2-WAY MOBILE RADIO

# MAINTENANCE MANUAL FOR GENERAL ELECTRIC TRANSISTORIZED PROGRESS LINE CHANNEL GUARD MODEL 4NS11B11

## SPECIFICATIONS

### CHANNEL GUARD TRANSMITTER

| | |
|---|---|
| Output Level: | 3.0 volts across 4000 ohms (low band). 1.1 volts across 4000 ohms (high band). |

### CHANNEL GUARD RECEIVER

| | |
|---|---|
| Input Impedance: | 2000 ohms. |
| Input Level: | 0.03 volt tone developed from a signal having 1 KC deviation. |
| Output: | Designed for TPL applications. |
| Tone Rejection: | Down at least 30 db relative to audio output at 2/3 system dev. |
| Response Time: | Less than 250 ms. |

### SYSTEM

| | |
|---|---|
| Distortion: | Less than 3 percent. |
| Supply Voltage: | 13.8 volts DC nominal, operable at ±20%. |
| Deviation: | 0.8 KC (narrow band) |
| Receiver Opening: | Less than 5 db |
| Temp.Range: | -30°C to +60°C |
| Monitoring: | Provides automatic monitoring before transmission (FCC requirement) by reverting to normal squelch operation. |

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## ILLUSTRATIONS



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These instructions do not purport to cover all details or variations in equipment nor to provide for every possible contingency to be met in connection with installation, operation, or maintenance. Should further information be desired, or should particular problems arise which are not covered sufficiently for the purchaser's purposes, the matter should be referred to the nearest General Electric Company District Sales Office.

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# GENERAL ELECTRIC
# TRANSISTORIZED PROGRESS LINE
# CHANNEL GUARD

## GENERAL DESCRIPTION

General Electric Transistorized CHANNEL GUARD options are designed to eliminate the reception of undesired signals by the Transistorized Progress Line Receiver. All signals are locked out except those from transmitters which are continuously tone coded for positive identification by the receiver.

The CHANNEL GUARD unit consists of a Tone Squelch Transmitter-Receiver Combination. The Tone Transmitter provides the proper tone to modulate the carrier in transmission, and the Tone Receiver decodes the tone from a desired signal to unsquelch the TPL Receiver. Thus, stations and mobiles equipped with CHANNEL GUARD are able to communicate without hearing undesired signals from other users of the same channel.

General Electric Transistorized CHANNEL GUARD provides automatic channel monitoring, enabling the operator to comply automatically with the FCC ruling that the channel be monitored before transmitting. This is accomplished by using the standard squelch circuit in the TPL Receiver when the microphone is removed from its hanger.

The standard squelch circuit prevents the objectionable burst of noise which would otherwise be heard whenever the channel is monitored and found to be clear of signals.

Lifting the microphone from its hanger instantly disables the tone squelch operation so that everything on the channel can be heard over the speaker in the conventional manner.

A reed encoder (RD601) is used as the frequency determining component in the Tone Transmitter. This reed is an electro-mechanical device resonant to the desired tone frequency. The reed is connected as a frequency selective device in the tone oscillator so that a tone of the proper frequency is generated when power is applied to the circuit.

A reed decoder (RD602) responds to the desired tone frequency, closing a set of contacts to operate the standard squelch circuit in the TPL Receiver.

Tone is removed from the audio in the Tone Squelch unit so that tone is not heard in the TPL Receiver speaker.

The Tone Squelch Unit has only two adjustments. These are the gain and modulation controls in the Transmitter Unit.

The output of the Tone Squelch Transmitter is fed to the tone modulator on the oscillator board of the Audio/Exciter in the TPL unit. The oscillator of the Audio/Exciter is frequency modulated at the tone rate.

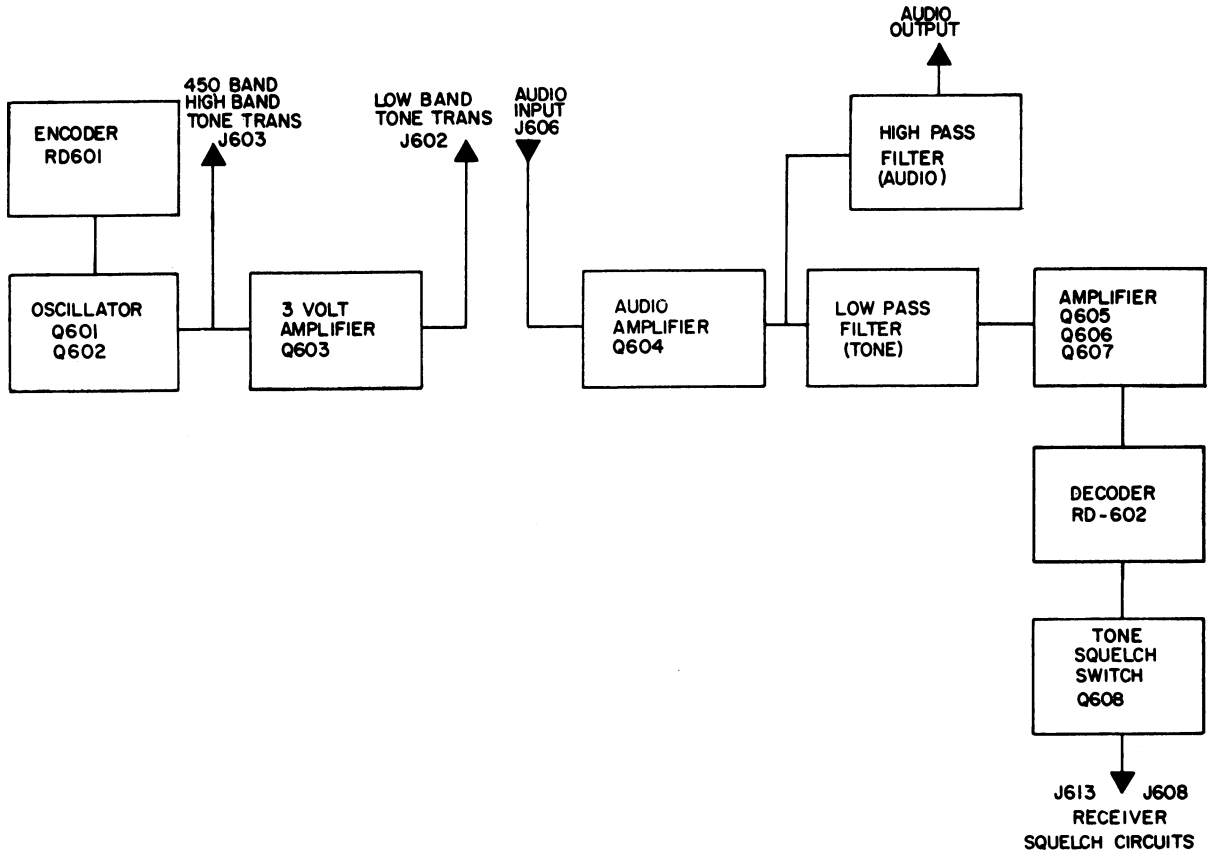


Fig. 1 - Block Diagram
Transistorized PROGRESS LINE CHANNEL GUARD
(RC-623)

## INSTALLATION

The Tone Squelch Unit is housed in Option Case D-5498341-P1 which attaches to the rear of the TPL Receiver. The rear unit of the TPL Combination can be fastened to the rear of the Tone Squelch unit for single unit mounting. A 10-conductor cable (PL-5493379-G1) connects the Tone Squelch unit to the Option Plug J707 on the TPL Control Unit.

Installation Diagram RC-640 shows complete interconnections of the CHANNEL GUARD unit to the TPL equipment. Also outlined in this Diagram are the connections of the TPL Tone Squelch Option Cable.

## OPERATION

When the microphone of the TPL Combination is on the hang-up bracket, the CHANNEL GUARD (Tone Squelch) circuit keeps the TPL audio circuits squelched until a signal with the proper tone is received.

When a properly coded signal is received, the cutoff bias to the TPL Receiver audio circuits is removed to permit the Receiver to operate normally.

To initiate a call, the operator lifts the microphone from the hang-up bracket. This permits the operator to monitor the channel. If he finds the channel clear, he makes the call in the normal manner, simultaneously transmitting the proper tone to unsquelch the receiver of the unit he is calling.

## ADJUSTMENT

Only two adjustments are required on the Tone Squelch unit. These are the tone transmitter Gain (R608) and Modulation (R613) controls. Normally these controls are set at the factory and should require no further adjustment. If operating conditions or system applications require re-adjustment of these controls, the following procedure should be followed:

A. GAIN ADJUSTMENT

1. Place the Modulation control (R613) in the full CCW position.
2. Connect the positive lead of an AC VTVM to J612 (yellow).
3. Adjust Gain control R608 for a reading of 2.0 volts AC.

B. MODULATION ADJUSTMENT

1. Using a modulation monitor at the transmitter:
   a. For wide-band applications, adjust R613 for 1 KC deviation.
   b. For narrow-band applications, adjust R613 for 0.75 KC deviation.
   c. Re-check Gain adjustment for 2.0 volts; readjust if necessary.

## CIRCUIT OPERATION

### TONE TRANSMITTER

Q601 and Q602, together with reed RD601, comprise the oscillator circuit of the Tone Transmitter. Feedback for proper oscillator action is accomplished by coupling from the collector of Q602, through R608, R605 and C601, to the base of Q601.

The output of the oscillator is set to the proper level by R608 and regulated by the circuit consisting of C602 and the incandescent lamp I601. This lamp acts as a variable resistance to adjust the degeneration of the oscillator to stabilize the tone amplitude and to reduce distortion.

Feedback from the emitter of Q602 through CR601 and R602 stabilizes the oscillator circuit for temperature variations.

R613 serves as the modulation control and the signal is fed to J603 for 130 to 170 MC applications and through Q603 to J602 for 25 to 50 MC applications. Q603 is a voltage amplifier, providing the necessary 3 volts for low band applications. J602 connects to the -15 volt regulated supply of the TPL Audio/Exciter.

TONE RECEIVER

The audio from the TPL Receiver is fed to the Tone Receiver from J606 and coupled to the base of Q604. The signal is amplified, passed through a high pass filter (L601, C626, C611) to remove the tone from the audio signal. The voice signal is fed to J607 and back to the TPL Receiver audio circuits.

The audio signal at the collector of Q604 is applied to a low pass filter (L602, L603, C612, C614). This filter removes the voice signals from the audio providing pure tone for the Tone Receiver.

The tone is coupled to the Tone Receiver amplifier circuit (Q605, Q606, Q607). These amplifiers raise the level of the tone signal for proper operation of the decoder reed RD602. Limiting also occurs in these circuits.

In negative ground systems, with the mike on the hangup bracket, Q608 conducts and provides the additional bias on the base of Q308 (in the TPL Receiver audio circuits) to hold the audio circuits at cutoff. Removing the mike from the hangup bracket permits the TPL Receiver audio circuits to operate normally. The path through CR604 is broken and Q608 is cut off. This removes the added bias on Q308.

In positive ground systems, removing the mike from the hangup bracket opens the path through CR605, cutting off Q608, and removing the bias from Q308 to permit the TPL Receiver to operate normally.

When a tone of the proper frequency is received, RD602 operates to close its contact; this in turn cuts off Q608, allowing the TPL squelch circuits to operate the Receiver.

## MAINTENANCE

Refer to the Service Outline Diagram, Elementary Diagram, and Voltage and Resistance Charts when servicing the Tone Squelch circuits.