



Tomorrow's Telemetry Today!

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G-7901D TELEMETER, FS TRANSMITTER INSTRUCTION INFORMATION

- **CRYSTAL CONTROLLED**
- **WIDE TEMPERATURE OPERATION**
- **0.15% ACCURACY**
- **DIFFERENTIAL INPUTS**
- **OPERATION INDICATOR**
- **UNIVERSAL PLUG-IN FILTER OPTIONAL**

GENERAL DESCRIPTION

The G7901D and G-7902C telemetry system provides higher accuracy and greater temperature stability than conventional telemetering systems. These features stem from the extensive use of crystal stabilized oscillators for frequency synthesis and detection circuits. Typical telemeter converter accuracy is better than 0.1% over a temperature span of 0 to 50 degrees C.

The G-7901D Telemeter, FS Transmitter linearly converts a dc voltage or current to a sub-audio frequency in the ranges of 10 to 30, 5 to 15, 18 to 30 and 5 to 25 Hz. This sub-audio frequency modulates an on-board frequency shift (FS) transmitter to produce narrow band FS signals in a range between 420 Hz to 10 kHz. These signals can be transmitted over standard, voice-grade telecommunication channels such as telephone wires, microwave or optical fibers. The output filter of the transmitter exhibits 600 ohms nominal with rising impedance out of band to allow frequency multiplexing of several transmitters onto one transmission medium.

The input to the telemeter converter may have spans in the range of 100 mV to 10 V with 0.0 V at left scale or within the span. A differential input is provided to allow the user to drive the telemeter without concern for ground placement. This differential input exhibits an input impedance exceeding 1 megohm per volt. An on-board calibration network with front panel switch allows the user to move from the operation mode to the calibration mode to tune the telemeter response. The calibration network typically allows left, center and right scale user calibration.

The output of the differential amplifier on the calibration network drives the scaling amplifier. The scaling amplifier is calibrated such that when the left scale and right scale voltages are input, the output of the voltage-to-frequency converter is the sub-audio or modulation fre-



quency required. The voltage-to-frequency converter then keys the two-frequency transmitter at the sub-audio rate. A solderless jumper selects either 10-30 Hz or 5-15 Hz sub-audio tone rate.

An optional relay can be provided on the G-7901D for retransmission of the sub-audio frequencies, allowing a second FS transmitter to be keyed. A plug-in filter section is also available.

G-7901D FS TRANSMITTER SECTION

U1 of this section generates a frequency to pump the LC tank oscillator of L3 and C3. The values of L3 and C3 determine the resonate frequency of the tone channel transmitter oscillator. Capacitors C4 and C5 when keyed by the switching operation of Q101 and Q102, shifts the frequency of the oscillator. Q102 switches C5 for a three frequency option allowing special telemetry and pulse transmissions over a single channel. Normally, when terminal 13 is keyed, either externally or by the telemeter converter output, the frequency tone shifts from mark, the highest frequency, to space, the lowest frequency. U2 divides oscillator frequencies by 16 to reduce jitter in low frequency, wide bandwidth channels.

Tone level on the line out can be adjusted from the front panel using R111 to control the amplifier stage of Q103. The combination of L2, C2, C1, and L1 creates a 600 ohm nominal termination impedance at the center frequency with rising impedance out of band characteristics. The band-pass response of this output filter reduces harmonic distortion caused when the divider is used. Tone signals can be monitored be-

tween TP6 and TP7 of the test receptacle on the front panel.

G-7901D TELEMETER CONVERTER SECTION

The input to the G-7901D telemeter converter employs these signal conditioning techniques. The combination of R32, R33, and C10 form a low pass filter with cutoff at approximately 10 kHz. Diode CR1, CR2, CR3, and CR4 form a bridge to clip positive and negative transients above an amplitude of 12 V. R34 provides a shunt for current loop inputs when a shunt resistor is desired on the board and not on the shelf. U3A and U3B form the differential input buffer amplifiers to exhibit a greater than 1 megohm per volt input impedance at frequencies which are less than approximately 2 kHz. Note that one side of the differential input is referenced to common by a resistor with a value of 100K ohms between either input and common.

S1 allows the operator to calibrate the scaling amplifier, U4A and U4B, when required. The resistor networks of R2 through R9 provide the calibrating potentials of left scale, center scale and right scale. R1, R4, and R7 have been set at the factory for the calibration specified. When S1 is moved out of the operational mode, center scale, right scale and left scale can be calibrated individually. The center scale input position is used to check the deviation at center scale.

To begin the procedure of calibrating the telemeter converter, the differential amplifier, U4A, must be balanced using R17. Differential balance occurs when the potential between TP1 and TP2 is equal to the potential between TP3 and TP7. With the differential amplifier balanced, the left scale and span may be adjusted. When S1 is in the LS position, R21 is adjusted for the left scale sub-audiofrequency at TP5, typically 20 Hz. When S1 is then in RS position, R24 is adjusted for the right scale sub-audio

frequency at TP5, typically 60 Hz. The process of calibration is a back and forth procedure, bringing the left scale and span into specified values.

G-7901D SPECIFICATIONS

DC Input Span: 100 mV to 10 V ranges standard, custom ranges available.

Input Impedance: Greater than one megohm without current shunts.

Modulation Frequency: 10 to 30 Hz standard; 5 to 15 Hz and others available.

Accuracy: 0.15% from -5 degrees C to +55 degrees C.

Linearity: 0.015% of full span.

Response Time: Left scale to right scale in less than 100 ms.

Temperature Stability: Better than 0.005% per degrees C from -5 to +55 degrees C range.

Operating Temperature: -5 to +70 degrees C.

FS Transmitter Stability: 0.15% +/-2 Hz in temperature range of -5 to +55 degrees C.

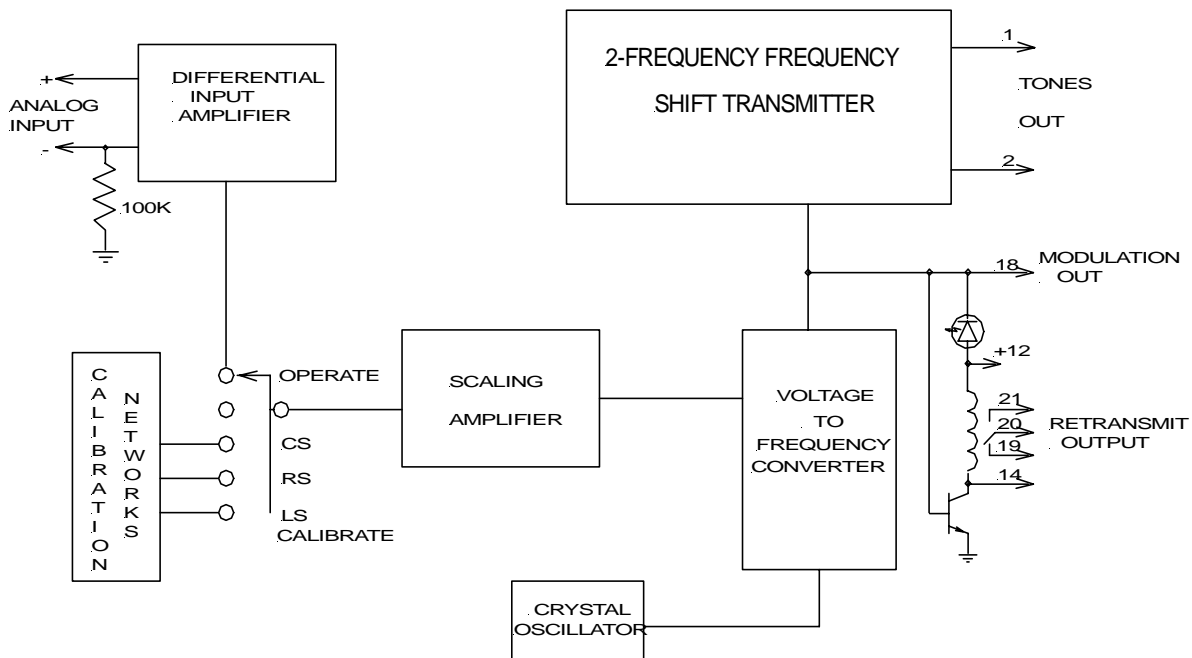
Output Levels: -25 to 0 dBm, adjustable.

Squelch: +3 to +25 Vdc turns off tones.

Output Filter: Rising impedance out of band characteristics, coils soldered in with plug-in filter section available.

Power Requirements: +12 V supply, 46 mA; -12 V supply, 24 mA.

NOTE: Using the G-7901D in a G-7901B position requires that Q5, CR8, and K1 be left off the G-7901D board. Also, note that if squelch was being used on the G-7901B module that the squelch pin changes from pin 14 to pin 3 on the G7901D board. These changes are required for compatibility of the G-7901B to G-7901D modules. The G-7901C and G-7901D are completely compatible.



G-7901D TELEMETER FS TRANSMITTER