

Microwave Radios

Portable, Tunable, High-Capacity Microwave Transceiver TCM-930

- **Portable** - Tripod, Tower/Pipe, or Rack mounting options.
- **Ruggedized** - Capable of operation in extreme outdoor environments.
- **Integrated Internal Programmable High-Speed Modem** - Programmable for QPSK or 16 QAM to 128 QAM.
- **Modular Customer Interfaces** - Easily field change interfaces between 155 Mbps OC3/STM-1, single/multiple DS3/E3/STS-1 or 100 Base T.
- **Field-Tunable** - Continuously tunable across entire operational frequency band.
- **Multiple RF Bands** - Transceiver can be easily reconfigured by customer to any RF band by changing the plug-in transmitter and receiver modules and antenna feed.
- **User-Friendly** - Radio operation controlled via radio front panel keypad and alphanumeric display. All connectors are on radio front panel.



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The TCM-930 is designed to serve as a high-capacity, temporary service or emergency restoration radio. It will operate in an outdoor environment with no protection from the elements, and can be set up for operation in a matter of minutes!

Digital interfaces on the front panel of the radio terminal can be changed in the field as needed by the operator from direct interface 155 Mbps OC3/STM-1, to single/multiple DS3, E3 or STM-1 channels, or a 100 BaseT channel. The TCM-930 can be transported without worry of damage due to its heritage TerraCom rugged mechanical design. Any unique user interface with data rates between 19 Mbps and 210 Mbps can be accommodated.

The radio modem offers programmable modulation waveforms (QPSK and 16 QAM to 128 QAM) with adaptive equalization and variable FEC rates. Customers desiring to utilize external third-party modem technology may interface to the radio via input and output 70 MHz IF ports (consult factory for interface compatibility requirements).

RF Branching - TX/RX Frequency Separation

Configurations of up to 3+0 can be accommodated on a single antenna. Built-in tunable transmit and receive pre-select filters and circulators are used to allow multiple transmitters and receivers to be combined onto the antenna system. The RF filter and LO tuning is fully automatic and controlled by the built-in microprocessor from the radio front panel keypad.

The radio also provides 2 full duplex asynchronous RS-232 user service channels and a voice orderwire channel.

The Next Generation TCM-930-microwave radio system follows L-3 TW's continued worldwide success with their TCM-600 and TCM-620 Series radios. These radios are deployed in over 55 countries serving the needs of telecommunications companies, and supporting PT&T, commercial and military applications.

TCM-930 Specifications

GENERAL

Configuration	Simplex or Duplex 1+0 with no external branching. (Configurable up to 3+0 without external branching.)
Transmission Capacity	Up to 210 Mb/s of user data + user service channels
Modulation Types	QPSK and 16 to 128 QAM. Programmable with internal L-3 TW Modem
T/R Separation	160 MHz minimum
Frequency Selection	Synthesizer controlled
Tuning Step Size	Up to 10 GHz, 250 kHz standard Above 10 GHz, 500 kHz std., 10 kHz opt.
Tuning Time	.60 sec
Control/Display	Local operation via front panel keyboard. Remote control available, 20-character by 4-line alphanumeric display on radio.

Internal Modem Features and Specifications

General Characteristics and Limitations	
User Data I/O Rate Range	19 to 210 Mb/s + user service channels
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Overhead Channels	256 Kb/s, 4 x 64 Kb/s Channels
Modulation Formats	QPSK and 16 to 128 QAM, selection dependent on Emissions Bandwidth Limitations
Forward Error Correction	
FEC Coding	Convolutional/TCM, Reed Solomon, INTELSAT Scrambler, INTELSAT Style Byte Deinterleaver
Receive Equalization	Fast locking multi-tap adaptive equalizer
Spectral Shaping	Root raised cosine
I/Q Correction	Automatic transmit I/Q imbalance compensation, signal scaling and spectral inversion correction
Down Conversion	Digital with AGC, matched filtering, symbol timing recovery and carrier synchronization
IF I/O Frequency	70.0 MHz

User Interfaces

Common Interfaces	
Built-in voice link orderwire with call and call received functions	
2 Duplex, Asynchronous RS-232 service channels up to 19.2 Kb/s each	
DATA I/O Interfaces	155 Mb/s -- Single I/O Programmable as OC-3, STM-1 Optical or STM-1 Electrical
	MULTI-CHANNEL -- Multiple I/O Programmable as 1 x DS3, 3 x DS3, 1 x E3, 3 x E3, 4 x E3 or 3 x STS-1
	ETHERNET -- Single, Duplex 100 Base-T Electric
External Modem Interface (For use with factory qualified modems only)	
(IF Transmit and Receiver)	
Frequency	70 MHz
Level	-9 to +6 dBm
Impedance	75 Ω unbalanced
Connector	TNC(F)

Power Requirements

(DC only Input standard, AC/DC Input optional)	
DC Input Voltage	.44 to 56 Vdc (floating)
AC Input Voltage	100-260 Vac
AC Input Frequency	.50/60 Hz (nominal)
Auto Switching	When configured for AC and DC operation and both AC and DC power are applied simultaneously, the radio will automatically switch between AC and DC power without any interruption in service

Mechanical

(Nominal)	
Height	.85 inches (21.6 cm)
Width	.17.5 inches (44.5 cm)
Depth	.19.5 inches (49.5 cm)
Weight	.32 kg/70 lbs
Orientation	The radio must be stored, transported and operated in a horizontal position with the top side up to meet the environmental specifications as listed herein.

Transmit

Frequency Bands	3.6-15.35 GHz in standard bands
RF Power Output	(See Table A)
RF Frequency Stability	± 5 ppm
IF Frequency	70 MHz
Spurious Emissions	≤ -65 dBc
Harmonics	≤ -65 dBc

Receive

Threshold (1x10E-6)	(See Table A)
Image Rejection	> 70 dB
LO Leakage at Antenna	
Connector	-70 dBm nominal
IF Frequency	70 MHz
IF 3 dB Bandwidth	
Selectable on Radio	
Keypad	Narrowband: 30 MHz Wideband: 40 MHz
IF Filter Type	.SAW

Environmental

Temperature Range	
Operating	-20° to +50°C -30° to +50°C optional
Storage	-40° to +70°C
Humidity	.95% relative at 25°C (non-condensing)
Altitude	4600 m (15,000 feet) - operating or non operating
Rain	The transceiver is rain resistant. It may be operated in the outdoors without the optional protective front cover.
Vibration	.12-minute sine sweep (5-200-5 Hz) at 1.5 g's for six hours in vertical axis.
Shock	.40 g's terminal peak sawtooth with 11 ms duration when radio is packed in standard shipping container. Three shocks in vertical axis.

TABLE A

CONFIG.	64 QAM		128 QAM		QPSK	
	POWER OUT	THRESHOLD 1x10E-6	POWER OUT	THRESHOLD (1x10-6)	POWER OUT	THRESHOLD (1x10-6)
Dual Pol	+28 dBm	-67.5 dBm	+25 dBm	-64.5 dBm	+31 dBm	-76 dBm
Single Pol	+28 dBm	-66.5 dBm	+25 dBm	-63.5 dBm	+31 dBm	-76 dBm

NOTE: Power Out is typical variation is + or -1 dB, threshold figures are guaranteed minimums.

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