Self-Healing Multi-Drop Fiber Optic Multiplexer

Model TC2800

- Sophisticated Self-Healing Ring

- All Digital Design

- Hardened Temperature version exceeds NEMA & CALTRANS specs

- Protocol Transparent

- Separate Broadcast/Receive Channels

- RS-232, RS-422, RS-485 (2/4-wire)

- Multimode (850/1300nm) or Single Mode (1300/1550nm)

- Built-In Power Redundancy

- Optical Loop Integrity Test

- Local Dry Contact Alarm Relay

- Rackmount or Standalone

TC2800S Standalone/Wallmount Unit

TC2800R (Housed in TCRM195 19" High, 1U High Rackmount Card Cage)

Intended for Ring and Self-Healing Ring topologies, the TC2800 Multi-Drop Fiber Optic Multiplexer interconnects up to 12 devices with RS-232, RS-422 or RS-485 (2- or 4-wire) interfaces over single mode or multimode fiber.

The TC2800 is transparent to all protocols and supports data rates up to 38.4 Kbps. Each unit provides two pairs of fiber interfaces and 4, 8 or 12 independent channels. Optical signals are regenerated at each drop. Hardened temperature versions (-20°C to 70°C & -40°C to 80°C) are available for extreme environments.

The TC2800 is available in three basic configurations:
- Single Ring with one Master Unit
- Self-Healing (Dual) Ring with one Master Unit
- Self-Healing Ring with Multiple Master Units

The TC2800 offers a sophisticated Self-Healing Ring scheme. Fault conditions are detected on both Tx and Rx, upstream and downstream of each unit, and automatically re-routed to maintain Ring integrity. Dry contact alarms can be connected to RTUs/PLCs to help pinpoint the location of a fault.

Diagnostics include Local and Remote Loopback, a Test Signal Generator for verifying system integrity and Dry Contact Alarms. An Anti-Streaming function prevents a single node failure (e.g. "babbling") from bringing down the entire network.

The TC2800 is compatible with all popular types and sizes of fiber optic cable. Fiber optic connectors are ST or FC. Electrical connectors are RJ-11 female. Standard power is 12 VDC. Optional power sources are 24VDC, -48VDC, 125VDC or 115/230VAC with an external power cube.
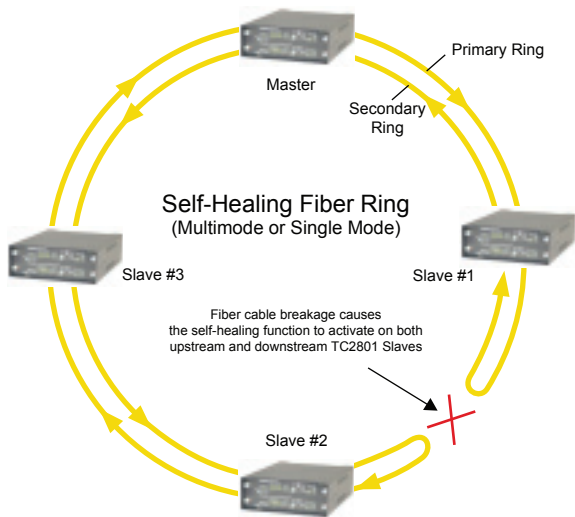
TC COMMUNICATIONS
FIBER OPTIC CONNECTIVITY

Applications

The TC2800 is frequently used to interconnect Remote Terminal Units (RTUs) or Programmable Logic Controllers (PLCs) in Utility substation SCADA Networks that require multiple channels. It is also used for similar connectivity applications in Traffic Control, Industrial Process Control and Security System Networks.

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Self-Healing Ring

Self-Healing Fiber Ring
(Multimode or Single Mode)

Primary Ring
Master
Secondary Ring
Slave #3
Slave #1

Fiber cable breakage causes
the self-healing function to activate on both
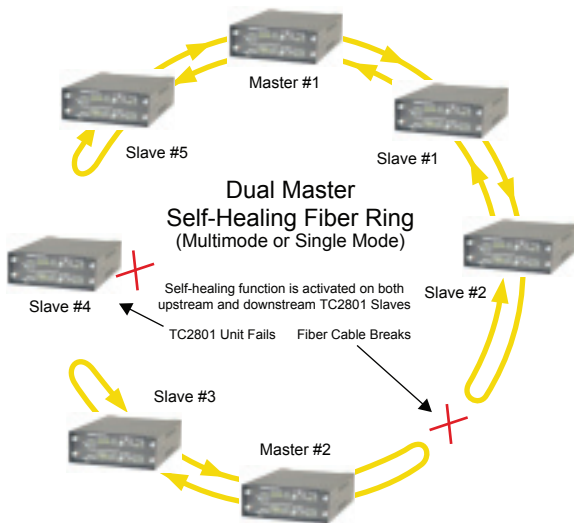upstream and downstream TC2801 Slaves

Slave #2

A Self-Healing Ring (also called Dual Ring or Counter-Rotating Ring) topology provides maximum fault tolerance and network flexibility.

It 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 fault (cable or failed device), the data path will turn around before it reaches the fault of failed unit and use the secondary data path to complete the link. In this manner, the data path to the remainder of the units will remain intact.

Self-Healing Ring w/ Multiple Masters

**Dual Master
Self-Healing Fiber Ring**
(Multimode or Single Mode)

Master #1
Slave #5
Slave #1
Slave #4
Slave #2
Slave #3
Master #2

Self-healing function is activated on both
upstream and downstream TC2801 Slaves

TC2801 Unit Fails   Fiber Cable Breaks

The TC2800's most reliable configuration is the "multiple master" Self- Healing Ring.

This innovative configuration maximizes the reliability of a single Master because it can recover faults or failures in both rings in multiple places.

During normal operation, Master # 2 is set in a "THRU" mode via a DIP switch at the front panel.
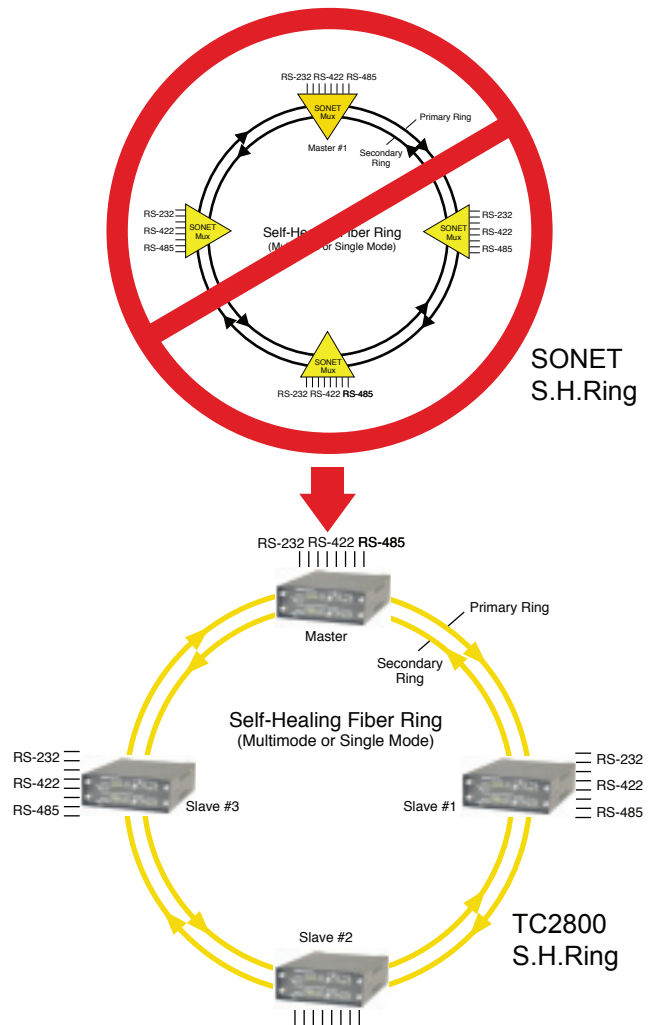
When a double fault (all four fiber optic cables in a fault condition) occurs (see figure), Master #2 is switched back to "MASTER" mode.

In the "MASTER" mode, the broadcast messages are sent through Master #1 and Master #2 at the same time. The responses from the slave units are also received by Master's #1 and #2.

In extreme situations where both rings are broken in two separate places, both Master units poll the Slaves at the same time, but through different "half" rings.
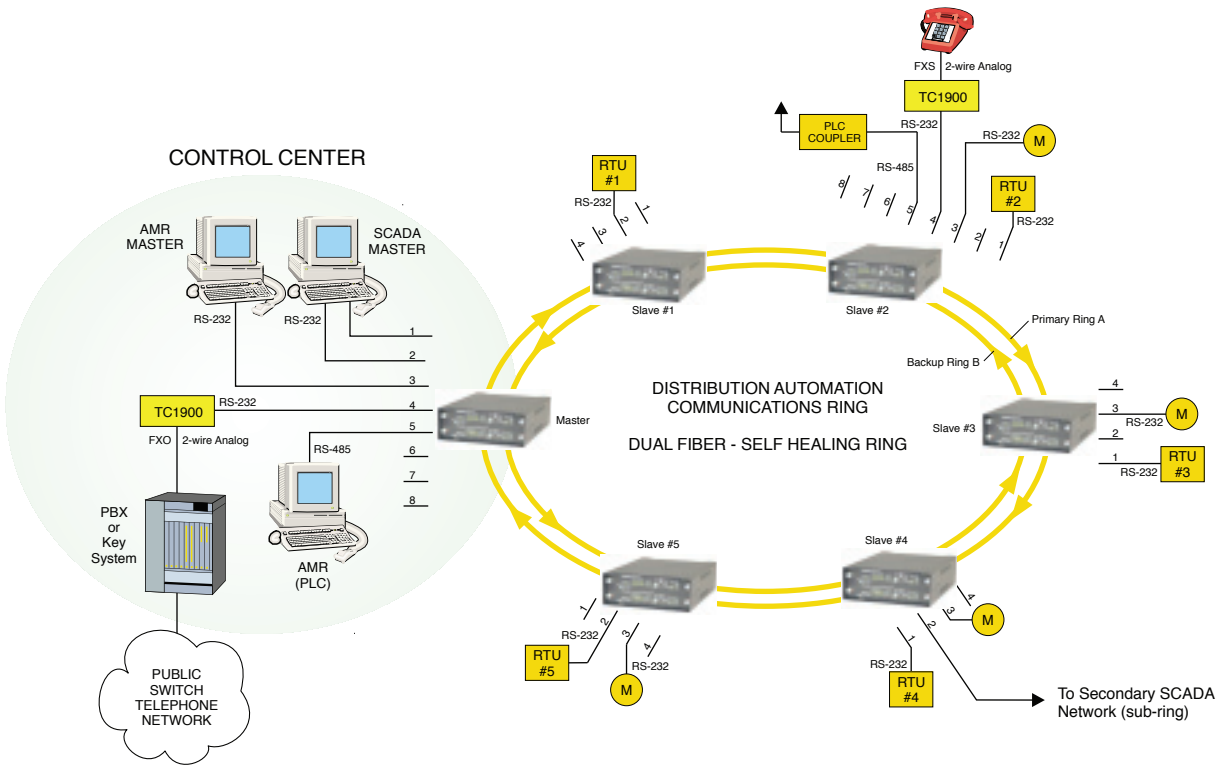
Sample Application #1

Traffic Control SONET Ring Alternative Application

RS-232 RS-422 RS-485
SONET Mux
Master #1
Primary Ring
Secondary Ring
RS-232
RS-422
RS-485
SONET Mux
Self-Healing Fiber Ring
(Multimode or Single Mode)
RS-232
RS-422
RS-485
SONET Mux
SONET Mux
RS-232 RS-422 **RS-485**

SONET S.H.Ring

RS-232 RS-422 **RS-485**

Master
Primary Ring
Secondary Ring

Self-Healing Fiber Ring
(Multimode or Single Mode)

RS-232
RS-422
RS-485
Slave #3
Slave #1
RS-232
RS-422
RS-485

Slave #2

TC2800 S.H.Ring

In many traffic control applications, the TC2800 can be used as a low cost alternative to SONET or T1 Rings. The diagram above illustrates how the TC2800 can create a self-healing ring network for linking traffic intersections with multiple RS-232 drops for traffic lights, cross walks, camera PTZ, etc.

High speed SONET networks are often expensive and the TC2800 easily provides the desired ring fault protection

A similar application uses the TC2800 to link PTZ, radar detectors, ramp meters, weather stations, etc. along a stretch of highway.

CONTROL CENTER

DISTRIBUTION AUTOMATION
COMMUNICATIONS RING

DUAL FIBER - SELF HEALING RING

Sample Application #2

SCADA Utility Application

The abobe diagram illustrates a Distribution Automation Network (DAN) with a Self-Healing Ring topology over a distance of about 100 kilometers. The DAN includes Automated Meter Reading and telephone extentions (TC1900's).

It uses a TC2800 Master multi-drop multiplexer at the main office and TC2801 slave muxes at each of the other sites.

The DAN uses four asynchronous 38.4 kbps data channels. To speed up the SCADA polling process (which runs at 9600 kbps), the master station at the main office communicates simultaneously with one-half of the Remote Terminal Units (RTUs) on channel 1, the other half on channel 2.

The DAN uses channel 3 for an Automated Meter Reading (AMR) system capable of reading meters manufactured by multiple vendors, again at 9600 bps. Channel 4 is used for telephone extension and channel 5 is RS-485 AMR test applications. The integrity of the DAN is monitored entirely through the SCADA system.

TC2800S (rear view)

Sample Application #3

Telephone & Data Application

The TC2800 can multiplex both telephone and data by using the "Quick-Talk" RS-232 Telephone Extender. Quick-Talk is compatible with most analog PBXs and enables dial-up telephone extensions to be plugged into most RS-232 circuits.
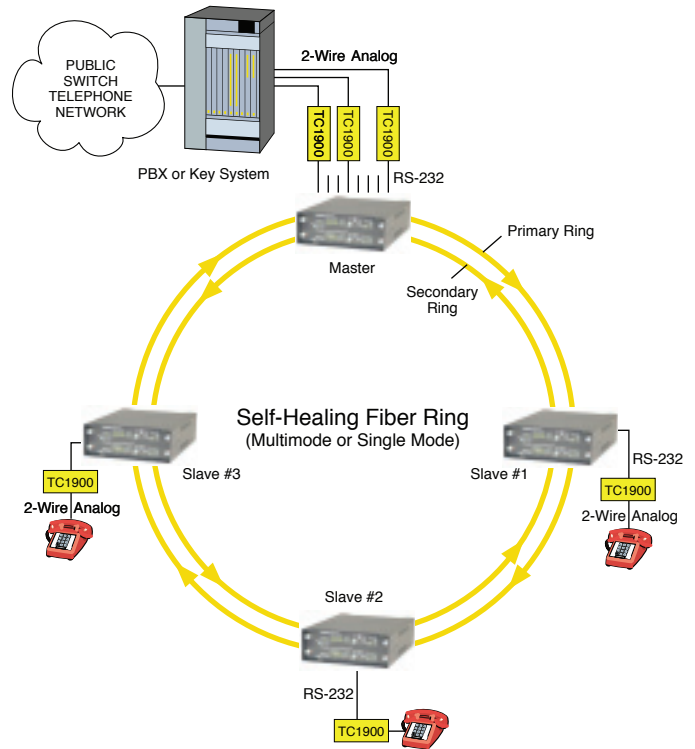
TC2800 Special User Benefits

The TC2800 offers several unique features that enhance network flexibility for installation, troubleshooting and expansion. These user benefits include:

- The ability to adapt to different power sources or interfaces.

- Separating broadcast & receive signals to avoid interference if the self-healing function is activated.

- Detecting faults both upstream and downstream from each unit. Unless the devbice can detect failures at the transmit side, there is no way to know if the next device is receiving the signal. Many vendor's SHR offerings can detect cable only at the receiving side.

- The ability to re-configure the network at any time, e.g. decives to different rooms.

- Slave Units provide loop monitor signal LEDs to detect incorrectly connected cables. This is critical. If cables are inadvertently cross connected, the network will appear to be functioning normally but the Self-Healing function will be inoperable.

- Slave units include a Dry Contact Alarm which enables pinpointing faults.

- The ability to add additional channels to the network at any time without affecting the system.

- Provides built-in Test Signal Generator to verify optical loop integrity.

Customer Testimonials

"Our system was built in stages over the past 2 to 3 years and it has been operating extremely reliably. We are very pleased with the TC2800/TC2801 product and we are also very pleased with TC Communications customer support." - Public Utility

"The TC2800s are working so well that we forget that they even there." - Canadian DOT

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

Electrical

Connector ....RJ11 Female
Interface ....RS-232, RS-422, ...or RS-485 (2 or 4-wire)

Diagnostic Functions

................Local & Remote Loopback, ...Signal Generator, Disable Alarm, ...Enable Anti-Streaming (TC2801)

Power

Standard ....12VDC @500mA
Optional....24VDC, −48VDC, 125VDC, ...or 115/230VAC w/ power cube

System

Bit Error Rate ....1 in 10^9 or better

Alarm

Dry Contact...................Normal OPEN

Visual Indicators

System ...PWR A, PWR B, VccA, VccB
Electrical Signal ....BRD & RSP (for each channel), AST (TC2801 only)
Optic Signal ....RxA, TxB, RxB, ...SYNCA, SYNCB, A2B (TC2801 only), B2A (TC2801 only), LPA, LPB
Alarm ....PWRA, PWRB, OPTIC, ...AST (TC2801 only)

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
Humidity ....95% non-condensing

Physical (Standalone Unit)

Height.........................(6.71 cm) 2.64"
Width........................(18.13 cm) 7.14"
Depth........................(24.89 cm) 9.80"
Weight.....................(1.20 kg) 2.66 lbs

Contact factory for higher requirements (LASER)

TC COMMUNICATIONS®
FIBER OPTIC CONNECTIVITY

Certified System

ISO 9001
QMI-SAI Global
#1045959

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Note - Information contained in this data sheet is subject to change without prior notice. 010C