

TC8614

4 CH. 600Ω Analog & Dry Contact over T1/E1 Multiplexer

User Manual
MNL-86140-01-09



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Record of Revisions

Revision	Date	Description of Changes
1.0	01/13/15	Initial Release of TC8614.
1.1	08/17/16	Add E1 Support. 2-Channel 4 Wire / 2-Channel 2-Wire mix option
1.2	12/12/16	Adding additional Power Supply LED information. Added E1 impedance information. Added T1/E1 local loopback test procedure. Added Chassis Ground information. Typo fixes.
1.3	04/26/17	Updated Front Panel with AIS and RAI alarm indicators. Added Internal Clock diagrams. Updated images (PCB layout, product image, line drawings).

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Revision	Date	Description of Changes
1.4	06/02/17	Updated product photos. Updated LED definitions front and rear panels. Added Latched Alarm section. Added remote unit status and remote unit reset section. Add Appendix C for R2 ("Reset Too") push button and LED funtions. Move old Appendix C to Appendix D.
1.5	12/06/2018	Added Appendix C.3 CSU Loop Operation.
1.6	05/31/2019	Updated Rear panel LED definitons. Updated RMTLB Dip switch funtion description.
1.7	08/26/2019	Added Appendix D Bridge Conference Group Setup.
1.8	09/11/2020	Updated rear panel dip switches. Removed unneeded sections Chapter 4. Added 4U Chassis to Appendix A. Added alternate front panel LED definitions
1.9	08/30/2023	Update E1 timeslot numbering usage.

Guide to Alert Symbols

These alert symbols are used in Caution, Warning, and Danger notes.





Symbol	Meaning
	Pinching or crushing hazard
	Electrical hazard.
	Equipment alert: be careful of damage from static electricity
	General alert: used for all other hazardous conditions (referring to people, not equipment).

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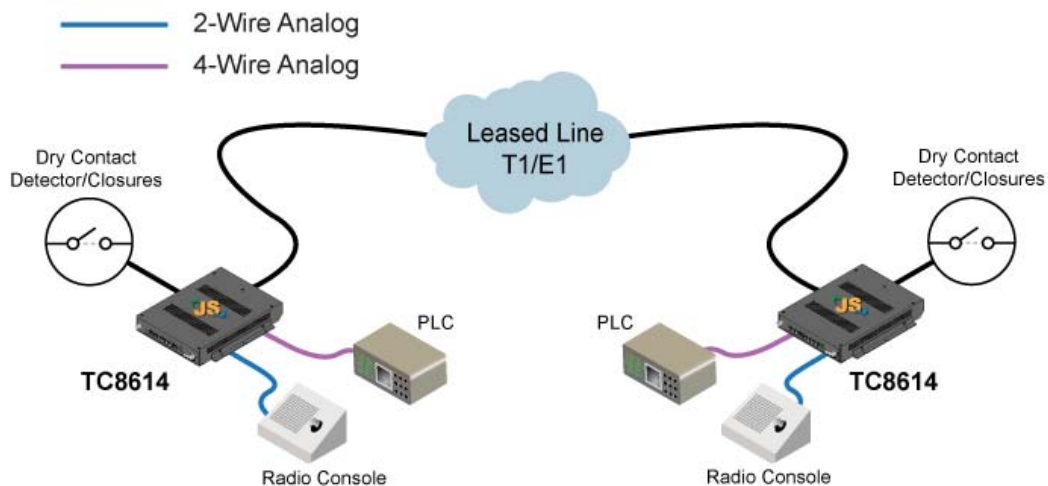
- *Product Description*, on page 1-1
- *Specifications*, on page 1-9

1.1 General Information

This manual is intended to describe the features and functionality in addition to aiding in the planning, configuring, commissioning and maintaining of the TC8614 600Ω Analog & Dry Contact-over-T1/E1 multiplexer.

1.2 Product Description

The TC8614 is a 4-channel 600Ω Analog & Dry Contact-over-T1/E1 Multiplexer that allows network managers the flexibility of leveraging their existing T1/E1 circuits by adding low cost analog or dry contact links as needed. It is economical, simple to install and comes standard with built-in power redundancy.



The TC8614 is available in three configurations:

- 4-Channel 2-Wire Analog with 4-Channel Dry Contact
- 4-Channel 4-Wire Analog with 4-Channel Dry Contact
- 2-Channel 4-Wire / 2-Channel 2-Wire Analog with 4-Channel Dry Contact

Diagnostics are extensive and include DIP switches for Local & Remote Loopback and other application configuration switches. Each unit also provides multiple LEDs for Alarm, Power, Vcc, T1/E1 Status, and RX/TX or DET/RLY LEDs for each channel.

The built-in Sync mechanism verifies both device and T1/E1 link operation. No other test equipment is required for link and device verification.

The TC8614 is compatible with standard 100 Ω T1 for copper line lengths up to 3000ft and up to 2.5km for 75 Ω / 120 Ω E1 (copper line length is the distance between the TC8614 and the T1/E1 cross-connect). The T1/E1 uses a RJ-48F connector and the analog and dry contact channels use RJ-11 connectors. Optional BNC adapter cable is available for 75 Ohm E1. Power is 12VDC standard or optional 24VDC, -48VDC, 125VDC, or 115/230VAC with an external power cube. Optionally, a high temperature version (-20°C to 70°C) and extreme temperature version (-40°C to 80°C) are also available.



Figure 1-1 TC8614 600Ω Analog & Dry Contact Over T1/E1 Multiplexer

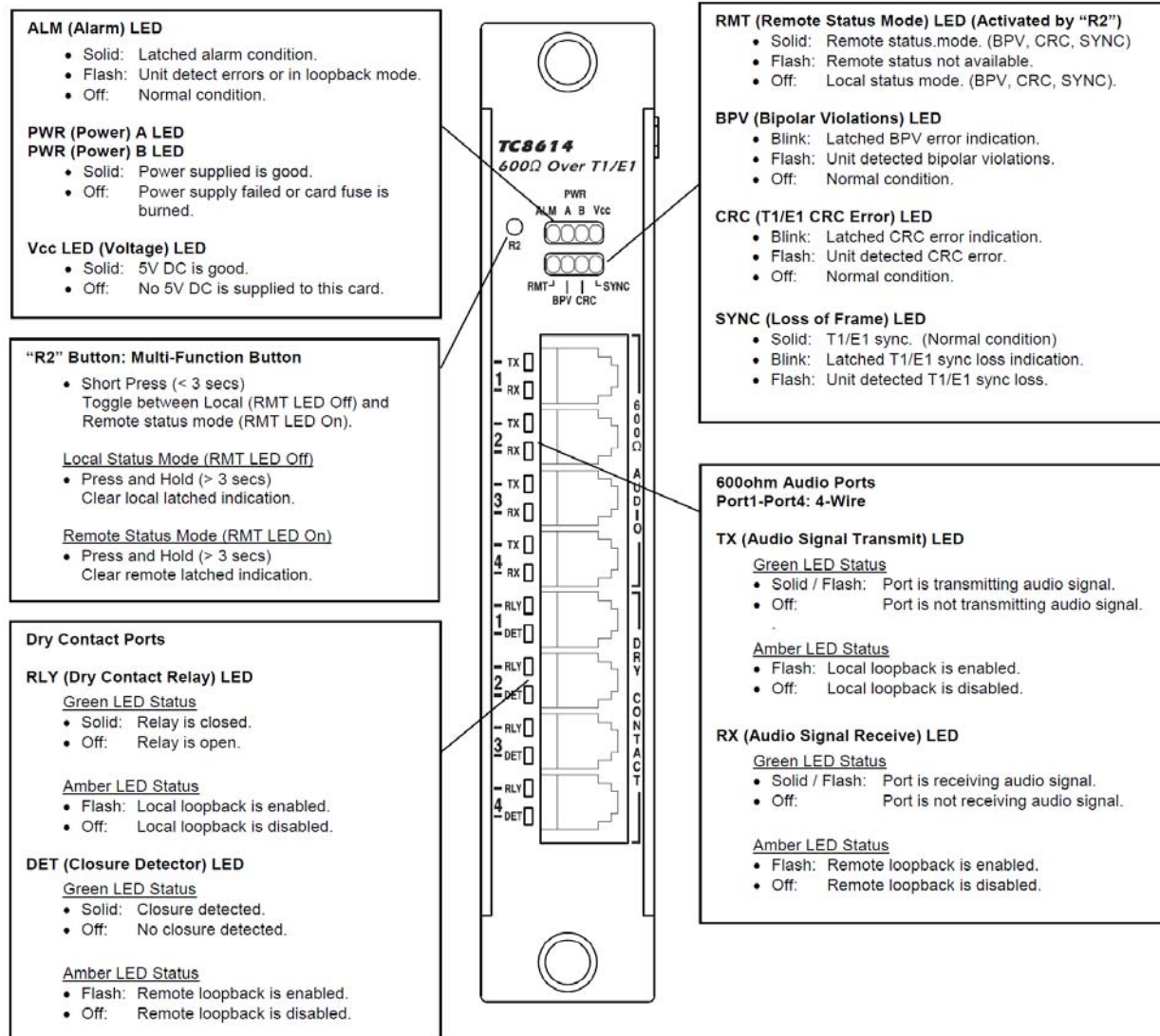


Figure 1-2 TC8614 Front Panel LED Definitions (4-Wire Audio & Dry Contact)

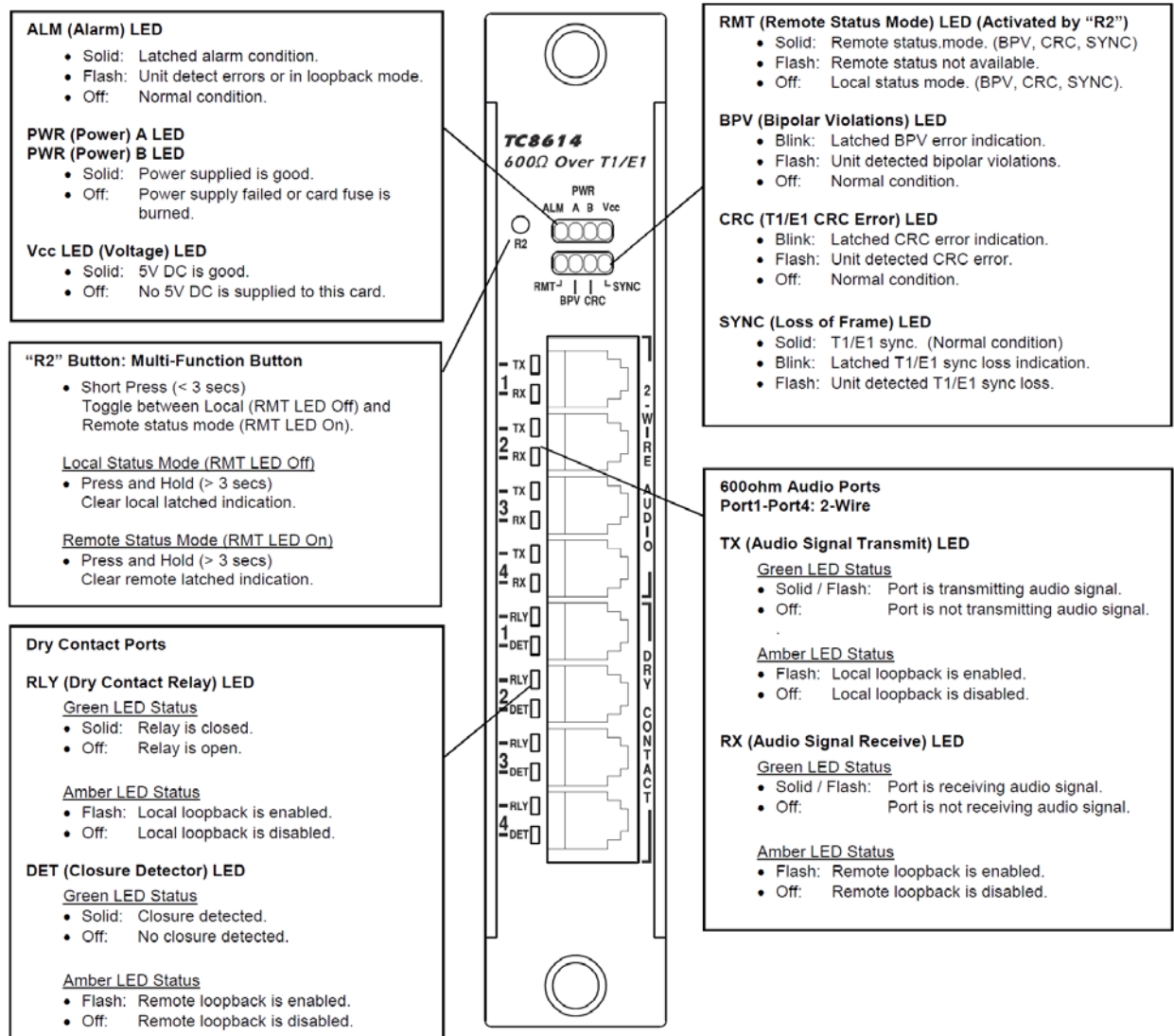


Figure 1-3 TC8614 Front Panel LED Definitions (2-Wire Audio & Dry Contact)

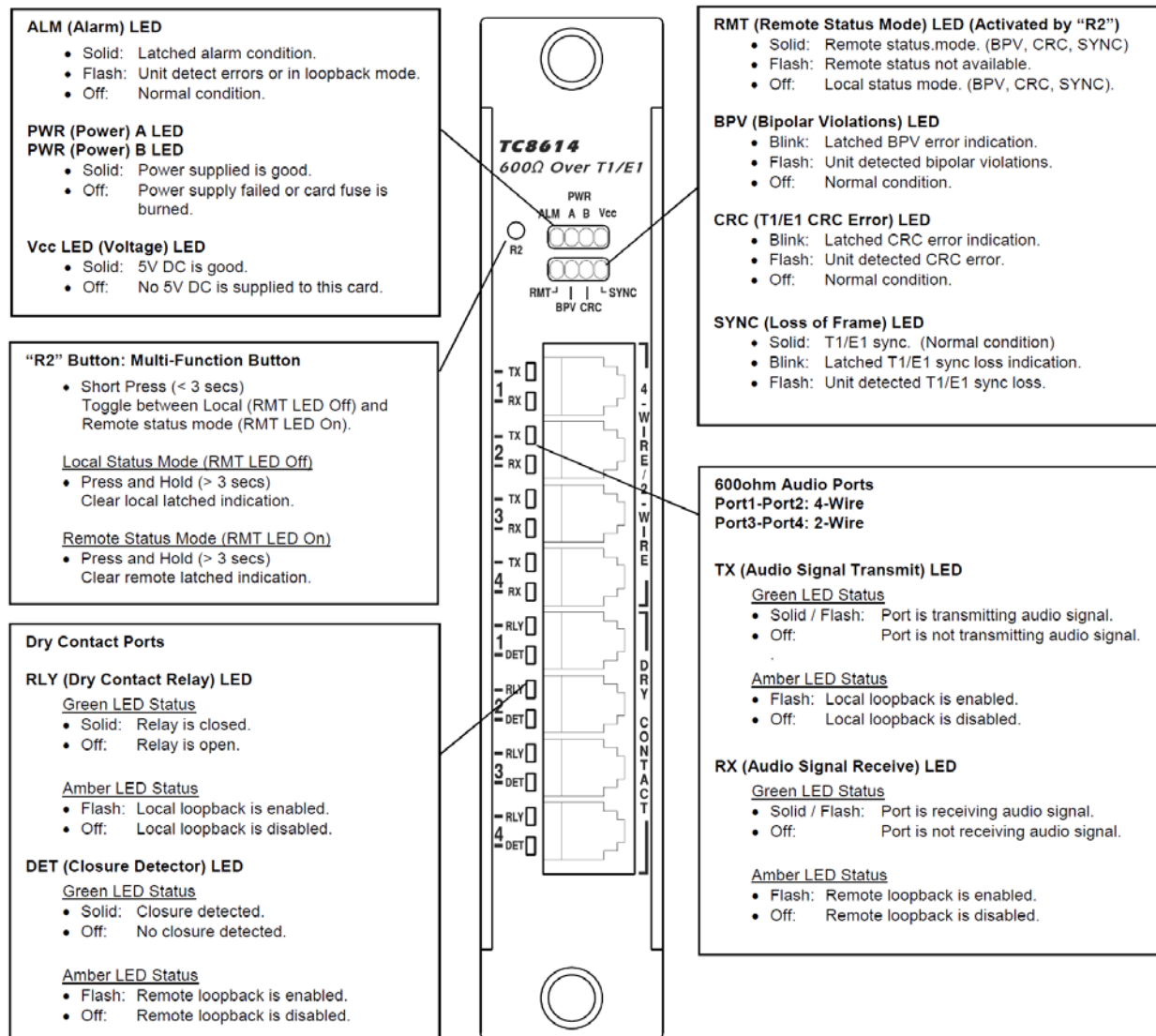


Figure 1-4 TC8614 Front Panel LED Definitions (4-Wire/2-Wire & Dry Contact)

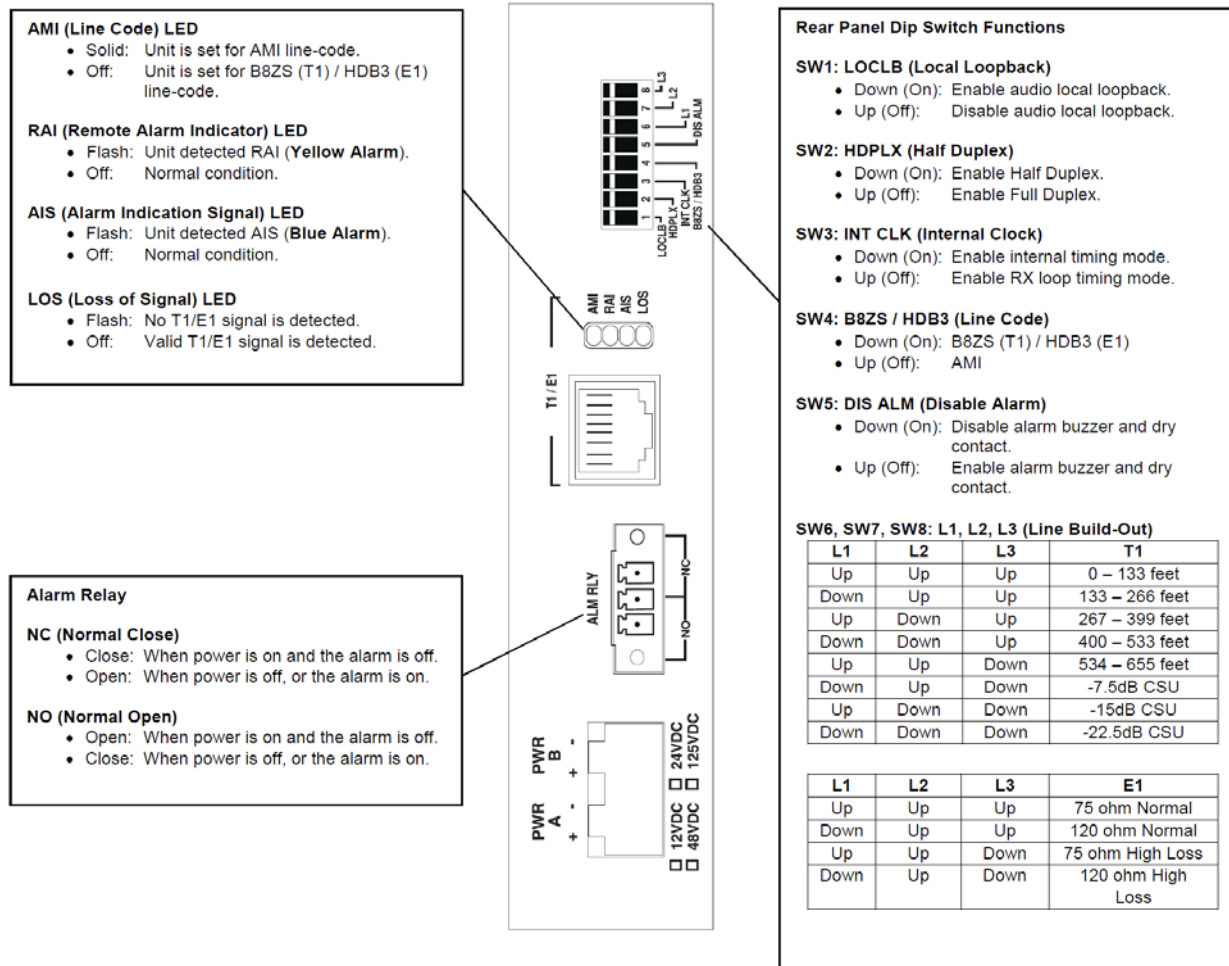


Figure 1-5 TC8614 Rear Panel LED Definitions

1.2.1 Features

- 4-channel 600Ω Analog & 4-channel Dry Contact
- Two or Four Wire Analog
- T1 Features:
 - ESF Framing Support (SF Framing, Optional)
 - Supports Line Length up to 3000ft (T1)*
 - 24 timeslots (DS0) 1-24. TC8614 utilizes timeslots 1, 7, 12, 13, 19, and 24
- E1 Features:
 - Supports Line Length up to 2.5km
 - PCM31C Framing Support (PCM30, PCM30C, PCM31 Optional)
 - 32 timeslots 0-31. TC8614 utilizes timeslots 1, 8, 15, 17, 24, and 31

- Very Low Latency
- Dry contact detectors with Isolated Ground
- LEDs for "RX/TX" or "DET/RLY" (to monitor each channel's analog and dry contact signal status)
- LEDs for "SYNC", "AMI", "BPV", "LOS", "AIS", "RAI", "CRC" (to monitor each T1/E1 channel status)
- LEDs for "PWR A," "PWR B," "Vcc," & "ALM" (to monitor each unit's power supply and alarm condition status)
- Built-in Power Redundancy
- Diagnostic DIP Switches for Local Loopback, and T1/E1 Loopback Tests.
- Both half duplex and full duplex supported
- Rack Mount or Stand Alone

**Note: For line lengths beyond 655ft additional testing is required.*

1.2.2 Applications

The TC8614 600Ω Analog & Dry Contact-over-T1/E1 Multiplexer is typically used to link or extend various 600Ω analog, audio and intercom devices (e.g. FSK modems, E&M, teleprotection relay controllers, etc.) and dry contacts over existing T1/E1 links. It is also used as a backup network to ensure business continuity.

It is also used to improve voice quality and increase system reliability in harsh environments, to replace unreliable leased phone circuits and to stabilize voice level settings for 600Ω audio channels.

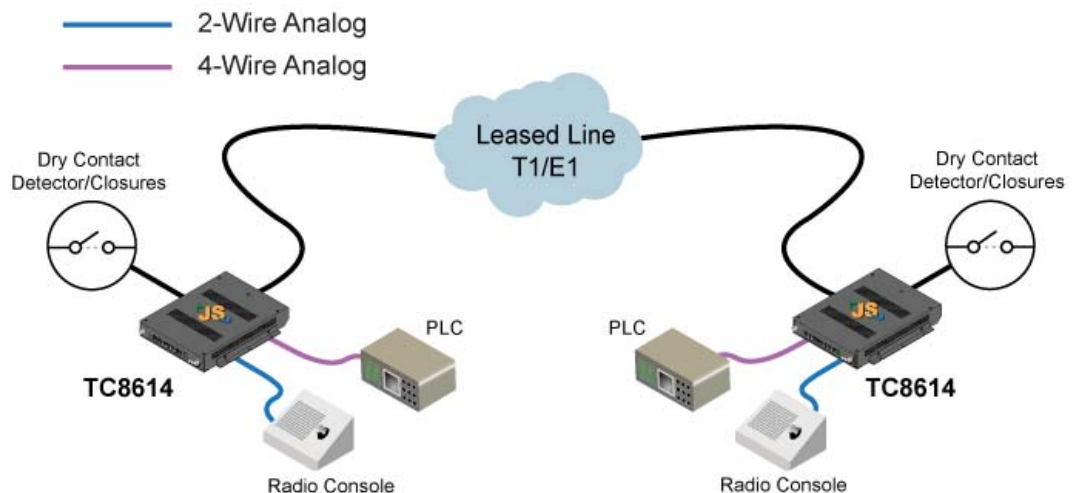


Figure 1-6 Typical Application using the TC8614

1.3 Specifications

Connection Capacity	
600Ω (2/4-Wire)	4 ports
Dry Contact	4 ports

Electrical	
Analog/Dry Contact Connector	RJ-11
T1/E1 Connector	RJ-48F
Impedance	600Ω

Dry Contact Interface Specification	
Normal open	Standard
Normal close	Optional
Load Voltage (peak AC)	60V
Load Voltage (DC)	60V
Continuous load current	0.55A
Peak load current	1.2A
Max On Resistance	2.5Ω
Output Capacitance	150pF

System	
Bit Error Rate	1 in 10 ⁹ or better
Visual Indicators	PWR A, PWR B, Vcc, ALM, SYNC, AMI, BPV, LOS, AIS, RAI, CRC, RMT RX (1 each 600Ω Audio Ports 1-4) TX (1 each 600Ω Audio Ports 1-4) DET (1 each Dry Contact Ports 1-4) RLY (1 each Dr Contact Ports 1-4)
Diagnostic Functions	Local Loopback, Remote Loopback, and T1/E1 Loopback

Power Source	
Standard	12VDC @200mA (2.4 Watts)
Optional	24VDC, -48VDC, 125VDC, or 115/230VAC with an external power cube

Temperature	
Operating	-10°C to 50°C
(Optional Hi-Temp Version)	-20°C to 70°C
(Optional Extreme-Temp Version)	-40°C to 80°C
Storage	-40°C to 90°C
Humidity	95% non-condensing

Physical (Standalone Unit)	
Height	(3.53 cm) 1.40"
Width	(18.14 cm) 7.20"
Depth	(24.89 cm) 9.80"
Weight	(907g) 2.0 lbs.

Physical (Rack mount 1U "Pizza Box" with two cards)	
Height	(4.45 cm) 1.75"
Width	(48.26 cm) 19"
Depth	(22.86 cm) 9"
Weight	(1.86 Kg) 4.1 lbs.

In this chapter:

- *Power Supply*, on page 2-2
- *System Configuration*, on page 2-3

2.1 General Information

The installation section describes how to:

- Unpack the unit
- Ensure an optimum site location
- Install the power supply and dry contact connection

2.2 Unpacking

Before unpacking any equipment:

- Inspect all shipping containers for evidence of external damage caused during transportation
- Inspect for damage after it is removed from the containers

IMPORTANT



Any claims concerning shipping damage should be made directly to the pertinent shipping agencies. Any discrepancies should be reported immediately to the Customer Service Department at TC Communications, Inc. at (949) 852-1973.

2.3 Equipment Location

The TC8614 should be located in an area that provides adequate light, work space and ventilation.

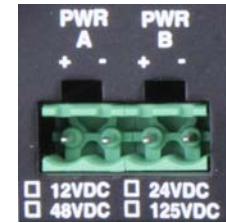
Important

Avoid locating it next to any equipment that may produce electrical interference or strong magnetic fields, such as elevator shafts or heavy duty power supplies.

As with any electronic equipment, keep the unit from excessive moisture, heat, vibration and freezing temperatures.

2.4 Power Supply

The TC8614 can be powered by external DC power. Available power options are 12 VDC, 24 VDC, -48 VDC, and 125 VDC. There are two terminal block connectors labeled "PWR A" and "PWR B" only one is required to power up the unit. Since each TC8614 card is equipped with a power redundancy capability, the power LEDs on the front panel will light according to which power jack (A or B) is connected. Both LEDs will light when power redundancy is utilized.



Important

Read and only connect a supply voltage that corresponds to the type plate of your device. Make sure that the contact load capacity of the signal contact is not exceeded.

2.5 Dry Contact Alarm Relay (DCAR)

A terminal block connector at the rear panel provides for the Dry Contact Alarm Relay. This relay can be used in NO (Normal Open) or NC (Normal Close) configuration.

When used in NO (Normal Open) configuration, the relay will close if the unit loses power completely or the Alarm is on. The relay remains open during normal operation.

When used in NC (Normal Close) configuration, the relay will open if the unit loses power completely or the Alarm is on. The relay remains close during normal operation.

2.6 System Start Up

Apply the power by plugging the power plug into a power jack (both PWR A & PWR B for dual power units).

After power is applied, all LEDs (except PWR & VCC LEDs) will flash momentarily and the following LED status should be observed from the front and back panels:

1. The Power "A" and/or "B" and VCC LEDs should be lit.

Note: TC8614 cards installed in the 1U rack chassis will not show the PWR A LED in the "On" lit state and will be Off. This is normal and the power to the card will be monitored by the VCC LED being "On" lit.
2. The "AMI" LED on the rear panel will be Lit or Off depending on the setting of the rear panel DIP switch SW4. The LED will be Lit when SW4 is "Off" (Up) position, set for AMI. The LED will be Off when SW4 is "On" (Down) position, set for B8ZS (T1) or HDB3 (E1).

3. The "ALM" and "SYNC" LEDs on the front panel will be flashing indicating that the T1/E1 connection is not established. This is normal when T1/E1 connection has not been established.

2.7 System Configuration

The TC8614 has been pre-tested and switches have been set per factory specifications.

2.7.1 Front Panel (Analog & DCCD Pin Assignments)

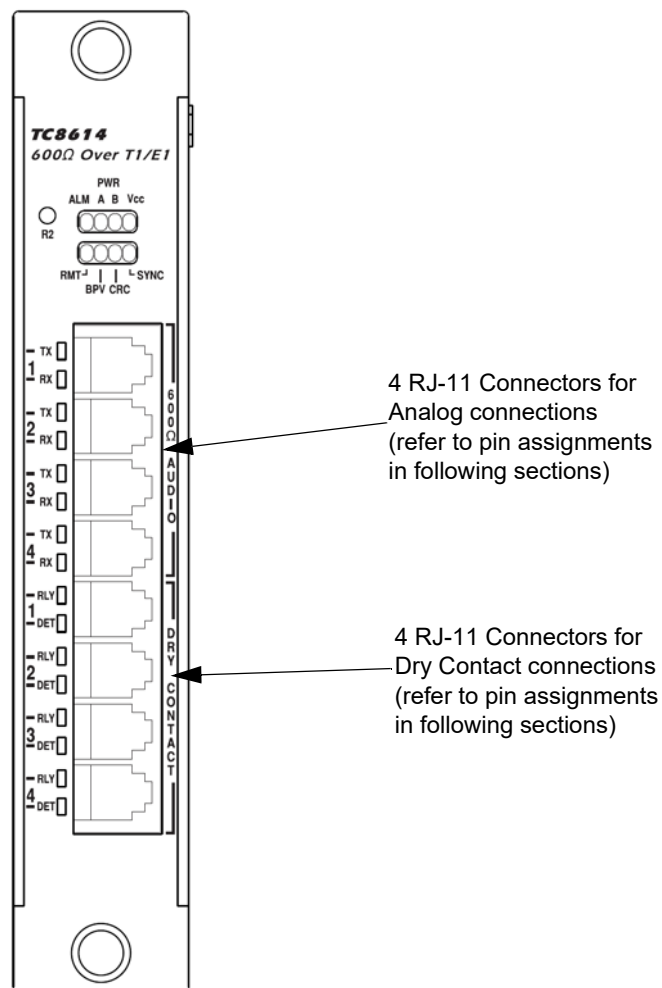
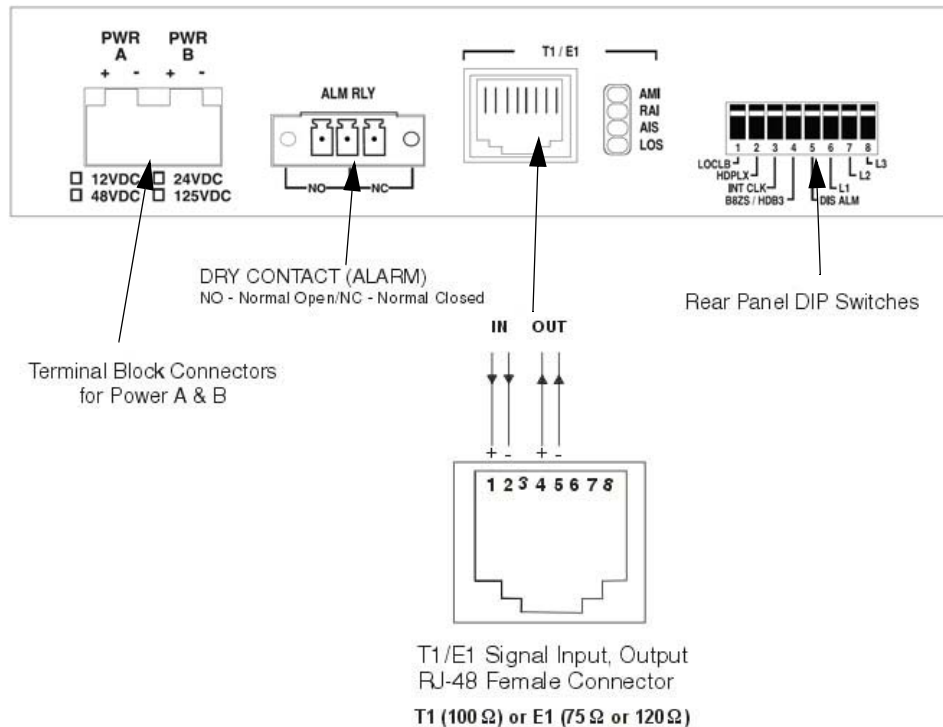


Figure 2-1 TC8614 Front Panel Analog & Dry Contact Connectors

2.7.2 Rear Panel (T1/E1 RJ-48F Connector & Pin Assignments)

An RJ-48 female connector is provide on the rear panel for the connection of the T1/E1 wire pairs. When viewing the RJ-48F connector, the left pair (Pin # 1 & 2) of the RJ-48F connector are for T1 or E1 signal going into the TC8614 (receive), while the right pair (Pin # 4 & 5) of the RJ-48F connector are for the transmit signal coming out of the unit, refer to diagram below.

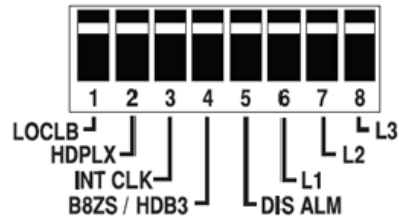


Note 1: The T1/E1 signal use the same pin connections on the RJ-48 female connector.

Note 2: The T1/E1 signal is bipolar, independent of the polarity.

Figure 2-2 TC8614 Rear Panel T1/E1 Connector & Pin Assignment

2.7.2.1 Rear Panel DIP Switch Functions



The DIP switch functions on the TC8614 are described below. To activate the function, set the appropriate switch to the “On” (Down) position.

- **LOCLB:** Local Loopback. This switch (SW1) initiates the Local Loopback function. The analog signals are received on the “RX Data” pins and looped back to the “TX Data” pins for diagnostic testing.
- **HDPLX:** Half Duplex. This switch (SW2) initiates the Half Duplex function. “On” for half duplex mode. “Off” for full duplex mode.
- **INT CLK:** Internal Clock. This switch (SW3) is used to setup the T1 timing mode. “On” for internal timing mode. “Off” for RX loop timing mode.
- **B8ZS /HDB3:** This switch (SW4) is used to setup the T1/E1 Line Code. “On” for B8ZS(T1) or HDB3(E1). “Off” for AMI.
- **DIS ALM:** This switch (SW5) is used to disable the audio buzzer and dry contact alarm relay. “On” (Down) position disables the buzzer and relay. “Off” enables the buzzer and relay. “DIS ALM” dip switch should be in “Off” under normal condition.
- **L1, L2, L3:** These switches (SW6, SW7, & SW8) are used to set the T1/E1 crossconnect distance (copper line build-out/impedance).

For example, in a T1/E1 application, this is the length of twisted pair cable connecting the TC8614 to the user's equipment, which may be a CSU or DSU. See Table 2-1 and Table 2-2 below.

Table 2-1: Copper Line Length Setup Table

T1 Settings			
L1	L2	L3	Application Line Length
Up	Up	Up	DSX-1 (0 to 133 feet) / 0 dB CSU
Down	Up	Up	DSX-1 (134 to 266 feet)
Up	Down	Up	DSX-1 (267 to 399 feet)
Down	Down	Up	DSX-1 (400 to 533 feet)
Up	Up	Down	DSX-1 (534 to 655 feet)
Down	Up	Down	-7.5 dB CSU

T1 Settings			
Up	Down	Down	-15 dB CSU
Down	Down	Down	-22.5 dB CSU

Table 2-2: E1 Termination Setup Table

E1 Settings			
L1	L2	L3	Application Termination
Up	Up	Up	75 Ohm Normal
Down	Up	Up	120 Ohm Normal
Up	Up	Down	75 Ohm High Loss
Down	Up	Down	120 Ohm High Loss

2.7.3 Electrical Signal Interface Connection & Pin Assignments

The RJ-11 connectors are located at the front panel of the TC8614.

2.7.3.1 600Ω Analog Connections

These ports allow you to transport the 600Ω (2/4 Wire) signals over T1/E1.

RJ-11 600Ω Analog 4-Wire Port Pin Assignment	
1	N/A
2	Input RING
3	Output RING
4	Output TIP
5	Input TIP
6	N/A

RJ-11 Jack

RJ-11 600Ω Analog 2-Wire Port Pin Assignment	
1	N/A
2	N/A
3	Input/Output
4	Input/Output
5	N/A
6	N/A

RJ-11 Jack

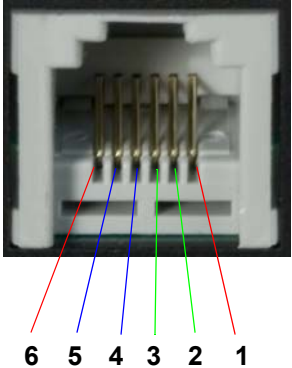
Important

When 2-Channel 4-Wire / 2-Channel 2-Wire Analog is ordered, 4-Wire is always on Channel 1 & 2, 2-Wire will be on Channel 3 & 4.

2.7.3.2 Dry Contact Ports

For dry contact closure applications, the TC8614 can be used as either the Closure Detector or Relay depending on which pins are used.

By default, the dry contact Relay will open when T1/E1 link is not in sync.
(Optional factory setting: Dry contact Relay will retain the last good state when T1/E1 link is not in sync.)

RJ-11 Dry Contact Relay Pin Assignment		
Pin	Connection	RJ-11 Jack
1	N/A	
2	Relay	
3	Relay	
4	Detector	
5	Detector GND	
6	N/A	

- The Closure Detector side has a dry contact closure detector.
- The Receiver side has a dry contact Relay.

The Close or Open status is controlled by a relay switch inside the card. It reflects the remote detector's status. The virtual pin connections allow the TC8614 to be used as either a closure detector or a dry contact relay. (See *Dry Contact Closure Detector*, on page 2-9)

- The RJ-11's pins 4 and 5 are closed at the closure detector side, the status is reflected at the remote relay side of the RJ-11's pins 2 and 3.
- The Relay switch is rated 1.5A DC maximum switching current with a maximum voltage of 60 VDC. (See *Specifications*, on page 1-9.)

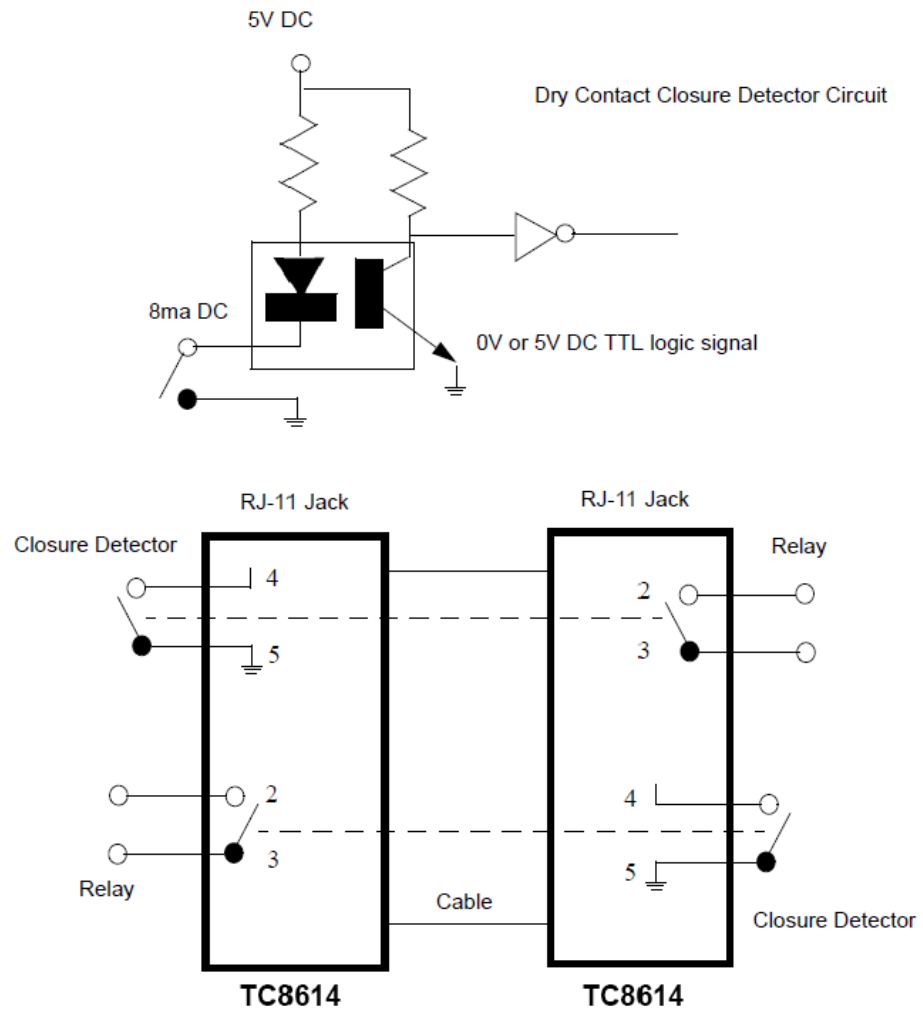


Figure 2-3 Dry Contact Closure Detector

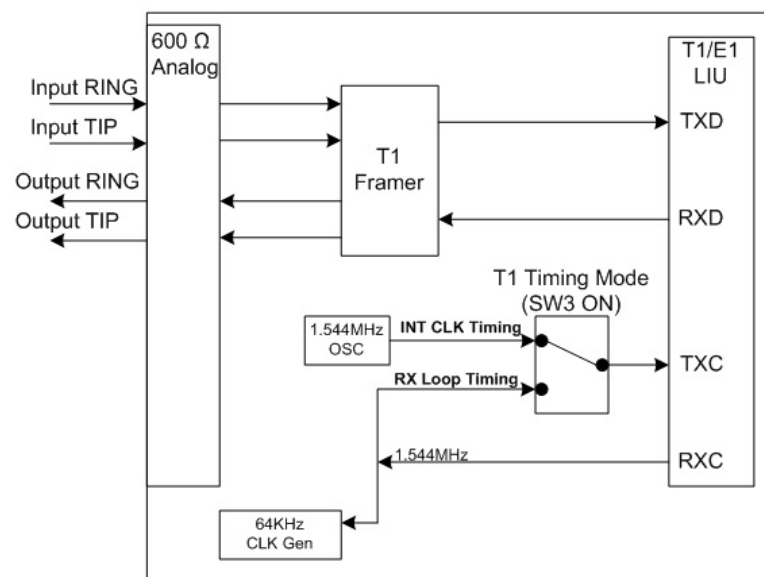
3.1 Introduction

The TC8614 is designed for quick and easy installation. First, configure the unit for your specific application by setting the Line Code and Line Length. Once configured, you can connect the Analog or Dry Contact, T1/E1 signal source and power.

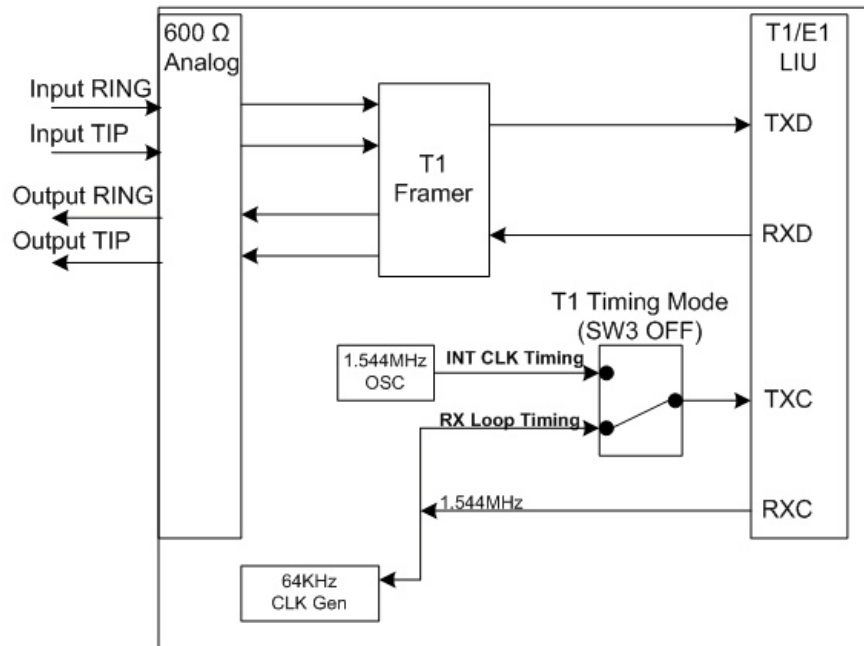
3.2 Setup

1. Select the appropriate Line Code for your application with the rear panel DIP switch SW4. “On” (Down) for B8ZS(T1) or HDB3(E1) and “Off” (Up) for AMI .
2. For T1 applications, set the Copper Line Length with the rear panel DIP switch SW6, SW7, & SW8. Generally, it will be factory set to "0-133 feet." (Refer to [Copper Line Length Setup Table](#), on page 2-5)
3. For E1 applications, set the proper impedance for your application with the rear panel DIP switch SW6, SW7, & SW8. Generally, it will be factory set to “75 ohm.” ([E1 Termination Setup Table](#), on page 2-6)
4. Set the appropriate T1/E1 timing mode with rear panel DIP switch SW3. There should be one and only one clock source throughout the entire T1/E1 network. If two TC8614 units are connected back to back, one unit should set to “Internal” timing mode, and the other unit should set to “RX Loop” timing mode.

“On” for internal timing mode



“Off” for Rx loop timing mode



5. Verify the analog/dry contact pin connections as well as the T1/E1 pin connections. After that, connect the two TC8614 units with a T1/E1 cable.
6. After the T1/E1 connection is established, the front panel "ALM" LED should be off and the "SYNC" LED should be lit solidly.
7. If the front panel "ALM" LED is solidly lit, press and hold the "R2" (“Reset Too”) button for 3 seconds until the "ALM", "BPV", "CRC", and "SYNC" LEDs are flashing. The alarm will reset after the "R2" button is released.
8. Connect the analog/dry contact signal source to the TC8614 Port 1 RJ-11 connector.
9. Verify the corresponding channel's "RX" LED is solidly lit to indicate that audio signal is being received. If the "RX" LED does not light up solidly on a particular channel, it usually indicates incorrect connections at the RJ-11 input port (Please double-check your connections and verify them with the pin assignments table see 2.7.3.1, [600Ω Analog Connections](#), on page 2-7

In this chapter:

- *Local Loopback Test (for 4-Wire analog only)*, on page 4-4
- *Upon successful completion of this test, please return DIP switch SW1(LOCLB) to the “Off” (Up) position..*, on page 4-4

4.1 Introduction

It is highly recommended to conduct bench tests before actual installation. Bench testing allows the user to become familiar with all the functions and features of the TC8614 in a controlled environment. Knowledge of these functions and features will ease installation and troubleshooting efforts later on.

Loopback tests assist troubleshooting by helping in pinpointing the source of errors. The TC8614 is a sophisticated product designed with multiple advanced technologies. Loopback tests have been implemented to test independent components of it.

4.2 Latched Alarm

The front panel "ALM", "BPV", "CRC" and "SYNC" LEDs can display both current and latched error conditions.

For example, if the "ALM" LED is on, and "SYNC" LED blinks twice, it indicates that there are two "T1/E1 sync loss" after the last alarm reset.

To reset the alarm, press and hold the "R2" ("Reset Too") button for 3 seconds until the "ALM", "BPV", "CRC", and "SYNC" LEDs are flashing. The alarm will reset after the "R2" button is released.

See the table below for latched alarm definitions,

LED	Normal	Current Error	Latched Error	Note
ALM	Off	Flashing Continuously	On	
BPV	Off	Flashing Continuously	Blink	The number of blinks indicates the number of times the error condition happens. (Max. 3 Blinks)
CRC	Off	Flashing Continuously	Blink	The number of blinks indicates the number of times the error condition happens. (Max. 3 Blinks)
SYNC	On	Flashing Continuously	Blink	The number of blinks indicates the number of times the error condition happens. (Max. 3 Blinks)

4.3 Remote Unit Status Monitoring and Remote Unit Alarm Reset

TC8614 is capable of monitoring the remote unit status and resetting the remote unit alarm condition.

Short press (less than 3 seconds) the "R2" button will toggle between local and remote status display.

"RMT" LED Off: Display Local Status

"RMT" LED On: Display Remote Status

To monitor remote unit status:

1. Check if T1/E1 connection is synched ("SYNC" LED is solidly lit).
2. Short press (< 3 secs) the "R2" button and the "RMT" LED should be lit to indicate it is displaying remote unit status.
3. When "RMT" LED is lit, "ALM", "BPV", "CRC", and "SYNC" LEDs will be displaying remote unit status.
4. The "RMT" LED will turn off automatically after 20 seconds and switch back to local status display.

To reset remote unit alarm condition:

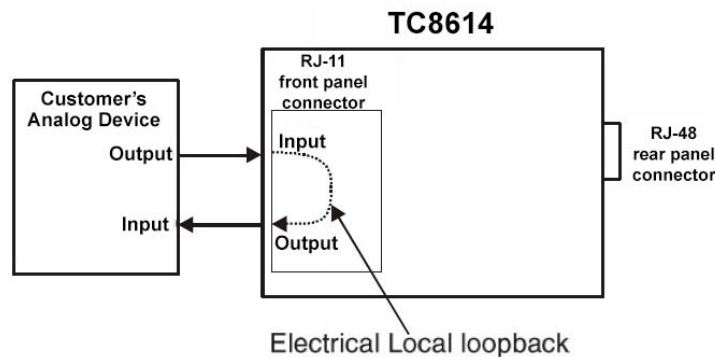
1. Check if T1/E1 connection is synched ("SYNC" LED is solidly lit).
2. Short press (< 3 secs) the "R2" button and the "RMT" LED should be lit to indicate it is displaying remote unit status.
3. Press and hold the "R2" button for 3 seconds until the "ALM", "BPV", "CRC", and "SYNC" LEDs are flashing. The remote unit alarm will reset after the "R2" button is released.
4. The "RMT" LED will turn off automatically after 20 seconds and switch back to local status display.

4.4 Local Loopback Test (for 4-Wire analog only)

When the rear panel SW1 (LOCLB) in the “On”(Down) position the analog signals are received on the “Input” pins and looped back to the ”Output” pins on the TC8614.

1. The “TX” LED will be flashing amber for that particular channel being tested and the "ALM" alarm LED will flash to indicate that the unit is in local loopback mode. (Note, the TX LED will be lit green when TX activity is detected.)
2. The Customer’s Analog Device should receive audio signal back as transmitted.
3. Upon successful completion of this test, please return DIP switch SW1(LOCLB) to the “Off” (Up) position..

Local Loopback Test



5.1 General

Alarm conditions occur whenever a T1/E1 sync "fault" condition is detected by the TC8614. Under normal operation, PWR, Vcc, and SYNC LEDs should be lit.

5.2 All LEDs are OFF

If no LEDs are lit on the unit, check the DC power supply, connector plug, and/or the power source. If the problem persists, contact the Technical Support Department at TC Communications, Inc. @ (949) 852-1973.

5.3 Alarm LED

The ALARM LED will flash when the unit has any loopbacks enabled. It will be solid when alarm conditions are present such as T1/E1 loss of frame (no SYNC) or T1/E1 loss of signal (LOS).

Appendix A 19" Rack Mount Card Cages

A.1 1U Rack Mount Card Cage (TCRM195)

A.1.1 Features

- 1U height (1.75")
- Universal Power Supply Accepts 90V to 264V AC and 47 to 63 Hz AC
- Standard Power Supply is 12VDC, Optional 24VDC, -48VDC, 125VDC, or AC Power Supply Available
- Over Load & Short Circuit Protection

A.1.2 Description

The TCRM195 "Pizza Box" Rack Mount Card Cages hold up to 2 single multiplexer type cards.

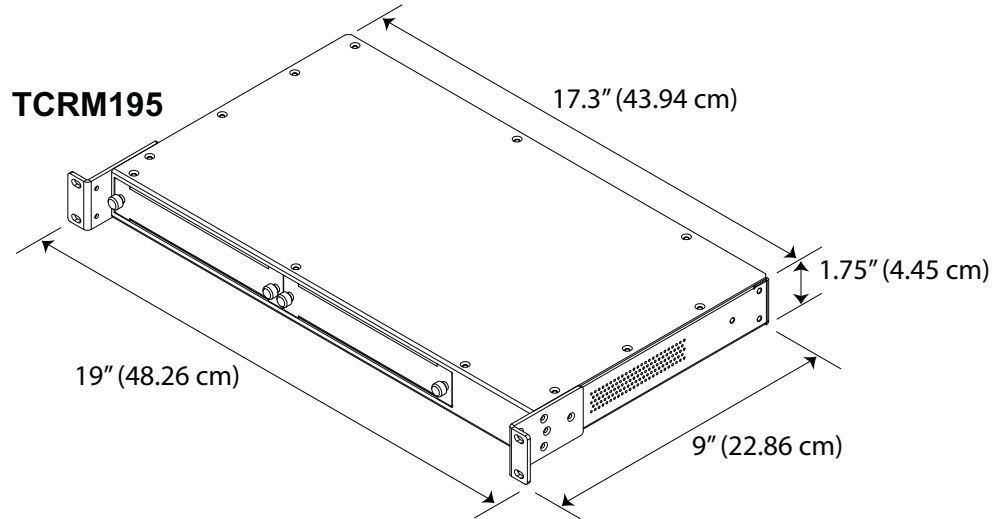
It operates with one power supply. The AC power supply automatically adjusts for 90V to 264V AC input and 47 to 63 Hz operation. The DC power supply accepts 24VDC, -48VDC, or 125VDC input (Optional).

The rack assemblies are 19" wide by 1.75" high. The TCRM195 is 9" deep.

A.1.3 Chassis Ground

The Stand alone and Rack mount chassis provide a connection point for chassis ground with a dedicated chassis ground screw and lock washer. The chassis ground screw is located on the rear side of the chassis. This chassis ground connection point is available in case chassis ground is taken into design consideration by the end user.

A.1.4 Physical Dimensions



A.2 4U Rack Mount Card Cage (TCRM191)

A.2.1 Features

- 4 U Height (7")
- Dual Power Capability with Automatic Switchover in the Event of Failure
- Universal Switching Power Supply Accepts 90 to 264VAC (47 to 63 Hz)
- Optional 24VDC or -48VDC Power Supply
- Overload & Short-Circuit Protection

A.2.2 Description

The TCRM191 Universal Rack Mount Card Cage holds up to 10 single multiplexer-type cards, or up to 5 doublemux type cards.

It can operate with one power supply or dual load-sharing power supplies. The AC power supply automatically adjusts for 90 to 264VAC input and 47 to 63 Hz operation. The DC power supply accepts 24VDC or -48VDC input. The AC and DC power supplies can be mixed in the same unit.

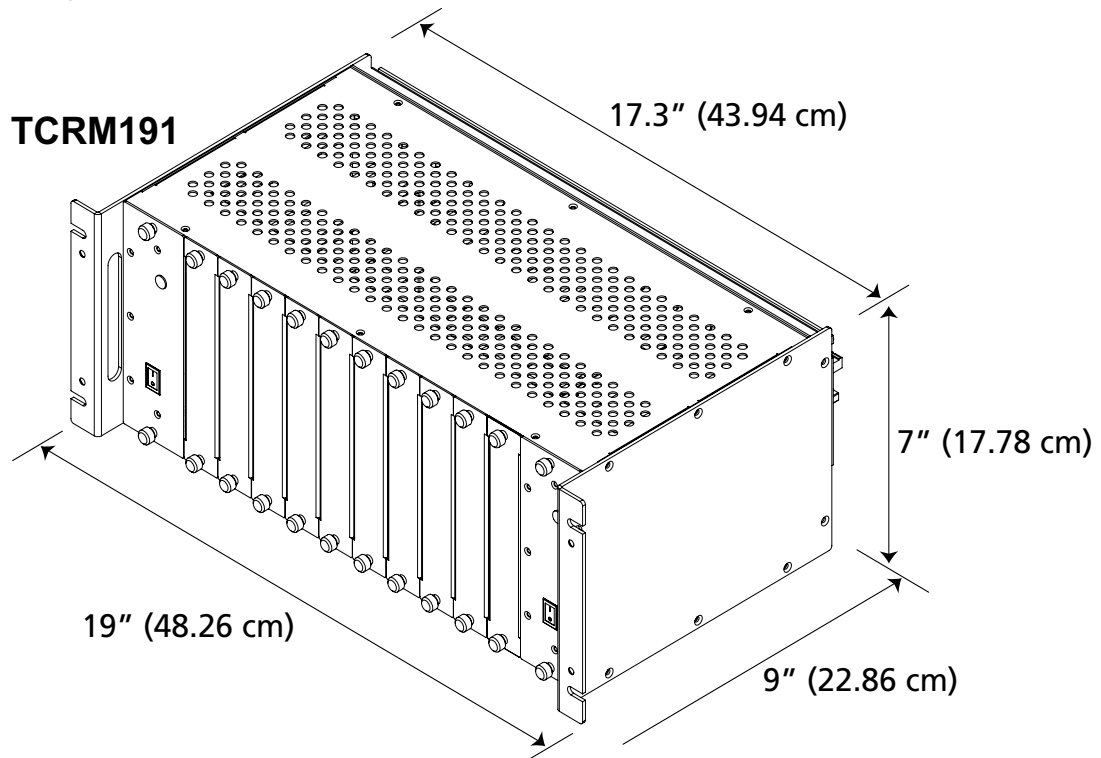
The dual load-sharing power supplies feature automatic switchover in the event of a power failure. The power switch and its LED are located on the front panel.

TCRM191 is 19" wide by 7" high and is 9" deep.

A.2.3 Chassis Ground

The Rack mount chassis provide a connection point for chassis ground with a dedicated chassis ground screw and lock washer. The chassis ground screw is located on the lower right rear side of the chassis. This chassis ground connection point is available in case chassis ground is taken into design consideration by the end user.

A.2.4 Physical Dimensions



A.2.5 Rear Panel Power Connectors

The Figure below shows the rear panel for the 19" 4U rack with dual power supply cards. It consists of two subassemblies; TCRM191 which is the 19" 4U rack with dual 48VDC to 12VDC power cards and the TCRM191-BKPL, which is the power back plane. The power card(s) can be ordered for universal AC input, 24VDC - 48VDC or 125VDC input. The output of each kind of power card is 12VDC, different input voltage has different output power rating. They are listed as the following:

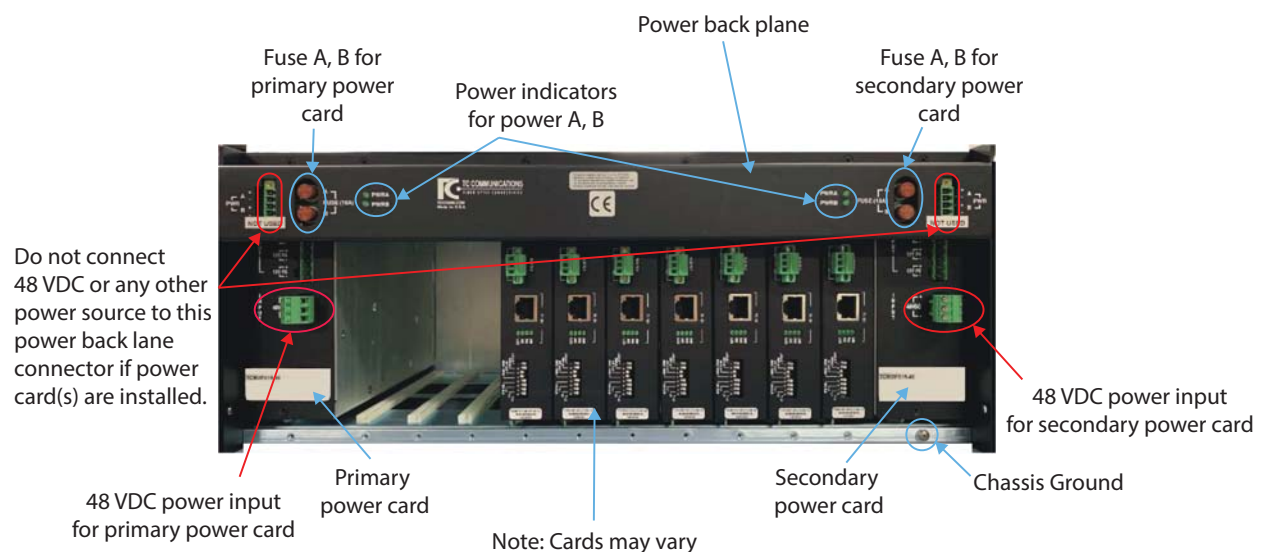
- TCRM191-48-48: 19" rack with dual power cards, each has 48VDC(36-75VDC) input, 12VDC output and 100 Watts.
- TCRM191-24-24: Same as above but with 24VDC(18-36VDC) input, 12VDC output and 100 Watts output power.
- TCRM191-01-01: 19" rack with dual power cards, each has universal AC input (90VAC to 240VAC, 50Hz to 60Hz) with 12VDC output. Maximum output power is 65 Watts.

The add-on subassembly to the 19" rack is TCRM-BKPL, which is a power strip PCB connected to both power cards via two pair cable assembly. This power back plane has built-in fuses and power indicators to ease installation and troubleshooting.

WARNING



Never plug any power source to the "NOT USED" labeled terminal block power connectors if the TCRM191 (4U chassis) contains power supplies. The power back plane connectors are reserved only for 12 VDC if and only if no power supply card(s) are installed.



B.1 Overview

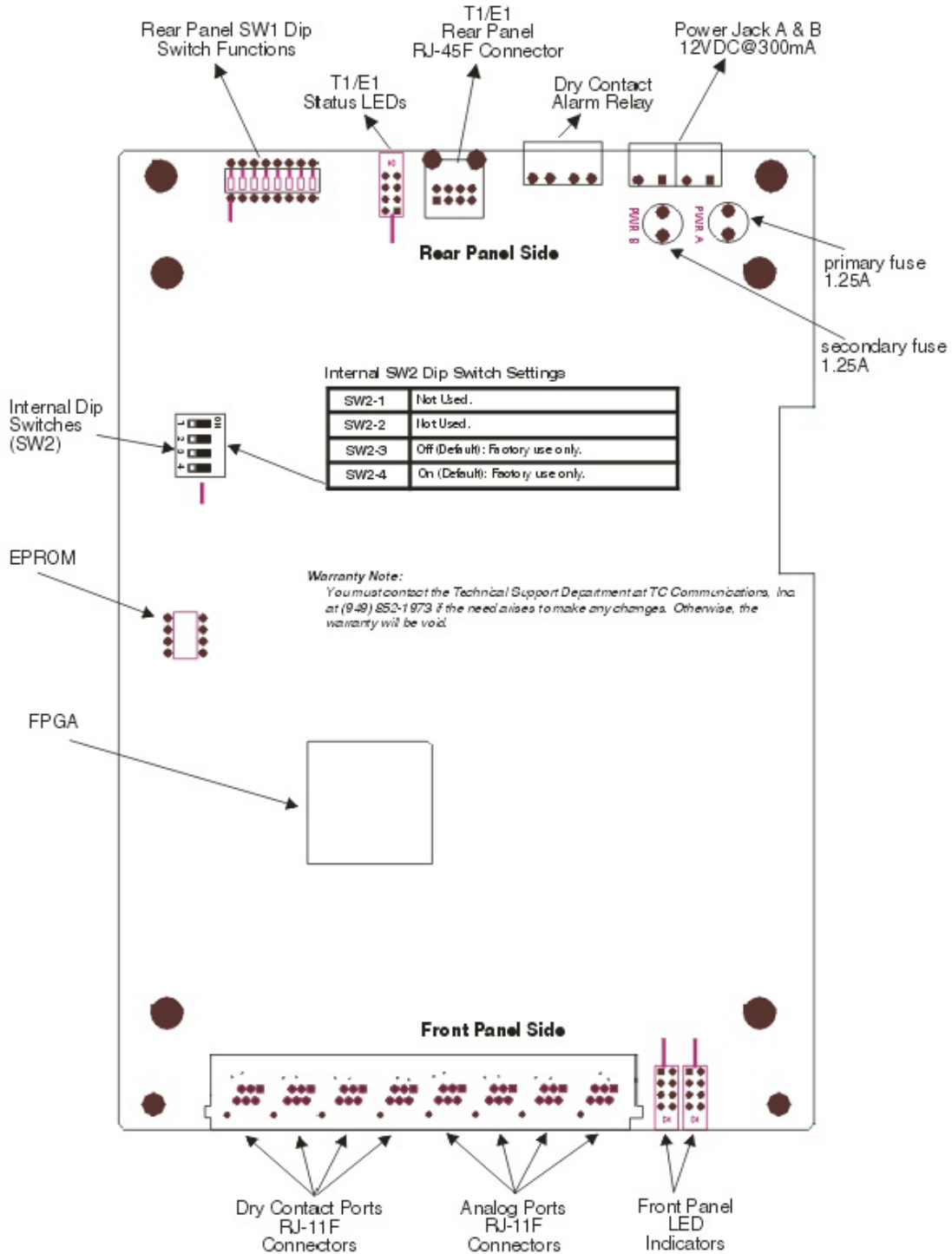


Figure B-1 TC8614 PCB Layout

Appendix C R2 Button & LED Functions

C.1 R2 (“Reset Too”) Button Description

The recent enhancements implemented on the TC8614 (Analog/Dry Contact over T1/E1) will make troubleshooting a much easier process. The alarm LEDs - BPV, CRC, and SYNC - can now latch abnormal conditions until they are reset by the user. These functions are realized in part by the newly added "R2" ("Reset Too") push button.



The "R2" push button is for displaying remote unit LED status and to reset local or remote error and alarm LEDs.

C.1.1 R2 (“Reset Too”) Push Button Functions

R2 push button:

1. To reset the local unit's alarm LEDs, hold down the R2 button for at least 3 seconds until you see the alarm LEDs flash in sequence.
2. To display the remote unit's alarm LEDs on the local unit, briefly press the R2 button on the local unit. The local unit's RMT LED will subsequently turn on and whatever alarm LEDs are being displayed on the remote unit will now be displayed on the local unit's alarm LEDs.
3. To reset the remote unit's alarm LEDs from the local unit, while the RMT LED is lit on the local unit, hold down the local unit's R2 button for at least 3 seconds until you see the alarm LEDs flash in sequence.

Automatic return to local alarm LED status:

Upon briefly pressing the R2 button on a local unit, the local unit will remain in remote alarm LED status (RMT LED is on) for 20 seconds, after which the local unit will automatically revert back to local alarm LED status.

C.2 LED Functions

RMT: displays the remote unit's LED status on the local unit

BPV: displays bi-polar violation(s) for the ingress T1/E1 signal

CRC: displays error(s) in data integrity (only for T1 ESF frame and E1 built-in CRC)

SYNC: displays frame locking for T1 (ESF framing) or E1 (PCM31C framing)

The alarm LEDs - BPV, CRC and SYNC - all have a latching functionality to indicate the number of occurrences for each error. These LEDs will continuously flash at regular intervals until reset by the user. The behavior is noted here:

- When an LED blinks once, it indicates a single error has occurred once. When an LED blinks twice, it indicates the error has occurred twice. When the LED blinks 3 times, it indicates the error has occurred 3 or more times.

The 600Ω Analog Tx and Rx LEDs are tied to a volume threshold level of -31dBm; when the volume is greater than -31dBm, the LED(s) will turn on.

C.3 CSU Loop Operation

When the ISP transmits the CSU Loop Up Code towards the unit, the unit will recognize the code and loop back the entire T1/E1 signal back towards the ISP.

Once the Loop Up condition is established, the unit alarm will be flashing and the ISP may perform BER testing and other tests on the looped link.

To cancel the loop, the ISP must transmit the CSU Loop Down Code towards the unit. Alternatively, disconnecting the T1/E1 cable will also cancel the loop.

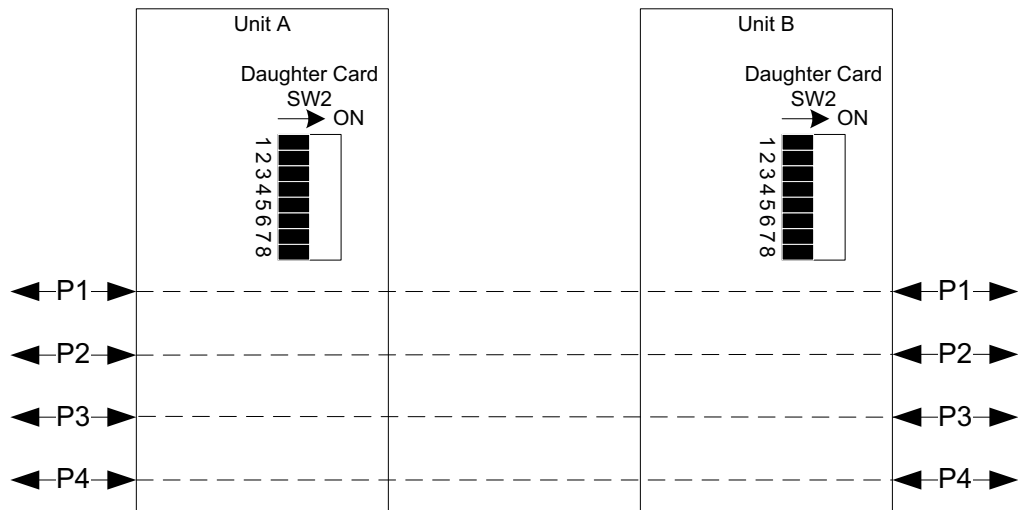
Appendix D

Bridge Conference Group

D.1 Setup

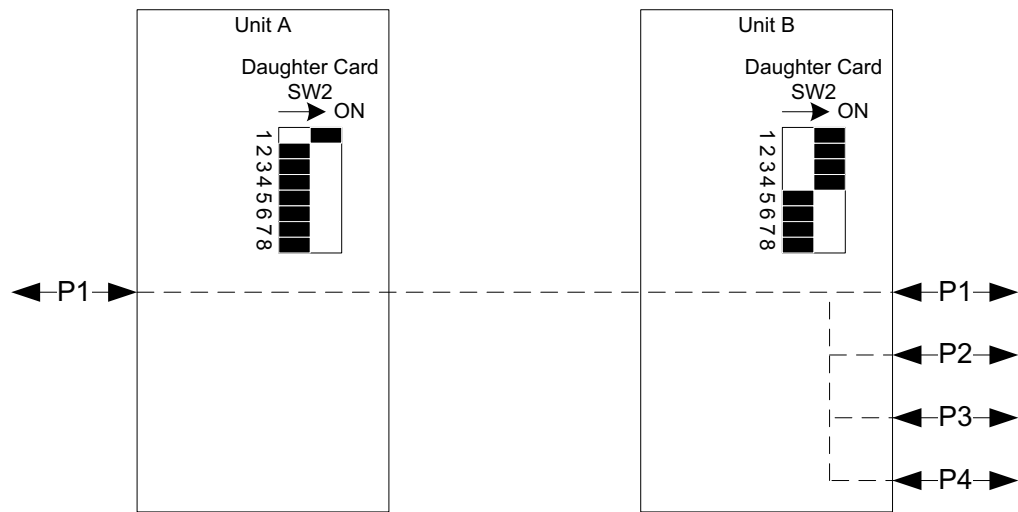
To setup a bridge conference group between two TC8614 units, use the daughter card internal dipswitch SW2 to identify which port(s) will join the conference group.

By default, bridge conference group is disabled. (SW2: All Off)



For each dipswitch on Unit-B set to the “ON” position the corresponding port will join the conference group.

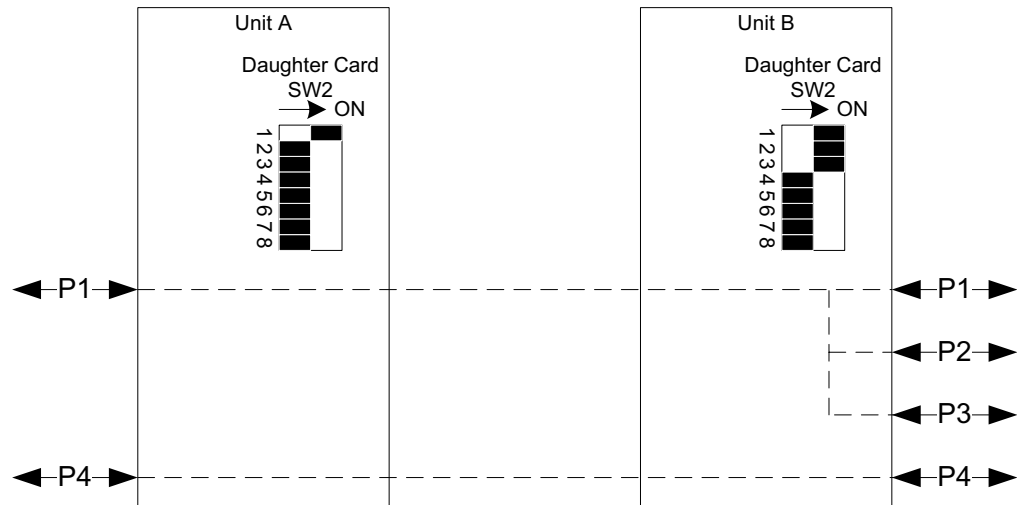
Example 1: Bridge Conference Group between Unit-A P1 and Unit-B P1-P4.



* P1 in both units must be included to form a bridge group.

Dipswitches left in the “OFF” position will have the corresponding ports continue to function as an independent link.

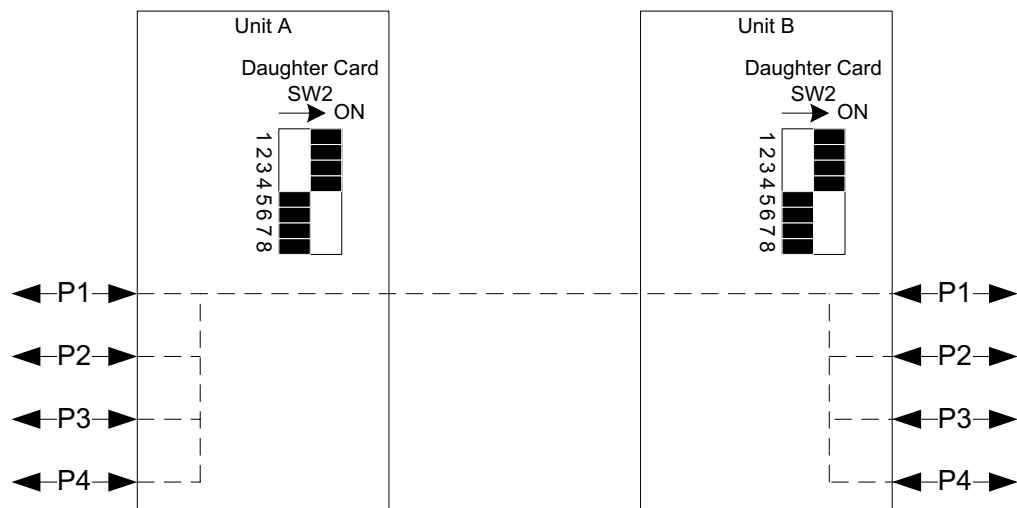
Example 2: Bridge Conference Group between Unit-A P1 and Unit-B P1-P3



* Unit-A P4 and Unit-B P4 works as normal independent link.

By setting the dipswitches on both units to the “ON” position all ports can be included into a conference group.

Example 3: Bridge Conference Group between Unit-A P1-P4 and Unit-B P1-P4



E.1 Return Policy

To return a product, you must first obtain a Return Material Authorization number from the Customer Service Department. If the product's warranty has expired, you will need to provide a purchase order to authorize the repair. When returning a product for a suspected failure, please provide a description of the problem and any results of diagnostic tests that have been conducted.

E.1.1 Warranty

Damages by lightning or power surges are not covered under this warranty.

All products manufactured by TC Communications, Inc. come with a five year (beginning 1-1-02) warranty. TC Communications, Inc. warrants to the Buyer that all goods sold will perform in accordance with the applicable data sheets, drawings or written specifications. It also warrants that, at the time of sale, the goods will be free from defects in material or workmanship. This warranty shall apply for a period of five years from the date of shipment, unless goods have been subject to misuse, neglect, altered or destroyed serial number labels, accidents (damages caused in whole or in part to accident, lightning, power surge, floods, fires, earthquakes, natural disasters, or Acts of God.), improper installation or maintenance, or alteration or repair by anyone other than Seller or its authorized representative.

Buyer should notify TC Communications, Inc. promptly in writing of any claim based upon warranty, and TC Communications, Inc., at its option, may first inspect such goods at the premises of the Buyer, or may give written authorization to Buyer to return the goods to TC Communications, Inc., transportation charges prepaid, for examination by TC Communications, Inc. Buyer shall bear the risk of loss until all goods authorized to be returned are delivered to TC Communications, Inc. TC Communications, Inc. shall not be liable for any inspection, packing or labor costs in connection with the return of goods.

In the event that TC Communications, Inc. breaches its obligation of warranty, the sole and exclusive remedy of the Buyer is limited to replacement, repair or credit of the purchase price, at TC Communications, Inc.'s option.

To return a product, you must first obtain a Return Material Authorization (RMA) number and RMA form from the Customer Service Department. If the product's warranty has expired, you will need to provide a purchase order to authorize the repair. When returning a product for a suspected failure, please fill out RMA form provided with a description of the problem(s) and any results of diagnostic tests that have been conducted. The shipping expense to TC Communications should be prepaid. The product should be properly packaged and insured. After the product is repaired, TC Communications will ship the product back to the shipper at TC's cost to U.S. domestic destinations. (Foreign customers are responsible for all shipping costs, duties and taxes [both ways]. We will reject any packages with airway bill indicating TC communications is responsible for Duties and Taxes. To avoid Customs Duties and Taxes, please include proper documents indicating the product(s) are returned for repair/retest).

E.1.2 Limitation of Liability

1. In no event shall the total liability of T C COMMUNICATIONS, INC. to purchaser and/or end user for all damages including but not limited to compensatory, consequential and punitive damages, exceed the total amount paid to T C Communications, Inc. by purchaser for the goods from which the claim arose, in no event shall T C COMMUNICATIONS, INC. be responsible for indirect and consequential damages.
2. In no event shall liability attached to T C COMMUNICATIONS, INC. unless notice in writing is given to T C COMMUNICATIONS, INC. within ten days of the occurrence of the event giving rise to such claim.
3. T C COMMUNICATIONS, INC. shall not be responsible for delays or non-deliveries directly or indirectly resulting from or contributed to by foreign or domestic embargoes, seizure, fire, flood, explosion, strike, act of God, vandalism, insurrection, riot, war, or the adoption or enactment of any law, ordinances, regulation, or ruling or order or any other cause beyond the control of T C COMMUNICATIONS, INC.
4. T C COMMUNICATIONS, INC. shall not be responsible for loss or damage in transit and any claims for such loss or damage shall be filed by the purchaser with the carrier.