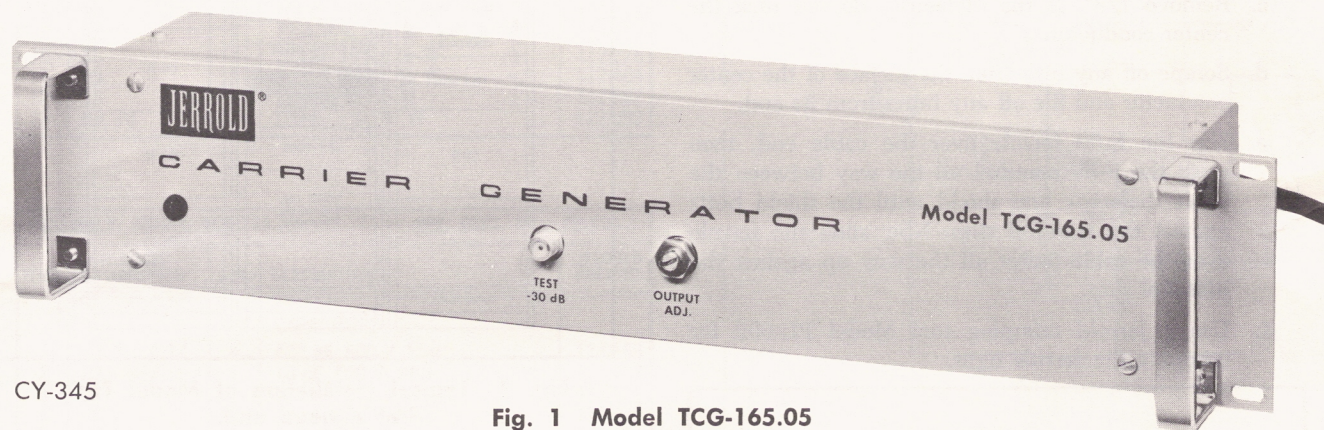


SOLID-STATE

# CONTROL CARRIER GENERATOR Model TCG-\*



CY-345

Fig. 1 Model TCG-165.05

## DESCRIPTION

Model TCG-° is a solid-state, crystal-controlled carrier generator designed for installation at CATV head ends to provide a pilot tone for AGC amplifiers installed along trunk lines and to have a test signal available throughout the system when broadcasting stations are off the air.

Shelf units are available for carrier frequencies of 49.0 MHz (for sub-channel equipment), 73.5 MHz (compatible with Starline One equipment), 118.25 MHz (compatible with Starline Twenty equipment), and 165.05 MHz (compatible with Model AGC-165 amplifiers). Generators for other carrier frequencies can be supplied on special order.

All Models are designed for flush-mounting on a 19" standard relay rack.

## INSTALLATION

1. The following accessories are shipped with each Model TCG-°:
  - 4 rack-mounting screws.
  - 3 Jerrold Model F-59 connectors and ferrules.
2. Mount the TCG-° in the head-end rack with the four screws supplied. Fig. 2 illustrates the recommended practice for the racking of the unit in relation to other head-end equipment.
3. Fig. 3 is a rear view of a Model TCG-° showing the trunk line bridging LINE IN and LINE OUT terminals. Where both terminals are to be used, install one F-59 connector on the head-end output cable and connect it to the LINE IN terminal, then install an

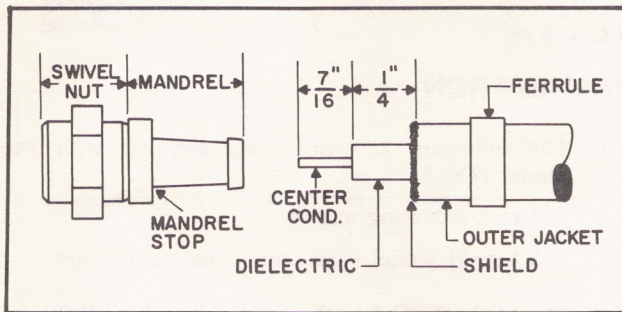
## SPECIFICATIONS

CARRIER FREQUENCY	49.0 MHz, 73.5 MHz, 118.25 MHz, 165.05 MHz; accuracy: $\pm 0.005\%$
OUTPUT	10 dBmV min., 45 dBmV max.
OUTPUT STABILITY	$\pm 0.25$ dB for line voltage fluctuations between 95 and 130 V a.c.
OUTPUT OPERATING LEVEL	10 dB below visual carrier level (ch. 5 for TCG-73.5, ch. 6 for TCG-118.25, ch. 7 for TCG-165.05)
TERMINAL IMPEDANCE	75 $\Omega$
INSERTION LOSS	1.5 dB max.
RETURN LOSS	21 dB min. (max. VSWR 1.2:1)
TEST POINT LEVEL	-30 dB
SIGNAL-TO-HUM RATIO	60 dB min.
POWER REQUIREMENT	120 V, 60 Hz, 50 mA, 6 W
REGULATION	series regulation with over-current protection
DIMENSIONS, overall	19" x 3½" x 5¾"
SHIPPING WEIGHT	7 lbs.



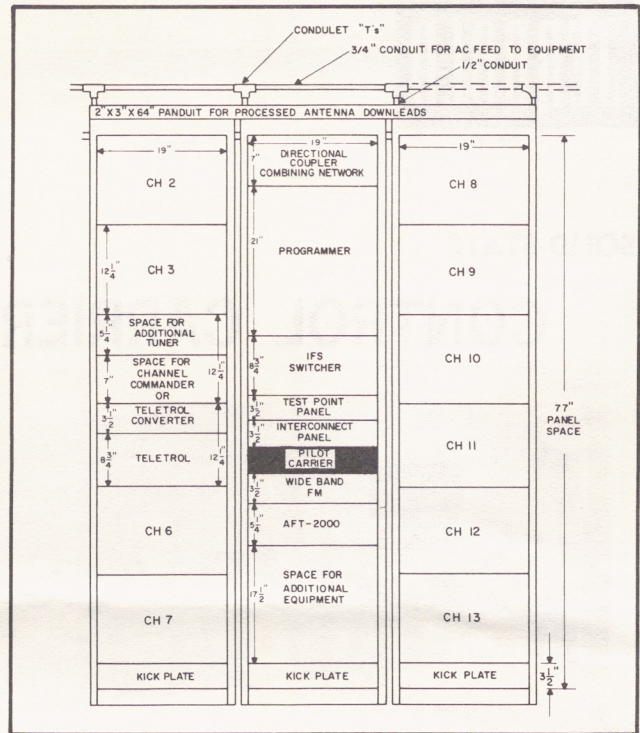
F-59 on a RG-59/U jumper and connect it to the LINE OUT terminal; connect the other end of this jumper with an appropriate adapter to the outgoing trunk line cable. Where the LINE OUT terminal only is to be used, the LINE IN terminal must be terminated in a Jerrold Model TR-72F.

4. F-59 connectors are installed as follows (compare Fig. 4):
  - a. Remove  $7/16$ " of the outer jacket.
  - b. Fan the shield back over the outer jacket, then trim the shield close to the jacket.
  - c. Remove  $1/4$ " of the dielectric; do not nick the center conductor.
  - d. Scrape off any fuzz from the surface of the center conductor and file off any burrs from its end.
  - e. Slip the F-59 ferrule over the cable end, then push the F-59 mandrel all the way between the cable dielectric and shield until the shield butts against the mandrel stop. Now slide the ferrule over the cable jacket all the way up against the mandrel stop.
  - f. Use a Jerrold crimping tool Model PL-602 for crimping the ferrule tight.



**Fig. 4 Preparation of RG-59/U Cable for Mounting an F-59 Connector.**

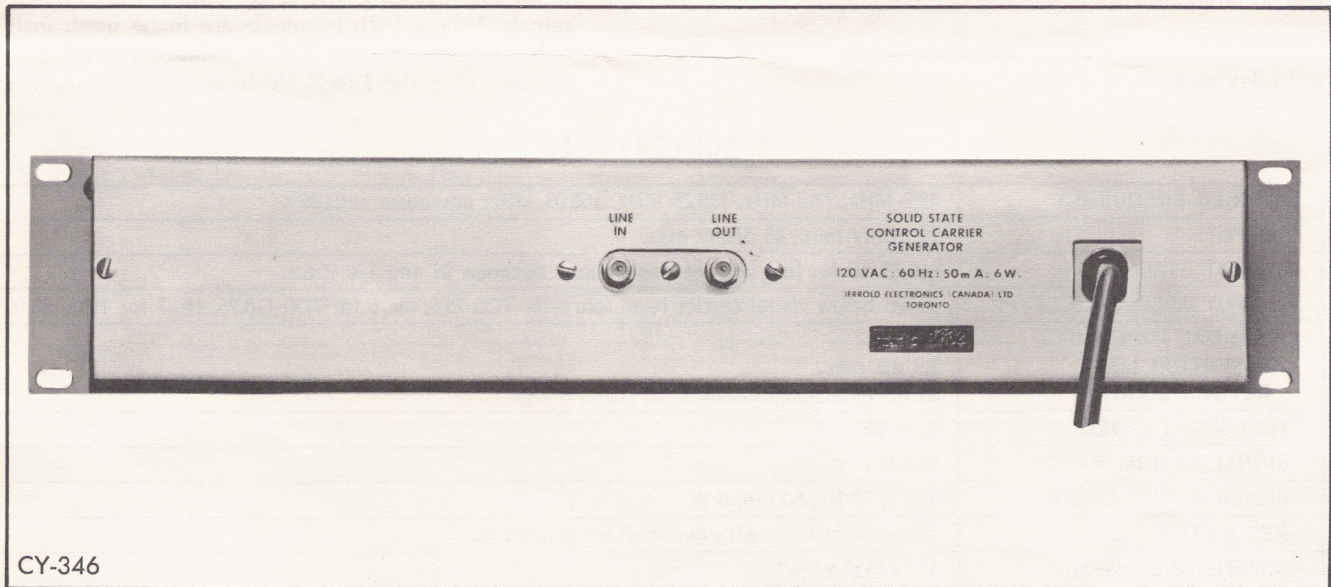
5. Connect the line cord and plug of the TCG-° to the appropriate outlet in the rack. The front panel pilot lamp should light up.



**Fig. 2 Typical Installation of Model TCG-\* at a head end.**

6. Using a field strength meter, check the head end output level of:
 

Visual carrier of that channel which is closest to the TGC-frequency.
7. Loosen the locknut on the TCG-° front panel OUTPUT ADJ. control, set the control for a carrier level as required and then tighten the locknut.
8. The TEST -30 dB terminal should be capped when not in use. An F-59 connector is provided for use on an RG-59/U jumper where the test terminal is to be permanently connected to a monitoring instrument.



**Fig. 3 Model TCG-\*, rear view.**



## MAINTENANCE

### GENERAL

The circuit description, alignment procedure, parts lists, and schematic circuit diagram given here will permit troubleshooting and, if necessary, re-align the equipment. The equipment should be serviced only by qualified personnel equipped with the necessary instruments and facilities.

### CIRCUIT DESCRIPTION

The Model TCG-\* Carrier Generator is energized by its own regulated d-c power supply connected by plug P1 to a 100-120 V a-c 60-Hz source. The primary circuit of power transformer T3 includes front panel pilot lamp DS1

and several filtering components which keep r-f out of the a-c power source. The d-c power supply consists of a full-wave rectifier (CR1 and CR2), with heavy capacitive filtering (C21 and C22), driving a Zener-referenced series regulating circuit (Q3 and CR6). The transistor is protected against overloads by the current-limiting circuit consisting of R19, CR3, CR4 and CR5.

Transistor Q1 is connected as a Colpitts-type crystal oscillator using collector-emitter regeneration. Depending on selection of crystal Y1 and the values of capacitors C1, C2 and C3 and resistors R3 and R4, the generated carrier will have the frequency as indicated by model number. Resistors R1 and R2 provide d-c operating bias for the stage. The r-f signal is developed across L2 and coupled by C4 to buffer amplifier stage Q2 which uses a common-

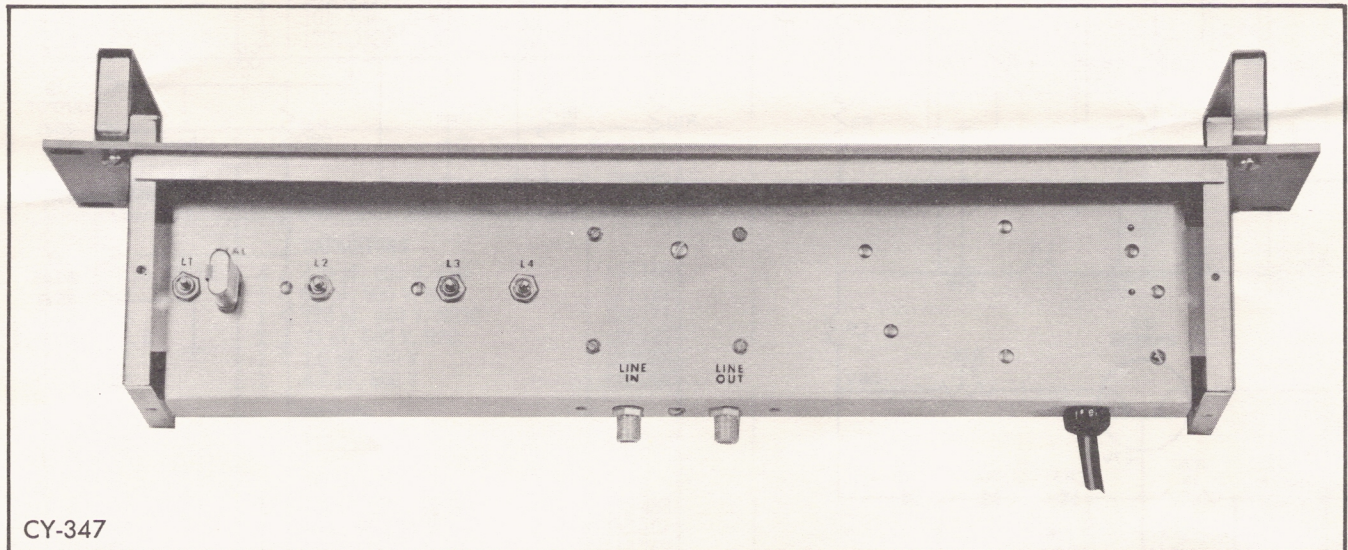


Fig. 5 Model TCG-\* Top View, Cover Removed, Showing Tuning Elements.

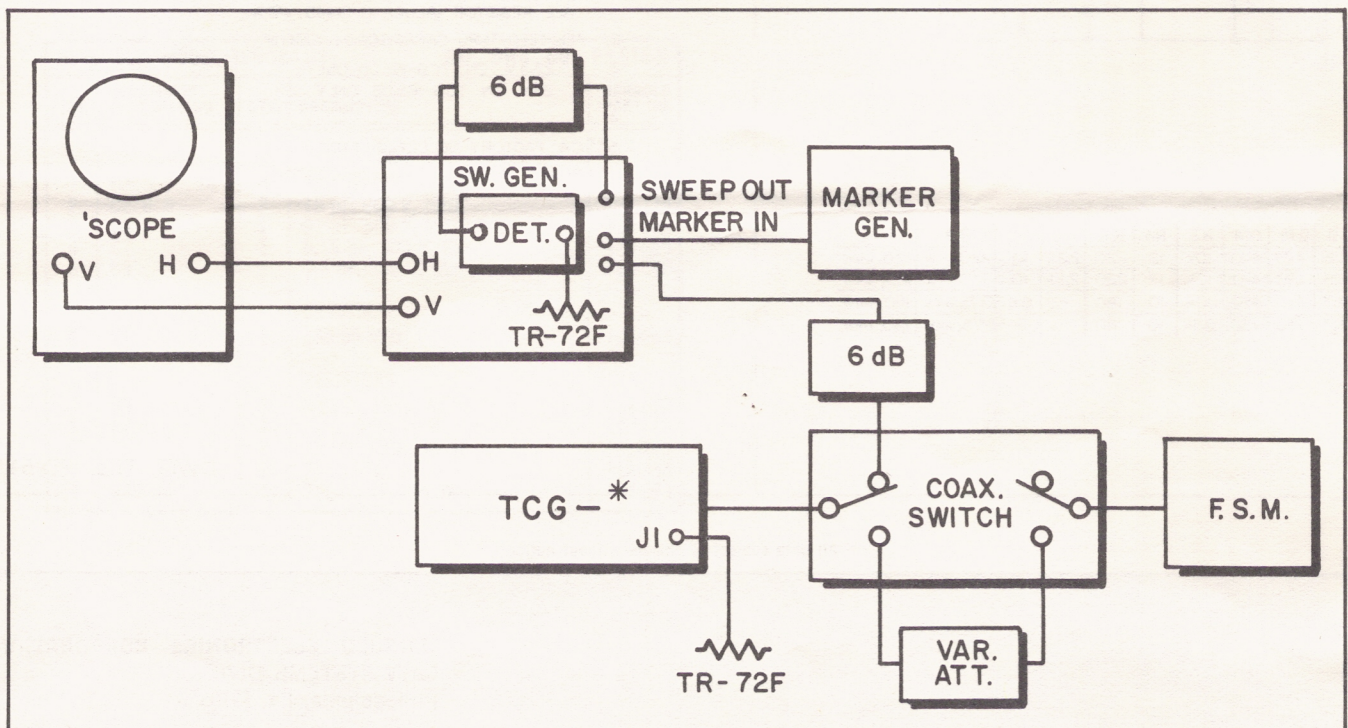


Fig. 6 Model TCG-\* in Test Steps.



emitter circuit configuration. Operating bias for this stage is provided via L5 and R5.

From the collector of Q2 the signal frequency is peaked by a pair of parallel resonant circuits, and front panel OUTPUT ADJ. control R7 permits adjusting the output level over a 35 dB range. Resistors R9, R10 and R11 form an output attenuator, while cross-coupled transformers T1 and T2 provide a directional coupler network which permits other head-end signals connected to J1 to be combined with the carrier generator output at J2. Front panel TEST connector J3 provides a test signal which is 30 dB below the output signal at J2.

### ALIGNMENT PROCEDURE

#### 1. INSTRUMENTS REQUIRED

- Oscilloscope, Tektronix Type 504
- Sweep Generator, Jerrold Model 900C
- Marker Generator, Jerrold CM-6
- Field Strength Meter, Jerrold Model 727 or 704B
- Coaxial Comparator, Jerrold Model TC-2 or FD-30
- Variable Attenuator, Jerrold Model AV-75F
- 6-dB pads, two, Jerrold Model PDL-6
- Terminator, Jerrold Model TR-72F
- Grid-Dip Meter, Measurements Model 159

Note: Equivalent instruments can be substituted.

2. Remove the cover from the TCG (see Fig. 5).
3. Calibrate the grid-dip meter for the crystal frequency. Detune L2 to stop oscillation. Bring the grid-dip meter close to L1, and adjust L1 for a minimum meter reading.
4. Set up the test equipment with the TCG as illustrated in Fig. 6.
5. The marker generator should be turned off; set the coaxial switch to MARKER IN position, set the sweep generator for NARROW BAND sweeping. The TCG should be equipped with a terminating resistor at the unused bridging connector J1.
6. Set OUTPUT ADJ. control R7 on the TCG to maximum (fully clockwise); the TCG output should be observable as a marker on the oscilloscope.
7. Pass the TCG output through the other leg of the coaxial switch with the variable attenuator set at 45 dB, and then to the field strength meter. Set the meter to the 3000-microvolt range.
8. Adjust L2 until the TCG oscillates. Tune L3 and L4 for maximum output indication on the field strength meter.
9. Turn on the marker generator and set it to provide a 49.0, 73.5, 118.25, or 165.05 MHz signal as required. Observe the oscilloscope for zero beat, then tune L2 through its entire range. The TCG oscillator should not pull or "squeeg"; it should exhibit an on-off (stable) characteristic.
10. Adjust L2 for maximum output. Where the tuning exhibits a fast or slow side, back L2 off 0.5 dB from maximum on the slow side.

11. Tune L3 and L4 for maximum output; the meter should read 45 dBmV.
12. Disconnect the TCG from the test set-up and replace the cover on the unit.

### REPLACEMENT PARTS LIST

ASSEMBLY: MODEL TCG*			REF. DWG. NO.: PD-515-H	
ITEM	SCHEMATIC DESIGNATION	QTY.	DESCRIPTION	JERROLD PART NO.
CAPACITORS				
1	C4	1	Factory selected (4.7 to 8.2 pF)	
2	C10	1	2.2 pF, 500 V, Gim.	122-008
3	C11, 12	2	1000 pF, 500 V, X5R	124-057
4	C15, 15, 23	3	1000 pF, feed-thru	129-200
5	C17, 18	2	470 pF, 1500 V, Z5U	124-165
6	C19, 20	2	0.01 $\mu$ F, 200 V, Y5V	124-164
7	C21, 22	2	160 $\mu$ F, 64 V, electrolytic	127-318
CONNECTORS				
8	J1, 2, 3	3	F61A	B821-155
DIODES				
9	CR1 thru 5	5	Silicon, 150 mA, 280 V	137-719
10	CR6	1	Zener, IN971B, 27 V, 400 mA	137-822
PILOT LIGHT				
11	DS1	1	Neon	102-514
RESISTORS				
12	R1	1	390 $\Omega$ , 10%, 1/2 W	112-311
13	R2, 18	2	1k $\Omega$ , 10%, 1/2 W	112-362
14	R7	1	1k $\Omega$ , 2 W, potentiometer	118-078
15	R11	1	75 $\Omega$ , 5%, 1/2 W	112-221
16	R12	1	620 $\Omega$ , 5%, 1/2 W	112-335
17	R13	1	560 $\Omega$ , 5%, 1/2 W	112-337
18	R14	1	82 $\Omega$ , 5%, 1/2 W	112-329
19	R15	1	100k $\Omega$ , 1%, 1/2 W	112-614
20	R16	1	1M $\Omega$ , 20%, 1/2 W	112-743
21	R17	1	3.3k $\Omega$ , 10%, 1/2 W	112-425
22	R19	1	22 $\Omega$ , 5%, 1/2 W	112-149
TRANSFORMERS				
23	T1, 2	2	Transformer assembly	Special
24	T3	1	Power transformer	141-267
TRANSISTORS				
25	Q1, 2	2	2N3866, Factory selected	130-172
26	Q3	1	2N3638	130-145

\*These parts common to all models.

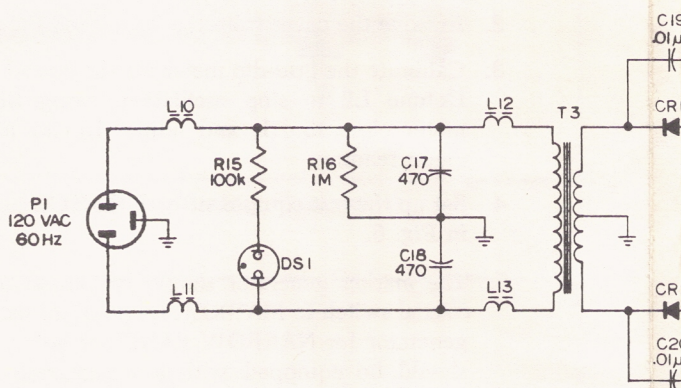
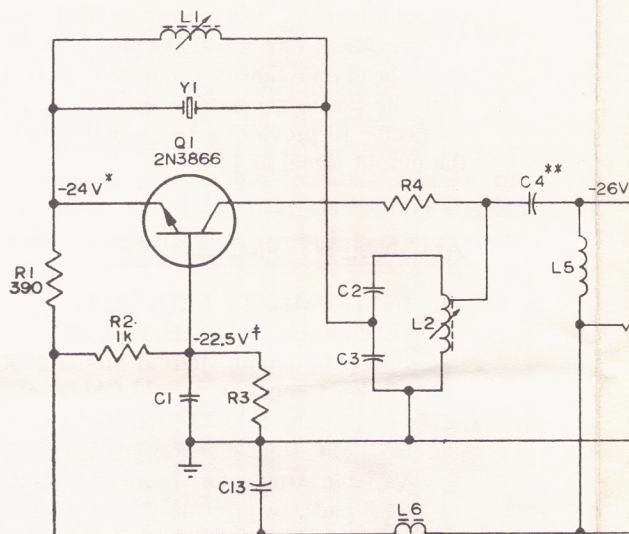
ASSEMBLY: MODEL TCG-49.0			REF. DWG. NO.: PD-515-H	
ITEM	SCHEMATIC DESIGNATION	QTY.	DESCRIPTION	JERROLD PART NO.
CAPACITORS				
1	C1, 5, 13, 14	4	470 pF, 500 V, X5U	124-166
2	C2	1	33 pF, 600 V, NPO	124-125
3	C3	1	120 pF, 500 V, N030	124-171
4	C6, 8	2	51 pF, 500 V, N030	124-168
5	C7	1	2.2 pF, 500 V	122-008
6	C9	1	6.8 pF, 500 V	122-013
CRYSTAL				
7	Y1	1	49.0 MHz	
RESISTORS				
8	R3	1	10k $\Omega$ , 10%, 1/2 W	112-488
9	R4	1	12 $\Omega$ , 5%, 1/2 W	112-119
10	R5	1	220 $\Omega$ , 10%, 1/2 W	112-278
11	R6	1	2.2k $\Omega$ , 10%, 1/2 W	112-404
12	R8	1	10 $\Omega$ , 5%, 1/2 W	112-107
13	R9, 10	2	120 $\Omega$ , 5%, 1/4 W	112-093



ASSEMBLY: MODEL TCG-73.5			REF. DWG. NO.: PD-515-H	
ITEM	SCHEMATIC DESIGNATION	QTY.	DESCRIPTION	JERROLD PART NO.
CAPACITORS				
1	C1, 5, 13, 14	4	470 pF, 500 V, X5U	124-166
2	C2	1	33 pF, 600 V, NPO	124-125
3	C3	1	120 pF, 500 V, N080	124-167
4	C6, 8	2	51 pF, 500 V, N030	124-168
5	C7	1	0.68 pF, 500 V, Gim.	122-003
6	C9	1	6.8 pF, 500 V, Gim.	122-013
CRYSTAL				
7	Y1	1	73.5 MHz	139-130
RESISTORS				
8	R3	1	10k $\Omega$ , 10%, 1/2 W	112-488
9	R4	1	12 $\Omega$ , 5%, 1/2 W	112-119
10	R5	1	220 $\Omega$ , 10%, 1/2 W	112-278
11	R6	1	2.2k $\Omega$ , 10%, 1/2 W	112-404
12	R8	1	10 $\Omega$ , 5%, 1/2 W	112-107
13	R9, 10	2	120 $\Omega$ , 5%, 1/4 W	112-093

ASSEMBLY: MODEL TCG-118.25			REF. DWG. NO.: PD-515-H	
ITEM	SCHEMATIC DESIGNATION	QTY.	DESCRIPTION	JERROLD PART NO.
CAPACITORS				
1	C1, 5, 13, 14	4	470 pF, 500 V, X5U	124-166
2	C2	1	10 pF, 500 V, NPO	124-137
3	C3	1	120 pF, 500 V, N030	124-171
4	C6, 8	2	33 pF, 600 V, NPO	124-125
5	C7	1	1.0 pF, 500 V	122-004
6	C9	1	4.7 pF, 500 V	122-011
CRYSTAL				
7	Y1	1	118.25 MHz	139-262
RESISTORS				
8	R3	1	10k $\Omega$ , 10%, 1/2 W	112-488
9	R4	1	10 $\Omega$ , 5%, 1/2 W	112-107
10	R5	1	180 $\Omega$ , 10%, 1/2 W	112-269
11	R8	1	6.8 $\Omega$ , 5%, 1/2 W	112-044
12	R9, 10	2	150 $\Omega$ , 5%, 1/2 W	112-974

ASSEMBLY: MODEL TCG-165.05			REF. DWG. NO.: PD-515-H	
ITEM	SCHEMATIC DESIGNATION	QTY.	DESCRIPTION	JERROLD PART NO.
CAPACITORS				
1	C1, 5, 13, 14	4	130 pF, 500 V, Y5E	124-169
2	C2, 6, 8	3	15 pF, 600 V, NPO	124-114
3	C3	1	91 pF, 500 V, N030	124-170
4	C7	1	0.18 pF, 500 V, Gim.	122-019
5	C9	1	3.3 pF, 500 V, Gim.	122-010
CRYSTAL				
6	Y1	1	165.05 MHz	139-263
RESISTORS				
7	R3	1	6.8k $\Omega$ , 10%, 1/2 W	112-467
8	R4	1	10 $\Omega$ , 5%, 1/2 W	112-107
9	R5	1	180 $\Omega$ , 10%, 1/2 W	112-269
10	R9	1	75 $\Omega$ , 5%, 1/4 W	112-954
11	R10	1	150 $\Omega$ , 5%, 1/4 W	112-974



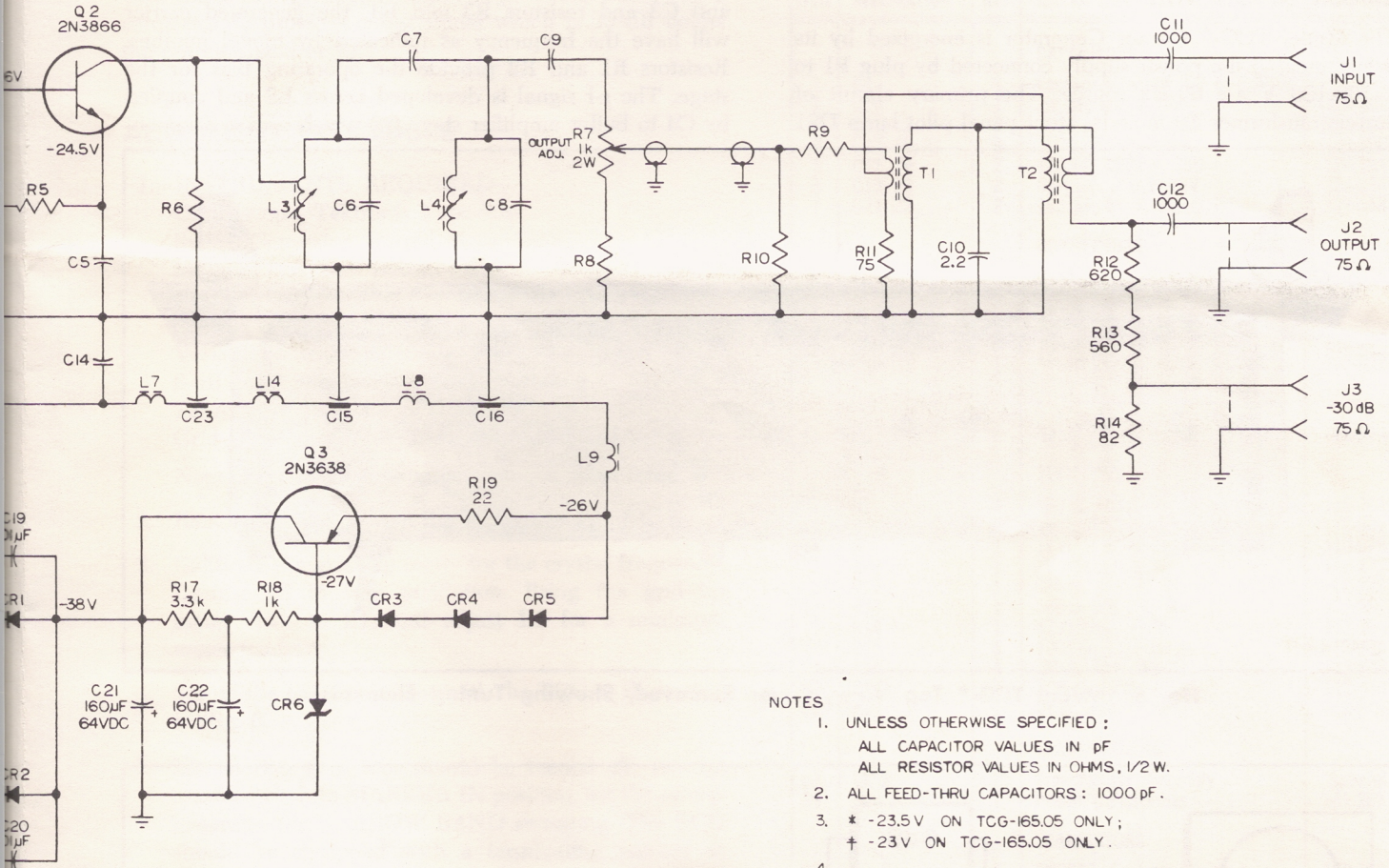
LAST NOS

C23  
CR6  
DS1  
J3  
L14  
PI  
Q3  
R19  
T3  
Y1

Y1	C1	C2	C3	C5	C6
49.0 MHz	470	33	120	470	51
73.5 MHz	470	33	120	470	51
118.25 MHz	470	10	120	470	33
165.05 MHz	130	15	91	130	15



SCHEMATIC  
 SOLID STATE CRYSTAL  
 CONTROLLED CARRIER GENERATOR  
 MODEL TCG-\*



- NOTES
1. UNLESS OTHERWISE SPECIFIED :  
 ALL CAPACITOR VALUES IN pF  
 ALL RESISTOR VALUES IN OHMS, 1/2 W.
  2. ALL FEED-THRU CAPACITORS : 1000 pF.
  3. \* -23.5 V ON TCG-165.05 ONLY ;  
 † -23 V ON TCG-165.05 ONLY .
  - 4.
  - 5.\*\* C4 FACTORY SELECTED , TYPICAL  
 4.7 pF - 8.2 pF .

	C7	C8	C9	C13	C14	R3	R4	R5	R6	R8	R9	R10
6	2.2	51	6.8	470	470	10k	12	220	2.2k	10	120, 1/4W	120, 1/4W
1	1.5	51	6.8	470	470	10k	12	220	2.2k	10	120, 1/4W	120, 1/4W
3	1.0	33	4.7	470	470	10k	10	180	-	6.8	75, 1/4W	150, 1/4W
5	0.68	15	3.3	130	130	6.8k	10	180	-	-	75, 1/4W	150, 1/4W

DWG. NO. PD-515-H

All data subject to change without notice.

**JERROLD ELECTRONICS CORPORATION**  
 CATV SYSTEMS DIVISION  
 Philadelphia, Pa. 19105