

Self-Healing Multi-Drop Fiber Optic Modem (Dual Channel)

Model TC2100

- Async Data Rates up to 38.4 Kbps
- Protocol Transparent
- All-Digital Design
- Multiple Master Capability
- Multimode (850/1300nm) or Single Mode (1300/1550nm)
- RS-232, RS-422 or RS-485 (2/4-wire)
- Local and Remote Loopback Tests
- Optical Loop Integrity Test
- Anti-Streaming (Anti-Jabber)
- Local Dry Contact Alarm Relay
- Hardened Temperature Versions (optional)
- Hi-Temp2 Version Exceeds NEMA & Caltrans Traffic Control Specs



TC2100S Standalone Unit



2 X TC2100R

(Housed in TCRM196 19" Wide, 1U High Rackmount Card Cage)

The TC2100 Multi-Drop Fiber Optic Modem provides maximum reliability for linking monitoring devices (typically RTUs or PLCs) to a Host Controller or CPU. It is completely transparent to data or communications protocols.

The TC2100 can be configured in Ring or Self-Healing Ring topologies. The Self-Healing Ring scheme is sophisticated, i.e. it detects upstream and downstream failures on both Tx and Rx, and automatically re-routes any cable or equipment failure. TC2100 master and TC2101 slave units are interchangeable by setting a dip switch. "Multiple master" units are optional.

It supports asynchronous data rates up to 38.4 Kbps. Electrical interfaces are RS-232, RS-422 or RS-485. The RS-485 electrical port can be multi-dropped. There are two optional versions (Model TC2100T) for extreme temperature applications (-20°C to 70°C & -40°C to 80°C).

Each unit comes standard with two pairs of fiber interfaces and either 2-Channel RS-232 or 1-Channel RS-422/RS-485 interfaces. The second channel on the RS-232 interface can be used for data, RTS/CTS handshaking signals or as a telephone extension with the Model TC1900 "Quick-Talk" phone adapter.

Local and remote loopback is standard. Diagnostic LEDs are provided to help installation and troubleshooting. Dry contact alarms can be connected to RTUs/PLCs to indicate specifically where a fault has occurred. A test signal generator for verifying link integrity is provided to aid installation and troubleshooting. "Anti-streaming" capability is standard.

The TC2100 is compatible with all popular types and sizes of fiber optic cable and is available multimode (850/1300nm) or single mode (1300/1550nm). Fiber optic connectors are ST or FC. Electrical connectors are DB25 female. Power is 12VDC; optional 24VDC, -48VDC, 125VDC or 115/230VAC with an external power cube.

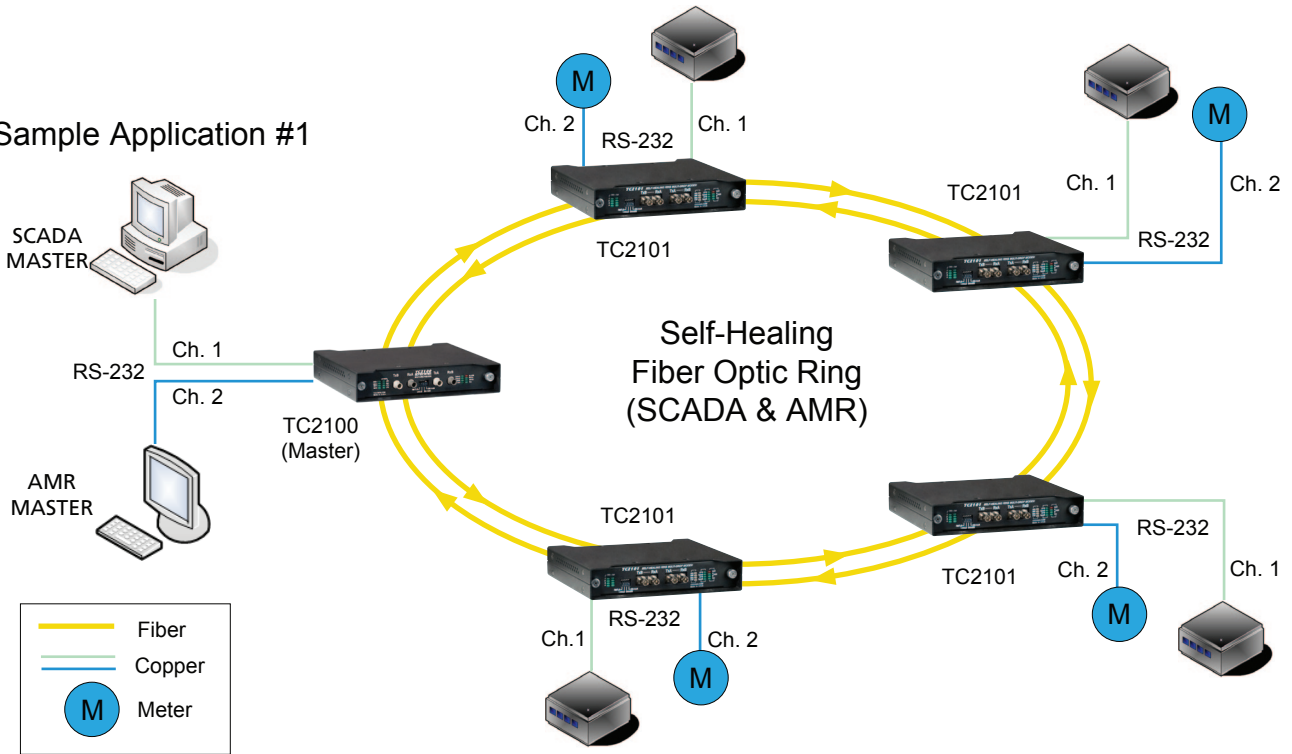


Applications

Renowned for its high reliability, the TC2100 Multi-Drop Modem is ideal for Ring or Self-Healing Ring communication links in SCADA, Traffic Control, Industrial Process Control and Security Networks. It is frequently used to interconnect Remote Terminal Units (RTUs) or Programmable Logic Controllers (PLCs) in Utility substation SCADA Networks.

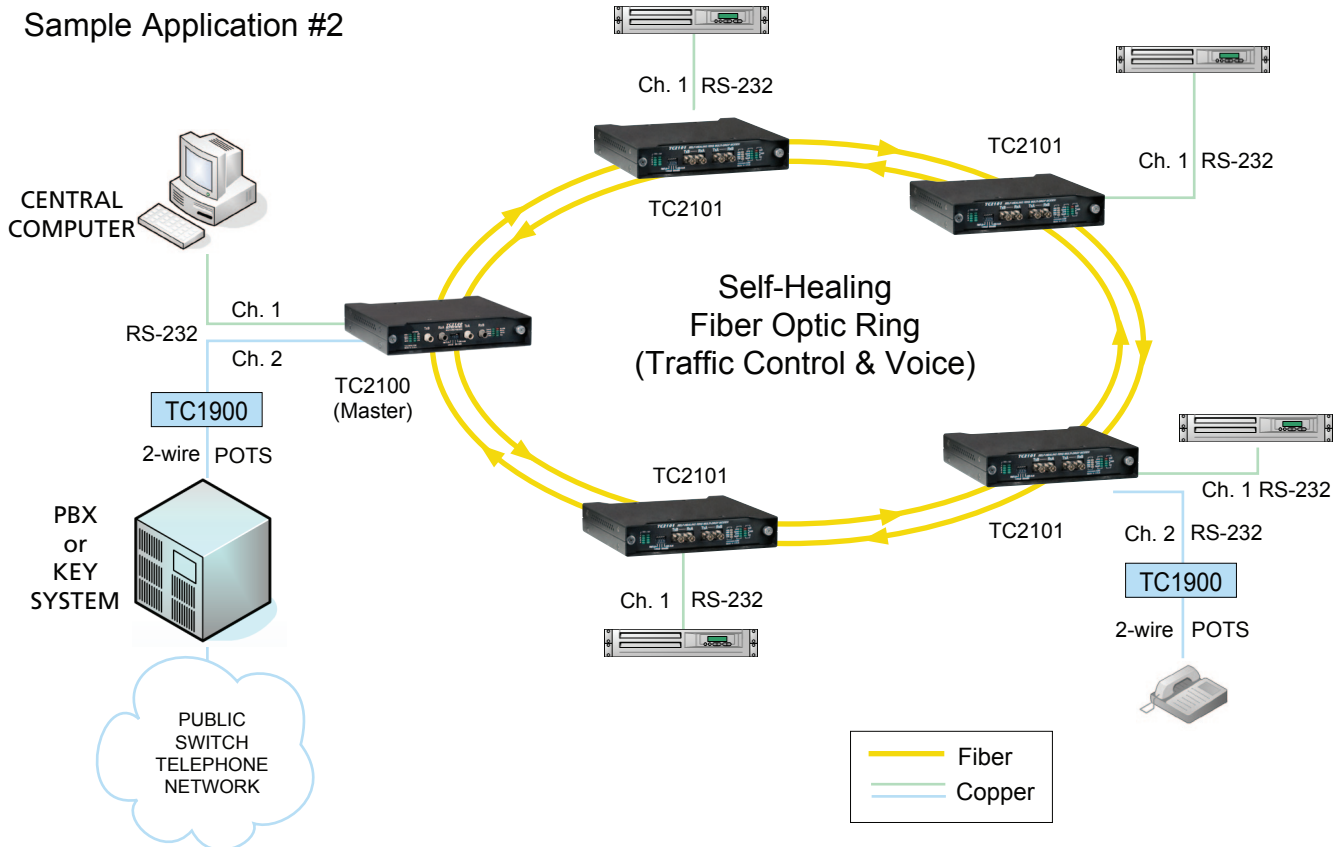
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Sample Application #1



Typical SCADA and AMR Application Using TC2100 "Self-Healing" Fiber Modems In a Utility Substation Environment

Sample Application #2



Typical Poll Response Application Using TC2100 "Self-Healing" Fiber Modems In a Traffic Control Environment

What Makes the TC2100 Self-Healing Ring Different from Other Vendors?

Many of the TC2100's features are critical to network operation; some are unique for a product of this type. It is important to note that the term "Self-Healing Ring" means different things to different vendors. Because there is no industry standard for Self-Healing Rings, vendor offerings vary greatly in terms of function, features and sophistication.

The TC2100 Self Healing Ring differs from competitor offerings in its sophistication. This sophistication enables it to build in a variety of user benefits often not available with many other vendor's Self-Healing Rings.

These benefits include:

- **The TC2101 Slave Unit Provides Loop Monitor Signal LEDs that Detect if any Incorrect Fiber Cables are Connected.**

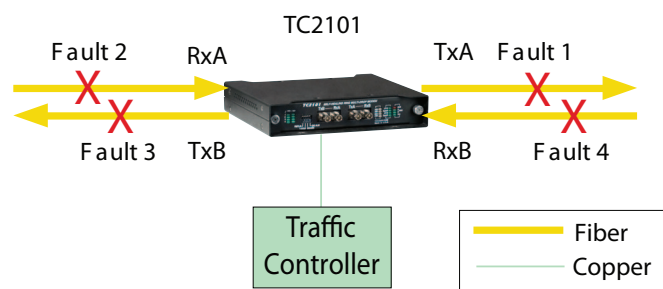
Solidly lit green LPA (Loop "A") and LPB (Loop "B") LEDs indicate a normal system; blinking green LEDs indicate that the fiber cables have been cross-connected.

Some vendors do not offer any simple means to verify that the fiber optic cables are cross-connected at remote nodes.

This is absolutely critical! For example, if a technician inadvertently cross-connects the Ring A and Ring B cables to a modem, the network will appear to function normally, but the Self-Healing portion will not be operable. Technicians must have specific diagnostics to pinpoint where the errant cable cross-connect has occurred.

- **The TC2100 can Detect Faults Both Upstream and Downstream from Each Unit.**

The TC2100 can detect cable breakage at both transmit and receiving sides. Some vendor's SHR products detect cable breakage only at the receiving side. Unless the device can detect failures at the transmit side, there is no way to know if the next device is receiving the signal (see adjacent diagram).

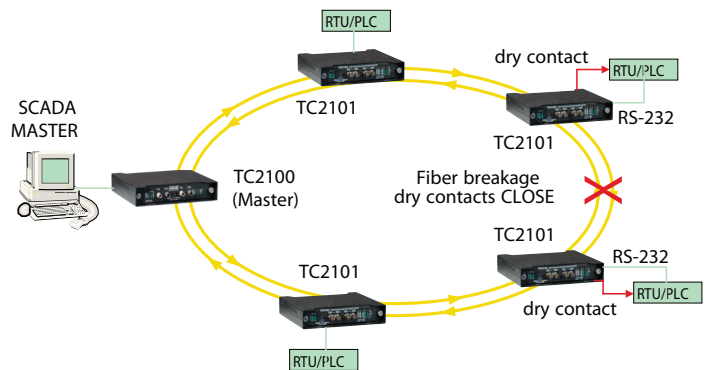


- **The TC2100 Prevents any Type of Echo Effect.**

Some vendors offer a self-healing scheme that doesn't separate broadcast and receive channels. This often results in an "Echo" effect that can disable network communications. ("Echo" happens when the data signal transmitted into the Master unit, and around the ring, is received back at the Master unit's port).

- **Each TC2101 (Slave) Includes a Dry Contact Alarm which Enables Pinpointing any Fault.**

Technicians must be able to pinpoint exactly where a fault has occurred. A dry alarm contact on the modem's master unit indicates when self-healing has occurred somewhere on the ring. Dry alarm contacts from the modem slave units on either side of a fault effectively pinpoint the location of the break or failure (see diagram).



- **The TC2100 Offers a Multiple-Master Self-Healing Ring Topology.**

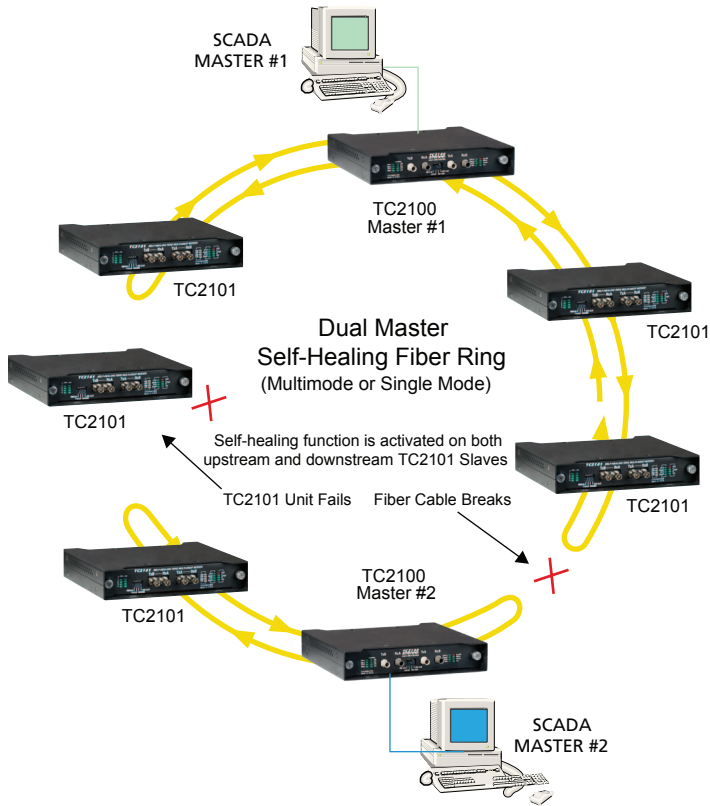
This innovative configuration virtually doubles the reliability of a single Master because it can recover faults or failures in both rings A and B in two different places (See diagram on page 4). System integrity is maintained because both Master units poll the Slaves at the same time, but through different "half" rings.

- **The TC2100 Provides Two Channels for Data, Controls or a Telephone Link (via the TC1900 Telephone Adapter)**

Use two channels for RS-232 or one for RS-422 or RS-485. You can also add telephone service by using the TC1900 RS-232 Telephone Extender. The TC1900 is compatible with most analog PBXs and enables dial-up telephone extensions to be plugged into RS-232 circuits.

- **The TC2100 Provides a Built-In Test Signal Generator to Verify Optical Loop Integrity**

A built-in test signal generator provides a simple and effective method for a self test verifying link integrity.



TC2100 Self-Healing Ring with Multiple Masters

A Self-Healing Ring consists of two data paths, Ring A and Ring B, with each data path running in an opposite direction to the other. Under normal operation only the primary data path (Ring A) is used. When there is a fault (cable or failed device), the data path will turn around before it reaches the fault or failed unit and use the secondary data path to complete the link. In this manner, the data/communication path remains intact.

A multiple master topology (see diagram at left) provides maximum reliability. It can maintain Ring integrity despite faults or failures in both rings in several different places, depending on the number of master units.

Data Rates

Async RS-232, RS-422, RS-485.....
.....up to 38.4 Kbps*

Optical

Transmitter.....LED/ELED/LASER*
Receiver.....PIN Diode
Wavelength

.....850/1300nm Multimode
.....1300/1550nm Single Mode

Fiber Optic Connectors

.....ST, Optional FC
Loss Budget* - 850/1300/1550nm
15dB.....Multimode @62.5/125µm
20dB.....Single Mode @9/125µm

Electrical

Connector.....DB25 Female
Interface.....(DCE or DTE) RS-232,
.....RS-422, or RS-485 (2 or 4-wire)

System

Bit Error Rate.....1 in 10⁹ or better

Diagnostic Functions

.....Local & Remote Loopback,
.....Signal Generator, Disable Alarm,
.....Loop Monitor

Visual Indicators

.....MSTR, SLAV, Sync-A, Sync-B, Vcc,
.....PWRA, PWRB, ALARM, BRD-1,
.....BRD-2, RSP-1, RSP-2, LPA, LPB,
.....A2B, B2A

Alarm

Dry Contact.....Normal OPEN

Power

Standard.....12VDC @300mA
Optional.....24VDC, -48VDC, 125VDC,
.....or 115/230VAC w/ power cube

Temperature

Operating-10°C to 50°C
Hi-Temp1 (optional)...-20°C to 70°C
Hi-Temp2 (optional)...-40°C to 80°C
Storage-40°C to 90°C
Humidity95% non-condensing

Physical (Standalone Unit)

Height.....(3.53 cm) 1.39"
Width.....(18.13 cm) 7.14"
Depth.....(16.59 cm) 6.53"
Weight.....(567 gm) 1.25 lbs

*Contact factory for higher requirements (LASER)



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Note: Information contained in this data sheet is subject to change without prior notice.