

TRANSMITTER SPECIFICATIONS

Frequency Range Standard:	928-944 MHz, 944-960 MHz	Duty Cycle (w/o Degradation):	Continuous (-30°C to +60°C)
High Stability Option:	944-960 MHz	Modulation Deviation:	±5 kHz with 2.0 Volts P-P at data input (J1-1)
Number of Channels:	One (crystal con- trolled)	Frequency Response:	Flat within ±2.0 dB from 50 Hz to 10 kHz (referenced at 1.0 kHz)
RF Power Output:	1.0 - 2.0 Watts (ad- justable)	Harmonic Distortion:	3% maximum
Operating Temperature:	-30° to +60°C	FM Hum and Noise:	-50 dB maximum (ref- erenced to 5 kHz de- viation)
Dimensions		Harmonic Output:	-50 dBc maximum
Length (w/ conn.):	5.62"	Spurious Output:	-60 dBc maximum at 2 Watts RF output -50 dBc maximum at 1 Watt RF output
Length (w/o conn.):	5.10"	Carrier Attack Time:	5 mS max. (>90% power and frequency within ±1 kHz)
Width:	2.10"	VSWR Stability:	Output will withstand 20:1 VSWR (1 dB re- turn loss) at all angles, at any power level, with no break- up or damage.
Height:	1.03" max.		
Frequency Stability			
Standard:	±5 ppm		
Optional:	±1.5 ppm		
Emission Type:	16F3, 16F9, 15F2		
Power Supply Volts:	+12.5 VDC ±10%		
Power Supply Current:			
Standard:	650 mA max. at 2.0 Watts; 550 mA max. at 1.0 Watt; 0.1 mA max. with Tx unkeyed		
High Stability Option:	850 mA max. at 2.0 watts; 1A max. at 2 watts and -30°C, 700 mA max. at 1 watt; 350 mA max. with Tx unkeyed		

RECEIVER SPECIFICATIONS

Frequency Range:	928-960 MHz	Signal Present Indicator:	.28 uV (-118 dBm) (switching time <25 mS at .35 uV input)
Number of Channels:	One (crystal con- trolled)	Intermodulation:	-24 dBm typ. 3rd order intercept
Operating Temperature:	-30° to +60°C	I.F. Selectivity:	6 dB (bandwidth = ±7.5 kHz minimum) 60 dB (bandwidth = ±25 kHz maximum)
Dimensions		Harmonic Distortion:	5% max. (±3 kHz dev. at 1 kHz audio)
Length (w/ conn.):	5.62"	Frequency Response:	3 dB bandwidth from 50 Hz to 4.5 kHz
Length (w/o conn.):	5.10"	Discriminator Output:	1.4V P-P into 600 ohm load (±5kHz deviation)
Width:	2.10"	T/R Switch Loss (Option):	1.0 dB maximum
Height:	1.03" max.		
Power Supply Volts:	+12.5 VDC ±10%		
Power Supply Current:	25 mA max. at rated discriminator output		
Frequency Stability:	±5 ppm		
Sensitivity:			
10 dB S+N/N:	0.35 (-116 dBm) uV max. (300 Hz baseband bandwidth)		
20 dB Quieting:	2.1 uV (-100.5 dBm) max. (6.5 kHz base band bandwidth)		

Specifications Subject To Change Without Notice

Transmitter Unit

The RDL series transmitter is designed to provide reliable wireless transmission of data from remote or unattended locations. It provides 1.0 to 2.0 watts of R.F. power in the 928-960 MHz frequency range operating from a 12.5 volt DC source. A crystal oscillator is used in conjunction with a varactor diode to produce direct FM. The transmitter is available in the standard 5 ppm stability configuration or with the 1.5 ppm high stability option in the 944-960 MHz frequency range. Connection to the transmitter unit may be made via hard wiring installed by the user (plated through holes are provided) or through the use of the optional 10 pin connector (721-050-02). The antenna is connected via coaxial cable and an accessory connector (21-15-038) to J2, an SMB type coaxial connector. Also available to the user is an external line that will supply a regulated 8 volts when the transmitter is keyed. When installed in a system employing suitable modulation limiting and filtering along with proper R.F. cabling and mounting techniques, transmitter performance complies with FCC parts 21 and 90.

The transmitter frequency is determined by a crystal (Y1) located in the base circuit of the oscillator. Q1 is a crystal controlled oscillator with its collector circuit tuned to three times the crystal frequency. Stan-

dard models (5 ppm frequency stability) use a variable inductor in series with the crystal to adjust the transmit frequency. Models with the High Stability (1.5 ppm) Option use a variable capacitor to set the unit on frequency and a crystal oven to hold the crystal's temperature constant and thus improve the stability of the transmitter. A varactor diode, CR1, in series with the crystal and Q1, is used for frequency modulating the oscillator, hence the transmitter. Q2 is a tripler, and Q3 and Q4 are doublers, increasing the multiplication factor to 36. Two test points, R9 (TP1) and R13 (TP2) are provided in the emitter circuit of the multiplier stages, and are used for observing the peak emitter voltage while tuning. Multiple tuned circuits between the oscillator and multipliers enhance the suppression of the crystal and multiplier products. Q5 is the driver stage, and amplifies the FM signal to a level adequate for driving the final stage amplifier, Q6, to over the rated wattage. A low pass filter in the collector circuit of the final amplifier (Q6) provides matching to the antenna, and assists in the suppression of spurious radiation.

When a transistor to transistor logic (TTL) level voltage (+2.5V to +5.0V) is applied to

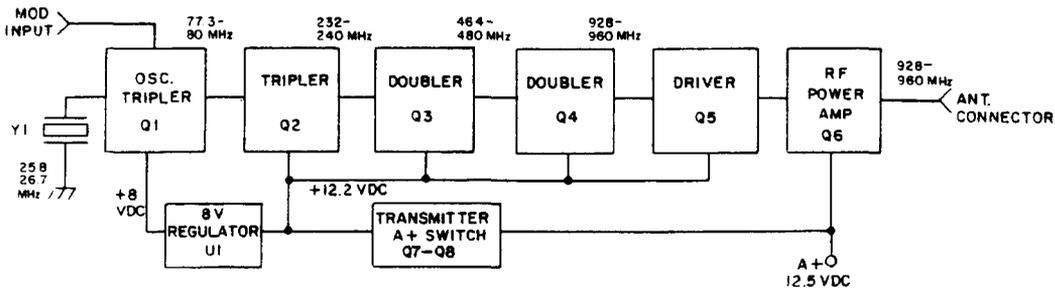


Fig. 1

the key line (J1-8) the base of Q8 goes high causing it to conduct. This in turn pulls the base of Q7 low allowing it to conduct, supplying voltage to the transmitter circuits. U1 serves as a voltage regulator to supply the crystal controlled oscillator with a regulated 8 volts. The tripler, doubler, and driver stages are powered by the switched 12.2 volts while the final stage is supplied directly from the battery. For the user's convenience a regulated 8 volts (20 milliamp max.) is supplied to pin 9 of J1 when the transmitter is keyed.

trol, R15. The bias of CR1 varies at the rate of the modulated input as does the capacitance. This causes the frequency of the oscillator to vary at the modulated input rate to produce the desired frequency modulation. The small frequency shift of the oscillator is also multiplied by thirty-six to produce the ± 5 kHz of deviation. Variable resistor R15 adjusts the level of the modulated input applied to the varactor diode and consequently the deviation of the transmitter. The standard deviation is ± 5 kHz and the transmitter should be adjusted so that the peaks of the modulating signal do not cause the deviation to exceed that figure (no limiting action is provided by the transmitter circuitry).

The data input to the transmitter enters at J1-1 and develops across the deviation con-

Transmitter Pin Functions

Pin No.	Function
1	Data Input (2VPP into 7K resistive load)
2	Not Used
3	Ground
4	Ground
5	Not Used
6	Not Used
7	Ground
8	Keyline (high to transmit, TTL level* compatible)
9	Regulated +8.0 VDC Out (20 mA max.)
10	+12.5 VDC In

*TTL Levels: High = +2.5V to 5.0V
Low = 0V to 0.5V

Circuitry shown is farside

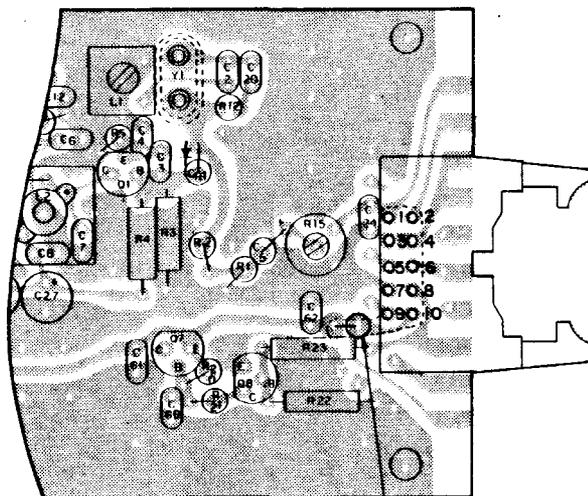


Fig. 2

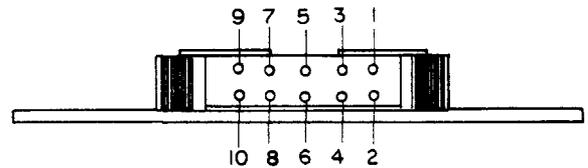


Fig. 3

OPTIONAL CONNECTOR (J1)
(721-050-02)
(includes mating connector)

If circuit protection is required, install a 4 amp fuse (part number 51-15-006) as shown and cut the trace on the bottom of the p.c. board.

Receiver Unit

The RDL 950 telemetry receiver is a single p.c. board unit designed to handle coded R.F. intelligence. Because the receiver is intended primarily for use in decoding digital transmissions, there is no audio processing circuitry. Figure 9 is a simplified block schematic, and shows the process of converting an RF signal at the input to recovered information at the output. The receiver is available in two basic configurations. One model comes without transmit/receive switching circuitry, while the other is equipped with the transmit/receive switching option. Those so equipped are designed to interface with a transmitter unit and an external transmit/receive switch. The modulated output from the transmitter is coupled to the receiver through an additional coaxial connector (J2, part number 21-15-039*) positioned on the receiver p.c.

board. Connection to the receiver unit may be made via hard wiring installed by the user (plated through holes are provided) or through the use of the optional 10 pin connector (part number 721-050-02). A board-mounted coaxial connector (J1, part number 21-15-039*) is used to connect the unit to the antenna.

The supply voltage (12.5 VDC) flows through switching transistor Q12 and is regulated by Q11 to 8.0 V. Variable resistor R56 is used to adjust this voltage. The receiver may be muted by applying a logic level voltage (2.5 to 5.0 V) to pin 1 of J3. This causes switching transistor Q10 to conduct which in turn pulls down the base of NPN transistor Q12. Q12 stops conducting, removing supply voltage from the receiver. The received

*The accessory mating connector for J1 and J2 has part number 21-15-038.

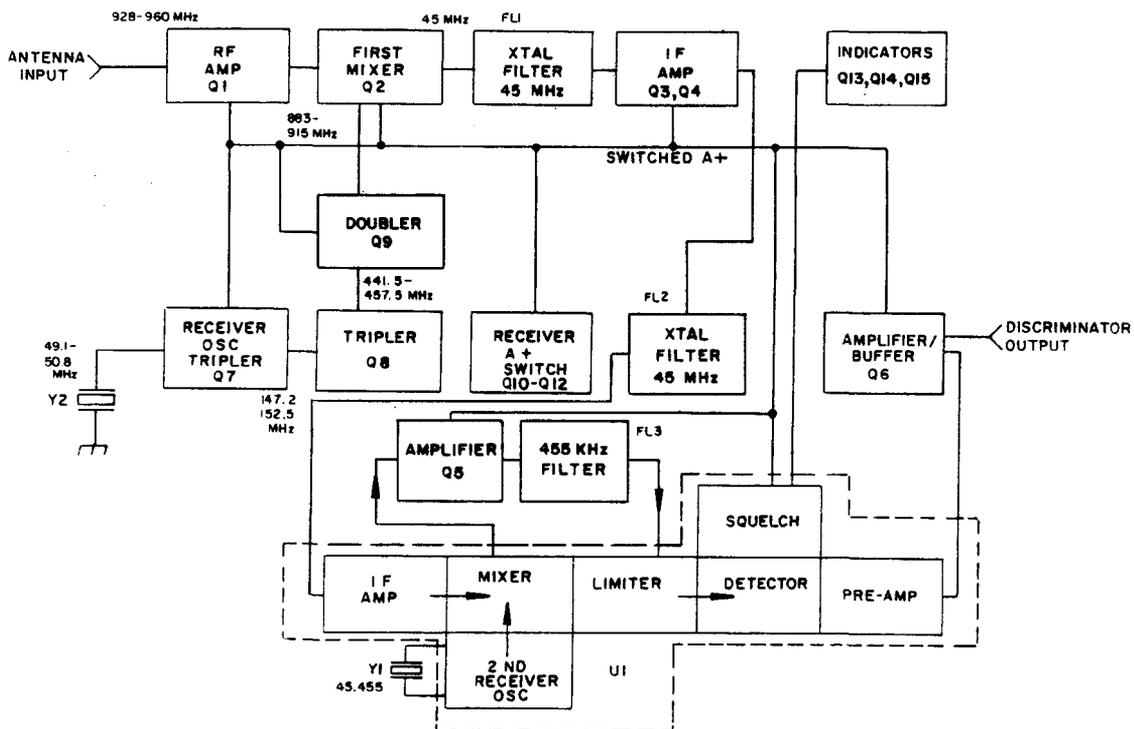


Fig. 10

signal from the antenna is fed to the input stage of the receiver, RF amplifier Q1, through a two pole bandpass filter comprised of helical resonators L3 and L4. C1 provides impedance matching from the antenna to the input of the filter and C6 provides matching to the RF amplifier from the output of the filter.

Q1 is a common emitter RF amplifier. The amplified RF signal at the collector of Q1 is coupled to the base of mixer transistor, Q2, through a two pole helical filter comprised of L6 and L7. Q7 is a crystal controlled oscillator, with its collector tuned to three times the crystal frequency. (A third overtone crystal is used with this oscillator.) The receiver frequency is determined by a crystal (Y2) located in the base circuit of the oscillator. A variable capacitor (C46) in series with the crystal is used to set the receive channel on frequency. The output of the oscillator ($3F_x$) is fed to a tripler, Q8, a doubler, Q9, and the resulting output signal ($18F_x$) is capacitively coupled to the emitter of the mixer, Q2. The difference frequency of 45.0 MHz (the first I.F.) is selected by a two pole crystal filter (FL1), amplified by I.F. amplifiers Q3, and Q4 and further filtered by two pole crystal filter FL2. The output of FL2 is then fed through an impedance matching network to multipurpose integrated circuit, U1.

U1 operates as an I.F. amplifier, oscillator, mixer, limiter, detector, amplifier, and in addition has a Schmitt trigger circuit that is used to activate the signal present alert. The crystal Y1, in the circuit of pins 1 and 2, sets the frequency of the second oscillator to 45.455 MHz, and the second I.F. of 455 kHz is amplified by Q5 and filtered by ceramic filter FL3. Inductor L18 tunes the detector to 455 kHz, and the detector output is taken from pin 9, and develops across the discriminator output level control (R29). Q6 serves as an amplifier/buffer, supplying pin 5 of J3 with the final amplified discriminator output.

When the receiver is equipped with the T/R switching option, W1 forms a quarter wave section at the RF input to the receiver (see Figure 10). If the transmit mode is desired, switched voltage (3 to 5 volts at 20 mA typical) is applied to the antenna circuit through J3-2 and R1. Pin diodes CR1 and CR2 are forward biased, and CR2 shorts the receiver input and one end of the quarter wave section. Looking at the receiver, the antenna sees an infinitely high impedance, and looking at the transmitter it sees a relatively low impedance (on the order of 50 ohms) through conducting pin diode CR1. Thus, the transmitter is "connected" to the antenna. To return to the receive mode, the T/R switch voltage is removed from J3-2 and thus from pin diodes CR1 and CR2. The antenna now sees an extremely high impedance looking at the transmitter, and approximately 50 ohms looking at the receiver. Signals at the antenna are consequently routed to the receiver.

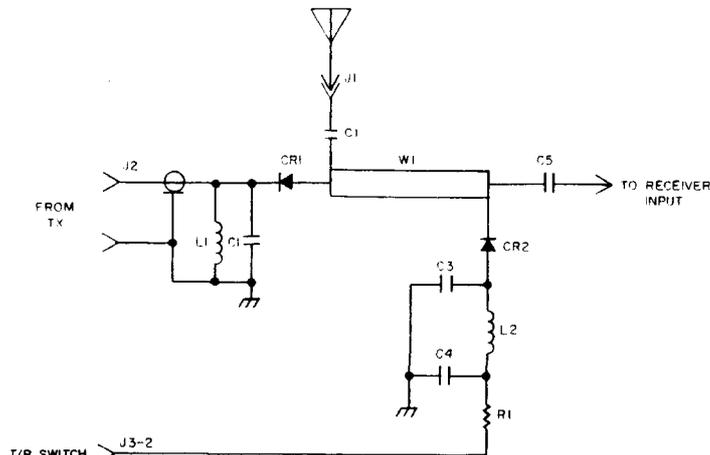


Fig. 11

The signal present indicator control (R38) is part of a voltage divider network and controls the DC voltage to the Schmitt trigger input at pin 12. The output of pin 13 is used to activate the signal present light (DS1) and external indicator (J3-6) through switching transistors Q13, Q14, and Q15. With no signal present, pin 13 supplies the base of Q13 with sufficient voltage to cause it to conduct, thus shutting off Q14 and Q15. Upon receipt of a signal, pin 13 goes to ground and Q13 quits conducting. This switches on both Q14 and Q15 by supplying voltage to their bases. Q15 causes pin J3-6 to sink to ground (the user may wish to utilize this function to provide an external indicator, etc.) while Q14 allows the signal present light (DS1) to illuminate.

As indicated by the dotted lines shown on the receiver schematic, several variations of the basic signal present circuitry are possible. These additional components (R61, R62, R63) may be installed by the user in predrilled positions on the p.c. board (refer to figure 18). The functions of these components are as follows:

R61 adds hysteresis to the signal present indicator circuitry. i.e. The rated indicator threshold is .28 uV. When R61 is added, .28 uV is still required to activate the indicator, however, it will remain activated even if the signal strength falls slightly below the initial .28 uV threshold level.

R62 is used to bypass Q13 and thus invert the function of Q15 and the external signal present indicator (J3-6). Instead of sinking to ground when a signal is received, J3-6 is now grounded when no signal is present. NOTE: R59 must be removed when R62 is installed.

R63 serves as a pull-up resistor at the collector of Q15. When there is no received signal present, pin J3-6 is supplied with current through R63. A received signal will cause Q15 to go to ground and remove the voltage from pin J3-6. NOTE: R62 may be used in conjunction with R63 to invert the output at pin J3-6 according to the presence or absence of a signal.