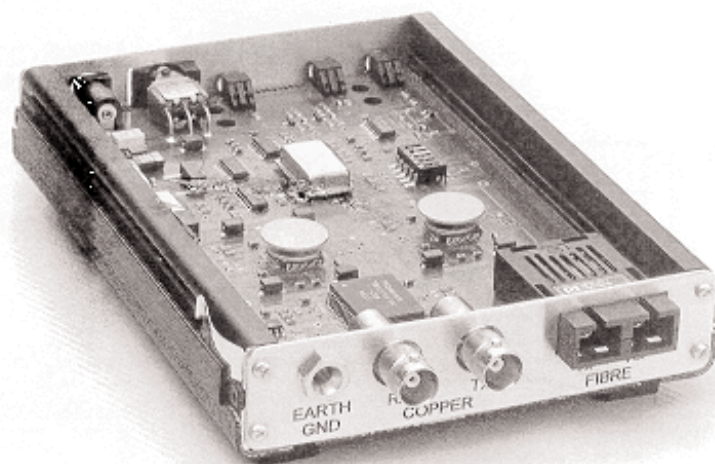


Copperhead™ bi-directional fiber (NRZ) to copper (CMI) converters

*Compact, easy to install
modules provide all
connections and signal conditioning
for NRZ/CMI network junctions*



Features

- Connection-ready module for E4/STM-1/OC3 applications
- Maximum operating distance exceeds 200 meters on 75 ohm RG-6/u and RG-11/u coaxial cable
- Tested and proven interface using AMCC S3015/S3016 chip sets
- Loss-of-signal (LOS) detection
- Low transmit/receive jitter
- Encoder and decoder
- Clock recovery
- Typical power dissipation of 10.8W at 12Vdc (with voltage regulator)
- See applicable specifications below

Copperhead™ bi-directional converters allow network developers to conveniently utilize both fiberoptic- and coax-connected system components in network configurations, and to conduct bi-directional cross media data, voice, and video communications at fibre speed data rates.

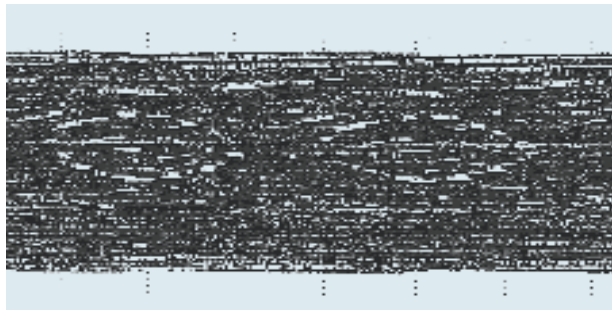
It provides a convenient, self-contained interface with all connections necessary for installation onto the network. Besides the signal connections, all that is required is 12Vdc power.

The TC155/311 converts and conditions 155.52 Mb/s NRZ over fiber signals to 311 Mb/s CMI over copper signals for Telecom/SONET (OC-3/STM-1) applications. It interfaces, regenerates, performs a protocol conversion, and clocks the optical and electrical signals. It can be used in single and multi-mode fiber applications. The heart of the TC155/311 converter is its Copperhead™ transceiver, which minimizes output waveform jitter to ITU-T G.703 masking requirements and corrects for the distortion of high frequency input signals received over coaxial cable. The proprietary transceiver permits 311 Mb/s communication over a remarkable distance of up to 200 meters of 75 ohm, RG-6/u coaxial cable.

- CE Certified
- Meets FCC Class A, 55022 Class A CISPR
 - IEC 1000-4-2 EN50082-1, Criteria B, Level 2
 - IEC 801-3 EN50082-1, Criteria A
 - IEC 1000-4-4 EN50082-1, Criteria B, Level 3 (on I/O Ports)
 - IEC 950:(1991,1992,1993) Safety Regulations

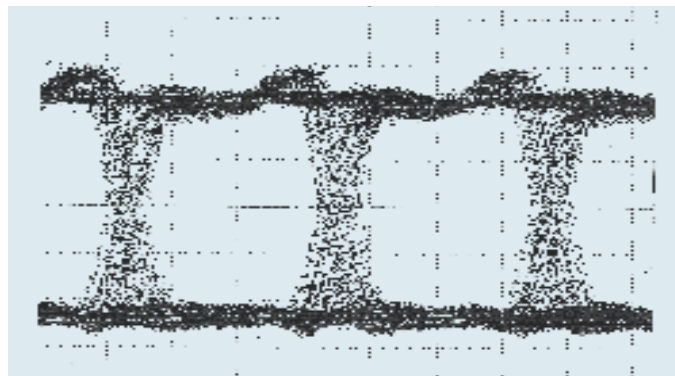


BEFORE (unequalized)



(Figure 1) Actual oscilloscope tracing of 311 Mb/s unequalized input to receiver pins 13 and 14 after transmission over 200 meters of RG-6/u coaxial cable.

AFTER (equalized for CMI)



(Figure 2) Tracing of the same signal after equalization. Receiver output measured at pins 2 and 3.

Technical description

The TC155/311 Converter converts fiber (NRZ coding) to coax (CMI coding) and coax (CMI coding) to fiber (NRZ coding).

Coax (CMI) receiver: The receiver performs equalization, isolation (AC coupled), amplification and clock recovery on the CMI serial data stream from coax. The serial data stream is decoded from CMI to NRZ. The NRZ serial data stream is fed to the fibre transceiver (TX side).

Fiber (NRZ) receiver: Clock recovery is performed on the NRZ serial data stream received from the fiber. The NRZ data is encoded to Coded Mark Inversion (CMI). The CMI data is converted to an appropriate media drive level and is fed to the coax transceiver (TX side). Here, the signal is pre-conditioned with an output filter to meet G.703 output masks (for binary "ones" and "zeros") and launched on the coax cable through interfacing wideband pulse transformers.

Automatic reset circuit: The TC155/311 converter also includes an automatic reset when the power is turned on, and when the coax or fiber signal detect goes from a logic low to a high.

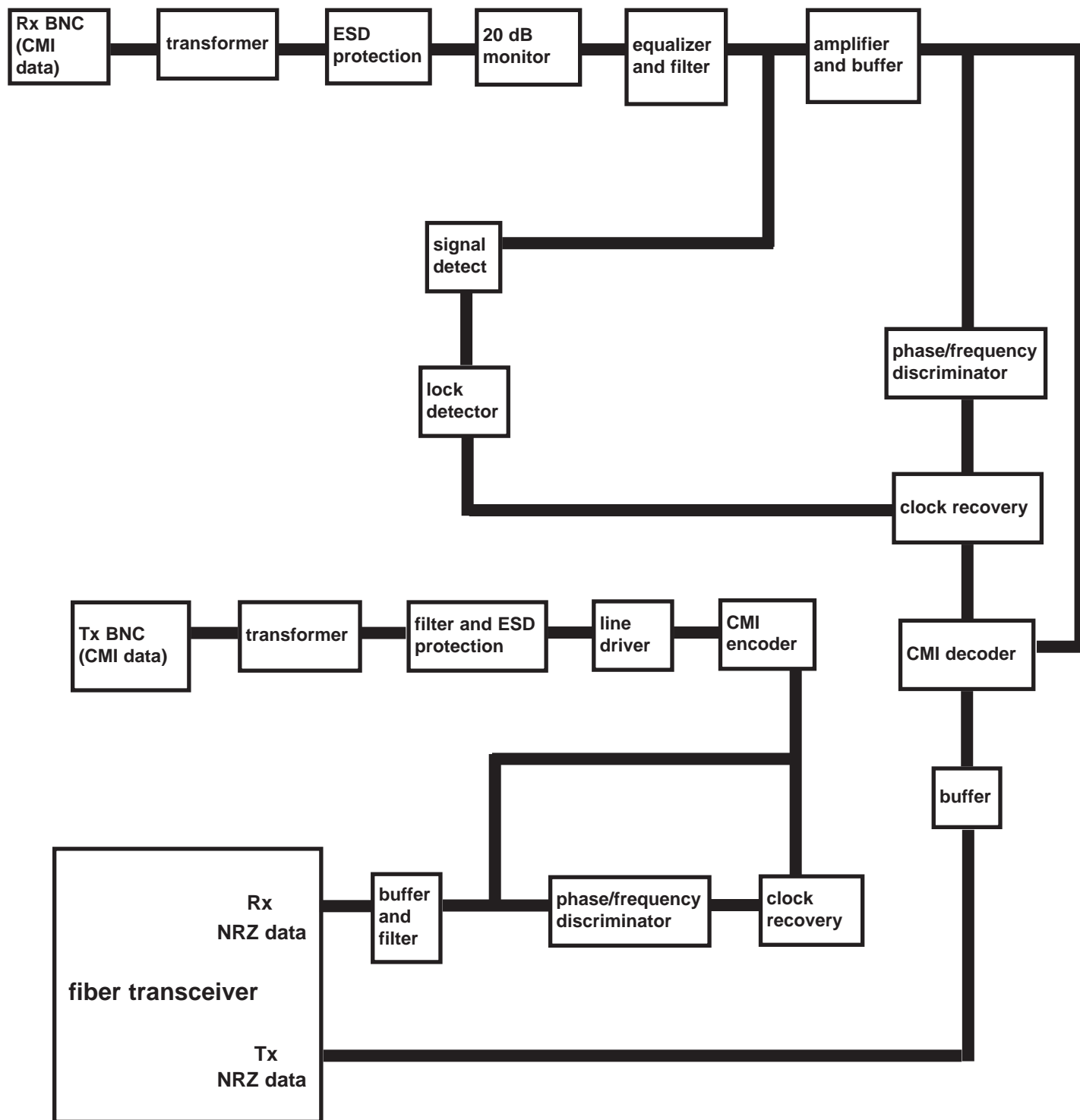
-20 dB monitor access point: In addition, the converter includes a -20dB monitor access point. This allows for utilizing the converter in applications where a -20dB buffer has been installed to prevent disturbing the signal under test.

Benefits of transformer coupling

The pulse transformers used in Copperhead™ transceivers provide high isolation and optimum damping of transients. They also eliminate DC components in the signal and provide common mode signal rejection. The transformer is also used to perform impedance matching of the load to the source to provide maximum power transfer, and also to prevent reflections from transmission line effects.



TC155/311 function diagram





Connections

Fiber transceiver	SC connector provides link to cable; single mode and multimode options are available
Copper connections	Two 75 ohm BNC
Power connector	2.0 mm male power jack on converter to mate with 2.1 mm female power plug
Earth ground	In order to meet all EMC requirements, a 16 AWG or heavier (2 feet max) wire must be connected between earth ground of the converter and earth ground of the power source

Converter & data link LEDs

Fiber	Indicates that data is present on the receiver
Copper	Indicates that data is present on the receiver
Power status	Indicates that power is connected to the power jack

Table 1 Absolute Maximum Ratings

PARAMETER	SYM	MIN	MAX	UNIT
Storage temperature	T_S	-40	+75	°C
Operating temperature ambient, active	T_A	0	+40	°C
Power supply voltage (regulator) ¹	V_{CC}	10.8	13.2	V
Power supply current ¹	I_C	-	1.0	A
Power dissipation (total) ¹	P_D	-	13.2	W
Weight	#	-	1	pounds
Size: 6.50"L x 4.60"W x 1.50"H	-	-	-	inches
Size: 165 x 117 x 38 mm	-	-	-	millimeters

Note 1: Measured @ 12 Vdc

Note 2: Coas transmitter meets ITU-T G.703 data masks

Table 2 General Electrical Parameters

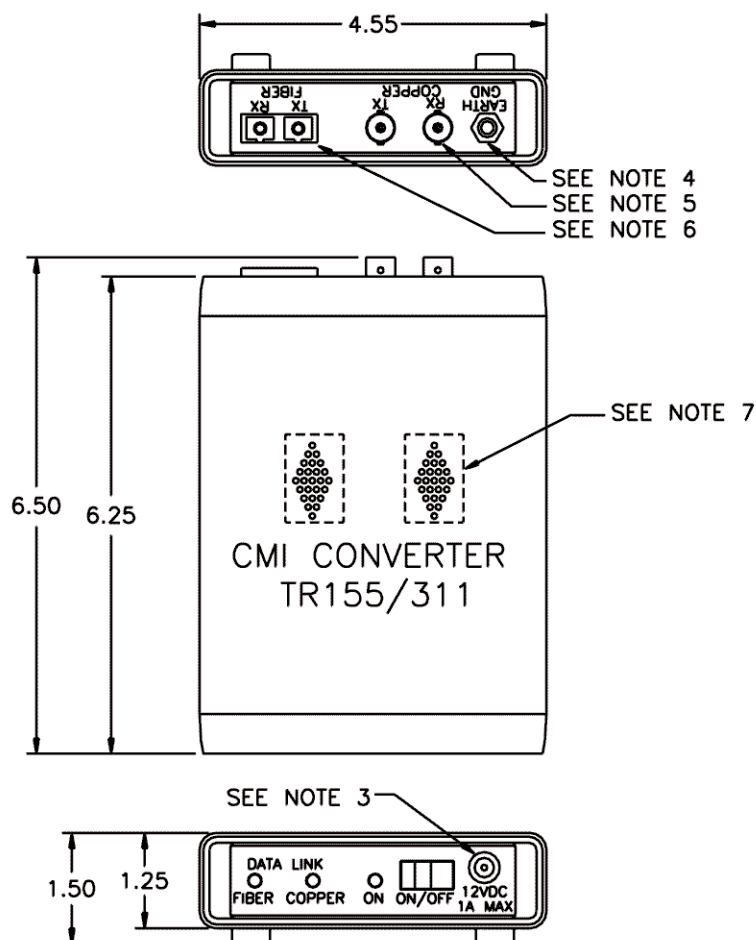
PARAMETER	TC155/311 STM-1 OC-3	TC139/279 E4/STM-1 OC-3	UNIT
Data rate	155.52	139.264	MBaud/s
Nominal bit rate	311.04	278.528	Mb/s
Tolerance	± 100	± 100	ppm
Operating distance (min) single mode fiber (long reach)	40	40	K meters
Operating distance (min) multimode fiber	2	2	K meters
Operating distance (min) ¹	100 + 20dB	100 + 20dB	meters
Cable impedance ¹	75	75	ohms (nom)

Note 1: Using RG-6/u coaxial cable.

Note: The numbers and parameters shown are derived from Recommendation G.703.



Mechanical Dimensions



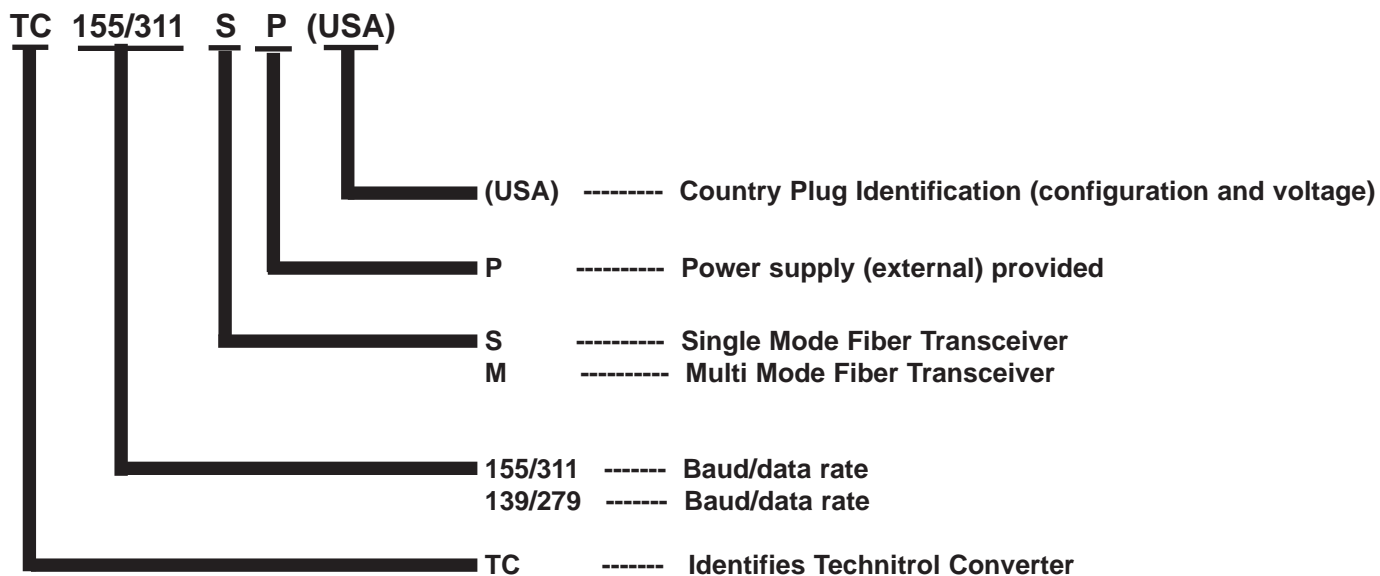
NOTES:

1. DIMENSIONS ARE IN INCHES AND FOR REFERENCE ONLY
2. ENCLOSURE—TRACEWELL SL150
3. POWER CONNECTOR—MALE POWER JACK 2.0mm
REQUIRED INTERFACE JACK—FEMALE 2.1mm
4. EARTH GND—BANANA PLUG
5. COPPER TERMINATION—75 OHM BNC
6. FIBER TERMINATION—SC
7. VENTILATION HOLES—DO NOT BLOCK



Ordering Information

Part Number Example:



Related Products

Series	Features
TM311DVA	311.04 Mb version SONET STM1 (also SONET E4 278.528 Mb) CMI
TM311TRFVA	311.04 Mb version SONET STM1 (also SONET E4 278.528 Mb) CMI with G.775 LOS
TM622 Series	622.08 Mbaud version SONET OC-12, STM-4
T-330SCT	330 Mbaud "HOT LINK" / 265.625 Mbaud version 1/4 speed Fibre Channel Transformer
T-1062SCT	1.0625 Gbaud version full speed Fibre Channel Transformer



Declaration of EU Conformity

Application of Council Directive: 89/336/EEC

Standards to which conformity is declared are as follows:

Harmonized Standards		
EN 55022: (1993)	Measurement of radio disturbance characteristics of information technology equipment CIS PR Class A.	
EN50081-1:(1991)	Generic Emission Standard. Part 1: Residential - Standard for using products in domestic, commercial and light-industrial environments.	
EN50082-1:(1991)	Generic Immunity Standard. Part 1: Residential - General immunity standard for using products in domestic, commercial and light-industrial environments.	
Test Standards		
IEC 801.3	EMC Radiated Immunity	
IEC 1000-4-2	IEC 801.2	ESD Test Method
IEC 1000-4-4	IEC 801.4	EFT Test Method
EN50082-1	Performance Criteria A	
EN50082-1	Performance Criteria B, Level 2	
EN50082-1	Performance Criteria B, Level 3 (at I/O Port)	
Safety		
IEC 950: (1991); A mend ment 1:(1992); A mend ment 2:(1993)	Safety of Information Technology Equipment	

Manufacturer's Name:

Pulse Specialty Components
A Technitrol Company
Two Pearl Buck Court
Bristol, PA 19007-6812 USA

CE Mark Test Reports on File in Europe:

Pulse
Dunmore Road
Tuam10
Co. Galway, Ireland

Type of Equipment: Information Technology Equipment
Equipment Class: Commercial & Light Industrial
Model: C155/311 Converter
Year of Manufacture: 1996,1997
Technical File Number: TP 10327

Pulse Specialty Components hereby declares that the equipment specified above conforms to the above Directive(s) and Standard(s). This Declaration is the sole responsibility of Pulse Specialty Components.

WARRANTY

Pulse Specialty Components warrants for a period of 90 days from the date of shipment, that under normal use and service, its products will be free from defects in workmanship and material. Pulse Specialty Components' sole responsibility under this warranty is, at its option, to repair or replace, without charge, any defective product or part, or to credit buyer for the purchase price of such defective product, provided:

- 1) Buyer promptly notifies Pulse Specialty Components in writing within the warranty period, and
- 2) The defective product or part is returned to Pulse Specialty Components with transportation charges prepaid by Buyer, and
- 3) Pulse Specialty Components examination of such product shall disclose to its satisfaction that said defect exists and has not been caused by misuse, neglect, improper installation, repair or alteration, or accident.

EXCEPT FOR THE ABOVE WARRANTY AND THE IMPLIED WARRANTY OF TITLE, PULSE SPECIALTY COMPONENTS MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. NO LIABILITY IS ASSUMED FOR EXPENDABLE ITEMS SUCH AS LAMPS AND FUSES. PULSE SPECIALTY COMPONENTS WILL NOT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES UNDER ANY CIRCUMSTANCES.



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