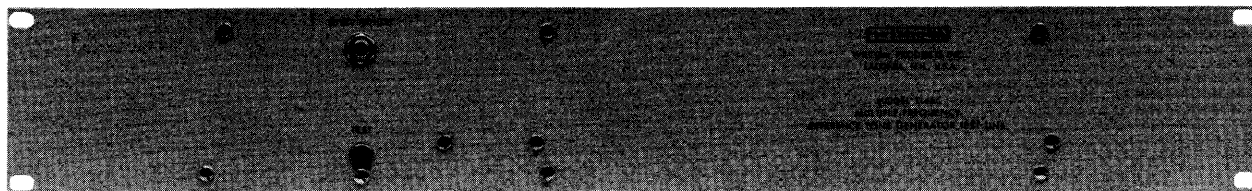


The Wilcom logo is displayed in a bold, lowercase, sans-serif font within a white rectangular box. Above the logo, there is a large, stylized graphic consisting of a thick black line forming a 'W' shape, with a solid black rectangle positioned above the central peak of the 'W'.

## Model T146C

# Multiple Frequency Reference Tone Generator

### FEATURES

- Up to 10 tones cycling in sequence
- Quiet termination during any part of the sequencing cycle
- Level Vernier Adjustment  $\pm 1$  dB
- Level Stability:  $\pm 0.03$  dB after adjustment
- Frequency Stability:  $\pm 1/2\%$
- Tone delay after initial OFF HOOK
- Rack Mount, and portable models
- Strap selectable operating options:
  - 600 or 900 ohms
  - Output level 0, -10, or -16 dBm
  - Ground start or loop start
  - ON HOOK — OFF HOOK cycling
  - Extended quiet termination after one or two tone cycles

### DESCRIPTION

The T146C is a stable reference tone generator designed to supply up to 10 tones or quiet intervals cycling in sequence. Any tones in the frequency range of 200 to 5000 Hz can be provided.

The cycling sequence consists of from one to ten equal periods. Each period consists of a  $1/4$  second interruption (or initial delay) during which the output is quiet, followed by an operating interval. The operating interval is normally six seconds but may be anywhere from one to fifteen seconds if specified on special order. Any of the operating intervals may consist of a quiet period instead of a tone. Also, more than one interval may be assigned to any one tone.

The cycling sequence starts when ground is applied to the S terminal (when strapped for ground start) or when battery is applied to a normally dry line connected to tip and ring terminals (when strapped for loop start). When this start condition disappears, the cycle is immediately interrupted and reset to its initial condition. After the tone cycle is complete, there are several possible operating modes. Selection of the desired mode is by soldering a wire strap between two terminals on a printed

circuit board. They are as follows:

1. The tone cycle may immediately start over and continue to repeat as long as the loop or ground start command is present.
2. The cycle may pause and the test line go ON HOOK for one second, to permit called party disconnect, after which it again goes OFF HOOK and the cycle starts over.
3. After completing one or two tone cycles (as selected) the test line may provide an extended quiet termination for noise measurements and impulse noise counting. The line will remain OFF HOOK and quiet as long as the loop or ground start condition remains. Since the duration of the extended quiet is determined by the calling party, there is no provision for called party disconnect with this feature.

Uninterrupted quiet termination is obtained by specifying as many adjacent quiet periods as may be required, since the intervening quarter second interruptions are themselves quiet and indistinguishable from quiet periods.

A typical cycle might be as follows:

Initial quarter second delay (quiet)	1/4 second
300 Hz tone	6 seconds
Interruption (quiet)	1/4 second
1004 Hz tone	6 seconds
Interruption (quiet)	1/4 second
3000 Hz tone	6 seconds
Three quiet periods (6 1/4 seconds each, including the initial quarter second)	18+ seconds
ON HOOK	1 second
Cycle repeats approximately every 38 seconds.	

The nominal output level is either 0, -10, or -16 dBm as determined by strap selection. A panel mounted level adjust vernier (screwdriver operated) permits fine adjustment of  $\pm 1$  dB with respect to the selected nominal level.

The output terminals may be connected to a telephone number to permit dialing the generator from a remote location. An elec-

tronic hold circuit is provided to trip the ring and provide OFF HOOK to the line. Either S lead ground start or tip-ring loop start may be used. Start option is determined by strap selection on rack mounted units and by a front panel switch on portable units. When loop start is used, the set must be connected to a dry circuit, i.e. no battery during idle, at the C.O.

The output impedance is either 600 or 900 ohms as selected by strapping on rack mounted units or by a front panel switch on portable units.

The output level will remain stable over long periods of normal use. For initial level setting at installation, be sure to use an accurate test set. The Wilcom Model T105B Reference Level Test Set may be used for this purpose. The T146C is mounted on a 3 1/2" x 19" panel (23" available on special order) and is powered from a 48 V office battery. Installation of this equipment is easy and may be performed by local personnel. Screw terminals are provided for tip, ring, sleeve and 48 V dc power.

## SPECIFICATIONS

### OUTPUT

#### Frequencies

Up to 10 frequencies cycling in sequence. Any frequency between 200 and 5000 Hz can be supplied in any sequence desired. Specify on order.

Harmonic Distortion: Less than 1% thd

#### Level

0, -10, or -16 dBm, as specified on order, adjustable  $\pm 1$  dB from front panel. Other levels available on special order.

Accuracies (0° C to 50° C operation)

Frequency:  $\pm 1/2\%$

Level:  $\pm 0.03$  dB after initial adjustment

Impedance and Quiet Termination:

600 or 900 ohms. Specify on order.

### FREQUENCY TIME INTERVALS

6 second duration for each tone or quiet period. 1/4 second interruption between tones. Continuous quiet termination through adjacent quiet periods. Cycling options as described in text. Entire cycle should be specified on order.

### HOLD CIRCUIT

Electronic; approximately 35 mA.

### POWER

48 V dc  $\pm 10\%$ , 200 mA max. The T146CQ and T146CP may also be operated on 115 V ac power.

### ENVIRONMENTAL CONDITIONS

Operating Temperature: 0° to 50° C

Humidity: 95% at 35° C  
40% at 50° C

Storage Temperature: -55° C to +70° C

Altitude (non-operating): 50,000 feet

### MECHANICAL

Panel Mounting:

3 1/2" H x 4 3/4" D x 19" or 23" W (specify width on order)

Portable Case: 7 1/2" H x 8 1/2" D x 11" W

### WEIGHT

T146C Approximately 3 lbs.

T146CQ Approximately 7 lbs.

T146CP Approximately 7 1/2 lbs.

### ORDERING INFORMATION

Specify Model T146C for:

Rack mounted, 48 V dc battery operation.  
Specify rack width.

Specify Model T146CQ for:

Rack mounted, operates from either 48 V dc or 115 V ac supply. Specify rack width.

Specify Model T146CP for:

Portable unit, operates from either 48 V dc or 115 ac supply.

Specify on order:

Frequencies required;  
Complete tone and quiet interval cycle;  
Loop or Ground Start;  
ON HOOK-OFF HOOK cycling if required;  
Extended quiet after one or two tone cycles if required;

Tone interval (if other than six seconds),

Output Impedance (600 or 900 ohms);

Output Level (0, -10, or -16 dBm standard).

MODEL T146C  
MULTIPLE FREQUENCY  
REFERENCE TONE GENERATOR

The logo consists of the word "wilcom" in a bold, lowercase, sans-serif font. The letters are black and are enclosed within a thick, black rectangular border that has rounded corners. The border is approximately 10 pixels thick.

**wilcom**

**wilcom products, inc., laconia, n.h.**

**BOX 508 • D.W. HIGHWAY 03246 U.S.A.**

**TEL. 603/524-2622 TWX 510-298-1120**

WILCOM PRODUCTS, INC.  
P.O. BOX 508  
LACONIA, N.H. 03246  
Phone: 603-524-2622  
TWX: 510 298 1120

MODEL T146C  
MULTIPLE FREQUENCY  
REFERENCE TONE GENERATOR

INSTALLATION INSTRUCTIONS

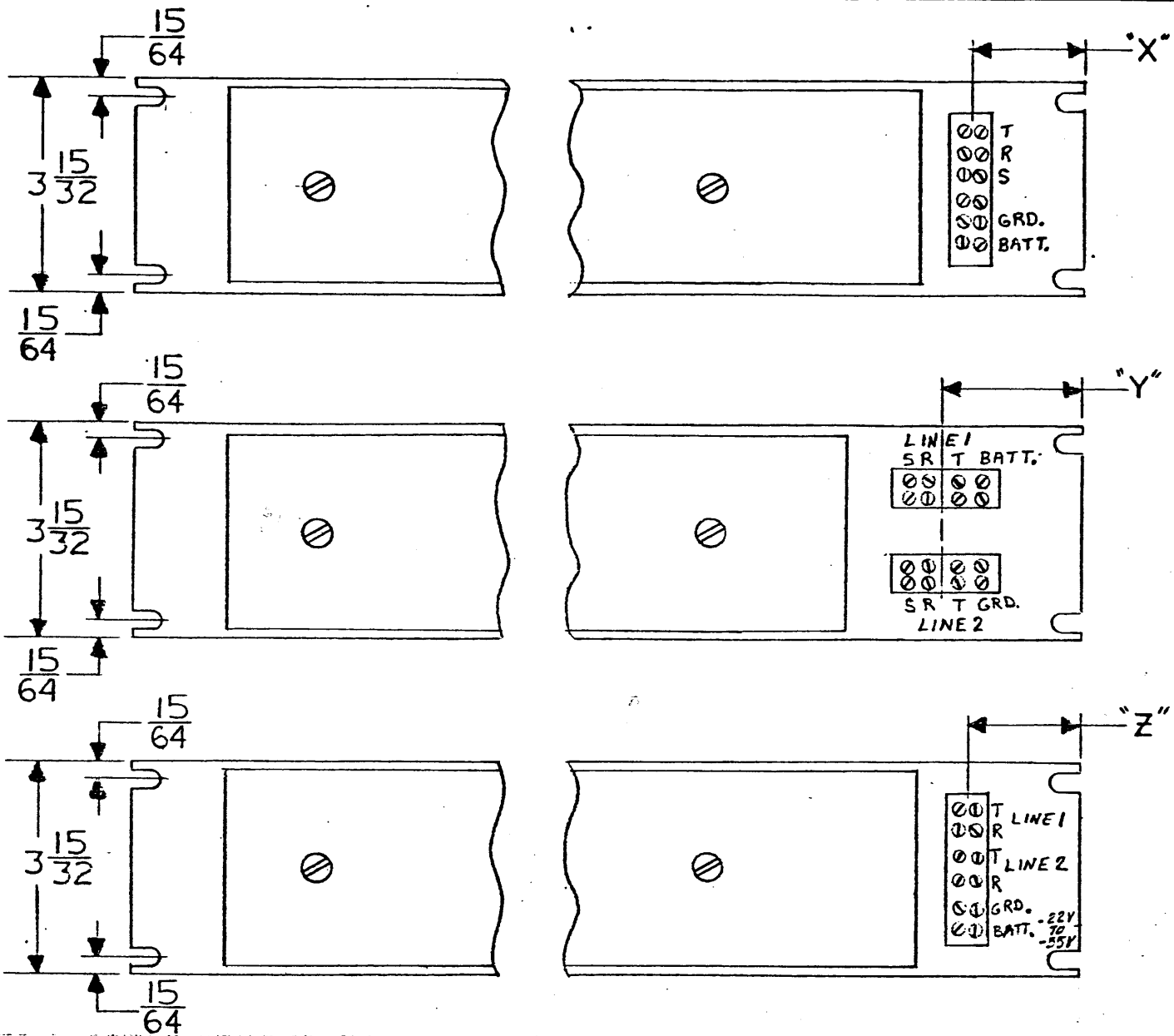
1. Inspect unit — remove dust cover and check for loose screws, parts, etc.
2. Referring to the P.C. Assembly Drawing, verify the correct start mode strapping and impedance strapping for intended operation.
  - a. Two straps are required to set the output impedance to either 600 or 900 ohms.
  - b. The Loop Start strap is normally used when the line for the assigned number is "dry" (no dc supervision voltage present) during the idle condition. An incoming call is indicated by application of dc supervision voltage to the line causing the line to be "wet".
  - c. The Ground Start strap is normally used when a sleeve control lead is available. The sleeve lead must be either open or office battery during the idle condition and be grounded during the calling period.
  - d. The On Hook/Off Hook Cycling strap is required in some applications to release the connector for the telephone number assigned to the T146C after the calling party has released the circuit.
3. An extended quiet termination — until the calling party goes On Hook — is a strap option for those applications that do not require On Hook cycling to release the connector.
  - a. The One Cycle strap will cause the test line to complete the tone sequence once and then provide a quiet termination until released.
  - b. The Two Cycle strap will cause the test line to complete the tone sequence twice and then provide a quiet termination until released.
4. The standard output level may be set to one of three nominal levels (0, -10, -16 dBm) by selecting the proper strap location.
5. Mount the test line in its assigned location. Connect C.O. ground to GND terminal and C.O. battery (-48V dc  $\pm 10\%$ ) to BATT terminal on the 6 position terminal strip.
6. With the T146CQ using ac power, verify presence of jumper on terminal strip between GND and PANEL GND.
7. With the T146CQ using office battery, remove jumper between GND and PANEL GND on terminal strip.

8. Using a VTVM or TMS with the proper terminating impedance, check the reference tone generator for output at the front panel jack marked TEST. Inserting a 310 plug initiates the tone sequence and disconnects the tone generator from the line. Verify tone sequence and extended quiet if specified.
9. Connect terminals T & R for loop start, or T, R & S for ground start on the 6 position terminal strip to the assigned telephone number. Dial the assigned telephone number and verify the operation of the tone generator.
10. Using a reference level test set (not a TMS) such as the Wilcom T150B, W.E. Co. 22A or equivalent, adjust the LEVEL ADJUST control on the T146C panel to set the level at the office TLP to the proper value according to office practice.

CAUTION: Be sure the proper termination is used. The tone generator level has been set at the factory to within  $\pm 0.02$  dB of the level specified by the purchase order. Any change should only be to compensate for office loss.

11. Replace the dust cover. Unit is now ready to be placed in service.

REVISIONS			
L T R	DESCRIPTION	DATE	APPROVED



PANEL 19" | 23"

'X" 2 1/16" | 4 1/16"

MODEL  
34,164 (COMB. TEST LINE)  
146,166 (MULTI-FREQ. TEST LINE)  
188 (REV. BATT. TEST LINE)

PANEL 19" | 23"

'Y" 1 1/2" | 3 1/2"

MODEL  
160 (LOOP AROUND  
TEST LINE)

PANEL 19" | 23"

'Z" 2 1/16" | 4 1/16"

MODEL  
161 (LOOP AROUND TEST LINE)

UNLESS OTHERWISE SPECIFIED  
DIMENSIONS ARE IN INCHES

TOLERANCES:  
FRACTIONS  $\pm 1/64$   
DECIMALS  $\pm 1/2$ "  
PLACE DECIMALS  $\pm .005$   
PLACE DECIMALS  $\pm .01$

MATERIAL

FINISH

DRAWN BY  
DCR

DATE  
1/8/76

CHECKED BY

DATE

APPROVED BY

DATE

**wilcom**

PRODUCTS INC.

LACONIA, N.H. 03246

DWG TITLE

TEST LINE INSTALLATION DWG.

SIZE

A

CODE IDENT NO.

51778

DWG. NO.

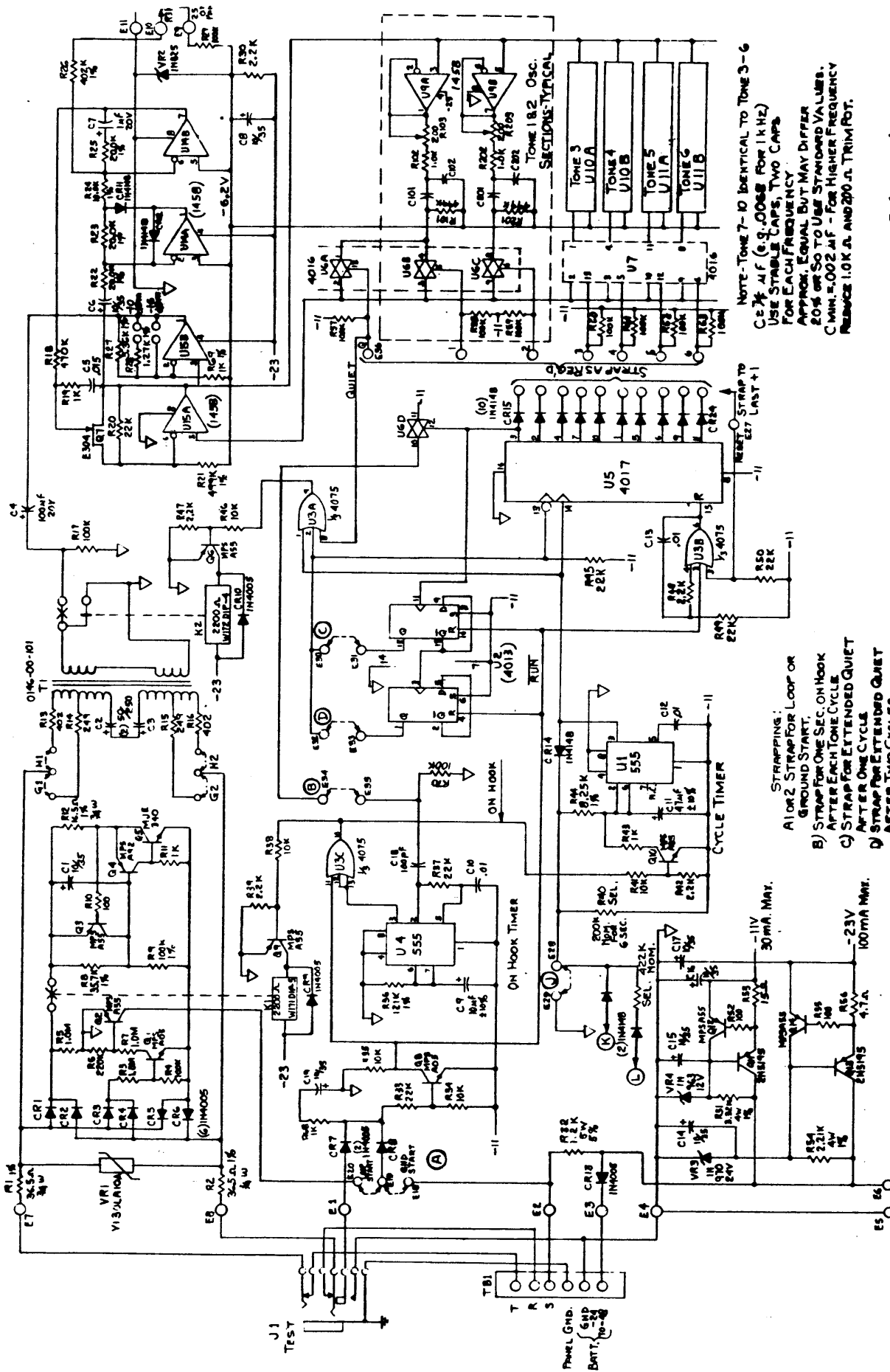
0051-00-109

REV

SCALE 3/8" = 1"

SHEET

R0001288



NOTE: TONE 7-10 IDENTICAL TO TONE 3-6  
 CE 7% A/F (6.9, 0.008 FOR 1K HZ)  
 USE STABLE CAPS, TWO CAPS  
 FOR EACH FREQUENCY  
 APPROX. EQUAL BUT MAY DIFFER  
 20% OR SO TO USE STANDARD VALUES.  
 C MIN. 5,002 A/F - FOR HIGHER FREQUENCY  
 REDUCE 1.0K & AND 200 Ω TRIM POT.

# Schematic TI46C Multiple Frequency Reference Tone Generator

STRAPPING:  
 A) OR 2 STRAP FOR LOOP OR  
 GROUND START.  
 B) STRAP FOR ONE SEC. ON HOOK  
 AFTER EACH TONE CYCLE  
 C) STRAP FOR EXTENDED QUIET  
 AFTER ONE CYCLE  
 D) STRAP FOR EXTENDED QUIET  
 AFTER TWO CYCLES  
 MINIMAL Q STRAP FOR -10 OR -16 DBM OUTPUT LEVEL  
 TONES STEPS 1-10, R&Q STRAP FOR TONE 2  
 QUIET SEQUENCE REQUIRED.  
 G R&Q STRAP FOR 600 OR 300 A.  
 J K L ON TEMPORARY STRAP TO  
 STOP CYCLE ON ANY STEP  
 K) STRAP TO TERMINALS STRAPPED FOR LAST TONE FOR  
 EXTENDED TONE UNTIL DISCONNECT.  
 L) STRAP TO TONE TERMINALS TO EXTEND TIME DURATION.

NOTES:  
 ALL WIRING 1458  
 LAST NIB - C-19,  
 R-70, CR-24  
 R&C NIB 100 THRU 1,000  
 DETERMINED BY NUMBER  
 OF TONES

