

## THEORY OF OPERATION

### FXV01 TERMINAL TRANCEIVER

The TERMINAL TRANCEIVER, FXV01, is a radio transceiver operating in the FCC, ISM, 915 Mega-Hertz, radio band. The transceiver consists of the following functional blocks:

1. Power conditioner, data demultiplexer and auxiliary "UP-LINK DATA" interface block. This block is supplied power, multiplexed with the "UP-LINK DATA", from the "TERMINAL TRANCEIVER INTERFACE". The power is demultiplexed for proper polarity then regulated to provide proper voltages to the transceiver electronics. The multiplexed "UP-LINK DATA" is striped off the power leads, level shifted and sent to the "DIN" pin of the transmitter hybrid module. The auxiliary "UP-LINK DATA" interface receives single ended non-multiplexed "UP-LINK DATA" directly from the RJ cable. (Power is supplied via the RJ cable the same as with the multiplexed "UP-LINK DATA".) The data is conditioned, level shifted and then sent to the "DIN" pin of the transmitter hybrid module. The auxiliary "UP-LINK DATA" interface may be configured for either active "HI" or active "LO" signals.
2. The radio frequency (RF) block consist of a transmitter hybrid module, monolithic low-pass filter, receiver hybrid module, antenna transmit/receive switch and integrated antenna. The transmitter module, RF Monolithics, Inc., HX2000, consist of a SAW stabilized oscillator with output band-pass filtering provided by a SAW filter. A data logic 1 (HI) on the "DIN" pin of the transmitter hybrid module causes the transmitter to output a continuous wave carrier at about 916.5 MHz, +/- 200 KHz, with a level of about 0dBm. The modulation format used is "ON OFF KEYING" (OOK) with a logic 1 at the "DIN" pin of the transmitter hybrid module, turning the transmitter on and a logic 0 turning the transmitter off. A logic zero at the "DIN" pin of the transmitter hybrid module is the idle state. The transmit signal is then sent through the monolithic low-pass filter to the antenna transmit/receive switch, Philips Semiconductor, Inc. NE630D. The antenna transmit/receive switch, using BiCMOS technology, selects the path to or from the integrated antenna. The non-active port is internally AC terminated to a 50 ohm resistor. When the transmitter is active, the antenna transmit/receive switch selects the path from the transmitter to the integrated 1/2 wave length dipole antenna, where the signal is radiated to the remote wireless devices. "DOWN-LINK DATA" signals received from the remote wireless devices, are routed from the integrated antenna through the antenna transmit/receive switch, to the receiver hybrid module. The receiver uses *AMPLIFIER-SQUENCED HYBRID* (ASH) technology RF Monolithics, Inc., RX2020. The input from the antenna switch is routed through a SAW band pass filter setting the receivers center frequency and band width. The output from the SAW is sent to RF amplifier number 1. RF amplifier number 1 is gated on and off by a pulse generator with a rate of 91 KHz to 1.3 MHz. The output of RF amplifier number 1 is sent through a SAW delay-line. The output of the SAW delay-line is sent to RF amplifier number 2. RF amplifier number 2 is gated on and off by the pulse generator, shifted 180 degrees from the gate signal to RF amplifier number 1. The frequency of the pulse generator is selected to allow the RF amplifier to fill the SAW delay-line. Amplifier number 1 is then turned off and amplifier 2 is turned on long enough to empty the SAW delay-line. Amplifier 2 is then turned off and amplifier 1 is turned on repeating the cycle. The action of the pulse generator and the SAW delay-line provide a simple, very high gain RF amplifier while insuring stability. The output of RF amplifier number 2 is sent to an AM data detector and a low pass filter. The data output from the low pass filter is amplified and AC coupled to a threshold detector where the data is conditioned and shaped. Thus the receiver hybrid module converts the received "DOWN-LINK DATA" signal to a logic level

representing the presence of signal (logic 1) or absence of signal (logic 0) at the "D-D" pin of the receiver hybrid module.

3. The "DOWN-LINK DATA" signal driver block conditions the "DOWN-LINK DATA" from the receiver hybrid module and formats the "DOWN-LINK DATA" signal into a pseudo, differential, RS485 signal. The driver section is configured as an "OPEN COLLECTOR" output. When the "DOWN-LINK DATA" from the "D-D" pin of the receiver hybrid module (logic 0) is inverted (logic 1) and sent to the driver input the driver is in a high impedance state allowing for a "WIRED OR" multiple transceiver configuration. The drivers are only active when a logic 0 is at the driver input, and outputs a logic 1 on the "RF\_DL-" line and a logic 0 on the "RF\_DL+" line.

