SPECIFICATIONS

RATED OUTPUT:
1.5 volts (peak to peak).
LOAD IMPEDANCE:
20,000 ohms.
POWER REQUIRED:
12 or 24 VDC selectable, 30 ma.
CONTROLS:
Output level control and pitch control.

DIMENSIONS:
5-1/2 inches (139.7 mm) high, 4-1/4 inches (107.9 mm) wide, and 1-1/2 inches (38.1 mm) deep.
FINISH:
Charcoal, baked enamel.
TERMINATIONS:
Feed-through, screw-type Terminal Block.

FUNCTION	FREQUENCY RANGE Hz ±15%	CYCLE RATE ±15 UNLESS NOTED
Wail	400-I 400	6.2 SEC ±25%
Warble	400-I 400	320 mSEC
Hi-Lo	400-550	.90 S.EC
Alarm	400-550	1 6 0 mSEC
Chimes	650-I 300*	1.5 SEC Chime decay time
Chime	650-I 300*	1.5 SEC 2.0 SEC ±30%
Tone	650-I 300*	

*Frequency set by pitch control

OUTPUT WAVEFORM: Square wave with 50% ±10% duty cycle.

INSTALLATION

MOUNTING THE MULTI-TONE GENERATOR

Use the four pan head screws provided to mount the 15A266 to a plywood backboard. Mount the 15A266 in such a way as to make the terminal strip easily accessible.

WIRING THE MULTI-TONE GENERATOR

Ground

No chassis ground is provided for. If the chassis is to be grounded, connect a wire from one of the pan head screws used to mount the Generator to the ground terminal on the terminal strip. For a24 volt positive ground system connect the wire to terminal IO. For a 12 volt positive ground system, connect the wire to terminal 9. For negative ground systems, connect the wire to terminal 12.

12 or 24VDC

Connect two 18AWG wires from the 15A266 to the power supply. Connect the negative side of the power supply to terminal 11 (12) (COMMON). If a 12-volt power supply is used, connect the positive side of the 12-volt power supply to terminal 9. If a 24-volt power supply is used, connect the positive side of the 24-volt power supply to terminal 10.

Tones (Terminals 2 thru 8)

The 15A266 may be wired in a number of different configurations. When only one tone is to be used connect that tone through an SPST switch to common. (See FIGURE 1).

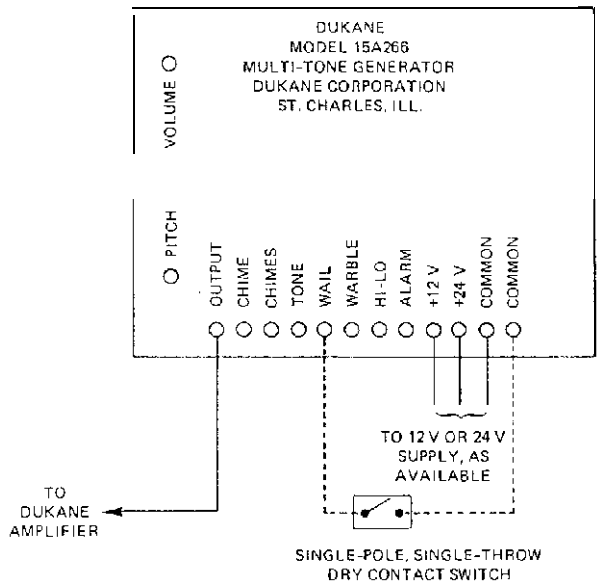


FIGURE 1: Switch arrangement for activating a particular tone.

When one selected tone must take precedence over all the other tones an SPDT switch is connected to that function (See FIGURE 2). The circuit in FIGURE 2 will have WAIL override the other functions. (Switches are customer supplied.)

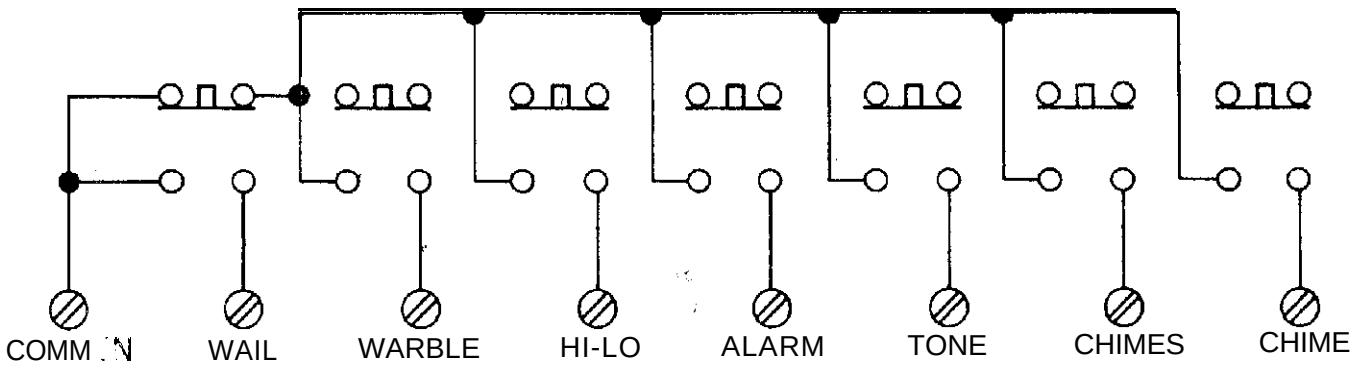


FIGURE 2: Setup for WAIL override.

When a specific hierarchy of operation is desired, use the circuit shown in FIGURE 3. The circuit in FIGURE 3 has the following order of precedence: 1. WAIL, 2. WARBLE, 3. HI-LO, 4. ALARM, 5. TONE, 6. CHIMES, 7. CHIME. Any order of precedence may be used. (Switches are customer supplied.)

Output

Connect the input of the amplifier (or intermediate device) to terminal 1 (OUTPUT) of the 15A266.

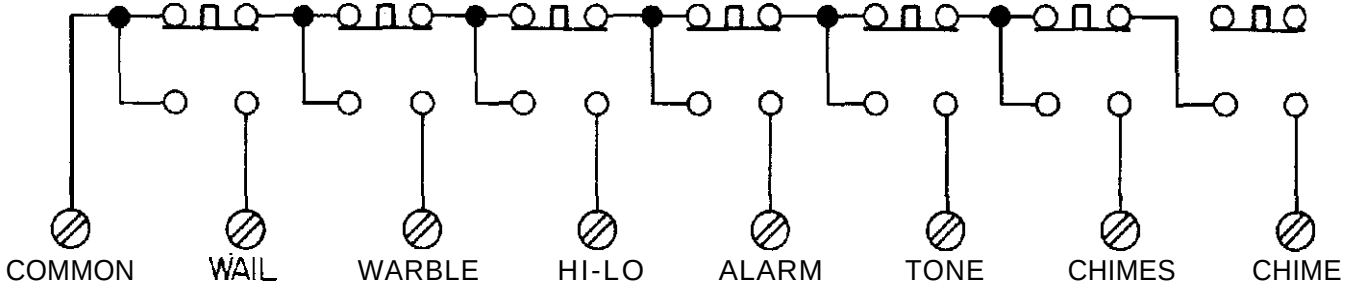


FIGURE 3: Example of a precedence circuit

SERVICE INFORMATION

Theory of operation

The multi-tone generator is comprised of a voltage controlled oscillator (VCO), U2, whose operating frequency is controlled by a modulation voltage provided by: (1) the ramp output of the rate generator (U1-4) in the wail and warble functions; (2) the square wave output of the rate generator (U1-3) in the hi-lo and alarm functions or; (3) the DC voltage set by the pitch control in the tone, chimes, and chime functions.

All modulation voltages act directly on Q2 which provides signal inversion, and a DC level shift to prepare the modulation voltages for use by the VCO modulation input, U 2-5. The VCO output, U 2-3, passes through CR14 and is AC coupled to the volume control by C10.

With the circuit energized and no functions selected, the circuit is operating in the tone mode and the output is muted. U3-10 is hi which, through CR15, reverse biases CR14 to mute the output. Since U3-11 is hi, Q4 and Q5 are off which allows C9 to charge to +12V through R38 and R39. Q4 and Q5 form the chime(s) decay envelope generator, with decay time set by R38, R39, and C9.

When the tone function is selected U3-11 goes lo which: (1) turns on Q4 and Q5 to discharge C9 and provide a pull-down resistance (R39) to forward bias CR14 and; (2) switches U3-10 lo to remove the output clamping by CR15 so that the square wave signal from U2-3 is gated out.

U3 forms a negative logic or gate with three intermediate outputs and one final output. The final output (U3-10) controls U1 through Q6. Any selected function will energize U1, plus set the other three outputs, U3-3, U3-4, and U3-11, either hi or lo as required. This switching of U1 causes all generated functions to start at the same **point** each time the function is selected, rather than at some random point during the cycle. In order to avoid a start-up delay caused when C6 is fully discharged during idle, R41, CR16, and R43 act to hold U1 at a static operating point which allows instant start-up.

The oscillating frequency of the rate generator is fundamentally set by R12, R14, R15, and C6. The rate is increased when Q1 switches R13 in parallel with R12 when turned on. Q1 is held on by the hi-lo function through CR2 and R10, and additionally by CR7 during the alarm function. In the wail or warble functions Q1 is controlled by U1-3. This serves to modify the normally 50% duty cycle needed for hi-lo and alarm, to an approximately 70% duty cycle used during the wail and warble functions. Further rate adjustments needed to tailor the rate for each individual function are provided by R19 for warble, R22 for hi-lo, R21 and R22 for alarm, and R7 for chimes.

When the chime function is selected the hi to lo transition at the chime line: (1) pulls down U3-8 through CR5 which causes U3-10 to go lo as described before and; (2) forms a negative going spike through C4 to the base of Q4. This 30mS spike discharges C9 after which it begins to charge. As C9 charges, the output voltage swing is reduced ultimately to zero as a full charge, +12V, is attained. The output of the VCO is unaffected but CR14 will reverse bias when the voltage at U2-3 drops below the voltage across C9 +0.6V.

When the chimes function is selected the lo level pulls down U3-8 through CR4. This causes U3-10 to unmute the output as before, plus the lo at U3-10 turns on Q6 to energize U1. The square wave output of the rate generator (U1-3) is coupled through R11 and C3 to the base of Q4. The hi to lo transition of the square wave output forms a negative spike in the same manner as described for the chime function, so the chime tone repeats for each cycle of the rate generator. R5 holds the repeating chime trigger signal hi through CR3 so that during the single chime function only one chime will be

heard. C5 and R23 hold U3-8 lo for 3 seconds after either chime(s) functions have been disconnected to provide for a complete chime decay to be generated, even if the chime(s) line is held&for as little as 50mS.

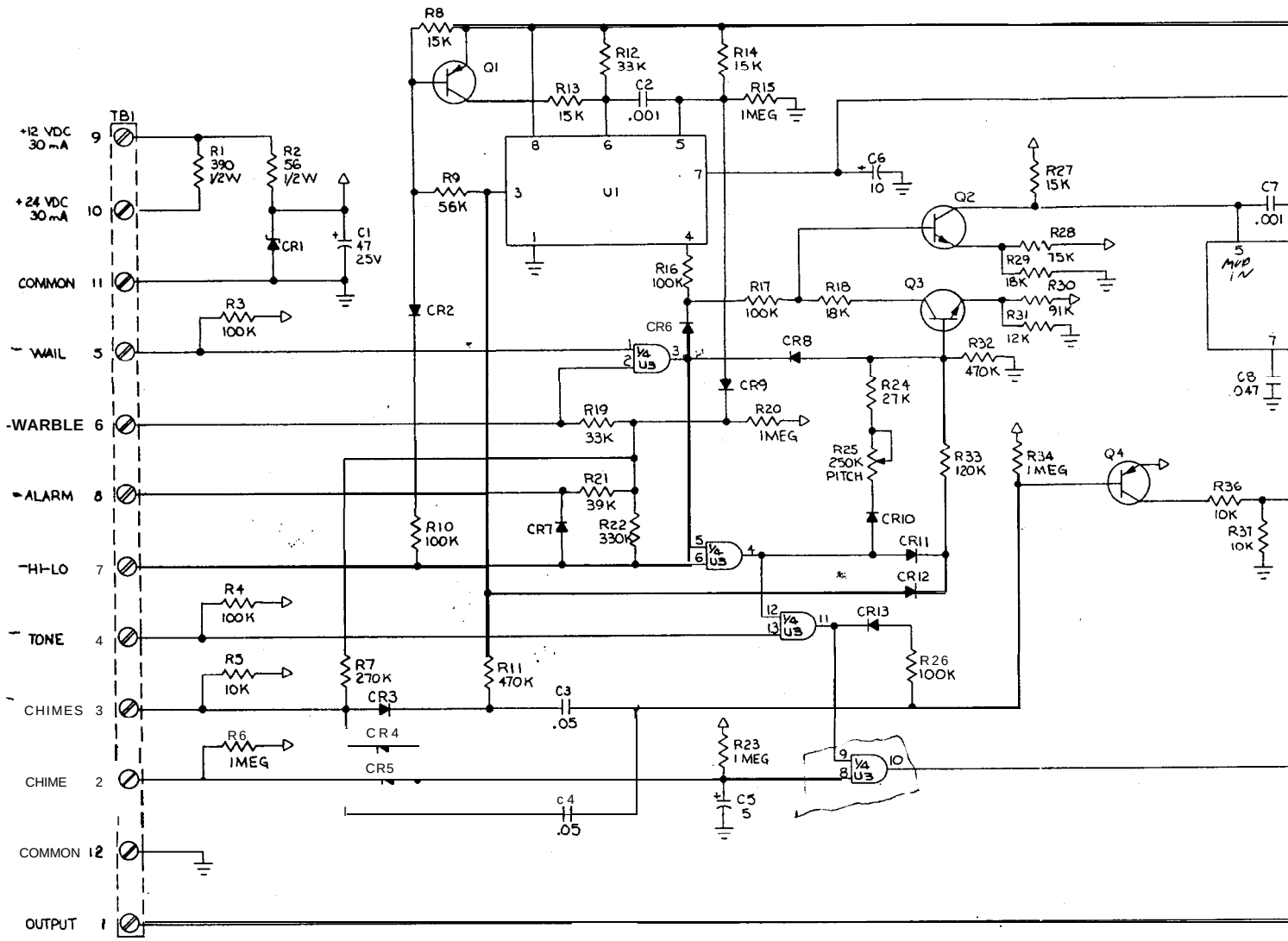
When the hi-lo function is selected Q1 is turned on and U3-4 goes lo. U3-3 remains hi which clamps the rampoutput (U1-4) to A hi value throughCR108. Bias isprovided to Q102 through CR6 and R17. The lo at U3-4 removes the pitch control bias as supplied through CR10, and gates the square wave output of the rate generator (U1-3) which was clamped hi by CR11. The voltage level of Ul-3 alternates between 6V and 12V at the hi-lo rate. This voltage swing through R38 holds Q3 in saturation. However, the current into the base of Q3 changes in relation to the voltage. This alternating current translates into an 0.6V voltage swing at the collector of Q3. Alarm operation is similar except that the rate is increased by R21.

When wail is selected U3-3 goes lo which gates the ramp output (Ul-4) into Q2. The base of Q3 is pulleddown by CR18 which turns Q3 off, therebypreventinganyofthesquarewavesignalfrom U1-3 from affecting the operation. Warble operation is similar except that R19 increases the rate.

The mechanism that selects the functions, that which connects the function lines to the common line may have a resistance of up to 1000 ohms and have a DC offset of 2 volts. Exceeding these limits will degrade operating characteristics. A switch or an open collectortransistor pull-down are typical methods of actuation. A transistor with a pull-up collector resistor or a CMOS output will not be suitable unless a diode is placed in series with the function line as shown.

LM566

MC 1408iB

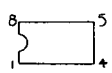


NOTES:

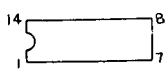
UNLESS OTHERWISE SPECIFIED:

1. RESISTORS ARE 1/4 WATT.
2. TOLERENCE ON FIXED RESISTORS IS ± 5%.
3. RESISTANCE VALUES ARE IN OHMS, K=1000, MEG=1000000.
4. CAPACITANCE VALUES ARE IN MICROFARADS.
5. Ø DENOTES SCREW TERMINAL ON TB1.
6. ⏚ DENOTES DC SUPPLY CONNECTION.
7. JU1 (NOT SHOWN) USED FOR GND JUMPER

BOTTOM VIEW



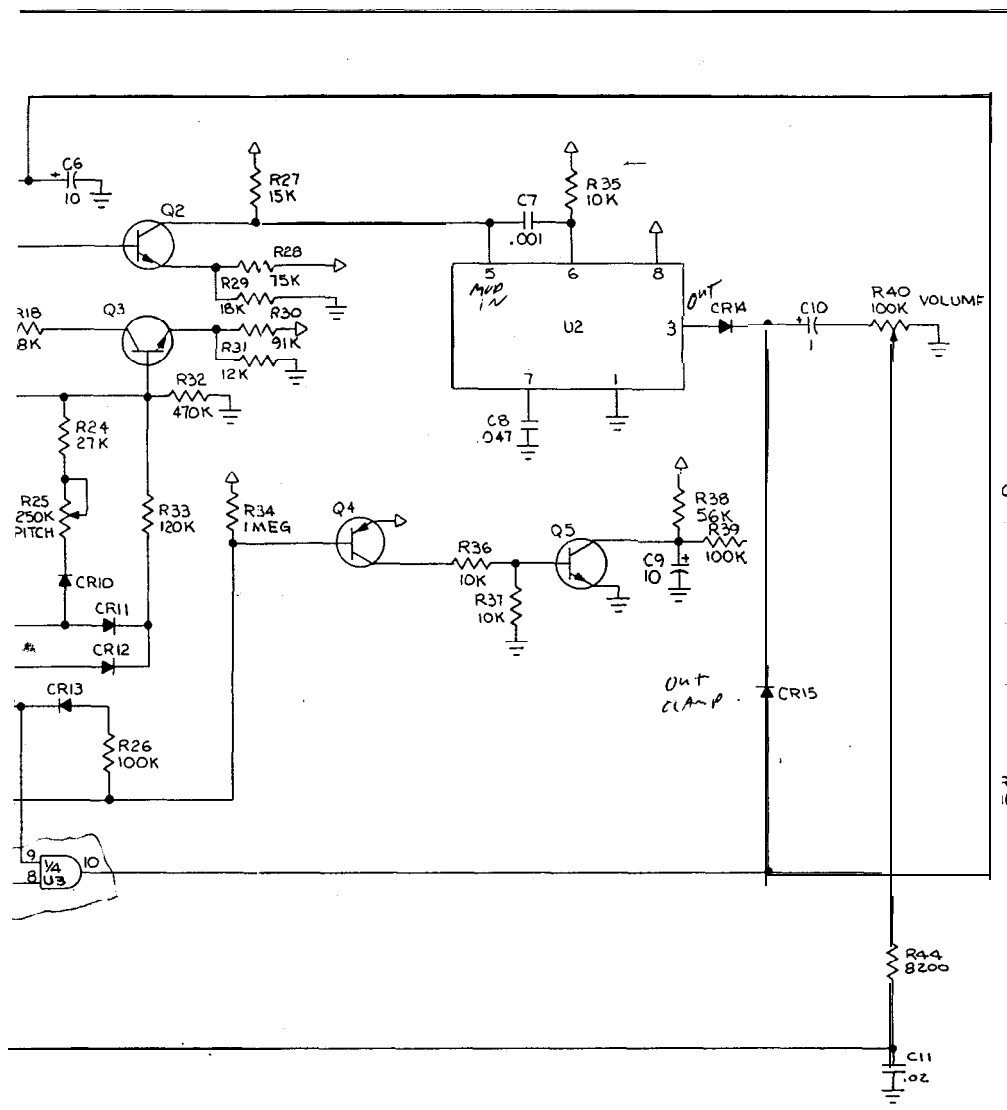
TOP VIEW



TOP VIEW

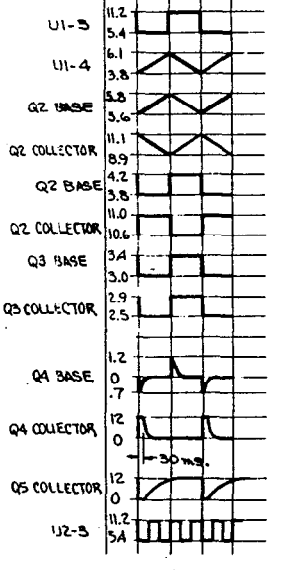
Q2,3	720-46 MPS6515	U1,2 408-35 LM566	U3 409-33 MC14081B
Q1,4,6	720-50 MPS6518		
Q5	720-47 MPS6566		

REVISIONS			
ISS.	DESCRIPTION	APP'D	DATE
01	ADD R44 & C11	DK	



U8-35 LM566 U3 409-33 MC14081B

TEST WAVEFORMS TAKEN ON OSCILLOSCOPE WITH 10 MEG. INPUT IMPEDENCE (x 10 PROBE) VOLTAGES SHOWN REFERENCED TO COMMON.



APPLICABLE FUNCTION	FUNCTIONS
	A-WAIL
A,B,C,D,E	B-WARBLE
	C-HI-LO
A,B,C,D,E	D-ALARM
	E-CHIMES
A,B	F-CHIME
	G-TONE
A,B	NOTE THAT TIME BASE WI CHANGE ACCORDING TO FUNCTION SELECTED.
C,D	
C,D	
C,D	
C,D	
E (AC COUPLED SCOPE)	
E	
E	
A,B,C,D,G	

MATERIAL FINISH

		15A266	
REQ	NEXT ASSY	USED ON	
APPLICATION			

UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES FRACTIONS ± 2 PLACE DECIMAL ± 3 PLACE DECIMAL ± ANGLES ±

DUKANE
ST CHARLES, ILLINOIS 60174

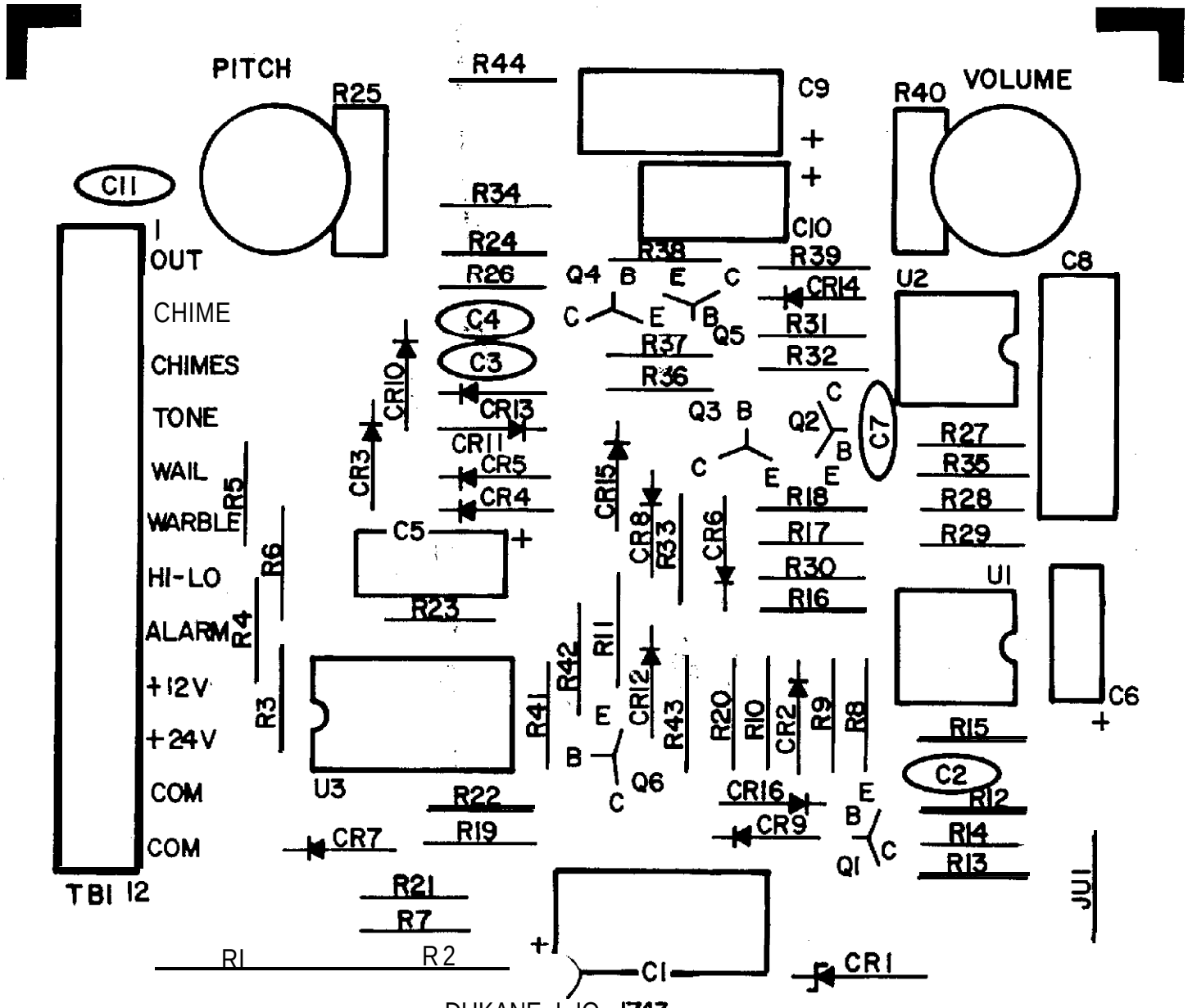
SCHEMATIC DIAGRAM
MULTI-TONE GENERATOR
110-1743

SCALE N/A
DRAWN BB APP'D
CHECKED ENGR.
DATE DRAWN 10-27-77
NO. 190-2257
SHEET 1 OF 1

MASTER

REPAIR PARTS LIST

LEGEND	DESCRIPTION	DUKANE PART NUMBER
C1	Capacitor, 50uF/25WVDC, 'lytic	199-2021-506
C2,C7	" .001uF, disc, ceramic	199-1006-102
C3,C4	" .05uF/50WVDC, disc ceramic	199-1011-503
C5	" 5uF/25WVDC, 'lytic	199-2021-505
C6	" 10uF/35WVDC, 'lytic	199-2054-106
C8	" .047uF/100WVDC, mylar	199-4043-473
C9	" 10uF/50WVDC, 'lytic	199-2048-106
C10	" 1uF/50WVDC, 'lytic	199-2048-105
C11	" .02uF/50WVDC, disc ceramic	199-1011-203
CR1	Diode, zener, 12.0V	230-19-00012
CR2-CR16	" , signal	230-27
R1	Resistor, 390 ohm, ½W, 5%	600-0073-391
R2	" , 56 ohm, ½W, 5%	6100-0073-560
R3,R4,R10 R16,R17, R26,R39, R41	" , 100K ohm, ¼W, 5%	600-0039-104
R5,R35, R36,R37	" , 10K ohm ¼, 5%	
R6, R15 R20,R23, R34	" , 1MEG ohm, ¼W, 5%	600-0039-105
R7	" , 270K ohm, ¼W, 5%	600-0039-274
R8,R13, R14,R27	" , 15K ohm, ¼W, 5%	600-0039-153
R9, R38	" , 56K ohm, ¼W, 5%	600-0039-563
R11,R32	" , 470K ohm, ¼ W, 5%	600-0039-474
R12,R19	Resistor, 33K ohm, ¼W, 5%	600-0039-333
R18,R29	" , 18K ohm, ¼W, 5%	600-0039-183
R21	" , 39K ohm, ¼W, 5%	600-0039-393
R22	" , 330K ohm, ¼W, 5%	600-0039-334
R24	" , 27K ohm, ¼W, 5%	600-0039-273
R25	" , variable, 250K ohm	501-1004-254
R28	" , 75K ohm, ¼W, 5%	600-0039-753
R30	" , 91K ohm, ¼W, 5%	600-0039-913
R31	" , 12K ohm, ¼W, 5%	600-0039-123
R33	" , 120K ohm, ¼W, 5%	600-0039-124
R40	" , variable, 100K 5%	601-1004-104
R42	" , 47K ohm, ¼W, 5%	600-0039-473
R43	" , 3000 ohm, ¼W, 5%	500-0039-302
R44	" , 8.2K ohm, ½W, 5%	600-0039-822
Q1,Q4,Q6	Transistor, MPS 6518	720-50
Q2,Q3	Transistor, MPS 6515	720-46
Q5	" , MPS 6566	720-47
U1,U2	Integrated Circuit LM566	408-35
U3	" " MC140818	409-33



DUKANE I IO- 1743