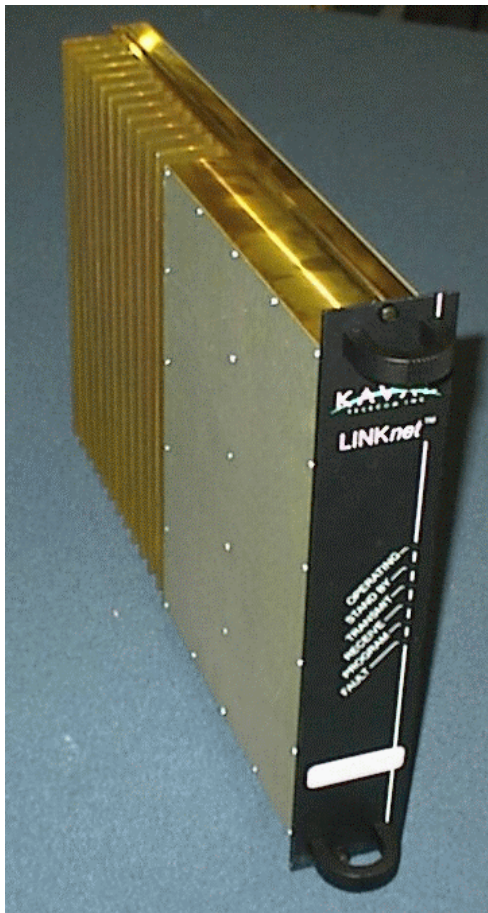




WIRELESS TECHNOLOGIES

**LinkNet™**  
**LNKC1900 RF 1900MHz PCS MODULES**  
**USER MANUAL**  
**INSTALLATION, OPERATION**  
**AND MAINTENANCE**



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# 1. LNKC1900 MODULES

## Overview Theory Of Operation

A LINKNET CDMA PCS MODULE is a banded repeater amplifier. The most common LINKNET CDMA PCS MODULE 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.

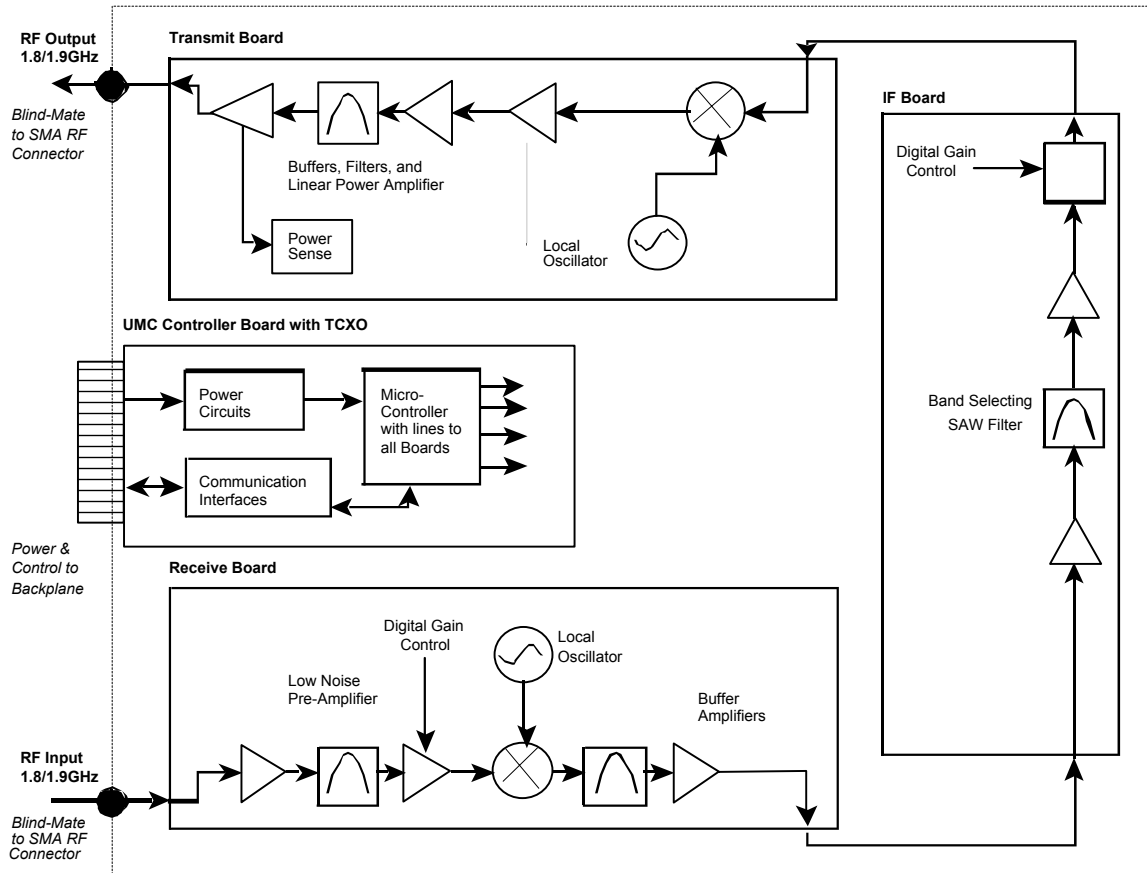
From an applications standpoint, an LINKNET CDMA PCS MODULE is very similar to a regular two-way radio repeater. On Frequency Radio Repeaters can be combined using regular two-way radio multicoupling or duplexing equipment and have input and output signal characteristics to those of regular transmitters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

The Modules are designed for indoor use only and are intended for mounting in a standard EIA 19 inch rack. Modular design of LINKNET CDMA PCS MODULE circuitry allows for easy servicing, stocking of spares, adaptability and upgrade ability.

## Models

LNKC1900 MODULE FAMILY		
MODEL	TYPE	FREQUENCY
LNKC1900-D	DownLink 1.25MHz BandWidth	1930 to 1990 MHz
LNKC1900-D5	DownLink 5MHz BandWidth	1930 to 1990 MHz
LNKC1900-D15	DownLink 15MHz BandWidth	1930 to 1990 MHz
LNKC1900-U	UpLink 1.25MHz BandWidth	1850 to 1910 MHz
LNKC1900-U5	UpLink 5MHz BandWidth	1850 to 1910 MHz
LNKC1900-U15	UpLink 15MHz BandWidth	1850 to 1910 MHz

**Block diagram LNKC1900 RF Module**



**Module Specifications**

Frequency Bands	See Model Chart
Modulation & BandWidths	Optimized for CDMA 1.25, 5, or 15 MHz BandWidth
RF Frequency Stability	Tracks Input Signal Exactly
Maximum Possible Power (CDMA or un-modulated) <i>These are NOT the recommended levels, see Recommended De-Rating Chart.</i>	1 Carrier: +36.3 dBm 2 Carriers: +24.7 dBm each 3 Carriers: +23.0 dBm each
RF Gain Adjustment Range	+65 to +95 dB in 1 dB Steps
Transmit Duty Cycle	Continuous
Transmit Spurious	-13 dBm max
Receive Conducted Spurious	-57 dBm Max
Group Delay	<5 uS
Noise Figure	<6 dB
RF Connectors	SMA (50Ω) Connectors on back of Card-Cage
Module Power Supply Requirements	40 Watts Maximum
Connections	Edge Connector & 2 Blind-Mate RF Connectors to Card-Cage, DB-15 Connector on back of Card-Cage provides per-Module Fault Relay, Interconnect to other Modules, & RS-232 Connection
Front Panel Indicators	Operating, Stand by, Fault, Program Mode
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.
Operating Temperature Range	-10 to +50°C; Consult Kaval for installation specific forced-air cooling requirements
Operating Humidity Range	10 to 90% RH, Non-Condensing
Size & Weight	9.11" High, 2.00" Wide, 14.00" Deep, 10 lbs, 4.5 kg Max

**Operation Software Set-up**

The LNK1900 module is shipped with the following factory set options:

OPTION	RANGE OF VALUES	DEFAULT VALUE
Frequency Band	See Model Chart	Order Specific
Gain	+65 to +95 dB	+65 dB
Power Limiting	+7 to +27 dBm	+27 dBm

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

In line with the versatility of the LinkNet™ Platform, it is possible to re-configure the LNK1900 module in the field. For further information on the modification software and the PC adapter, contact KAVAL WIRELESS TECHNOLOGIES by E-mail: info@kaval.com



**Configuration**

In line with the versatility of the LinkNet™ Platform, it is possible to re-configure the LNK1900 module in the field, either with a **Personal Computer (PC)** or via the optional **Control Module**. To use a **PC** it is necessary to have a **Kaval CAB00000057 Control Cable** to connect between the appropriate Module's DB15 connector on the back of the Card-Cage and the standard DB9 RS232 Connector on the PC. On the PC a terminal emulation program such as **HyperTerminal** is used to communicate to the LinkNet Module. The settings are 9600 baud, 8 bits, no parity, and 1 stop bit. Commands are one or two words followed by pressing *Return*. Commands may be given in upper or lower-case. Available commands are...

- ACCESS USER:** Required as a simple password to gain access to customer settable parameters and diagnostics; This will time-out after 10 minutes, and may have to be re-typed.
- HELP or ?:** Displays a list of Available Commands.
- LIST:** Displays Current Settings and Status Faults, Etc.
- VER:** Display the current Version of Software.
- ENABLE 1 or 0:** Enables or Disables the Module.
- FREQ #####:** Displays or Sets the current Transmit Frequency (in Hertz).
- TXPOWER ##:** Displays or Sets the Transmit Power Level (in tenths of a dBm).
- RXTHRESH ####:** Displays or Sets the Receive Threshold Level (in tenths of a dBm).
- RXHYSER ##:** Displays or Sets the Receive Hysteresis (in tenths of a dB).
- TIMEOUT ####:** Displays or Sets the Timeout-Timer value (in Seconds).
- TESTOSC 1 or 0:** Enables or Disables the Test Oscillator.

Please consult Kaval Wireless Technologies for further support.

**Recommended De-Rating Chart**

For the 5 MHz and 15 MHz BandWidth Models, if there will be multiple CDMA Carriers, it is recommended that they be de-rated in the system design as shown for proper operation...

Number of Carriers	Power per Carrier
1	+27 dBm
2	+23 dBm
3	+21 dBm
4	+19 dBm
5	+17 dBm



**Power On Self Test (POST)**

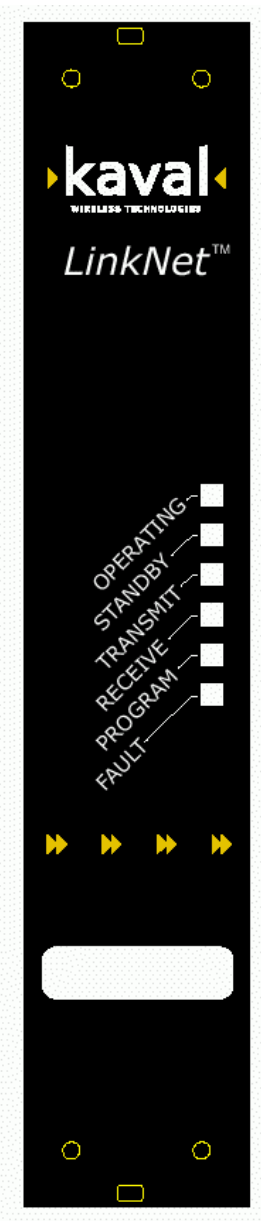
Each system module automatically performs a self-diagnostics when inserted into the system Card-cage. These tests determine that the unit is a) correctly installed in the Card-cage and b) not damaged in transit.

- 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 WIRELESS TECHNOLOGIES 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.**



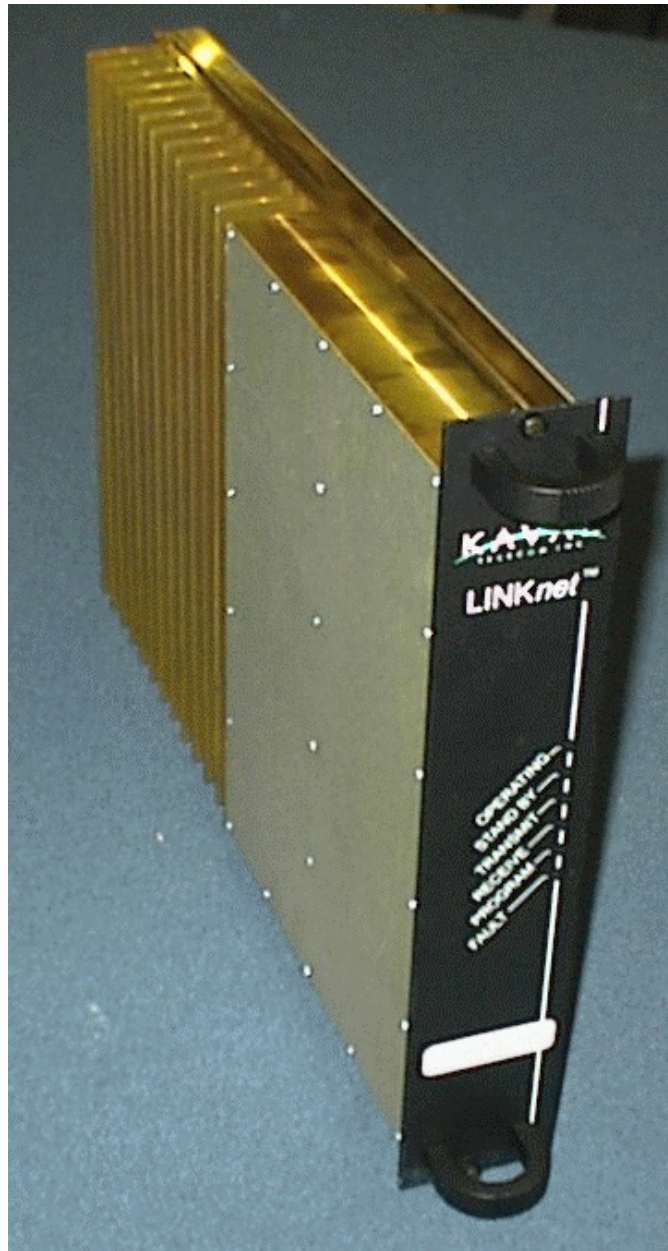


### Normal Operation

The LNKC1900 Module has six LED's on the faceplate:

1. OPERATING - Operating normally.
2. STANDBY – Under the control of the Control Module, the LNKC1900 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 – No function on these Modules.
4. RECEIVE – No function on these Modules.
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

### LINKNET CDMA PCS MODULE Module



## Antenna Installation

- All Antenna Installation 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.
- **Note that if multiple LinkNet™ Modules are used, the Instructions below apply to the composite power output of all Modules when transmitting simultaneously.**
- The *Roof Top Antenna or Antennae* for linking to the *Donor Site(s)* is/are directional (high gain) Antennae, 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. **If multiple LinkNet™ Modules are used with output combiners into any one Antenna, and/or multiple Antennae are used on one Roof Top, then the sum of composite powers into all Roof Top Antennae must not exceed 100 Watts maximum.** Please consult Kaval Wireless for assistance as required. The *Roof Top Antennae* 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 WIRELESS TECHNOLOGIES 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 LinkNet™ (+36.3 dBm); +24.3 dBm, or 0.27 Watts EIRP. **If multiple LinkNet™ Modules are used with output combiners, then the composite power output of all Modules transmitting simultaneously must meet this maximum EIRP requirement.** Please consult Kaval Wireless for assistance as required. 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.**