RLH Industries, Inc.

USER GUIDE

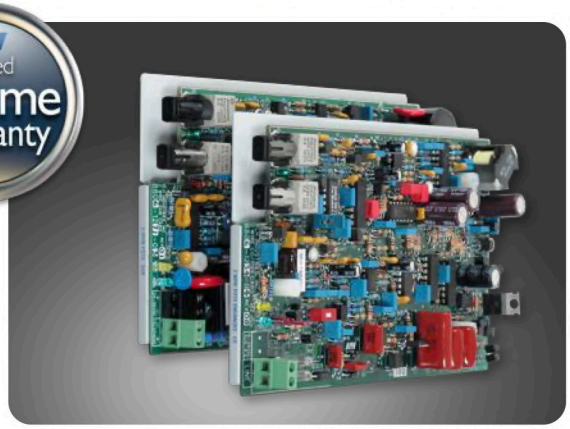
The leader in rugged fiber optic technology.

U-093 2020-03-17

2 Wire POTS Enhanced Fiber Link Card System

SYSTEM INSTALLATION INFORMATION

ANALOG PHONE OVER FIBER



2 Wire POTS Fiber Link Card System

Description

The 2 wire POTS (Plain Old Telephone Service) Enhanced Fiber Link Card System provides transmission of standard analog POTS, telemetering, or PBX loop start signals over two optical fibers. The system transmits signals in the voice-frequency or audio range (300Hz-3400Hz) while providing ringing and off-hook detection, and supports caller ID and forward disconnect. Common applications include telephone, faxes, and dial-up modems.

The 2 Wire POTS Enhanced system is complete with convenient status LED indicators, DIP switches, and are compatible with any RLH Fiber Link card housing or shelf. All RLH Fiber Link Cards are temperature hardened for tough environmental conditions, and covered by our **Limited Lifetime Warranty**.

Note: Square wave ringing ordering option is available (SM10).

Key Features

- Ideal for critical, high voltage, remote or un-manned locations that must remain operating 24/7/365
- Enhanced FXO/CO cards are loop powered
- Provides ringing and off-hook detection
- Supports Caller ID and Forward Disconnect
- Environmentally hardened to operate in -40°F to +158°F (-40°C to +70°C) environments
- Standard RLH Fiber Link Card form factor
- **Limited Lifetime Warranty**

Contents

Compliance Information

2W POTS Enhanced Fiber Link Card Systems are compliant with the following industry standards:

- **FCC PART-15**
- **FCC PART-68B**
- **IEEE-487**
- **IEEE-1590**
- **Motorola R56**
- **GR-1089**
- **GR-63**

General Safety Practices

Intended Audience

This guide is intended for use by knowledgeable telco/network installation, operation and repair personnel. Every effort has been made to ensure the accuracy of the information in this guide is accurate. However, due to constant product improvement, specifications and information contained in this document are subject to change without notice.

Conventions

Symbols for notes, attention, and caution are used throughout this manual to provide readers with additional information, advice when special attention is needed, and caution to prevent injury or equipment damage.

The equipment discussed in this document may require tools designed for the purpose being described. RLH recommends that service personnel be familiar with the correct handling and use of any installation equipment used, and follow all safety precautions including the use of protective personal equipment as required.

Caution - Severe Shock Hazard

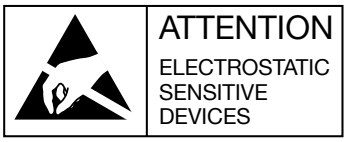
- Never install during a lightning storm or where unsafe high voltages are present.
- Active phone lines may carry high DC voltages. Use caution when handling copper wiring.

HVP Warning

The intra-building port(s) of the equipment or subassembly is suitable for connection to intrabuilding or unexposed wiring or cabling only. At the Substation side the intra-building port(s) of the equipment MUST NOT be metallically connected to interfaces that connect to the OSP or its wiring. These interfaces are designed for use as intra-building interfaces only (Type 4 ports as described in GR-1089-CORE, Issue 4) and require isolation from the exposed OSP cabling. The addition of Primary Protectors is not sufficient protection in order to connect these interfaces metallically to OSP wiring.

Special Handling Requirements

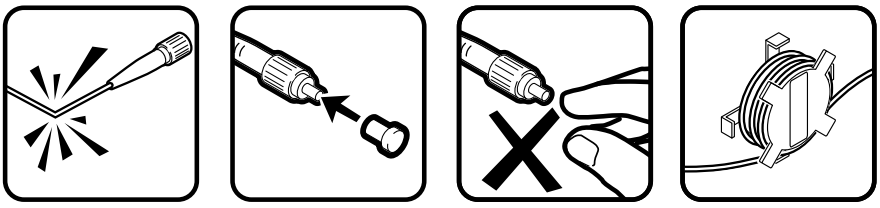
Be careful when handling electronic components



- This product contains static sensitive components.
- Handle Fiber Link Cards at their edges only.
- Follow proper electrostatic discharge procedures.

This card utilizes circuitry that can be damaged by static electricity. When transporting the card, carry it in an ESD safe container such as the antistatic bag provided with the card. Before handling cards, discharge yourself of static electricity. When handling cards, hold by outer edges and avoid touching circuitry. Failure to follow ESD precautions may cause serious damage to the card and prevent proper operation.

Guidelines for handling terminated fiber cable



- Do not bend fiber cable sharply. Use gradual and smooth bends to avoid damaging glass fiber.
- Keep dust caps on fiber optic connectors at all times when disconnected.
- Do not remove dust caps from unused fiber connectors.
- Keep fiber ends and fiber connectors clean and free from dust, dirt and debris. Contamination will cause signal loss.
- Do not touch fiber connector ends.
- Store excess fiber on housing spools or fiber spools at site

Acronyms

Commonly used acronyms and abbreviations

Acronym/Abbreviation	Description
POTS	Plain Old Telephone Service (analog phone)
FXO/CO	Foreign Exchange Office or Central Office location
FXS/Sub	Foreign Exchange Station or Subscriber side location
PBX	Private Branch Exchange
TX	Transmit
RX	Receive
CPE	Customer Premises Equipment
MM	Multimode
SM	Single Mode
2W	2 wire copper analog phone line
RU	EIA Rack Space Unit (1.75”)

Installation

Prior to installation:

Check for shipping damage:

- Check the contents to ensure correct model and fiber type
- Have a clean, dry, installation environment ready

Required for installation:

- 24~56VDC (200mA@24VDC min.) local power source for the FXS/Sub card
- RLH Fiber Link card housing or enclosure
- A weatherproof enclosure is required for outdoor use

The 2 Wire POTS Fiber Link Cards can be installed into any compatible RLH card housing. All electrical and fiber optic connection are made directly onto the card.

2 Wire POTS Enhanced FXO/CO (Central Office) Side Card

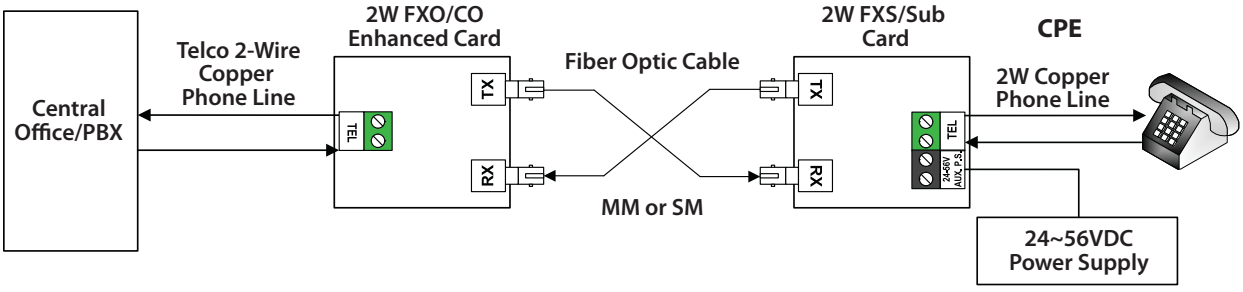
The 2 Wire POTS Enhanced FXO/CO Card provides the electrical-optical interface between a Central Office or PBX 2-wire copper line and two optical fiber strands. The FXO/CO card is powered by 2 wire loop current of 0.5mA maximum On-Hook and 15mA minimum Off-Hook. The DC Voltage at the Tip and Ring terminals must always be between 10VDC and 56VDC.

Note: If power is insufficient, the 2 Wire POTS Power Coupler (P/N: 8806-1252-01, 8806-1252-02) must be used to insert isolated DC power into the 2-wire line.

Note: To maintain high voltage isolation, Fiber Link FXO/CO and FXS/Sub cards must be powered from separate power sources.

2 Wire POTS FXS/Sub (Subscriber) Side Card.

The 2 Wire POTS Sub Card provides the optical-electrical interface between the two fiber strands and a 2-wire copper line to a telephone, fax, or modem. The FXS/Sub card is powered by a local 24-56VDC source. The FXS/Sub Card provides 90VRMS sine wave ringing (REN 5.0 max 80VRMS). Square wave ringing is available as an option. LED Indicators on the card display power, ringing and off-hook conditions. The FXS/Sub card is switchable between 14V or 48V power to the telephone port.

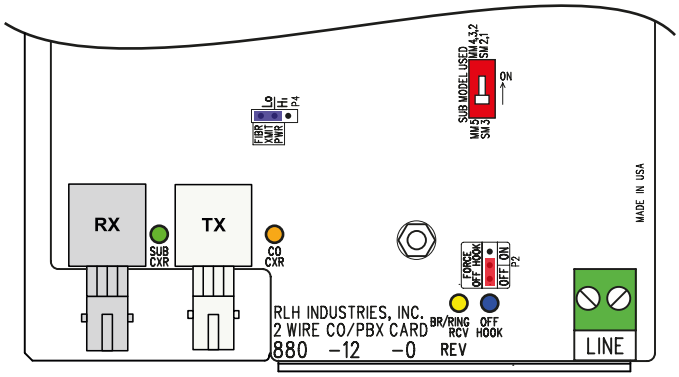


2 Wire POTS System Diagram

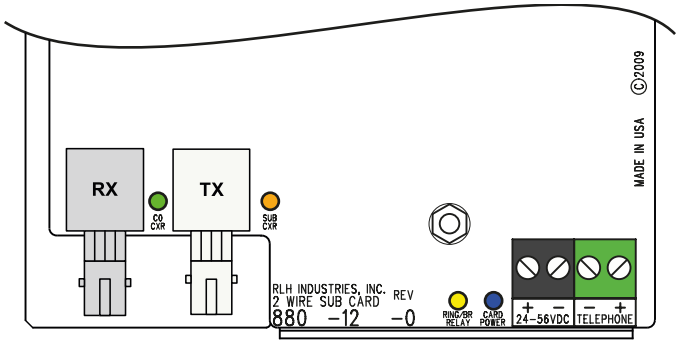
Connect fiber optic cable

The 2 Wire POTS Cards are each equipped with two optical connectors. Connect the fibers to the transmitter and receiver marked TX and RX respectively. The TX connector of one card is connected to the RX connector of the card at the other end. Refer to the *2 Wire POTS System Diagram*.

Note: Fiber cable should always be routed loosely avoiding tight bends.



2 Wire POTS Enhanced FXO/CO Card Connectors



2 Wire POTS FXS/Sub Connectors

Connect 2 wire copper pair

The copper pair from the FXO/CO or PBX connects to the green LINE screw-down terminal on the FXO/CO Card. The LINE connector on the FXO/CO card is not polarity sensitive

The copper pair from the telephone connects to the green TELEPHONE and screw-down terminals on the FXS/Sub Card. Attach the copper pair, **+** is for **TIP** and **-** is for **RING**. Make connections according to the polarity markings on the connector.

Connect Power

Connect a 24-56VDC (200mA minimum) power source (22 AWG wire typical) to the black “AUX. P.S.” screw-down terminal on the Sub card.

Note: The power input is ***polarity sensitive*** and marked with positive and negative.

Switches, Jumpers, & LED Indicators

FXS/Sub Card Switches

There are 2 user settable switches on the FXS/Sub card.

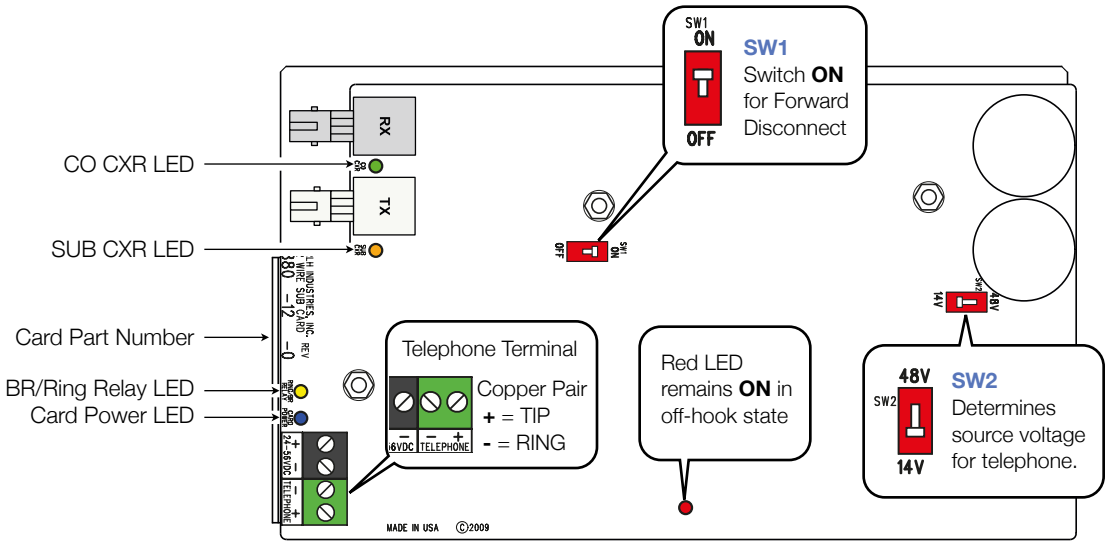
SW1 is set to **ON**, Factory Default.

Note: Enhanced FXO/CO cards placed in existing systems, that are replacing FXO/CO cards without the SM09 Forward Disconnect, will require the switch to be moved to the **ON** position to enable the feature.

SW2 is set to **14V**, Factory Default. Leave the switch at the **14V** position for most applications.

Note: Remove power from the power connector before changing the SW2 setting from 14V to 48V.

Set the switch to **48V** to simulate typical CO output from the telephone terminals when the Loop resistance is greater than 500 ohms or where connected equipment requires 48V. The telephone output current is always limited to 23mA regardless of the setting. 7-10mA Loop Current will give a valid Off-Hook.



FXS/Sub Card LED indicators and switches

FXS/Sub Card LED Indicators

The FXS/Sub card has four (4) LED indicators to help determine card operation. Please refer to the LED indicators and switches diagram and the function chart below.

Indicator	Color	State	Description
SUB CXR	Green	OFF	On-hook - no incoming signal from FXO/CO card
		Flashing	On-hook - Incoming call
		ON	Off-hook
CO CXR	Orange	OFF	On-hook - no outgoing signal from FXO/CO card
		ON	Off-hook
BR/RING RELAY	Yellow	OFF	On-hook - no signal to or from FXO/CO card
		ON	On-hook - Ring signal applied to Telephone terminals
CARD POWER	Blue	ON	Power is present
		OFF	No power is present or polarity is reversed

FXO/CO Card Jumpers & Switch

There are two jumpers and one user settable switch on the FXO/CO Enhanced card.

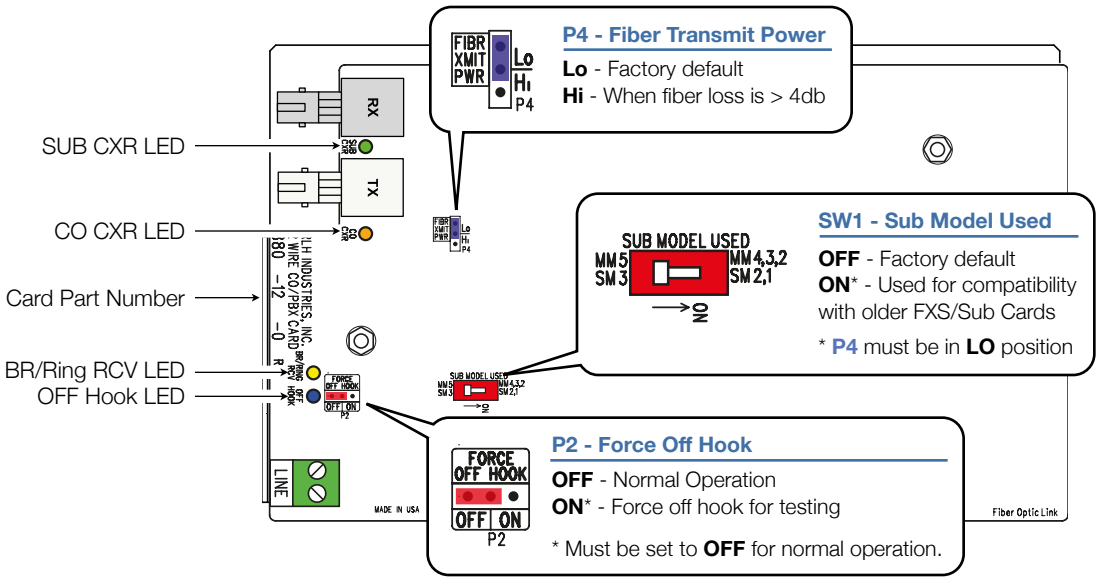
Jumper P2 - Force Off Hook (Red)
This jumper is used for diagnostics. The default position is **OFF**. Switching to the **ON** position will force the line off hook allowing for the POTS line to be tested from the CO side by a single installer.

Jumper P4 - Fiber Transmit Power (Blue)
This jumper is used for compensating fiber loss. The default position is **Lo**. Switching to the **Hi** position will increase the output optical power by 4db.

SW1 - Sub Model Used
This switch is used for compatibility with older versions of the FXS/Sub card. The default position is **OFF**. When installing the card in an existing system it is important to locate the FXS/Sub card's part number and REV level, which is located on the front end of the card.

Move to the **ON** position when using with the following FXS/SUB Cards:

Fiber	Description
Multimode	FXS/Sub Card REV -04
	FXS/Sub Card REV -03
	FXS/Sub Card REV -02
Single Mode	FXS/Sub Card REV -02
	FXS/Sub Card REV -01



FXO/CO Enhanced Card
LED indicators and switches

FXO/CO Enhanced Card LED Indicators

The FXO/CO Enhanced card has four (4) LED indicators to help determine card operation. Please refer to the LED indicators and switches diagram and the function chart below.

Indicator	Color	State	Description
SUB CXR	Green	Flashing *	Looking for incoming signal from FXS/Sub Card
		ON	FXS/Sub Card is Off-hook
CO CXR	Orange	OFF	On-Hook - not transmitting signal to FXS/SUB card
		Flashing	Incoming ring signal transmitting to FXS/SUB
		ON	Transmitting signal to FXS/Sub Card
BR/Ring RCV	Yellow	OFF	No incoming ring signal
		Flashing	Incoming ring signal
OFF Hook	Blue	OFF	On-hook
		ON	Off-hook

▶ * Very faint (each flash is on 1 ms each 40 ms)

Troubleshooting

If trouble is encountered, verify all installer connections, signal and voltage levels. If trouble persists, replace the unit and retest. If technical assistance is required, contact RLH Industries, Inc. Technical support department.

Ordering Information

Each 2 Wire POTS card is identified with the part number.

Optics	Distance	Fiber	Description	Part Number	CLEI
Multimode ST	1.5 mi. / 2.4km	62.5µm / 50µm	Enhanced CO Card (Line Powered)	8806-1234-05	–
			SUB Card (24–56VDC)	8806-1244-05	LFT1AAPEAA
Long Haul Single–mode ST	20 mi. / 32km	8~9µm	Enhanced CO Card (Line Powered)	8806-1261-05-LH	–
			SUB Card (24–56VDC)	8806-1271-03-LH	–
Long Haul Single–mode SC	20 mi. / 32km	8~9µm	Enhanced CO Card (Line Powered)	8805-1261-05-LH	–
			SUB Card (24–56VDC)	8805-1271-03-LH	–

- A complete system requires a CO side card and a SUB side card.
- Add –RJ to part number for installed RJ11 adapter.
- Add –SM10 to part number for square wave ringing option.
- Please contact your RLH sales representative for pricing and delivery information

General Specifications

Transmission method*	Multimode	850nm (Tx level: -27dBm +/- 2dBm
	Single-mode:	1310nm (Tx Level: -11dBm +/- 1dBm
	*Frequency modulated light via two optical fibers	
Maximum Fiber Loss / Distance*	Multimode:	10dB / 1.5 miles (2.4km)
	Single-mode:	16dB / 20 miles (32km)
	* Note: Distances equated using industry standard fiber losses and connector attenuation of 3dB. Fiber condition, splices and connectors will affect actual range.	
Fiber Type	Multimode:	62.5/125µm, 50/125µm
	Single-mode:	8-9/125µm
Fiber Connector Types	ST or SC	
Wire Connector	Screw clamp, 12-26 AWG	
Insertion Loss	0dB +/- 0.5dB each direction at 1000 Hz	
Bandwidth	300 Hz to 3400 Hz (± 3dB with respect to 1000 Hz)	
Dialing Protocol	Pulse or tone dialing	
Ringing	Sine wave matched to input frequency, REN 5.0	
	Square wave ringing option available - SM10	
Powering Method	CO Enhanced Card:	Loop Power
	Sub Card:	Local Power Supply Only
Power Requirements	CO Enhanced Card:	10-56VDC, On-hook 0.5mA maximum, off-hook 15mA minimum at 10V minimum (card will sink up to 27mA line seizure).
	Sub Card:	24-56VDC, 200mA maximum
Surge Protection	Fuses (CO only), PTC thermistors, zener diodes and varistors	
Operating Temperature	-40° to +158° F (-40° to +70° C), 95% non-condensing	
Dimensions	Standard RLH Fiber Link Card Form Factor (7”x4”x1”)	
Warranty	Limited Warranty	*Visit* www.fiberopticlink.com *for warranty details*

Technical Support

Email:	support@fiberopticlink.com
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Please contact your RLH sales representative for pricing and delivery information.

Specifications subject to change without notice.