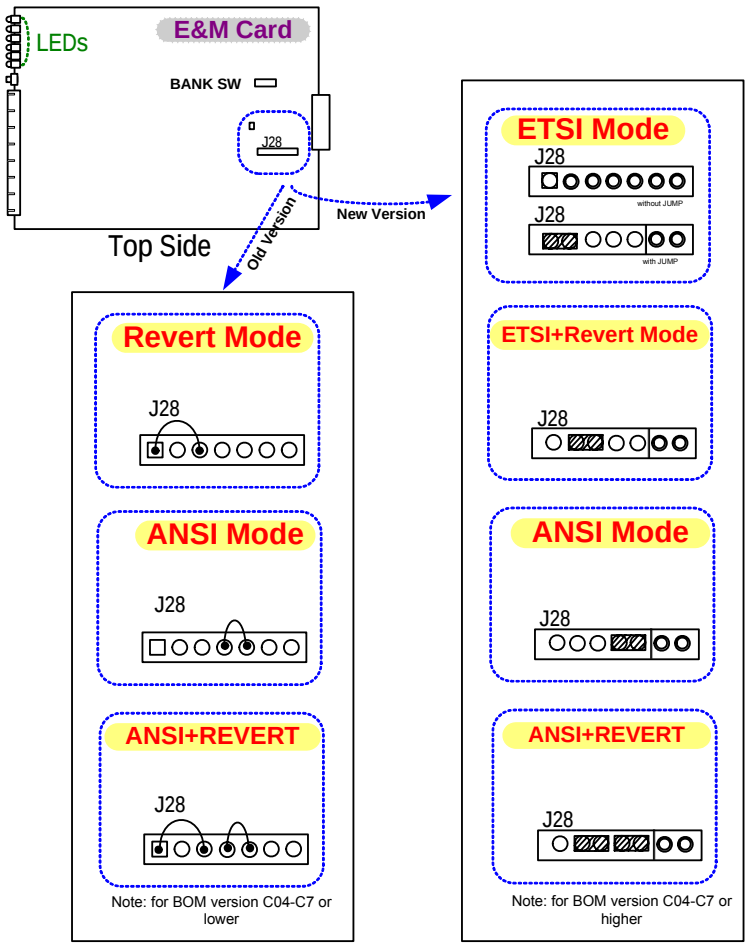


Figure 2-6 Jumper Location Setting Signaling Bit Mode (for PCB version C/E only)

2.5.6.2 Bit Mode Application

Mode		Status	A Side								B Side							
			E (TX bit)				M (RX bit)				M (TX bit)				E (RX bit)			
			A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
ETSI	Normal	Idle - on hook	0	0	0	1	0	*	*	*	0	0	0	1	0	*	*	*
		Active - off hook	1	1	0	1	1	1	*	*	1	1	0	1	1	1	*	*
ETSI	Revert	Idle - on hook	1	1	0	1	1	*	*	*	1	1	0	1	1	*	*	*
		Active - off hook	0	0	0	1	0	0	*	*	0	0	0	1	0	0	*	*
ANSI	Normal	Idle - on hook	0	0	0	0	0	*	*	*	0	0	0	0	0	*	*	*
		Active - off hook	1	1	1	1	1	1	*	*	1	1	1	1	1	1	*	*
ANSI	Revert	Idle - on hook	1	1	1	1	1	*	*	*	1	1	1	1	1	*	*	*
		Active - off hook	0	0	0	0	0	0	*	*	0	0	0	0	0	0	*	*

Table 2-6 Signaling Bits Application (for PCB version C/E only)

2.6 LED Indication

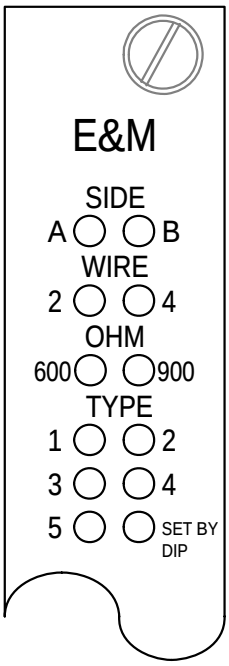
2.6.1 LED on Front Panel

● No Light ○ Green Light ☼ Flashing Red

■ **A SIDE/ B SIDE**

LED		Indication
A	B	
○	●	A side mode
●	○	B side mode
☼	☼	Alarm (Loss SYNC, AIS, RAI) or -48 V power error
●	●	A side, B side switch fail

Table 2-7 LED for A/B Side



■ **2 Wire/ 4 Wire**

LED		Indication
2	4	
○	●	2 Wire mode
●	○	4 Wire mode

Table 2-8 LED for 2 Wire/4 Wire

■ **600 ohm/ 900 ohm**

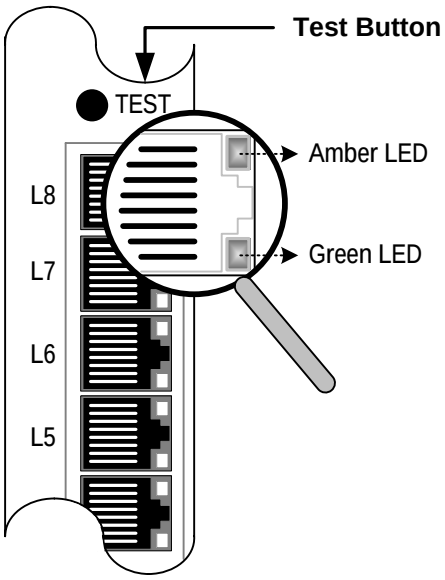
LED		Indication
600	900	
○	●	600 ohm mode
●	○	900 ohm mode

Table 2-9 LED for 600/900 ohm

■ **TYPE**

LED	TYPE 1	TYPE 2	TYPE 3	TYPE 4	TYPE 5	TX only	Test
1 ○ ○ 2	○ ●	● ○	● ●	● ●	● ●	● ●	● ●
3 ○ ○ 4	● ●	● ●	○ ●	● ○	● ●	● ●	● ●
5 ○ ○ SET BY DIP	● ●	● ●	● ●	● ●	○ ●	● ●	● ○

Table 2-10 LED Types



The Function of the Test Button: when you press down the test button, all the ports will be Active Relay (off-hook) and the green LED lights on each port will lit up.

Condition	LED		A Side Mode	B Side Mode
	Amber	Green		
Normal	☐	■	E lead to ground detected	M lead to ground detected
	■	☐	Active Relay: M lead to close	Active Relay: E lead to close.
	■	■	E lead open. M lead open.	M lead open. E lead open.
Test	■	☐	(All ports: L1 to L8) M lead to close.	(All ports: L1 to L8) E lead to close

■ No Light ☐ Light

Table 2-11 LED for E&M ports

2.6.2 LED on PCB Board

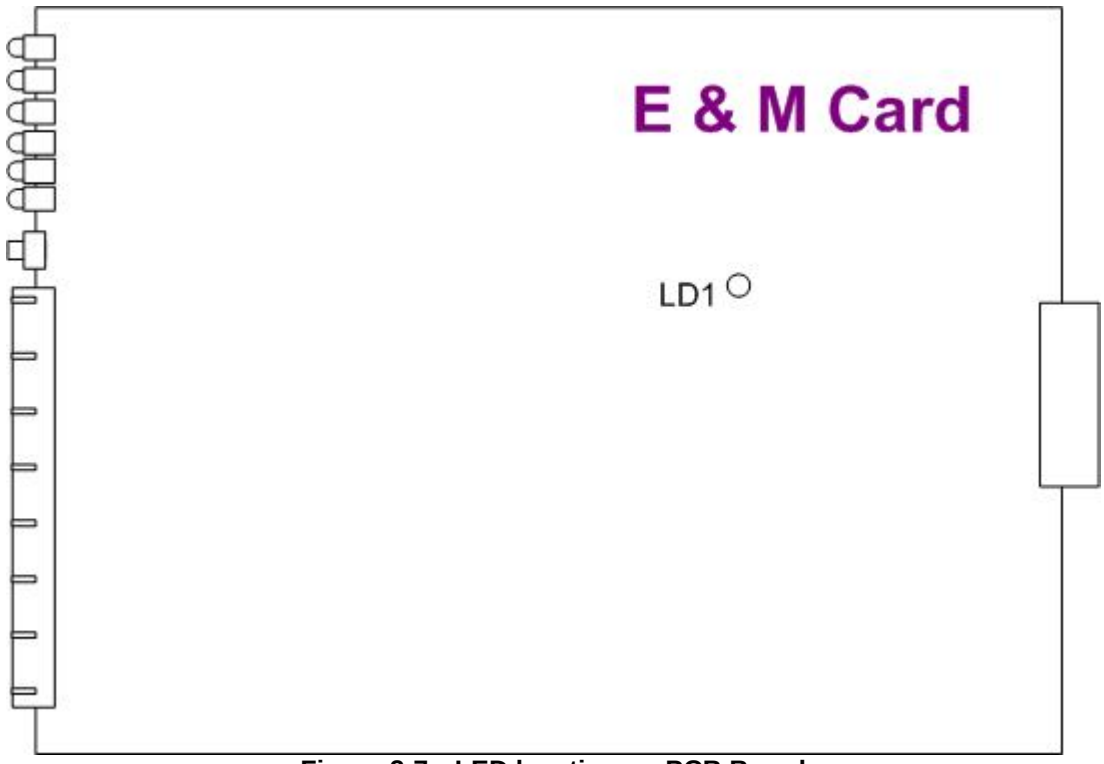


Figure 2-7 LED location on PCB Board

LD1 is the LED light for showing each step under device boot procedure. See below table for the color of the lights and the status they represent.

Steps under Boot Procedure	Time (sec)	LD1
Run flash	1	Dark
Test RAM ok, check bank	4	Red
Load firmware to RAM	15	Dark
Enter firmware	17	Red
Load FPGA	27	Dark
FPGA loading complete	-	Dark

Figure 2-8 LED light indication for device boot procedure

3. E&M Signaling

Transmission and signaling are service components of telephone calls. Transmission is the transport of voice signals between one telephone exchange and another. Signaling allows management of the calls. Signaling involves the functions of (a) request for service, (b) request for dialing, (c) ringing, (d) answer supervision, (e) call monitoring, and finally (f) call termination. During early telephony years, when copper wires were used for trunk lines between telephone exchanges, also called central offices, direct currents in the line were used for signaling. In one direction, "loop open" and "loop closed" were used. In the reverse direction, "normal polarity" and "reverse polarity" battery currents were used.

With the advent of analog carriers, tones replaced dc currents for signaling. The E&M signaling method was designed as a conversion standard between dc currents and tones, which for North American analog carriers was 2600 Hz. Later, for digital carriers, dedicated bits provide the same signaling function.

Below is the signaling direction table. For detailed application please refer to the following sections:

Signaling Direction		A Side		B Side	
A to B	**B to A**	**E lead**	**M lead**	**M lead**	**E lead**
ON HOOK	ON HOOK	OPEN	OPEN	OPEN	OPEN
ON HOOK	OFF HOOK	GROUND	OPEN	OPEN	CLOSE
OFF HOOK	ON HOOK	OPEN	CLOSE	GROUND	OPEN
OFF HOOK	OFF HOOK	GROUND	CLOSE	GROUND	CLOSE

Figure 3-1 E&M Signaling Channel Direction

3.1 Type I E&M Signaling

The original E&M circuit is shown below.

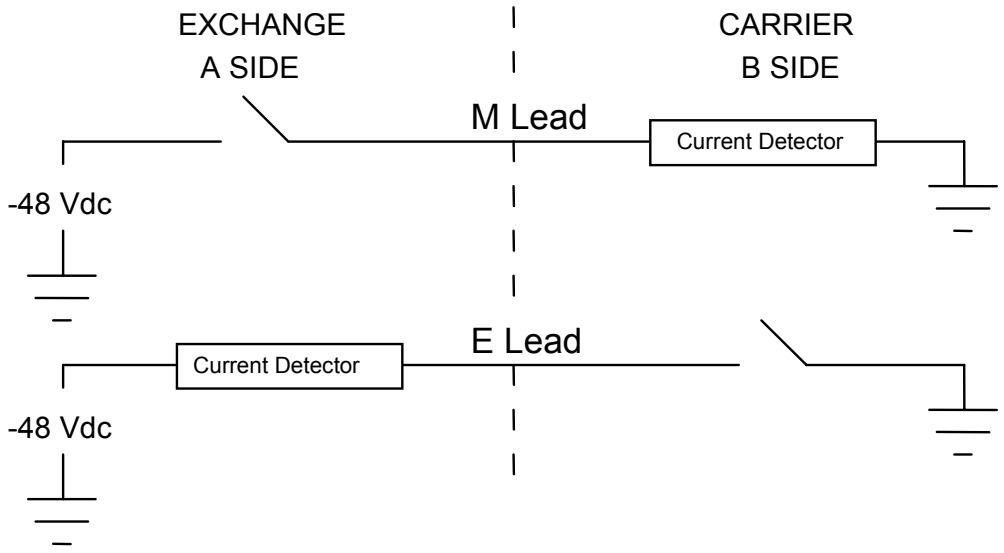


Figure 3-2 Type I E&M Signaling (I)

In a four wire circuit, the leads T and R (tip and ring) designate the pair of wires for transmitting voice signals from the exchange to the carrier. The leads T1 and R1 designate the receiving pair of wires. When two more leads were added for signaling, engineers did not want to repeat the choice of T and R for transmit and receive. Instead, they chose E and M derived from the second syllables within the words "receive" and "transmit". Subsequently, the mnemonics E for "ear" and M for "mouth" became popular.

For simplicity, the voltage sources of -48 V for both E lead and M lead are on the exchange side. On the carrier side, detection of current in the M lead, controlled by a switch on the exchange side, results in sending the 2600 Hz tone for analog carriers and setting the AB bit for digital carriers. On the exchange side, detection of current in the E lead, which results from reception of the 2600 Hz tone or the AB bit, asserts that the distant exchange has sent current in the far end M lead.

In an end-to-end circuit, sending a current in the M lead at the near end results in detection of current in the E lead at the far end. In this way, the two exchanges can "signal" each other, as shown below.

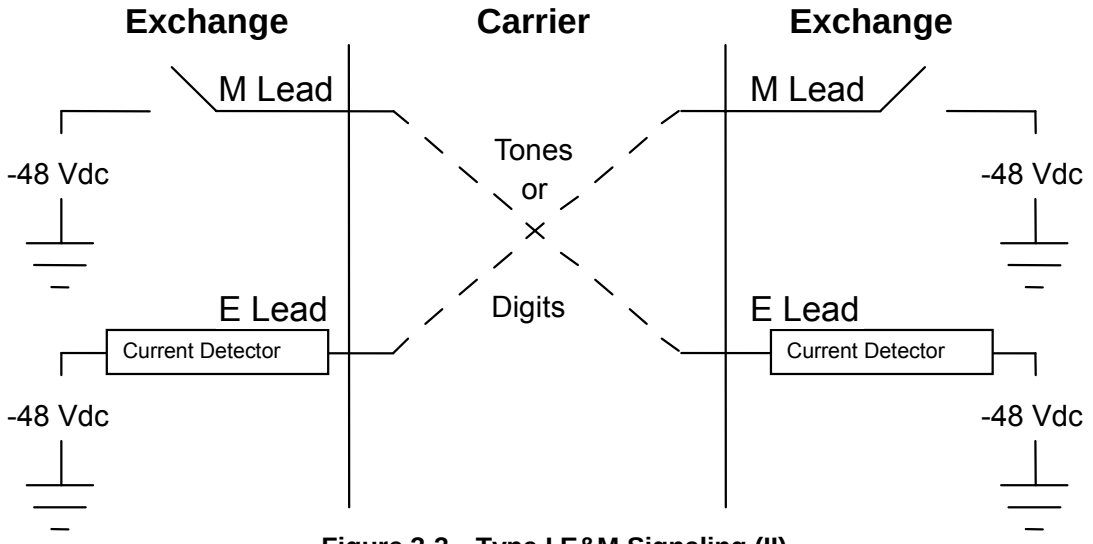


Figure 3-3 Type I E&M Signaling (II)

Because E&M circuits are also used in a tandem connection of two carriers, to avoid confusion in nomenclature, the exchange side and carrier side are also called the A side and B side. For carrier systems, B side is the normal side, while the A side is used in a tandem connection.

3.2 Technical Issues of Type I E&M Signaling

Following initial installation of the E&M circuits, several technical issues surfaced. The solutions to each of these technical issues resulted in variations of the original E&M circuit. These technical issues are as follows.

(1) Because the return current is through the ground connection, when large numbers of E&M circuits are in use, significant ground noise is generated, which affects voice signal quality..

(2) Because the original design is only for exchange to carrier connection, the two sides, A and B, are not symmetric. This causes complications for carrier to carrier connection, as when two carriers are connected in tandem. In such cases, with the original E&M design, one of the carrier interfaces must emulate an exchange.

(3) When the E&M leads are very long, resulting in significant inductance and capacitance, delays in the signaling operation for certain designs can occur.

To address one or more of these issues, derivatives of the original E&M circuit were introduced. These are designated types II to V, with the original E&M designated as Type I.

3.3 Type II E&M

In the first attempt to reduce ground noise, Type II E&M was designed. Starting from the original circuit, the leads connected to the other side of the switches were made to run back parallel to the E and M leads. In this way, ground current is eliminated at the cost of two more wires per circuit.

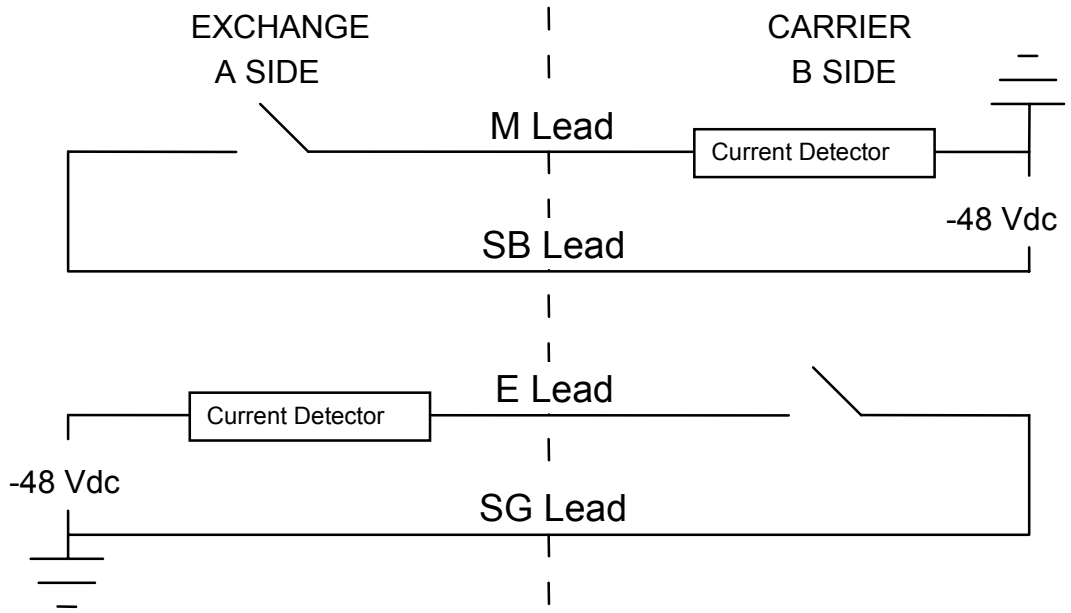


Figure 3-4 Type II E&M Signaling

This design requires the B side, the carrier side, to supply battery. The lead designation SB suggest "signal to battery", while SG suggest "signal to ground".

3.4 Type III E&M

In another variation of E&M, Type III, the SG lead used above is moved to serve as discharge for the M lead. This reduces delay caused by the combination of (a) low current electronic detectors, and (b) long runs of the E and M leads. Because ground currents on the E return would cause noise, Type III is rare.

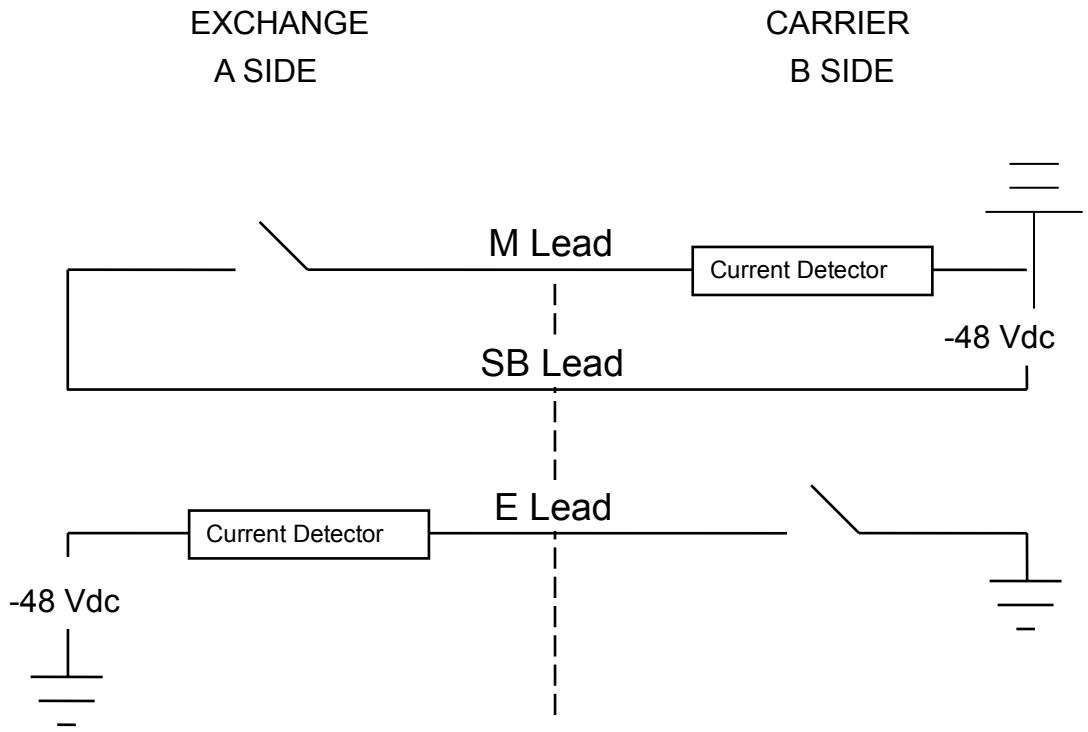


Figure 3-5 Type III E&M Signaling

3.5 Type IV E&M

This E&M circuit provides symmetry. Starting from the Type II circuit, on the B side, the battery and ground are interchanged so that the M circuit is now the mirror image of the E circuit, resulting in a Type IV. In this way, tandem connection of carriers can use the same E&M circuit. Such connections occur often in trunks consisting of a wire line carrier in tandem with a wireless carrier. A "cross-over" cable interconnects the two carriers.

Although still labeled SB, this lead now connects to ground, just like the SG lead.

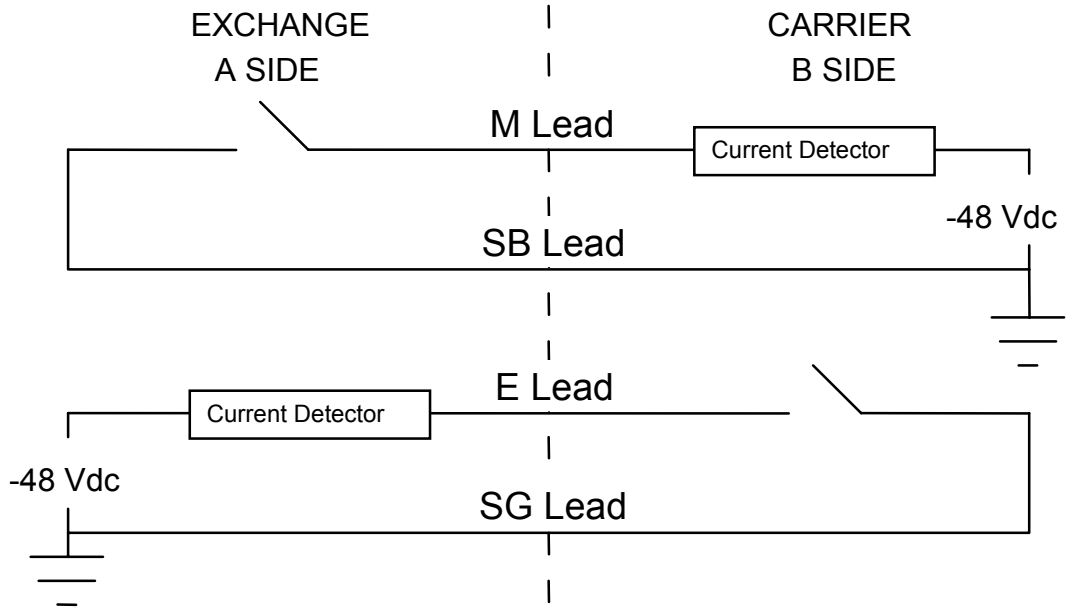


Figure 3-6 Type IV E&M Signaling

3.6 Type V E&M

Finally, for circuits where ground noise is not an issue, but symmetry is desired, the SB and SG leads can be eliminated from the above circuit, resulting in Type V E&M.

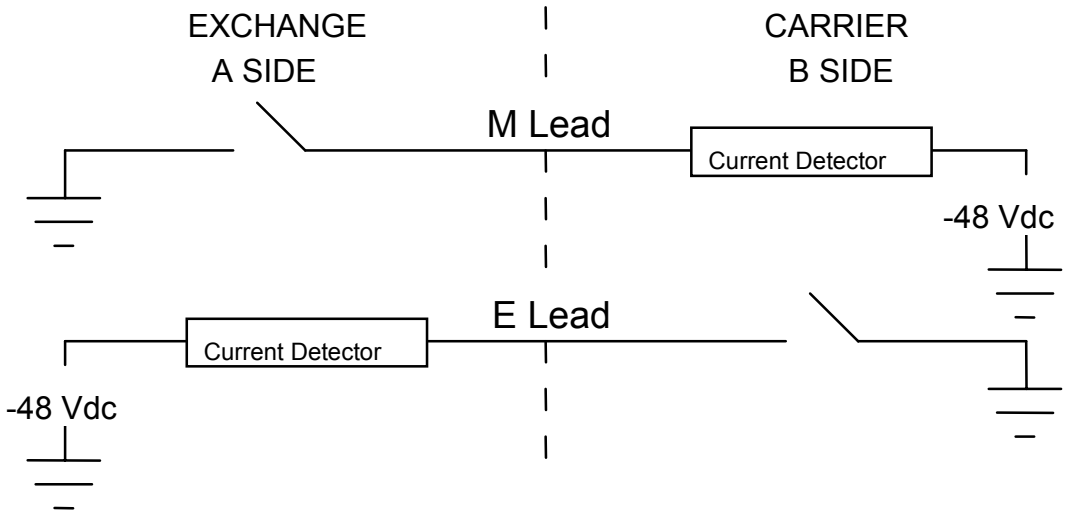


Figure 3-7 Type V E&M Signaling

In this circuit, as in Type IV, the A and B sides are symmetrical, allowing for tandem operation. At sites where carriers meet, the number of such connections is usually small enough not to result in significant ground noise.

With many types of E&M circuits in use, types I to V with A and B sides for each, network designers must insure that at each juncture, between exchange and carrier, and between carrier and carrier, all circuits have matching types and complementary sides. For Loop AM-3440, the E&M plug-in card allows the user to choose the type and side of E&M circuit during the installation process. This permits some trial and error.

4. TERMINAL OPERATION

4.1 E&M Sub-Menu

Under the Controller Menu, press “U” to choose a slot for the E&M port. Then the following screen will show.

```
SLOT 8  E&M                    === Port Menu ===            18:14:49 06/12/2001

Version       : SW V1.00  06/08/2001




[DISPLAY]                                  [SETUP]
C -> System Configuration                   S -> System Setup
I -> E&M Status                             T -> Self Test
                                            G -> Upgrade Firmware


[LOG]                                      [MISC]
U -> Choose Other Slot                      Y -> Unit Load Default Config
F -> Log Off
O -> Log On
E -> Return to Main Menu
```

4.1.1 System Configuration

Press "C" to view the system configuration as below.

For up to version 2.01:

```
SLOT 8  E&M               === System Configuration ===      13:46:32 06/15/2001


Side: A
Above Set by HW

     Line: 4-WIRE
Impedance: 600 ohm
Signaling: TYPE5
Above Set by SW

A/u-Law: A
Tx Gain:  -3.0 dB
Rx Gain:  -3.0 dB
Above Set by SW







<< ESC key to return to previous menu, SPACE bar to refresh >>
```

4.1.2 E&M Status

Press "I" from the port menu to view the E&M status.

For the version 5.01.01:

```
SLOT 1   E&M                      === E&M Status ===            21:15:42 05/03/2011


Side: A


E-Lead:   E1   E2   E3   E4   E5   E6   E7   E8
M-Lead:   M1   M2   M3   M4   M5   M6   M7   M8

M,SB Lead -48V: OK
UpLink Status : OK
Test Button   : Avaiable


<< press ESC key to return to main menu, SPACE key to refresh >>
```

Field	Status	Note
M, SB Lead -48V	OK, FAILURE	When it shows failure, it means either M or SB lead -48V is faulty.
UpLink Status	OK, FAILURE	The status indicates the current transmission status of E1/T1 signal.
Test Button	Available, Unavailable	It shows the test function is enable or disable. It is set by jumper; refer to jumper setting section for detail.

M Lead should be -48V for Type 1 in Site A. SB Lead should be -48V for Type 2 or Type 3 in Site B.

For version 4.02.02 up to 5:

```
SLOT 8   E&M                      === E&M Status ===            13:47:18 06/15/2001


Side: A


E-Led:   E1   E2   E3   E4   E5   E6   E7   E8
M-Led:   M1   M2   M3   M4   M5   M6   M7   M8

-48V Power: OK




<< press ESC key to return to main menu, SPACE key to refresh >>
```

4.1.3 System Setup

Press "S" from the main menu to setup the system.

For up to version 2.01:

```
SLOT 8  E&M              === System Configuration ===      13:46:32 06/15/2001


Side: A
Above Set by HW

     Line: 4-WIRE
Impedance: 600 ohm
Signaling: TYPE5
Above Set by SW

A/u-Law: A
Tx Gain:  -3.0 dB
Rx Gain:  -3.0 dB
Above Set by SW









<< ESC key to return to previous menu, SPACE bar to refresh >>
```

For version 2.02.01 up to 3:

```
SLOT 8  E&M                    === System Setup ===          01:31:01 06/05/2001
ARROW KEYS: CURSOR MOVE, TAB: ROLL OPTIONS

     Side: A ( Set by HW )

  A/u-Law: A
     Line: 4-WIRE
Impedance: 600 ohm
Signaling: TYPE5

               L1    L2    L3    L4    L5    L6    L7    L8
TxGain(D-A):   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0 (-16 ~ + 7 in dB)
RxGain(A-D):   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0 (-16 ~ + 7 in dB)
ALL Tx/Rx Gain = L1 : NO

Tx Signaling Bit ( Set by HW )          Rx Signaling Bit ( Set by HW )
        ON HOOK : 0   0   0   1                 RELAY OPEN  : 0   *   *   *
       OFF HOOK : 1   1   0   1                 RELAY CLOSE : 1   1   *   *

Trunk condition : ON HOOK  ( Set by HW )



<< Press ESC key to return to previous menu >>
```

For version 3.01.01 up to 5:

```
SLOT 8  E&M                    === System Setup ===          01:31:01 06/05/2001
ARROW KEYS: CURSOR MOVE, TAB: ROLL OPTIONS

     Side: A ( Set by HW )

  A/u-Law: A
     Line: 4-WIRE
Impedance: 600 ohm
Signaling: TYPE5

               L1    L2    L3    L4    L5    L6    L7    L8
TxGain(D-A):   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0 (-10 ~ + 7 in dB)
RxGain(A-D):   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0 (-10 ~ +14 in dB)
ALL Tx/Rx Gain = L1 : NO

Tx Signaling Bit ( Set by HW )          Rx Signaling Bit ( Set by HW )
        ON HOOK : 0   0   0   1                 RELAY OPEN  : 0   *   *   *
       OFF HOOK : 1   1   0   1                 RELAY CLOSE : 1   1   *   *

Trunk condition : ON HOOK  ( Set by HW )



<< Press ESC key to return to previous menu >>
```

For E&M card version 5.01.01 and controller card version 8.16.1

```
SLOT 1  E&M                    === System Setup ===          21:27:02 05/03/2011
ARROW KEYS: CURSOR MOVE, TAB: ROLL OPTIONS

     Side: B ( Set by HW )

  A/u-Law: A
     Line: 4-WIRE
Impedance: 600 ohm
Signaling: TYPE5

               L1    L2    L3    L4    L5    L6    L7    L8
TxGain(D-A):   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0 (-16 ~ + 7 in dB)
RxGain(A-D):   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0 (-16 ~ +14 in dB)
ALL Tx/Rx Gain = L1 : NO

Tx Signaling Bit ( Set by HW )          Rx Signaling Bit ( Set by HW )
        ON HOOK : 0   0   0   1                 RELAY OPEN  : 0   0   *   *
       OFF HOOK : 1   1   0   1                 RELAY CLOSE : 1   1   *   *

Trunk condition : NA        ( Set by HW )



<< Press ESC key to return to previous menu >>
```

Field	Status	Note
Trunk condition	NA, ON HOOK, OFF HOOK	It is determined on order.

The trunk condition on hardware H is setting by jumper; please refer to jumper section for detail.
NA means either the S4 is jumper on or there is no jumper on on-hook/off-hook. Detail refers to Jumper Setting section.

Note: In general, the default of TxGain and RxGain should be 0.0.

When the TxGain (D-A) and RxGain (A-D) on System Setup screen shows -6.0 or +6.0. It is happen only when the controller version is 8.16.01 to replace the old to new or new to old version of E&M card in the same plug-in slot after initialized the first card.

Press **Esc** key back to “Port Menu” screen and then press **Y -> Unit Load Default Config**. Then the Gain value on the System Setup screen will return back to 0.0 in the setup screen.

4.1.4 Self Test

Press "T" from the main menu to enter in the following screen. When the "Self Test" screen shows, press SPACE to start the self-test.

```
SLOT 8  E&M                    === Self Test ===              18:12:57 06/12/2001


Side: A
Test Button: START  9

E-Led:  E1  E2  E3  E4  E5  E6  E7  E8
M-Led:  M1  M2  M3  M4  M5  M6  M7  M8

-48V Power: OK









<< Press SPACE key to push Test Button  >>
<< press ESC key to return to main menu >>
```

4.1.5 Upgrade Firmware

Press “G” from the Port Menu to download firmware. You will see the firmware bank information on the screen. Type in the TFTP server IP and the firmware file name. Then, press ENTER to download the firmware.

```
LOOP AM3440-A                 === Upgrade Firmware ===                14:04:25 06/08/2009
ARROW KEYS: CURSOR MOVE, Please Input: nnn.nnn.nnn.nnn, BACKSPACE to edit

Bank 1 Firmware Ver. : V2.01.01 05/24/2009  (Good)
Bank 2 Firmware Ver. : V2.01.01 05/24/2009  (Good)
Working Firmware Bank: 2

TFTP Server IP       : 000.000.000.000
Firmware File Name   :









<< press ESC key to return to main menu >>
```

4.1.6 Unit Load Default Config

Press "Y" to return to default.

```
SLOT 8  E&M                    === Port Menu ===              18:14:49 06/12/2001



>> Return to default - are you sure ? [Y/N]
```