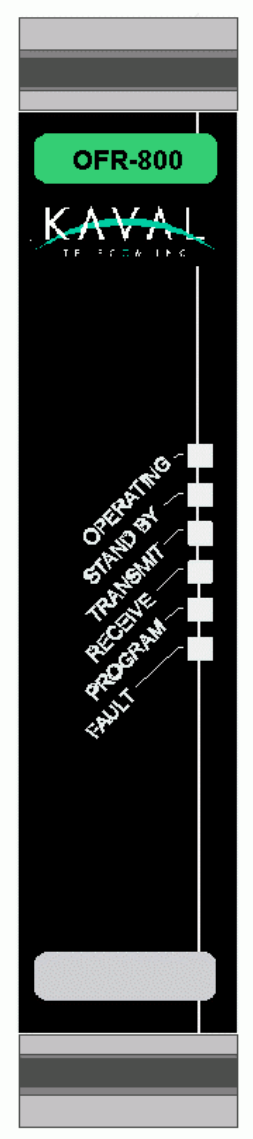
KAVAL

TELECOM INC.



LINK*net*™

OFR800 RF MODULES

USER MANUAL

INSTALLATION, OPERATION AND MAINTENANCE

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PROPRIETARY STATEMENT

REVISION RECORD

Rev. №	Page №	Description of Revision	Date
0 Pre-release	All	Draft Issues.	Feb.2000
1	All	Original Release	Mar.6,2000
2	All	Updated drawings and Logos	Mar.21,2000

TRADE MARK NOTICE

This manual makes reference to trademarks that are the property of other companies. References are used only to refer to the products or services of the trademark owners.

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1. OFR800 MODULES

Overview

Theory Of Operation

An OFR, or On Frequency Repeater, is a radio repeater that simultaneously receives and transmits a single narrow band radio channel on exactly the same frequency.

The OFR accomplishes its repeater function without store and forward circuitry, or expensive conventional simulcasting techniques. The fact that the same frequency is retransmitted by an OFR means that additional frequency allocations are not required in situations where an existing radio coverage pattern needs to be extended. The most common OFR applications are the extension of above ground signals into buildings, tunnels, vehicles or the extension of radio coverage patterns into outdoor shaded areas such as deep valleys.

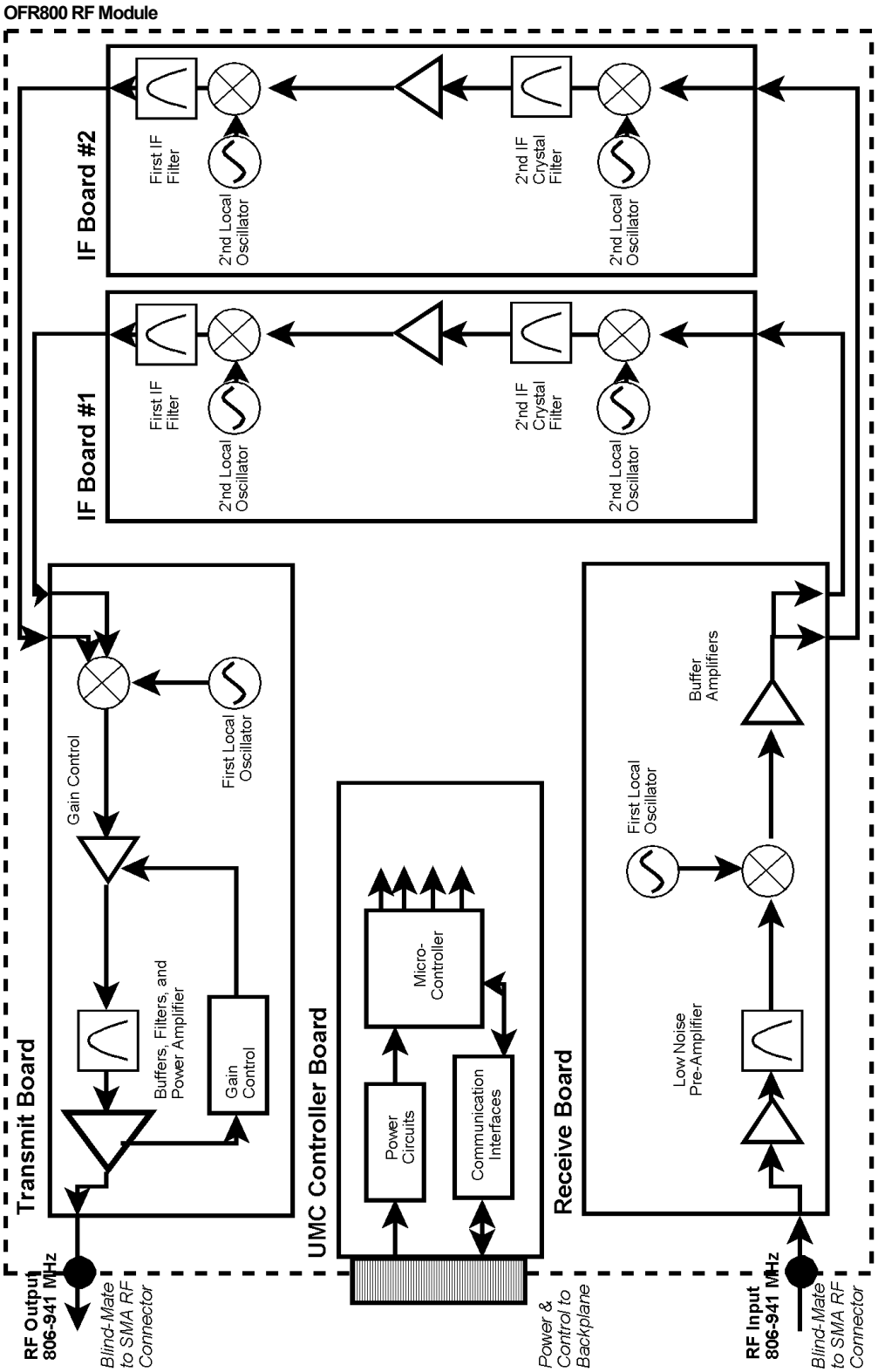
From an applications standpoint, an OFR is very similar to a regular two-way radio repeater. On Frequency Radio Repeaters can be combined using regular two-way radio multicoupling or duplexing equipment and have input and output signal characteristics to those of regular transmitters and receivers. The one special consideration in OFR systems is that of input to output antenna isolation. This must be carefully engineered for each installation.

Standard On Frequency Radio Repeaters are designed for indoor use only and are intended for mounting in a standard EIA 19 inch rack. Modular design of OFR circuitry allows for easy servicing, stocking of spares, adaptability and upgrade ability.

Models

OFR800 MODULE FAMILY		
MODEL	**TYPE**	**FREQUENCY**
OFR800-A1	SMR	806-821 MHz (FM)
OFR800-B1	SMR	851-866 MHz (FM)
OFR800-C2	PS	821-824 MHz (FM)
OFR800-D2	PS	866-869 MHz (FM)
OFR800-G2	TRUNKING	896-901 MHz (FM)
OFR800-H2	TRUNKING	935-940 MHz (FM)

Block diagram



Module Specifications

SPECIFICATION	SMR	PS	TRUNKING 900
Frequency Bands	806-821 MHz 851-866 MHz	821-824 MHz 866-869 MHz	896-901 MHz 935-940 MHz
Channel Spacing	25 KHz	12.5 KHz	12.5 KHz
Modulation Types	Narrowband FM	Narrowband FM	Narrowband FM
RF Frequency Stability	Tracks Input Signal Exactly	Tracks Input Signal Exactly	Tracks Input Signal Exactly
Adjacent Channel Selectivity	60 dB Minimum	60 dB Minimum	60 dB Minimum
Max. RF Output Power	38 dBm	38 dBm	38 dBm
RF Output Power Range	Power can be reduced 20 dB in 1 dB Steps (AGC Controlled)	Power can be reduced 20 dB in 1 dB Steps (AGC Controlled)	Power can be reduced 20 dB in 1 dB Steps (AGC Controlled)
RF Output Power Variation vs. Input (over -90 to -30 dBm)	0 TO +1 dB	0 TO +1 dB	0 TO +1 dB
Input Dynamic Range	-110 to -30 dBm	-110 to -30 dBm	-110 to -30 dBm
Input Sensitivity Adjust Range	-110 to -30 dBm	-110 to -30 dBm	-110 to -30 dBm
Input Hysteresis	1 to 10 dB	1 to 10 dB	1 to 10 dB
Transmit Duty Cycle	Continuous	Continuous	Continuous
Transmit Spurious Output	-13 dBm max	-13 dBm max	-13 dBm max
Receive Conducted Spurious Output	-57 dBm Max	-57 dBm Max	-57 dBm Max
Maximum Gain	140 dB	140 dB	140 dB
Audio Distortion & Noise (Narrowband FM)	<3% Increase	<3% Increase	<3% Increase
Transmit Key-Up Time	< 2 mS	< 2 mS	< 2 mS
Transmit Key-Down Time	< 1 mS	< 1 mS	< 1 mS
Group Delay	<120 uS	<120 uS	<120 uS
Input / Output Connectors	SMA Connectors on back of Card-Cage	SMA Connectors on back of Card-Cage	SMA Connectors on back of Card-Cage
Input / Output Impedance	50 Ohms	50 Ohms	50 Ohms
Module Power Supply Requirements	+12V & +28V from Card-Cage Power Supply	+12V & +28V from Card-Cage Power Supply	+12V & +28V from Card-Cage Power Supply
Module Power Consumption	45 W Maximum	45 W Maximum	45 W Maximum
Connections to Card-cage	Edge Connector for Power and Data and Two Blind-Mate RF Connectors	Edge Connector for Power and Data and Two Blind-Mate RF Connectors	Edge Connector for Power and Data and Two Blind-Mate RF Connectors

SPECIFICATION	SMR	PS	TRUNKING 900
Front Panel Indicators	Operating, Stand by, Fault, Program Mode, Receive, Transmit	Operating, Stand by, Fault, Program Mode, Receive, Transmit	Operating, Stand by, Fault, Program Mode, Receive, Transmit
Module Interconnections (via Card-Cage)	DB-15 Connector on back of Card-Cage provides per-Module Fault Relay, Interconnect to other Modules, & RS-232 connection to a PC.	DB-15 Connector on back of Card-Cage provides per-Module Fault Relay, Interconnect to other Modules, & RS-232 connection to a PC.	DB-15 Connector on back of Card-Cage provides per-Module Fault Relay, Interconnect to other Modules, & RS-232 connection to a PC.
Configuration Options	RF Modules may be configured either via the optional Controller Module, or via a PC and an RS-232 Connection via the Card-Cage.	RF Modules may be configured either via the optional Controller Module, or via a PC and an RS-232 Connection via the Card-Cage.	RF Modules may be configured either via the optional Controller Module, or via a PC and an RS-232 Connection via the Card-Cage.
Size	9.11” High, 2.00” Wide, 14.00” Deep	9.11” High, 2.00” Wide, 14.00” Deep	9.11” High, 2.00” Wide, 14.00” Deep
Weight	10 lbs, 4.5 kg Max	10 lbs, 4.5 kg Max	10 lbs, 4.5 kg Max

Operation

Software Set-up

The OFR800 module is shipped pre-configured with the following factory set options:

OPTION	RANGE OF VALUES	DEFAULT VALUE
Frequency	806 – 940 MHz (As per Model)	Order Specific
Receive Threshold	–110 to -50 dB	-89 dB
Receive Hysteresis	1 to 10 dB	2.5 dB
Hang Time	0.0 to 5.0 Seconds	2.0 Seconds
Time Out	0 to 600 Seconds Or none	300 Seconds
Module Enabled	On / Off	On
Transmit Power Level	20 to 39 dBm	Order Specific

In line with the versatility of the LINK*net*™ Platform, it is possible to re-configure the OFR800 module in the field. For further information on the modification software and the PC adapter, contact KAVAL TELECOM INC. by E-mail: info@kaval.com

Default values may be changed when an order is placed. Check your order confirmation (shipped with modules) for customized values.

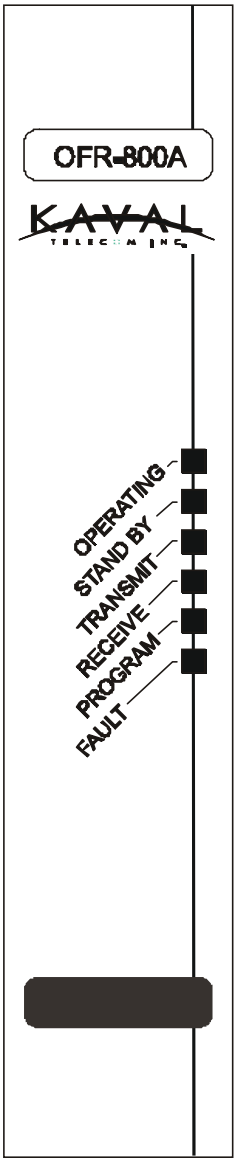
Power On Self Test (POST)

Each system module automatically performs a self-diagnostics when inserted into the system Card-cage. These tests determine that the unit is a) correctly installed in the Card-cage and b) not damaged in transit.

- All six of the LED's on the front panel will flash 3 times
- If the LED's do NOT flash three times, then remove the module, check the power source, and re-insert the module, (See Installation Instructions).
- If the card is "OK" the LED's will continue normally. (See Normal Operation)
- If there is a fault, then the Red Fault LED will remain on. If this occurs, contact your KAVAL TELECOM INC. Service Representative, (See Warranty / RMA Procedures).

The Power On Self Test is *Not* an RF test, it only verifies that there is power to the unit and that the logical circuitry is functioning.

Normal Operation



The OFR800 Module has six LED's on the faceplate:

1. OPERATING - Under normal operating conditions, this LED will flash GREEN when RF Data is present.

2. STAND BY – Under the control of the Controller Module, the OFR800 Module has the ability to act as a duplex transmitter, sitting perpetually in Stand by Mode waiting for the primary transmitter to fail. This LED should be constant Amber. If a Fault should occur with the primary module, the "Stand by" unit will immediately become the primary unit, at which time the Stand by LED will be turned off and the LED's will show an operating Module.

3. Transmit – This Green LED will be on when a signal is being transmitted

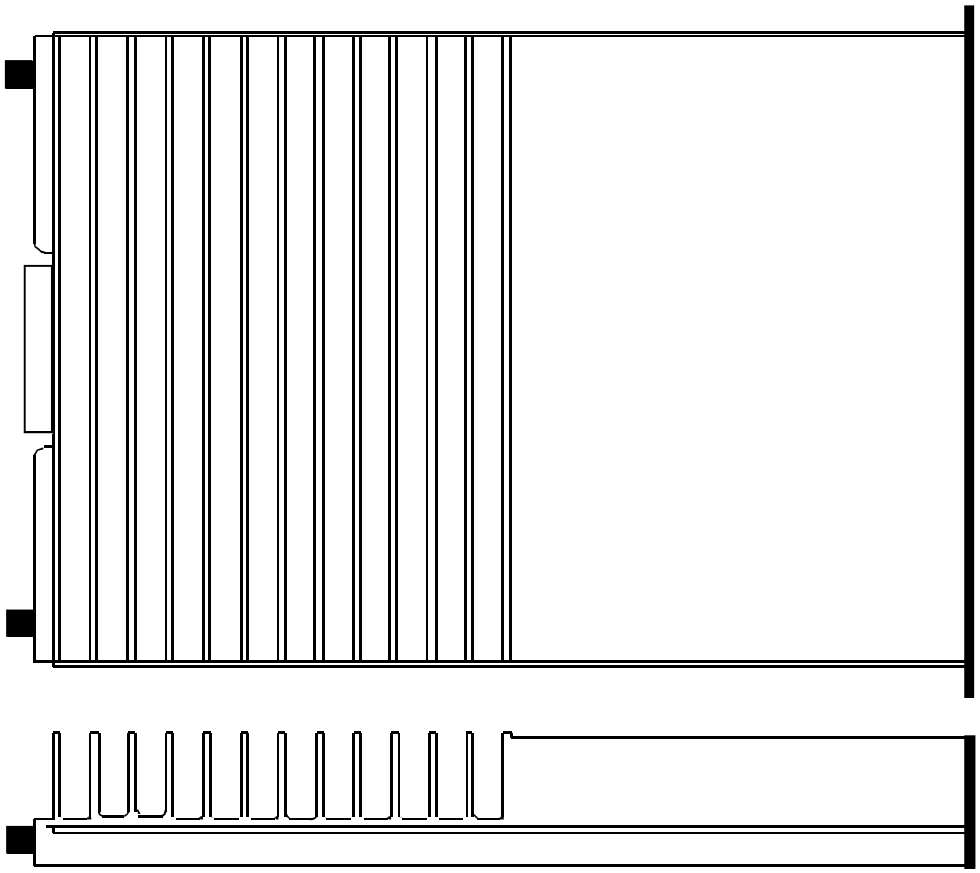
4. Receive – This Green LED will be on when a signal is being received

5. Program – This LED will be constant Amber when the unit is being re-programmed by the Controller Module. This will signify that the unit is powered on but unavailable for use.

6. FAULT – Red LED, If the internal diagnostics for the module detect a problem, then this LED will remain on

OFR Drawing (Sides and Top)

OFR800 Module



Antenna Installation

- All Antenna Installation is to be performed by Qualified Technical Personnel only.
- Antenna Installation Instructions and locations below are for the purpose of satisfying FCC RF Exposure Compliance requirements.
- The *Roof Top Antenna* for linking to the *Donor Site* is a directional (high gain) Antenna fixed-mounted physically on the side or top of a building, or on a tower. The Antenna Gain must be no more than 10 dB. The *Roof Top Antenna* location should be such that only Qualified Technical Personnel can access it, and that under normal operating conditions no other person can touch the Antenna, or approach within 10 meters of the Antenna.
- The *In-Building Antenna* connection is via a coaxial cable distribution system with Signal Taps at various points connected to the fixed-mounted *Indoor Antennae*. This is shown in the figure in the Introduction. The *Indoor Antennae* are simple 1/4 Wavelength (0 dB Gain) types. They are used with KAVAL TELECOM INC. 12, 16, or 20 dB Cable Taps. As such the maximum EIRP will be at the first Tapped Antenna, which will be 12 dB below the maximum signal level of the LINK*net*™ (+40 dBm); +28 dBm, or 0.63 Watts EIRP. These Antennae are to be installed such that no person can touch the Antenna, or approach within 0.2 Meters.

ANTENNA INSTALLATION WARNING

ALL ANTENNA INSTALLATION IS TO BE PERFORMED BY QUALIFIED TECHNICAL PERSONNEL ONLY.

ANTENNA INSTALLATION INSTRUCTIONS AND LOCATIONS ARE FOR THE PURPOSE OF SATISFYING FCC RF EXPOSURE COMPLIANCE REQUIREMENTS, AND ARE NOT OPTIONAL.

ALL ROOF TOP ANTENNA INSTALLATION MUST BE SUCH THAT NO PERSON CAN TOUCH THE ANTENNA, OR APPROACH CLOSER THAN 10 METERS.

ALL IN-BUILDING ANTENNAE INSTALLATIONS MUST BE SUCH THAT NO PERSON CAN TOUCH THE ANTENNAE, OR APPROACH CLOSER THAN 0.2 METERS.