

Power-Line Carrier



Pulsar
Technologies, Inc.

Self-Adjusting Receiver
AM or FSK Receiver
LED Bargraph
30-535 kHz
Totally Programmable
BW Selectivity
Fits into Existing Chassis
Field Upgradable

Universal Automatic Checkback
Loop Back Testing
Master or Remote Function
Encoded or Timed Checkback
Integral Instruction Set
Remote Communications

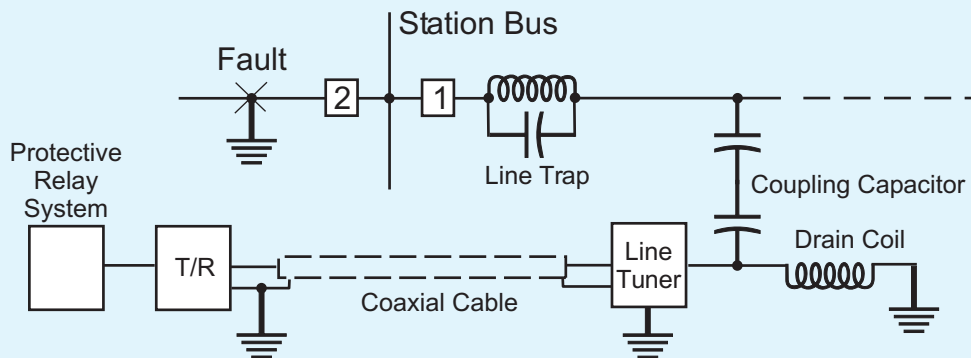


Redesigned Output
 μ P Relays
1 Ampere Rating
Any Voltage
20-200 mA Output

New Voice Adapter
Improved Voice Quality
Built-in Signaling Alarm

Power-Line Carrier is one of the most reliable and economical choices available for pilot relaying and transfer trip applications:

- ★ Reliability proven by more than fifty years of field experience at Electric Utilities all over the world.
- ★ Economic because it uses the power line itself as the medium, thereby not requiring more expensive alternatives such as microwave, leased circuits or fiber optics.
- ★ More transmission lines around the globe rely on Power-Line Carrier (PLC) for relay communications than any other method.



Applying PLC requires no licensing or right-of-way negotiations. In many cases the utility engineer can design, specify and install a PLC system without involving any other departments. For a new installation, the PLC channel is guaranteed to be ready before line energization since it uses the line itself for its communication path.

PLC, like other types of channels, works closely with protective relay systems to provide high speed clearing of internal line faults while restricting tripping for external faults. Channel logic, within the relay system, allows coordinating for identifying end zone faults, weak-infeed conditions and current reversals.

The Pulsar Technologies products presented here represent the latest generation of quality Power-Line Carrier products. They are based on more than fifty years experience in thousands of installations worldwide.

TC-10B and TCF-10B

- ★ Fully frequency programmable, 30 to 535kHz (no filter groups!).
- ★ Terminal blocks accept up to 12 AWG
- ★ 10 watt output standard, 50 watt or 100 watt available.
- ★ Selectable keying voltage – 15, 48/60, 110/125, or 220/250 Vdc.

TC-10B

- ★ Fully compatible with all other manufacturers' previous and current "on-off" carriers, i.e. TC, TC-10, TC-10A or KR (*Note: The voice adapter feature is not compatible with certain other manufacturers' versions*).
- ★ Independent start and stop inputs, circuit opening or closing options, allows interfacing to a wide range of relay schemes.
- ★ Two independent outputs, each capable of up to 1 ampere at station battery. Limiting resistors provided for use with electro-mechanical relays that require 20 or 200 mA.

Three bandwidths available

- ★ Wide-band (1600 Hz) for standard use.
- ★ Narrow-band (800 Hz) for applications requiring improved signal-to-noise ratio.
- ★ Extra Wide Band (3500 Hz) for Phase Comparison Relaying Systems.

Options

- ★ Universal checkback (programmable as remote or master).
- ★ Voice module with signaling.

TCF-10B

The TCF-10B is available as an individual transmitter, receiver or transceiver in one 3 RU high chassis.

Three available bandwidths

- ★ Narrow-band (380 Hz) where speed is not critical or spectrum conservation is important.
- ★ Medium-band (800 Hz) used in high-speed relaying.
- ★ Extrawide-band (1600 Hz) where relaying requires a super-high-speed channel.

Channel shift is based on the bandwidth

- ★ Narrow-band (380 Hz) shifts ± 100 Hz.
- ★ Medium-band (800 Hz) shifts ± 250 Hz.
- ★ Extra-wide (1600 Hz) shifts ± 600 Hz.
- ★ Medium-band (800 Hz) is available with ± 100 Hz shift for interfacing with previous generation equipment at the remote end.

Options

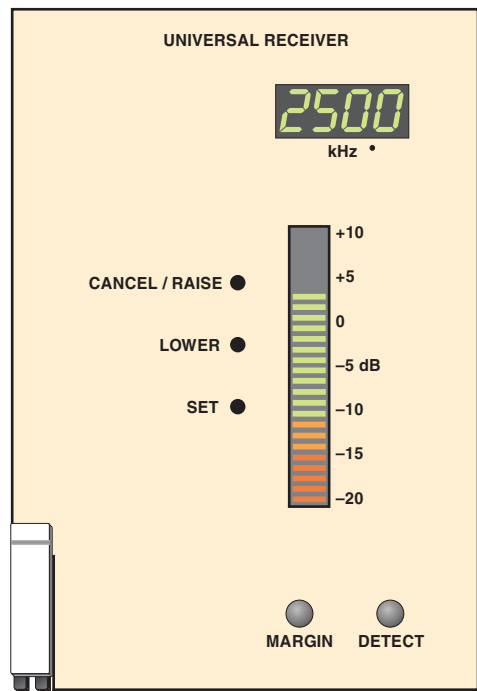
- ★ Electromechanical output option provides six contact outputs, each can be independently driven by Trip 1, Trip 2 (three-frequency application) or guard to produce a contact closure or contact opening.
- ★ Three-frequency option allows unblocking relaying and direct transfer trip functions over the same channel, economically conserving frequency spectrum. This option utilizes the medium-band or extrawide-band receivers with the ± 250 Hz shift.
- ★ Voice module with signaling (transceiver unit only).

Self-adjusting Receiver

This unit is pin-for-pin compatible with the previous TC-10B/ TCF-10B design, performs the same functions, and is even easier to adjust. This enhanced receiver with backward compatibility is evidence of our commitment to stay on the leading edge of Power-Line Carrier technology for our customer's benefit.

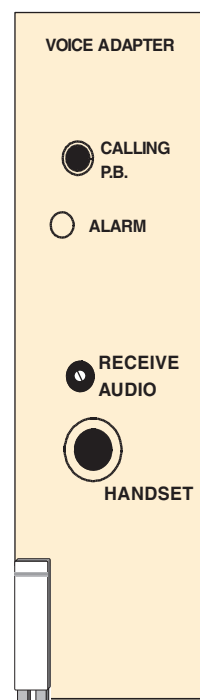
Receiver Features:

- ★ Digital Signal Processing (DSP) Technology.
Automatic setting of receiver margin to 15 dB, adjustable ± 5 dB in 1 dB steps.
- ★ Continuous four-digit LED frequency readout.
- ★ Carrier level indicator uses easy-to-read LED bargraph display.
- ★ Frequency programming, 30-535 kHz without changing filters.
- ★ Bandwidth is field selectable.
- ★ No instruments required to set the receiver module.
- ★ One module replaces two modules (Receiver/Detector & CLI for TC-10B or Receiver/Discriminator & CLI for TCF-10B).
- ★ Front-end analog and digital filtering provides superior bandwidth selectivity.
- ★ Optimum receiver sensitivity maintained.
- ★ Fits into existing chassis, even those shipped under the Westinghouse or ABB nameplates.
- ★ Older receiver units easily upgraded in the field.



Voice Adapter

- ★ Works with Self-Adjusting Receiver.
- ★ Works with old Voice adapters at remote end of line.
- ★ Improved voice quality.
- ★ Built-in signaling alarm for ringing.



TC-10B

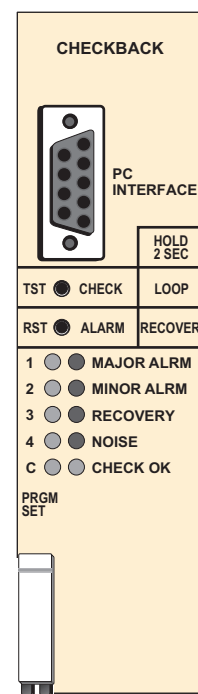
Application

The TC-10B is an "on-off" type PLC particularly suited for Directional Comparison Blocking or Phase Comparison Blocking schemes. It is available with Maintenance Voice and Universal Checkback options.

Universal Automatic Checkback

With the drive towards automation in substations, here is your answer for testing the on-off Power Line Carrier.

- ★ One module performs either remote or master functions.
- ★ Each master works with up to 10 remotes.
- ★ PC instruction set integral to checkback uses Windows terminal program.
- ★ Failed terminal identification.
- ★ Applicable to any TC-10B chassis.
- ★ Loop back testing.
- ★ Commands initiated via front pushbuttons, contact inputs or pc.
- ★ Retrieve & change remote settings & events.
- ★ 5 outputs:
 - Major alarm
 - Minor alarm
 - 3 user selectable
 - Delayed alarm
 - Test in progress
 - Successful test
 - Successful carrier recovery
 - Disabled automatic tests



TCF-10B

Application

The TCF-10B is a frequency-shift keyed type PLC particularly suited for Directional Comparison Unblocking or Phase Comparison Unblocking and Direct Transfer Trip relay schemes. A full-duplex maintenance voice channel, three-frequency configuration and electromechanical outputs are available as options.

TCF-10B Receiver Logic Module

Directional Comparison or Direct Transfer Trip

- ★ Low level time delay 50, 75 or 100 ms.
- ★ Selectable unblock timer 150, 300 or 500 ms.
- ★ Trip hold timer 10, 50 or 100 ms.
- ★ Guard hold timer 10, 50 or 100 ms.
- ★ Noise blocks unblock Yes or No.

Phase Comparison

- ★ Dual Phase Comparison or Segregated Phase Comparison.
- ★ Polarity Selectable for Trip Positive/Trip Negative.

One Amp Transistor Switched Outputs

No electro-mechanical outputs required unless directly tripping of the line breaker is required. In most applications, outputs can be powered from station battery, thereby eliminating the need for the 20 Vdc auxiliary power supply. *More compatible with microprocessor relays.* (Older relay systems or phase comparison systems may still require 20 Vdc supply.)

Optional Electromechanical Output

- ★ 6 Relays, field selectable for trip or guard; normally open or normally closed.
- ★ Breaker trip rated.



(DCU or DTT)

Hybrids

Application

Hybrids are used to insure proper combining and separation of signals when paralleling two or more transmitters or paralleling transmitters with receivers.

Three types of hybrids are available:

- ★ Resistive hybrid H1RB.
- ★ Reactive hybrid H3XB.
- ★ Skewed hybrid H1SB or H1SB-R.



Skewed Hybrid with Receiver Port 50 Ohm termination (H1SB-R)

This skewed hybrid has the receiver port internally terminated into a 50 ohm load. This eliminates the need for an external resistor, ensuring proper termination of the hybrid for optimal isolation.

Hardware

All three hybrids are available in a metal case measuring 3.25"H by 5.625"W by 5.00"D.

Characteristics			
	H1RB	H3XB	H1SB-R
Frequency Range	30-535kHz	30-535kHz	30-535kHz
Max Power	15 watts	15 watts	100 watts
Output Impedance	50 ohms	44-75 ohms	50 or 75 ohms
Insertion Loss	3.5 dB max	3.5 dB max	Xmtr: < 1dB Rcvr: 13 dB
Isolation/Return Loss	30 dB min	40 dB min	40 dB with 50 ohm termination

RF Connections			
Port	H1RB	H3XB	H1SB-R
Input 1	BNC	BNC	BNC
Input 2	BNC	BNC	BNC
Output	BNC (male)	UHF	UHF

Stand-Alone Universal Checkback

Amplifiers

Application

The Stand-Alone Universal Checkback (UCBS) provides periodic testing of non-TC-10B "on-off" carrier sets. The UCBS incorporates the same universal checkback module as is supplied in the TC-10B. The UCBS determines the viability of the complete channel including the transmitters, receivers and associated coupling equipment. Periodic testing is required for the normally "off" channel, to provide warning of signal deterioration prior to needing it for pilot relaying decisions.

Hardware

The UCBS is supplied in a modular chassis containing two plug-in modules and a "motherboard" with rear-mounted terminal blocks. Each unit contains a Universal Checkback Module and Power Supply module.

Mounting

Chassis 3 inches wide by 5.75 inches (3RU)
Optional 19 Inch rack with an adapter plate available

Connections

Rear-mounted terminal blocks

LPA50 and LPA100

Applications for PLC with high attenuation may require more transmitter power than the standard 10 watts. The LPA50 and LPA100 are available for these applications. They are typically applied where line attenuation is a serious problem as in extremely long lines (150 or more miles) or where underground cable is used for all or part of the line. Combining cable with overhead lines creates an impedance mismatch between the 20 to 60 ohm cable and the 150 to 300 ohm overhead line. This mismatch can cause a portion of the carrier signal to be reflected back to the transmit end, attenuating the signal significantly.

The LPA50 and LPA100 are linear amplifiers that allow several frequencies to be combined without intermodulation or custom filters. No adjustments or settings are required for any transmit frequency. By combining two or more frequencies at the lower levels, hybrids can be eliminated; thus increasing the resultant power output. Up to three frequencies can be combined using the LPA100 with each frequency having more than 10 watts of power going into the line tuner.

Hardware

The LPA50 is packaged in the same 3 RU chassis as the TC-10B and TCF-10B and utilizes the same power supply and power amplifier modules. The LPA100 is contained in two 3 RU chassis. Four 12.5 watt power amplifier modules are combined to form one LPA50, while the LPA100 consists of eight 12.5 watt modules.

Connections

Terminal blocks for the battery input and alarms
UHF/BNC connectors for the RF inputs and outputs

Pulsar Technologies, Inc. designs and manufactures specialized communications equipment for Electric Utility and Industrial applications. The employee owners of Pulsar are committed to providing our customers with high quality, robust, and cost effective solutions for their communication requirements.

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