System Specifications

Audio Communications

Audio tone versions of the RFL 9745 can be supplied with two or four FSK audio tone transceivers. All transceivers are bidirectional and can be programmed for any operating frequency or bandwidth between 300 and 4,000 Hz. Channel one can be set to operate as a modem channel. This channel provides a communication link to the remote terminal for remote interrogation, setting changes or system testing from the local terminal.

Audio Interface Configurations
Single Two-Wire Terminals
Dual Two-Wire Terminals
Single Four-Wire Terminals
Dual Four-Wire Terminals

Recommended Channel Frequencies
Range: 300 Hz to 4000 Hz
Resolution: 1Hz

Transmit Level
Adjustable from -40 dBm +10 dBm in 0.25 dB steps

Receiver Sensitivity
Minimum Input Level: -40 dBm
Maximum Input Level: 0 dBm

Receiver Dynamic Range (referenced to center point)
-17 dB to + 11 dB

Adjacent Channel Rejection
40 dB

60-Hz Rejection
A received tone at -30 dBm will not be affected by a 50 Hz or 60 Hz signal as great as 40 Vrms with optional 50/60 Hz blocking filter.

Amplitude Stability
The Transmit level will vary by no more than ±1 dB.

Spurious Output
All harmonics and spurious outputs are at least 40 dB lower than the carrier.

Transmitter Stability
The transmitter frequency is stable within 0.02 percent over the full range of temperature and input power variations.

Trip Boost
Amplitude: Adjustable from zero to +12 dB in 1 dB steps.
Duration: Adjustable from zero to 30 seconds in .5ms steps.

Input and Output Impedance
600 Ohms

Digital Communications

The RFL 9745 is available with five types of serial digital interfaces: 56Kbps/RS-449, 64Kbps/G.703 Codirectional and Contradirectional interfaces, 64Kbps/X.21, and 2.048Mbps/G.703.

The digital interfaces conform to the standards set forth in their respective specifications (RS-449, CCITT G.703, X.21). Figure 3 represents a typical parameter settings display for the digital system.

Fiber Optic Communications

Fiber Optic Communications Interfaces and System Gains are as follows:

Wavelength & Emitter Type	Fiber Type	Connector Type	Output Level	Receiver Sensitivity	System Gain
820/850nmLED	Multimode	ST	-24 dBm	-49 dBm	25 dB
1300nmLED	Multimode	ST	-13 dBm	-36 dBm	23 dB
1300nmLED	Singlemode	ST	-17 dBm	-36 dBm	19 dB
1300nmLaser	Singlemode	ST	0 dBm	-36 dBm	36 dB
1550nmLaser	Singlemode	ST	-3 dBm	-36 dBm	33 dB
850nm LED (short haul)	Multimode	ST	-19dBm	-32 dBm	13 dB

Short Haul Service Unit Fiber Optic Transceivers
Compliant to ANSI C37.94 Short Haul Fiber Standard

Fiber Type: 50 Micron core, 820/850 NM Multimode
62.5 Micron core, 820/850 NM Multimode

Optical Budget: 9db for 50 Micron core
13db for 62.5 Micron core

Fiber Connector: ST

Digital Connector:
RS-449, 64kbps, DB37 Male Connector
V.35, 64kbps, DB37 Male Connector
X.21, 64 Kbps, DB15 Male Connector
G.703, 64-768 Kbps, DB15 Male Connector

Input Power
Less than 5W with a 38-150VDC power supply input.

Real Time Clock

IRIG-B
The RFL 9745 accepts the IRIG-B Standard Time Code on a 1kHz modulated carrier. Nominal signal levels are 3.3 volts peak-to-peak (± 0.5v) for a logic “1” and 1 volt peak-to-peak (± 0.2v) for a logic “0”. The IRIG-B input presents a 3.7k ohm impedance and is transformer isolated.

Resolution
1 ms

Accuracy
Free Running: Within 1 minute per month
Under IRIG-B Control ±1msecs

Reset
Manual or by IRIG-B code

Isolation
The RFL 9745’s RS-232 ports (front and rear panel) are isolated from circuit common and chassis ground to a surge withstand level of 500 Vdc.

Events Storage
The Sequence of Events Recorder can store up to 100 events. After this limit is reached, older events are overwritten. The Log Counters keep a running tally of the number of times each function, input, output and alarm is active. Up to 1,000,000 counts can be stored for each item.

RS-232 Interrogation Ports
The 9745 provides two RS-232 Ports, located on the front and rear of the chassis. The RS-232 Port located on the front of the chassis has priority. The front of the RS-232 port is configured as a DCE Interface. The rear RS-232 port is configured as a DTE Interface.

Data Rates
300 bps, 1200 bps, 2400 bps, 9600 bps or 19.2 Kbps. Selection is made using front panel switches.

Communication Parameters:
Number of Data Bits: Eight
Number of Stop Bits: One
Parity: None
Flow Control: XON/XOFF

Ethernet Telnet Adapter

For applications where a telnet link is required, the RFL 9745 can be equipped with the optional Telnet Adapter module. This adapter contains one Ethernet port and two RS232 serial ports. One of the two serial ports is called the Craft port and the other is the Data port. These RS232 ports are three-wire RS232 ports with a DB9 connector. The Craft power is used to set up the TCP/IP and Data port parameters.

I/O Options

The RFL 9745 can be configured with a maximum of two I/O modules. There is a Solid-State, a Relay/Solid-State, and a HS Relay version available. All versions provide four optically isolated keying inputs and three independent form “C” alarm output contacts.

Solid-State I/O

Optically Isolated Inputs
Quantity: Four per module
Required Operation Range:

24 Volt Units:	14.6 to 60 Vdc, Nominal Input Current 8.8 mA
48 Volt Units:	31 to 60 Vdc, Nominal Input Current 5.8 mA
125 Volt Units:	75 to 150 Vdc, Nominal Input Current 4.6 mA
250 Volt Units:	155 to 280 Vdc, Nominal Input Current 5.25 mA
Input Current:	10 mA maximum

Minimum Acceptable Pulse Width: 100 micro-seconds

Solid-State Outputs
Quantity: Four per solid-state I/O module
Output Current: Maximum 1 ampere continuous,
2 amperes for one minute, or 10 amperes for 100 msec
Open-Circuit Voltage: 280 Vdc maximum
S/S Pick-up Time: 0 msec

Alarm Relays
Quantity: Three per I/O module
Contact Configurations: SPDT (Form C)
Maximum Output Current: 1 ampere continuous
Maximum Breaking Current: 1 ampere (non-inductive)
at 125 Vdc; derated to 0.25 amperes at 280 Vdc
Open Circuit Voltage: 280 Vdc Maximum

Relay/Solid-State I/O

Optically Isolated Inputs

Quantity: Four per module.
Required Operation Range:
24 Volt Units: 14.6 to 60 Vdc, Nominal Input Current 8.8 mA
48 Volt Units: 31 to 60 Vdc, Nominal Input Current 5.8 mA
125 Volt Units: 75 to 150 Vdc, Nominal Input Current 4.6 mA
250 Volt Units: 155 to 280 Vdc, Nominal Input Current 5.25 mA
Input Current: 10 mA maximum
Minimum Acceptable Pulse Width: 100 micro-seconds

Solid-State Outputs

Quantity: One per relay/solid-state I/O Module
Output Current: Maximum 1 ampere continuous, 2 amperes for one minute, or 10 amperes for 100 ms.
48 Volt Units: Open-Circuit Voltage: 150 Vdc maximum
250 Volt Units: Open-Circuit Voltage: 280 Vdc maximum
S/S Pick-up Time: 0 msec

Relay Output

Quantity: Three per module
Contact Configuration: SPST Form A or Form B - Jumper Selectable
Relay Pick-up Time: 7 msec
Output Current Rating: 5 amperes continuous
Surge: 30 amperes for 200 msec

Alarm Relays

Quantity: Three per I/O Module
Contact Configurations: SPDT (Form C)
Maximum Output Current: 1 ampere continuous
Maximum Breaking Current: 1 ampere (non-inductive) at 125 Vdc; derated to 0.25 amperes at 280 Vdc Open-Circuit Voltage: 280 Vdc maximum.

HS Relay I/O

Optically Isolated Inputs

Quantity: Four per module
Required Operation Range:
24 Volt Units: 14.6 to 60 Vdc, Nominal Input Current 8.8 mA
48 Volt Units: 31 to 60 Vdc, Nominal Input Current 5.8 mA
125 Volt Units: 75 to 150 Vdc, Nominal Input Current 4.6 mA
250 Volt Units: 155 to 280 Vdc, Nominal Input
Input Current: 10mA maximum
Minimum Acceptable Pulse Width: 100 micro-seconds

Relay Output

Quantity: Four per module
Contact Configuration: SPST Form A or Form B - Jumper Selectable
Relay Pick-up Time: 5 msec
Output Current Rating: 5 amperes continuous
Surge: 30 amperes for 200 msec

Alarm Relays

Quantity: Three per I/O Module
Contact Configurations: SPDT (Form C)
Maximum Output Current: 1 ampere continuous
Maximum Breaking Current: 1 ampere (non-inductive) at 125 Vdc; derated to 0.25 amperes at 280 Vdc
Open-Circuit Voltage: 280 Vdc maximum

Annunciator Chassis

The RFL 9745 can be supplied with an optional one rack unit Annunciator Chassis. This additional chassis is mounted below the standard Three Rack Unit Chassis and provides six programmable solid-state outputs. Each output can be individually programmed to provide specific output annunciation, such as Trip Sent, Trip Received, RS-232 Port Active, etc.

Output Ratings

Maximum Output Current: 1 A continuous
Breaking Current: 100 mA (non-inductive)

Auxiliary Trip Relays

The RFL 9745 can be configured with up to two auxiliary high speed trip relays which are mounted in either the primary or redundant power supply I/O module. The relays are typically controlled by one of the solid-state function outputs and provide two normally open and one normally closed contact each.

Relay Ratings:
Pick-up Time: 4 msec
Contact Rating: 5 amperes continuous, 30 amperes for 200 msec

General Specifications

Displayed Level Accuracy
The levels displayed on the front panel and through remote access using PC APRIL will be within 1 dB of the actual values.

Operate Time
Audio-Tone Units (average trip times—Dual-Tone System):
± 30 Hz Shift: 26.47 ms
± 42.5 Hz Shift: 20.57 ms
± 60 Hz Shift: 14.78 ms
± 75 Hz Shift: 12.65 ms
± 120 Hz Shift: 11.05 ms
± 150 Hz Shift: 10.12 ms
± 240 Hz Shift: 9.22 ms

Digital and Fiber systems: 3 ms maximum in the most secure mode. “Operate Time” is defined as the time from the receipt of a command input to the response of a solid-state output, less any channel propagation time.

Pre-Trip Timer
Adjustable in 0.5 ms steps

Trip Hold Timer
Adjustable in 0.5 ms steps

Command Extend Timer
Adjustable in 0.5 ms steps

Non-Volatile Storage
All parameters relating to system operation are stored in electric erasable non-volatile RAM. All parameters related to event logging are stored in battery-backed RAM.

RFI Susceptibility
ANSI PC37.90.2 (35 Volts/Meter)
IEC 255-22-3 (RFI Class III)

Interface Dielectric Strength
All contact inputs, solid-state outputs, power supply inputs and relay outputs meet the following specifications:
ANSI C37.90-1989 (Dielectric)
ANSI C37.90.1-1989 (SWC and Fast Transient)
IEC 255-5 (1500 Vrms Breakdown Voltage and Impulse Withstand)
IEC 255-22-1 (SWC Class III)
IEC 255-22-2 (ESD Class III)
IEC 255-22-4 (Fast-Transient Class III)
IEC 834-1

Input Power Requirements (per IEC 834-1)
24 Vdc Supply: 19 to 29 Vdc (1500 mA Typical)
48/125 Vdc Supply: 38 to 150 Vdc (750/325 mA Typical)
250Vdc Supply: 170 to 300 Vdc (150 mA Typical)

Power Supply
A single or redundant power supply can be provided depending on the reliability of the application. For example a DTT application for a higher voltage level line may demand the dependability of a redundant power supply.

Temperature
Operating: -30° C to +65° C (-22° F to +149° F)
Storage: -40° C to +75° C (-40° F to +165° F)

Relative Humidity
Up to 95 percent at +40° C (+104° F), non-condensing

Chassis Dimension
The RFL 9745 chassis mounts in a standard 19-inch rack or cabinet and is three rack-units high (5.25 inches or 13.3 cm).

Warranty Statement
RFL’s standard warranty for the RFL 9745 is *thirty-six* months from date of shipment for replacement or repair of any part which fails during normal operation or service.