communications

MAINTENANCE MANUAL

GENERAL ELECTRIC PACER DESK STATION CHANNEL GUARD

MODEL 4EK11A10

OPTIONS: 4572, 4573 AND 4574

LBI-3395

DF-5008

3362

COMMUNICATION PRODUCTS DEPARTMENT

GENERAL ELECTRIC

LYNCHBURG, VIRGINIA

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SPECIFICATIONS

Description:	Continuous Tone-Controlled Squelch, General Electric Model 4EK11A10.
Tubes:	12AU7 Tone Oscillator 1/2 8102 Cathode Follower 1/2 8102 Channel Monitor 8102 Tone Receiver
Transistor:	Silicon: Squelch Switching Circuit
Temperature:	-30°C to +60°C
Power Input:	+150 VDC @ 20 ma. 13.2 VAC @ 600 ma.
Tone Input:	1 volt for 0.75 KC deviation.
DC Input from limiter:	-1 volt change for 0.25 μv RF at antenna.
Tone Output:	Tone for transmitter modulator adjustable with a maximum of 3.5 volts rms into 10,000 ohms impedance.
Tone Oscillator Drift:	Less than ±0.3% from -30°C to +60°C.
Tone Oscillator Output:	+2, -3 db change from -30°C to +60°C.
Tone Receiver Bandwidth:	Minimum of ±1.2% of center frequency from -30°C to 85°C.
Tone Frequencies:	Complies with EIA Standard RS-220, April 1959 except for the following frequencies: 67.0 cps and 162.2 through 250.3 cps.
Size:	7-inches x 2.5-inches x 3.5-inches.

GENERAL ELECTRIC PACER
DESK STATION CHANNEL GUARD

MODEL 4EK11A10
OPTIONS: 4572, 4573 AND 4574

DESCRIPTION

The Model 4EK11A10 CHANNEL GUARD unit is designed as an integral part of the General Electric Pacer Desk Station. The unit will provide continuous tone controlled squelch for both high band and low band stations. The CHANNEL GUARD unit consists of a tone oscillator controlled by an electromechanical reed device for modulating the station transmitter. Also, a tone receiver is included which utilizes a reed decoding device to control the station receiver squelch circuit.

CHANNEL GUARD eliminates the reception of undesired signals by the station receiver, locking out all signals except those from transmitters which are continuously tone coded for positive identification by the receiver. Channel monitoring is provided which enables the operator to comply with the FCC ruling that the channel be monitored before transmission. The tone transmitter provides the proper tone to modulate the station transmitter permitting mobiles equipped with CHANNEL GUARD to communicate with the station without hearing undesired signals from other users of the same channel.

Three Options are available. Option 4572 applies CHANNEL GUARD to local-control, single-frequency stations. Switch Kit PL-4037104-G2 is supplied with this option to provide audible monitoring when desired. Option 4573 applies CHANNEL GUARD to local-control, two-frequency stations. Switch Kit PL-4037104-G3 is supplied with this cption for two-channel monitoring when desired. Option 4574 applies CHANNEL GUARD to single-frequency stations modified for remote control with Option 4569. Option 4574 connects the CHANNEL GUARD unit to the Remote Control Adaptor 4KC13A10 or A11.

The CHANNEL GUARD unit is mounted in the station cabinet by means of four Tinnerman type clips and thread-forming screws. Connections to the station are made through an application harness with bead chain pins and plugs. Tone input and output leads are shielded to prevent pick-up of extraneous noise from other circuits in the station.

ADJUSTMENT

Two adjustments are provided on the CHANNEL GUARD unit. These adjustments are accessible from the top of the station after the cover has been removed.

R604: This control adjusts positive feedback in the tone oscillator circuit. The control is used to compensate for differences in reed requirements as to the amount of feedback necessary to sustain oscillation.

1. Connect a VTVM to J601 (red).

2. Adjust R604 for a reading of 18 vrms at the reed frequency.

R613: This control adjusts the amplitude of the tone applied to the station transmitter modulator circuit.

1. Connect a deviation monitor to the station transmitter.

2. Adjust R613 for a deviation of 0.75 KC at the tone frequency.

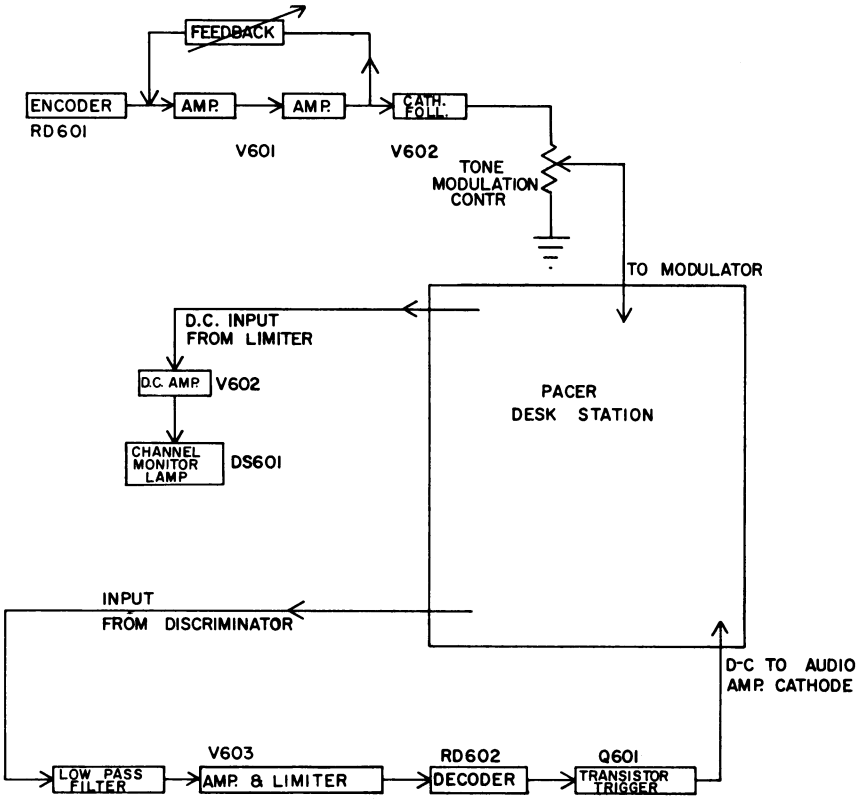
OPERATION

Before transmission, the operator must monitor the channel(s). The Busy Lamp (DS601) is provided as an aid to determine the channel busy condition. The operator should switch to MON position (S1 or S2) and listen to the channel before pressing the Push-to-Talk switch. When a properly coded call is received, the normal squelch circuit in the station receiver takes over and the call is heard in the speaker.

CIRCUIT DESCRIPTION

TONE TRANSMITTER

The reed encoder (RD601) is connected in the grid circuit of the first section of the twin-triode oscillator tube V601. The reed is resonant only to the assigned tone frequency. Feedback for proper oscillator action is accomplished from the plate of the second triode of V601 to the grid of the first triode. The oscillator voltage is applied to the grid of the triode section of V602. This triode is connected as a cathode follower to properly match the input circuit of the station transmitter modulator.



Block Diagram Pacer Desk Station Channel Guard

R604 is provided in the feedback path of the oscillator for compensating reed requirements for sustaining oscillation. R613 controls the gain of the tone signal for proper deviation of the station transmitter. The tone transmitter output is coupled to the modulator limiter stage of the station transmitter through P604.

AUTOMATIC CHANNEL MONITOR

DC is coupled from the squelch rectifier (CR302) in the station receiver, through P607 to the pentode section of V602. This tube is connected as a DC amplifier to the Busy Lamp DS601. A signal of the proper frequency (whether or not it is tone coded) will operate this lamp, providing a visual check on the channel busy conditions. This lamp should be used only as an aid and the MON position of switch S1 or S2 should be used to monitor the channel before transmitting.

TONE RECEIVER

A High Pass Tone Filter (PL-5493433-G1) is provided at the output of the discriminator to remove the tone from the audio signal before passing it to the audio stages of the station receiver. The output of the discriminator is also passed to the tone squelch unit through P608, to a low pass filter where the voice frequencies are removed from the signal. The tone is coupled to the pentode section of V603. The signal is amplified and limited. The output of the limiter (the triode section of V603) is connected to the reed decoder RD602. When a tone

is received at the resonant frequency of RD602, the reed closes its contacts, applying a voltage to the transistor trigger (Q601) which unsquelches the station receiver.

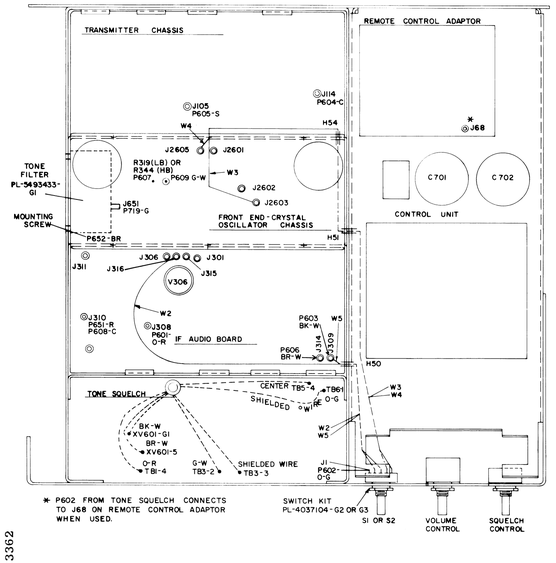
SWITCH KIT PL-4037104-G2 AND G3

Switch Kit PL-4037104-G2 permits automatic channel monitoring with DS601 when the switch (S1) is in the A position. Switching to MON position disables the tone squelch and permits the normal station receiver squelch circuit to take over. Switch Kit PL-4037104-G3 (S2) is used with two-frequency stations and the automatic channel monitoring lamp will indicate busy conditions in both the A and B positions. The MON position disables the tone squelch unit.

MAINTENANCE

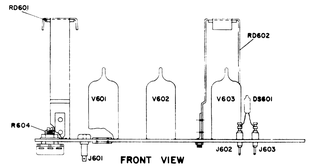
Refer to the Service Sheet (RC-914) for servicing and maintenance information on the CHANNEL GUARD unit. Reference should also be made to the General Servicing Information in the station Maintenance Manual.

FIG. 1



* P602 FROM TONE SQUELCH CONNECTS TO J68 ON REMOTE CONTROL ADAPTOR WHEN USED.

(RC-914)



TYPICAL VOLTAGE READINGS

PIN NO.	TUBE V601	TUBE V602	TUBE V603	PIN NO.	TRANSISTOR SQUELCHED Q601	TRANSISTOR UNSQUELCHED
1	-16V	-150V	-110V	C	6.4V	1.0V
2	+0.4V	+56V	+5V	E	0 V	0.4V
3	-0.1V	+50V	+1V*	B	0 V	1.0V
4	0 V	0 V	0 V			
5	13.6VAC	13.6VAC	13.6VAC			
6	-38V	-85V	-28V			
7	-0.7V	-55V	-20V			
8	-0.86V	-0.3V	0 V			
9	0 V	-0.8V	-0.6V			

These readings made with a 20,000 ohms-per-volt voltmeter.
Nominal Power Supply: 150 volts

* This reading varies with noise and signal.

TONE SQUELCH CONNECTION CHART

PLUG	FROM UNIT	TO JACK	ON UNIT	WIRE COLOR
P601	TONE SQUELCH	J308	IF/AUDIO BOARD	R-O
P602	TONE SQUELCH	J1	SWITCH KIT OR REMOTE ADAPTOR	O-G
P603	TONE SQUELCH	J309	IF/AUDIO BOARD	BK-W
P604	TONE SQUELCH	J114	TRANS. BOARD	Center
P605	TONE SQUELCH	J105	TRANS. BOARD	Shield
P606	TONE SQUELCH	J314	IF/AUDIO BOARD	BR-W
P607 P609	TONE SQUELCH	R319(LB) R344(HB)	FRONT END BOARD	G-W
P608	TONE SQUELCH	J310	IF/AUDIO BOARD	Center
P651	TONE FILTER	J310	IF/AUDIO BOARD	R
P652	TONE FILTER	MOUNTING SCREW	IF/AUDIO BOARD	BK
P719	POWER SUPPLY	J651	TONE FILTER	G

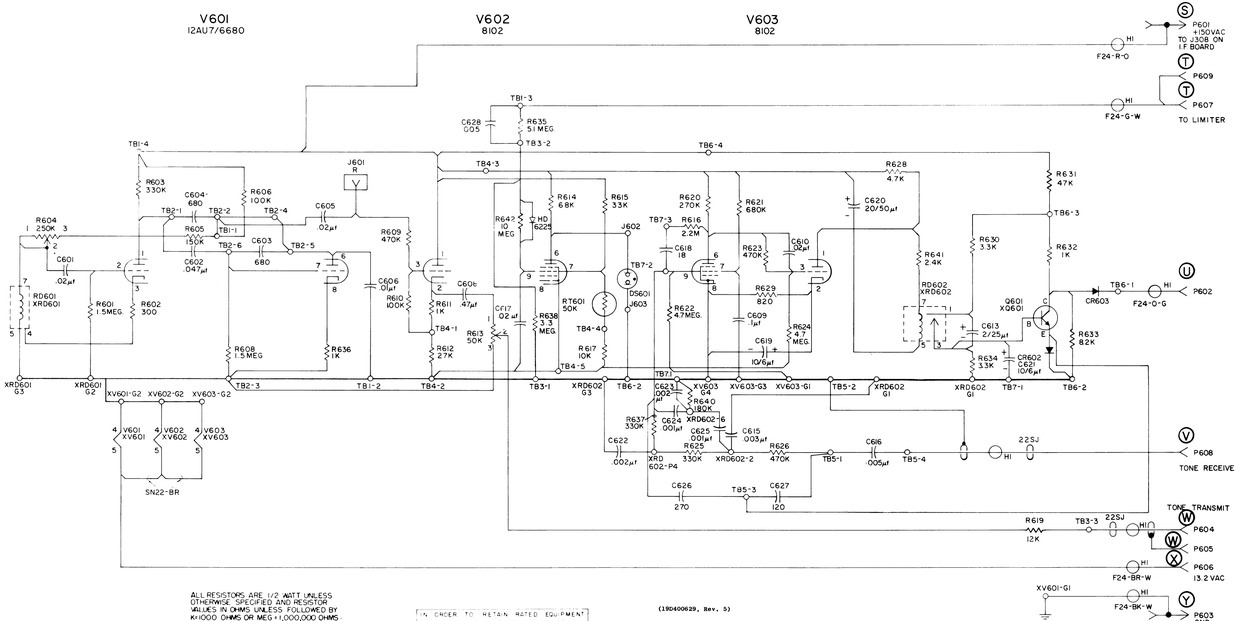
TYPICAL RESISTANCE READINGS

PIN NO.	TUBE V601	TUBE V602	TUBE V603	PIN NO.	TRANSISTOR SQUELCHED Q601	TRANSISTOR UNSQUELCHED
1	360K	22K	25K	C	6K	8K
2	1.5M	28K	2.2K	E	DIODE	DIODE
3	300Ω	127K	2.8M	B	3.3K	3.3K
4	0 Ω	0Ω	0Ω			
5	0.1Ω	0.1Ω	0.1Ω			
6	90K	92K	300K			
7	1.5M	28K	750K			
8	1K	270Ω	1500Ω			
9	N.C.	6M	2.6M			

These readings taken with 20,000 ohms-per-volt voltmeter.

All power removed from circuit.

Transistor removed from circuit.



ALL RESISTORS ARE 1/2 WATT UNLESS OTHERWISE SPECIFIED AND RESISTOR VALUES IN OHMS UNLESS FOLLOWED BY K=1000 OHMS OR MEG=1,000,000 OHMS. CAPACITOR VALUES IN MICROFARADS (EQUAL TO MICROMICROFARADS) UNLESS FOLLOWED BY UF= MICROFARADS, INDUCTANCE VALUES IN MICROHENRYS UNLESS FOLLOWED BY MH= MILLIHENRYS OR H=HENRYS

IN ORDER TO RETAIN RATED EQUIPMENT PERFORMANCE, REPLACEMENT OF ANY SERVICE PART SHOULD BE MADE ONLY WITH A COMPONENT HAVING THE SPECIFICATIONS SHOWN IN THE PARTS LIST FOR THAT PART.

(19D400629, Rev. 5)

Service Sheet

GENERAL ELECTRIC PACER DESK
DESK STATION CHANNEL GUARD
MODEL 4EK11A10

(RC-914)

3362

PARTS LIST

GENERAL ELECTRIC PACER STATION CHANNEL GUARD
MODEL 4EK11A10
PL-1982019G5

SYMBOL	G-E PART NO.	DESCRIPTION
		----------CAPACITORS----------
C601	7774750-P15	.02 uf, 500 VDCW
C602	7491096-P31	.047 uf, 400 VDCW
C603 & C604	7147203-P4	680 pf, 500 VDCW
C605	7774750-P15	.02 uf, 500 VDCW
C606	7774750-P13	.01 uf, 500 VDCW
C608	7491930-P12	0.47 uf, 100 VDCW
C609	7488160-P3	0.1 uf, 500 VDCW
C610	7774750-P15	.02 uf, 500 VDCW
C613	7489483-P13	2.0 uf, 25 VDCW
C615	5494481-P16	3000 pf, 500 VDCW
C616	7774750-P11	.005 uf, 500 VDCW
C617	7774750-P15	.02 uf, 500 VDCW
C618	7489162-P109	18 pf, 500 VDCW
C619	7489483-P2	10 uf, 6 VDCW
C620	7489483-P11	20 uf, 50 VDCW
C621	7489483-P2	10 uf, 6 VDCW
C622 & C623	7774750-P6	.002 uf, 500 VDCW
C624 & C625	7774750-P4	.001 uf, 500 VDCW
C626	7489162-P37	270 pf, 500 VDCW
C627	7489162-P29	120 pf, 500 VDCW
C628	7774750-P11	.005 uf, 500 VDCW
		----------RECTIFIERS----------
CR602	4036936-P1	Diode, silicon
CR603	5491705-P2	Diode, silicon
CR604	5491704-P2	Diode, silicon
		----------INDICATING DEVICE----------
DS601	NE-2H	Neon lamp
		----------JACKS AND RECEPTACLES----------
J601	7150763-P2	Jack
J602	4029868-P1	Terminal
J603	4029868-P1	Terminal
		----------PLUGS----------
P601	4033348-P1	Contact
P602	4036624-P1	Pin receptacle
P603	4033348-P1	Contact
P604 & P605	4029840-P2	Terminal
P606	4033348-P1	Contact
P607	19A115010-P1	Contact
P608	4029840-P2	Terminal
P609	19A115010-P1	Contact

*COMPONENTS ADDED, DELETED OR CHANGED BY PRODUCTION CHANGES.

SYMBOL	G-E PART NO	DESCRIPTION
		----------TRANSISTOR----------
Q601	4037333-P2	Silicon, NPN
		----------RESISTORS----------
R601	3R77-P155J	1.5 megohm ±5%, 1/2 w.
R602	3R77-P301J	300 ohms ±5%, 1/2 w.
R603	3R77-P334J	0.33 megohms ±5%, 1/2 w.
R604	5494774-P108	Potentiometer; .25 megohm ±20%, linear taper, 0.2 w.
R605	3R77-P154J	0.15 megohm ±5%, 1/2 w.
R606	3R77-P104J	0.10 megohm ±5%, 1/2 w.
R607	3R77-P514J	0.51 megohm ±5%, 1/2 w.
R608	3R77-P155J	1.5 megohm ±5%, 1/2 w.
R609	3R77-P474J	0.47 megohm ±5%, 1/2 w.
R610	3R77-P104J	0.1 megohm ±5%, 1/2 w.
R611	3R77-P102J	1,000 ohms ±5%, 1/2 w.
R612	3R77-P273J	27,000 ohms ±5%, 1/2 w.
R613	5494774-P106	Potentiometer; 50,000 ohms ±20%, linear taper, 0.2 w.
R614	3R77-P683J	68,000 ohms ±5%, 1/2 w.
R615	3R77-P333J	33,000 ohms ±5%, 1/2 w.
R616	3R77-P225J	2.2 megohm ±5%, 1/2 w.
R617	3R77-P103J	10,000 ohms ±5%, 1/2 w.
R619	3R77-P123J	12,000 ohms ±5%, 1/2 w.
R620	3R77-P274J	0.27 megohms ±5%, 1/2 w.
R621	3R77-P684J	0.68 megohms ±5%, 1/2 w.
R622	3R77-P475J	4.7 megohms ±5%, 1/2 w.
R623	3R77-P474J	0.47 megohms ±5%, 1/2 w.
R624	3R77-P475J	4.7 megohms ±5%, 1/2 w.
R625	3R77-P334J	0.33 megohms ±5%, 1/2 w.
R626	3R77-P474J	0.47 megohms ±5%, 1/2 w.
R628	3R77-P472J	4700 ohms ±5%, 1/2 w.
R629	3R77-P821J	820 ohms ±5%, 1/2 w.
R630	3R77-P332J	3300 ohms ±5%, 1/2 w.
R631	3R77-P473J	47,000 ohms ±5%, 1/2 w.
R632	3R77-P102J	1000 ohms ±5%, 1/2 w.
R633	3R77-P822J	8200 ohms ±5%, 1/2 w.
R634	3R77-P332J	3300 ohms ±5%, 1/2 w.
R635	3R77-P515J	5.1 megohms ±5%, 1/2 w.
R636	3R77-P102J	1000 ohms ±5%, 1/2 w.
R637	3R77-P334J	0.33 megohms ±5%, 1/2 w.
R638	3R77-P335J	3.3 megohms ±5%, 1/2 w.
R640	3R77-P184J	0.18 megohms ±5%, 1/2 w.
R641	3R77-P242J	2400 ohms ±5%, 1/2 w.
R642	3R77-P106J	10 megohms ±5%, 1/2 w.
		----------REEDS----------
RD601	3R161-*	Resonant reed encoder
RD602	3R160-*	Resonant reed decoder
		*Part No. determined by multiplying freq by a factor of 10. Example: 67.0 cps x 10 equals Part No. 670.
		----------SWITCHES----------
S1252		Part of Modification Kit PL-4037104-G2 or G3.

SYMBOL	G-E PART NO	DESCRIPTION
		----------THERMISTOR----------
RT601	5490828-P11	50,000 ohms ±10%, temp coef: 4000 ±5%
		----------TUBES----------
V601		12AU7/6680
V602		8102
V603		8102
		----------SOCKETS----------
XQ601	5490277-P1	Transistor socket
XRD601 & XRD602	7768887-P14	Reed socket
XV601-XV603	7480532-P8	Tube socket
		MODIFICATION KIT PL-4037104-G2 & G3
S1	PL-4037102-G2	Switch assembly; consists of SPDT switch (G-E Part No. 19B200394-P1).
S2	PL-4037102-G3	Switch assembly; consists of DP4T switch (G-E Part No. 5495227-P12).