SOLUTIONS FOR AN EVOLVING WORLD

RFL 9785
Programmable on/off Powerline carrier system
Your world is changing and so are we.

At RFL, we know your needs change much faster than your infrastructure. Our comprehensive line of solutions meets you wherever you are to help you bridge the gap from yesterday to tomorrow.

We aren’t just engineering products. We are continuously innovating to give legacy equipment the advantage of today’s technologies. Our highly adaptable solutions offer more features for more flexibility and a custom fit for your specific needs.

When we deliver, we also deliver our reputation. So when you open that box, you’re opening a custom-engineered solution, factory-tested and ready for deployment.

And as long as you own that equipment, you own the attention of RFL. We see you as our partner and we want to ensure that our solution is working for you – now and over the long haul.

RFL – delivering solutions that work. Period.
System Description

The RFL 9785 is an amplitude-modulated ON/OFF Powerline carrier transmitter/receiver terminal. It is based on three generations of proven RFL technology, with enhanced features to meet today's market demands. These features include improved RFI and surge withstand capabilities (meeting the requirements of ANSI/IEEE C93.5), ESD protection (per IEEE PC 37.90.3, 2001), available redundant power supplies, increased flexibility through field programmable frequencies and logic, reflected power measurement option, and no cost Windows™ web based user interface.

The RFL 9785 is designed for directional comparison blocking applications in high-speed protective relaying communications. Its interface circuits are compatible with almost every existing carrier blocking relay. One standard package is all you will need for most schemes. A complete 10 watt transmitter/receiver is contained in a 19-inch chassis that occupies three rack units of vertical rack space (5.25 inches, or 13.3 cm). An optional voice service channel, checkback module, sequence of events and redundant power supply can also be added in the same 3U chassis.

Key Features & Benefits

I/O Flexibility
The RFL 9785's I/O module can be set to match the I/O requirements of your equipment. This means you can interface your equipment directly to the RFL 9785 without special adapter circuits.

No Hybrid Required
A hybrid is not required between the transmitter and receiver. However, hybrids can be optionally supplied for applications where the transmitter and receiver ports will be used separately.

Power Supplies
Choice of 48V/125Vdc or 250 Vdc Power Supplies.
Chassis may be equipped with single or redundant supplies.

Optional Voice Service Channel
An optional voice service channel can be added to the RFL 9785. This channel can be used to provide voice communications between substations.

Event Storage
System status points are checked every millisecond; changes in system status (events) are recorded in the log with time and date stamps. The events are stored in non-volatile memory and are recalled most recent event first. The forty most recent events are retained. The local clock is automatically synchronized to an externally supplied IRIG-B signal if available.

Integrated Reflected Power Meter
Ability to locally or remotely verify the transmitter reflected power, as well as, both the transmit and receive signal levels. This feature eliminates the need for reflected power meter test equipment and enables the optimization of carrier performance and line tuning. Weather and temperature changes affect the characteristic impedance of the line and might warrant readjustment of the line tuner. The RFL Reflected Power Meter can be read-off remotely and makes it easy to check received signal level and reflected power during adverse weather conditions without the need to traveling to the substation.

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Checkback Module
Can be supplied with a Checkback Module which allows automatic testing of up to four terminal lines. It can be programmed to transmit a particular code, and to respond only when that code is received. This provides greater programming options.

Received Carrier Level Indicator
An LCD display on the CLI Module (visible through the front door) provides a visual indicator of the received carrier level (+/-10 dB from the adjusted nominal value). An analog output is also provided for use with external indicators (+/-1V, 0-100QA, or 0-5V, jumper selectable).

External Amplifiers
External 50 and 100W RF Power Amplifiers can be used to boost the output power if required.

Station Battery Output
A switched and fused station battery output is available from the RFL 9785’s non-redundant power supply. This output can be used to drive external low-current equipment.

Remote Interrogation
RS-232 port for remote interrogation of optional SOE Log and reflected power meter.

Warranty
RFL’s standard warranty for the RFL 9785 is twelve months from date of shipment for replacement or repair of any part which fails during normal operation or service.

Humidity
0 to 95% non-condensing

ESD protection
Per IEEE PC 37.90.3, 2001

Dielectric and surge withstand:
Per ANSI C93.5

Transmitter
The transmitter is a fully programmable Direct Digital Synthesis (DDS) generator followed by a 10 W power amplifier and filter. If the voice option is installed, the audio signal is AM modulated onto the carrier.

Frequency step size:
10 Hz

Frequency setting method:
Direct reading rotary switches

Rated output power:
10 Watts

Output impedance:
50 Ohms (with load-matching adjustment)

Carrier Level Indicator:
Display: Front panel 3-½ digit direct reading (in dB)
Range: ±10 dB

External Meter Output:
0 to 100 QAmp ±1 Volt or 0-5 Volt, jumper selectable.

Receiver
The receive circuit consists of an input normalizer, programmable frequency detector, and carrier level indicator.

Receiver sensitivity:
5 mVrms

Maximum receive level:
>25 Vrm

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Key Features & Benefits (continued)

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RFL9785 PCS
Optional Sequence of Events

The forty most recent events are retained. The local clock is automatically synchronized to an externally supplied IRIG-B signal if available.

IRIG-B input:
1000 Hz modulated or direct TTL

Signals monitored:
Start, Stop, Reserve Key, Remote Initiate, Transmitter Fail, Checkback Fail, Block Output, Power Up, Power supply # 1 fail, & Power supply # 2 fail

Output Ratings

Solid State Outputs
Maximum continuous current: 1 Amp
Maximum 1 minute current: 2 Amps
Maximum 100 mSec current: 10 Amps
Maximum open circuit voltage: 280 Volts

Trip Relay Outputs
Maximum continuous current: 5 Amps
Maximum 200 mSec current: 30 Amps
Maximum open circuit voltage: 280 Volts

Alarm Relay Outputs
Maximum continuous current: 1 Amp
Maximum breaking current (125 Vdc): 1 Amp, non-inductive
Maximum breaking current (280 Vdc): 0.25 Amp, non-inductive
Maximum open circuit voltage: 280 Volts
Note: Logic level (5 volt nominal) outputs are available.

Input Ratings

48 Volt Inputs
Will not operate at or below: 28 Volts
Will operate at or above: 35 Volts
Minimum pulse duration: 100 QSec
Input current: <10mA, 5mA typical

125 Volt Inputs
Will not operate at or below: 70 Volts
Will operate at or above: 90 Volts
Minimum pulse duration: 100 QSec
Input current: <10mA, 5mA typical

250 Volt Inputs
Will not operate at or below: 140 Volts
Will operate at or above: 175 Volts
Minimum pulse duration: 100 QSec
Input current: <10mA, 5mA typical
Note: Logic level (5 volt nominal) outputs are available.

Two Wire Operation

The RF transmitter output and receiver input are jumpered together with two UHF connectors, J5 and J7. Either connector can be connected to the line tuning equipment. This provides a maximum continuous output power of 10 Watts with a nominal input/output impedance of 50 Ohms.

Four Wire Operation

The RF transmitter output and receiver input are isolated utilizing separate UHF connectors. The transmitter output, J5, provides a maximum continuous output power of 10 Watts with a nominal output impedance of 50 Ohms. In four wire operation the receiver input signal is connected to J7. The receiver input impedance is jumper selectable between a 50 Ohm termination mode and a high impedance (>30 KΩ) non-terminated mode. The 50 Ohm termination mode has a maximum continuous power dissipation of 1 Watt.

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Figure 4. RFL 9785 50 Watt Configuration

The RFL 9785 ON/OFF Powerline Carrier can be configured for either 50 or 100 Watt RF power outputs. The RFL Model S508 RF power amplifier is rated for 50 Watt PEP and is the standard amplifier used for single sideband applications. Two amplifiers are required for 100 Watt applications.
# Ordering Information

## 9785 Programmable On / Off Powerline Carrier System

<table>
<thead>
<tr>
<th>Smart Number Ordering Information</th>
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</table>

| RFL Part Number (fill in blanks): | 9785 |

### Basic Transmitter/Receiver
- Chassis, motherboard & standard modules: 9785

### Power Supply
- 38 to 150 Vdc Single Supply: 1
- 38 to 150 Vdc Dual Supplies: 2
- 200 to 300 Vdc Single Supply: 3
- 200 to 300 Vdc Dual Supplies: 4

### Power Amplifier and Power Output Filter
- 10 W, 30 to 65 KHz: 1
- 10 W, 65 to 156 KHz: 2
- 10 W, 156 to 392 KHz: 3
- 10 W, 392 to 535 KHz: 4
- 10 W, 114 to 288 1/2 KHz: 5
- 50 W, 20 to 500 KHz: 7
- 100 W, 20 to 500 KHz: 8

### Relay I/O Control
- 48 Vdc: 1
- 125 Vdc: 2
- 250 Vdc: 3
- Logic Level Interface 48 Vdc: 4
- Logic Level Interface 125 Vdc: 5
- Logic Level Interface 250 Vdc: 6

### Receive Bandwidth
- 500 Hz: 1
- 1000 Hz: 2
- 1500 Hz: 3

### Sequence of Events Option
- No SOE Option: 1
- SOE Option w/ RPM: 2

### Checkback Option
- No Checkback Option: 1
- Checkback Option: 2
- Checkback with Aux. Alarm Chassis: 3

### Voice
- No Voice Functions: 0
- With Voice Functions: 1

### Current Limit / EM Relay Interface
- No Current Limit Module: 0
- 48 Vdc Current Limit Module: 1
- 125 Vdc Current Limit Module: 2

### Other Custom Configuration
- No user specified customization: A
- RF Line I/O with one UHF Port: B
- Additional system details provided by customer: Z

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### RFL 9780/9785 One Rack Unit Hybrid Chassis

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Notes

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