INSTRUCTION MANUAL

MODEL 172B PROGRAMMABLE SIGNAL SOURCE

WAVETEK

WAVETEK SAN DIEGO, INC.

9045 Balboa Ave., San Diego, CA 92123

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WARRANTY

Wavetek warrants that all products of its own manufacture conform to Wavetek specifications and are free from defects in material and workmanship when used under normal operating conditions and within the service conditions for which they were furnished.

The obligation of Wavetek hereunder shall expire one (1) year after delivery and is limited to repairing, or at its option, replacing without charge, any such product which in Wavetek's sole opinion proves to be defective within the scope of this Warranty. In the event Wavetek is not able to repair or replace defective products or components within a reasonable time after receipt thereof, Buyer shall be credited for their value at the original purchase price.

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SAFETY

This instrument is wired for earth grounding via the facility power wiring. Do not bypass earth grounding with two wire extension cords, plug adapters, etc.

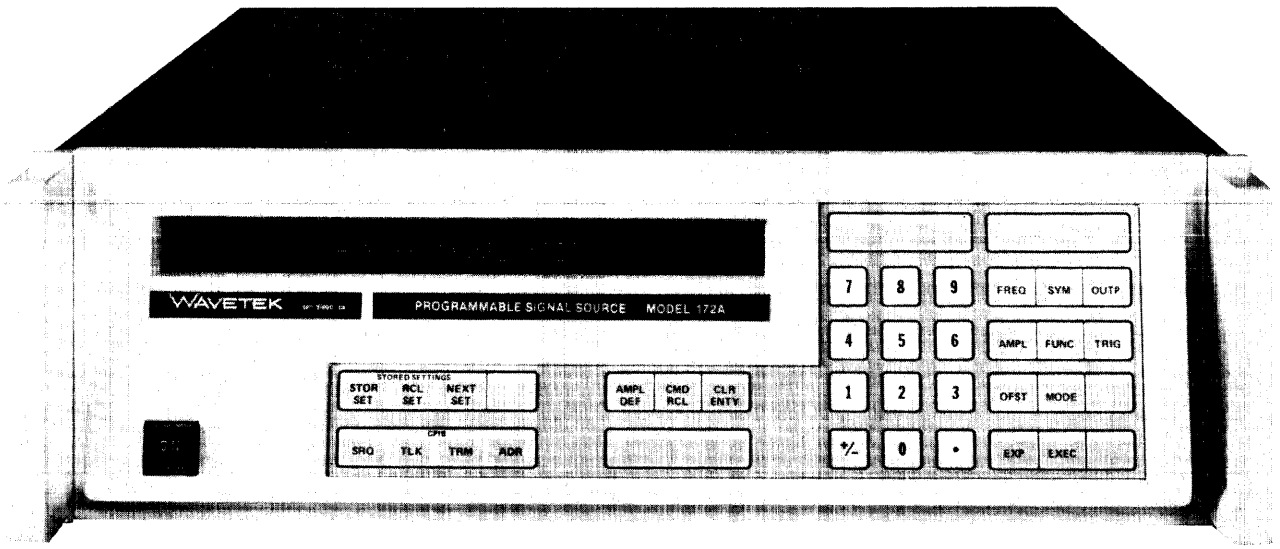
BEFORE PLUGGING IN the instrument, comply with installation instructions.

MAINTENANCE may require power on with the instrument covers removed. This should be done only by qualified personnel aware of the electrical hazards.

The instrument power receptacle is connected to the instrument safety earth terminal with a green/yellow wire. Do not alter this connection. (Reference: ⏚ or ⚠ stamped inside the rear panel near the safety earth terminal.)

WARNING notes call attention to possible injury or death hazards in subsequent operations.

CAUTION notes call attention to possible equipment damage in subsequent operations.



Model 172B Programmable Signal Source

SECTION 1
GENERAL DESCRIPTION

1.1 THE MODEL 172B AND OPTIONS

1.1.1 Standard Model

The standard Model 172B is a remote controlled 0.1 mHz to 13 MHz function generator whose functions are sine, square, triangle, pulse, ramps, haversine, havertriangle (see figure 1-1) and dc with 3 digit frequency, amplitude and dc offset amplitude resolution. Frequency, amplitude, function, function symmetry, dc offset, mode, 50Ω load in/out and output on/off are programmable. The frequency may also be controlled by a remote ac or dc voltage for sweep, FM and frequency shift keying operations. The output frequency of the generator may be phase locked to a supplied reference signal for a phase coherent output signal. The generator output may be continuous, triggered for one cycle (by external signal keyboard or program) or gated for a burst of cycles by an external signal. The output signal may be offset by a dc voltage or inverted 180 degrees. The waveform symmetry may be varied from 10 to 90% in 10% steps for variable duty cycle pulses, sawtooth ramps and non-symmetrical sine waves. A TTL level signal at generator frequency is output for synchronizing purposes. Standard programming is by a General Purpose Interface Bus (GPIB) conforming to IEEE Standard 488-1975, which utilizes an asynchronous handshake scheme to transmit an 8-bit parallel, byte serial ASCII language data stream. A stored program feature allows temporary storage of up to 240 instrument settings by use of Random Access Memory (RAM). Rapid setting recall allows frequency sweeps. An amplitude conversion feature allows sine wave amplitude programming in convenient dBm and rms values, as well as volts peak-to-peak into a 50Ω load.

1.1.2 Front Panel Option

The front panel option, an instrument mounted keyboard and 40 character display, gives local control of the instrument. The display shows the values being programmed and the status of the instrument parameters when in either local or remote control.

1.1.3 Synthesizer Option

The synthesizer option provides 5½ digit frequency resolution with 0.0005% accuracy, low phase noise and low spurious content. The internal 10 MHz reference is also output as a TTL pulse for synchronous operation. An external 10 MHz reference may be substituted for the internal reference.

1.2 SPECIFICATIONS

1.2.1 Versatility

Waveforms

Sine ∿ , square ⊓ , triangle ∿ , pulse ⎍ , ⎎ , ramps ◿ , ◺ , haversine ⌒ , havertriangle ⌒ and dc.

Operational Modes

Synthesizer: A closed loop mode locking the generator to a synthesizer for frequency accuracy and stability. See Option 002.

Phase Lock: Generator locks to an external 10 Hz to 13 MHz signal when programmed within 2% of the external frequency.

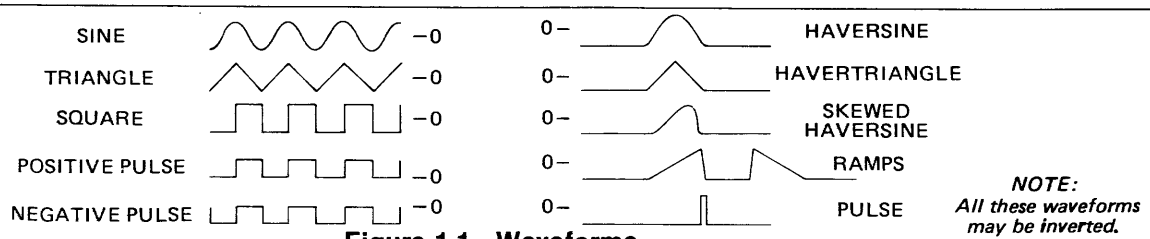


Figure 1-1. Waveforms

NOTE

The following modes are open loop; frequency of generator is not locked to a reference signal. Generator frequency is controlled by external VCG or FM voltage as well as programming.

Continuous: Generator runs continuously.

Triggered: Generator is quiescent until triggered by an external signal or manual trigger, then generates one cycle at selected frequency.

Gated: As triggered mode, except generator oscillates for the duration of the gate signal plus the remainder of the waveform in progress.

Triggered Haverwave: As triggered mode, except output is a sine or triangle waveform starting at −90° (or +90°).

Gated Haverwave: As gated mode, except output is a sine or triangle waveform starting at −90° (or +90°).

Frequency Range
0.0001 Hz to 12.99 MHz.

Resolution
3 digit resolution standard. Also see Option 002.

Main Output
∿ , ⊓ , ∿ , ◿ , ◺ , ⩘ , ⩗ and dc variable to 30V p-p (15V p-p into 50Ω load) with 3 digit resolution. ⎍ and ⎎ variable to ±15V p-p (7.5V p-p into 50Ω load) with 3 digit resolution. Composite waveform/offset not to exceed ±7.5V peak into 50Ω load. 50Ω source impedance with selectable internal 50Ω load.

Amplitude Output Conversion
Permits programming of the sine wave output amplitude in units of volts - root mean square (Vrms) and decibels relative to one milliwatt (dBm) into 50Ω load in addition to the standard units of volts peak-to-peak.
Vrms Range: 1 mV to 5.30V.
dBm Range: −56 to +27.4 dBm.

DC Offset and DC Voltage Output
0 to ±7.5 Vdc into 50Ω. 3 digit resolution. DC offset is attenuated by amplitude range attenuator.

Auxiliary Output
TTL pulse at generator frequency.

Phase Lock Input
Input: TTL level.
Range: 10 Hz to 13 MHz.

VCG - Voltage Controlled Generator
In open loop modes the frequency can be controlled by an external voltage for sweeping or for frequency modulation (FM). A 5V signal will change the frequency over the entire control range of 1000:1, three full decades. On ranges below 10 Hz, control is limited to 10:1.
Input Signal Bandwidth:
50 kHz for small signal (ΔV = 0.5V).
Input Impedance: 5 kΩ.

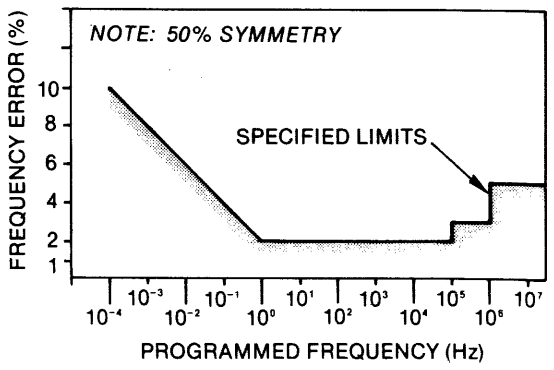
Symmetry Control
Waveform symmetry variable from 10 to 90% in 10% steps (50% is symmetrical). Varying symmetry provides variable duty cycle pulses, sawtooth ramps and unsymmetrical sine waves. Symmetry control is available for frequencies to 999,990 Hz.

Trigger Input
In triggered, gated, triggered haverwave and gated haverwave modes, a TTL (low true) compatible pulse will trigger or gate the generator.

Data Entry
Bit parallel, byte serial, ASCII character remote programming and optional front panel keyboard/display (see Option 001).

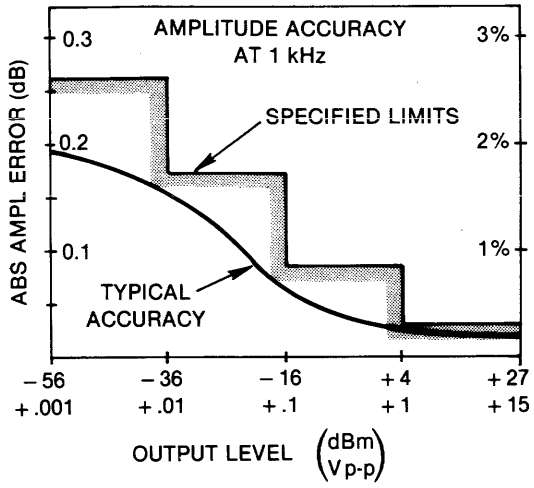
1.2.2 Frequency Precision

Open Loop Accuracy
(For synthesizer accuracy, see Option 002.)

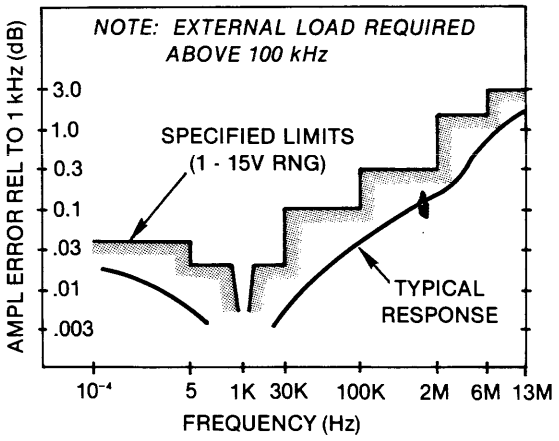


1.2.3 Amplitude Precision

Accuracy
Specified for 1 kHz sine wave or dc voltage output with internal 50Ω load and greater than 1 MΩ external impedance.



Frequency Response (sine wave, relative to 1 kHz signal)



NOTE

⊓ and ∿ accuracy are within 0.2 dB of sine wave accuracy.

Amplitude Resolution

Range	Resolution
10.00 to 14.99V	10 mV
1.00 to 9.99V	10 mV
100 to 999 mV	1 mV
10.0 to 99.9 mV	0.1 mV
1.00 to 9.99 mV	10 μV

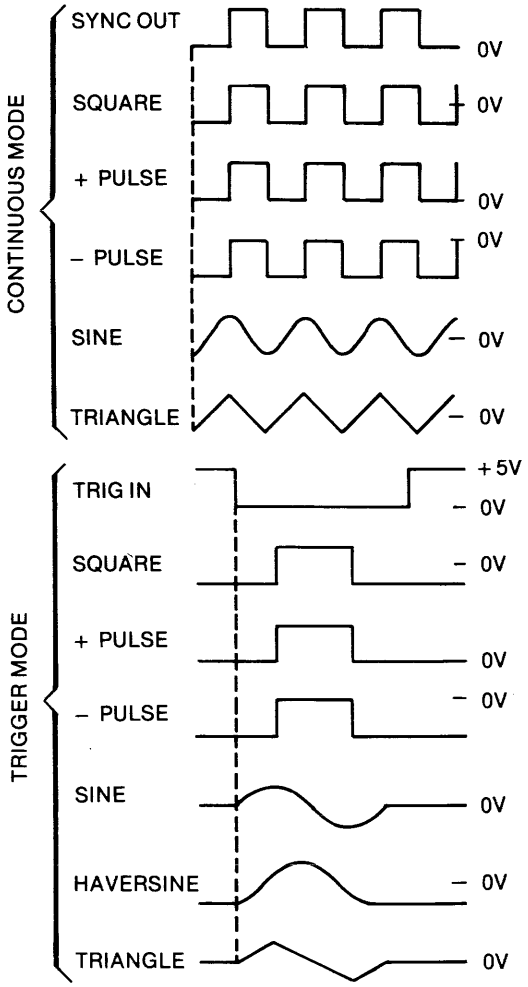
1.2.4 Waveform Characteristics

Sine Distortion
(continuous mode, 2.82V p-p test level)
Total harmonics referenced to carrier are −46 dB to 30 kHz. Each harmonic reference to carrier is less than:

−40 dB to 1 MHz
−30 dB to 13 MHz

Square Wave Rise and Fall Time
Less than 20 ns (typically 15 ns).

Waveform Timing



NOTE

Minus amplitude shifts all signals except sync by 180° and shifts baseline to opposite polarity.

GPIB Programming
General Purpose Interface Bus (GPIB) programming fully compatible with the IEEE Standard 488-1975 allows the 172B to be directly connected to the GPIB. The interface is isolated from the generator with optical couplers. The interface provides listener (AH1 and L4), talker (SH1 and T6), service request (SR1), remote/local (RL1), device clear (DC1) and device trigger (DT1) capabilities. Response time for setting and executing all parameters is 55 ms (18 settings per second); for setting and executing amplitude, frequency and dc offset, 39 ms (26 settings per second). A stored setting (all parameters) may be called by number and executed in 9 ms (111 settings per second); when using the GET command to sweep stored settings, response time is 2 ms (500 settings per second). The following table may be used to determine particular programming response times. Measurements were made with a 172B and an HP9825 controller. Data rates will follow the slowest listener on the bus and vary with different controllers.

Parameter	Time
Command Handshake	2 μs
Data Handshake	220 μs
Frequency Setting	10 ms
Amplitude Setting	13 ms
DC Offset Setting	13 ms
Mode	4 ms
Function	4 ms
Symmetry	4 ms
Output	4 ms
Recall Setting (by number)	6 ms*
Next or Last Setting	4 ms*
Execute	3 ms*
GET	1.6 ms

*2 ms when via GET.

Stored Settings and Sweep
Up to 240 complete instrument settings can be stored and recalled by number from volatile (RAM) memory. Settings may be modified or deleted. The setting number recalled may also be incremented or decremented and executed by the GET command, when in a special GET mode. This sweep stepping time requires 2 ms per setting.

1.2.5 General

Stability (measured at 25 ± 1°C)
Amplitude and DC Offset
Short Term: 0.025 dB for 15 minutes.
Long Term: 0.05 dB for 6 months.

Frequency
Short Term: 0.3% for 15 minutes.
Long Term: 1.0% for 8 hours (to 1 MHz).
See Option 002 for synthesizer stability.

Environmental
Specifications apply for 25 ± 10°C after 1 hour unless otherwise noted. Instrument will operate from 0 to 45°C to 10,000 foot altitude at 95% relative humidity.

Dimensions
Fits standard 48.3 cm (19 in.) rack. 43.2 cm (17 in.) wide; 13.3 cm (5¼ in.) high; 58.4 cm (23 in.) deep. Supplied with rack mount adapters.

Weight
26.3 kg (58 lb) net; 30.8 kg (68 lb) shipping.

Power
90 to 105V, 108 to 126V, 198 to 231V or 216 to 252V; 48 to 67 Hz; less than 200 watts.

1.2.6 Options

001: Display and Control Front Panel
This option includes a keyboard entry front panel and a 40 character alphanumeric display. The keyboard allows you to manually control all instrument parameters. The alphanumeric display indicates the values being programmed and also shows the status of the instrument when in the remote mode.

002: 5½ Digit Synthesizer
Provides synthesizer accuracy for any waveform selected. The following specifications apply.

Frequency
10 Hz to 12.9999 MHz.

Frequency Resolution

Range	Resolution
10 to 99.999 Hz	1 mHz
100 to 999.99 Hz	10 mHz
1 to 9.9999 kHz	0.1 Hz
10 to 99.999 kHz	1 Hz
100 to 999.99 kHz	10 Hz
1 to 9.9999 MHz	100 Hz
10 to 12.9999 MHz	100 Hz

Settling Time
Frequency reaches full accuracy 2 ms and 50 cycles after execution.

Accuracy

Better than 0.0005% of program setting (0.005% on 10-99 Hz range).

Frequency Stability

Short Term: $\pm 1 \times 10^{-7}$ of frequency per day.
Long Term: $\pm 1 \times 10^{-6}$ of frequency per month.
Temperature: 1.2×10^{-7} per °C.

Signal To Phase-Noise

Greater than 40 dB in a 30 kHz band centered on carrier but excluding a ±1 Hz band around the carrier.

Spurious

For spurious signals in the range of 400 Hz to 110 MHz, spurious levels are:

172B Frequency Range	Max Spurious Signals (greater value applies)
10 Hz to 999.99 kHz	−60 dB or 40 μV
1 kHz to 4.9999 MHz	−55 dB or 40 μV
5 to 12.9999 MHz	−50 dB or 40 μV

Internal Reference Output

10 MHz TTL compatible signal.

External Reference Input

An external sine or square wave within ±3 ppm of 10.0 MHz, 1 to 10V rms and 50 ±8% duty cycle will automatically replace the internal reference.

SECTION 2
INSTALLATION AND INTERFACE

2.1 MECHANICAL INSTALLATION

After unpacking the instrument, visually inspect all external parts for possible damage to connectors, surface areas, etc. If damage is discovered, file a claim with the carrier who transported the unit. The shipping container and packing material should be saved in case reshipment is required.

CAUTION

Do not mount this instrument by front panel alone. Slides or tray support is necessary to prevent instrument damage.

The generator can be used as a bench instrument or rack mounted. In either use, ensure that there is no impedance to air flow at any surface of the instrument. Before rack mounting, it may be desirable to perform the initial checkout (paragraph 2.2.5) to verify operation of all functions.

2.2 ELECTRICAL INSTALLATION

2.2.1 Power Connection

NOTE

Unless otherwise specified at the time of purchase, this instrument was shipped from the factory with the power transformer connected for operation on a 120 Vac line supply and with a 3 amp fuse.

Conversion to other input voltages requires a change in rear panel fuse holder voltage card position and fuse (figure 2-1) according to the following procedure.

1. Disconnect the power cord at the instrument, open fuse holder cover door and rotate fuse-pull to left to remove the fuse.
2. Remove the small printed circuit board and select operating voltage by orienting the printed circuit board to position the desired voltage to the top left side. Push the board firmly into its module slot.
3. Rotate the fuse-pull back into the normal position and insert the correct fuse into the fuse holder. Close the cover door.
4. Connect the ac line cord to the mating connector at the rear of the unit and the power source.

Card Position	Input Vac	Fuse
100	90 to 105	3 amp
120	108 to 126	3 amp
220	198 to 231	1.5 amp
240	216 to 252	1.5 amp

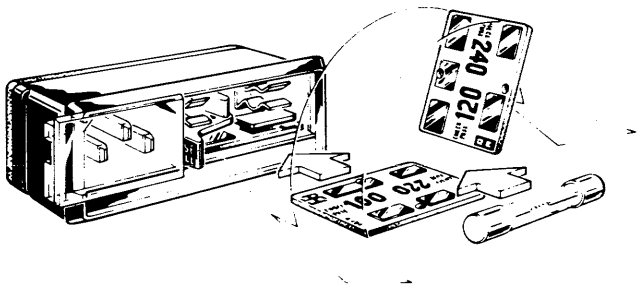


Figure 2-1. Voltage Selector and Fuse

2.2.2 Signal Connections

Use RG58U 50Ω coaxial cables equipped with BNC connectors to distribute signals when connecting this instrument to associated equipment.

2.2.3 GPIB Connections

The GPIB I/O rear panel connection is shown in figure 2-2; pin connections and signal names are given in table 2-1. The panel connector is an Amphenol 57-10240 or equivalent and connects to a GPIB bus cable connector (available from Wavetek in 1 and 2 meter lengths). The GPIB interface is optically isolated from the instrument.

Table 2-1. GPIB Data In/Out

Pin	Signal	
1	DIO1	True When Low
2	DIO2	
3	DIO3	
4	DIO4	
5	EOI	
6	DAV	
7	NRFD	True When High
8	NDAC	
9	IFC	True When Low
10	SRQ	
11	ATN	
12	Safety Gnd	
13	DIO5	True When Low
14	DIO6	
15	DIO7	
16	DIO8	
17	REN	
18		Signal Gnd
19		
20		
21		
22		
23		
24		

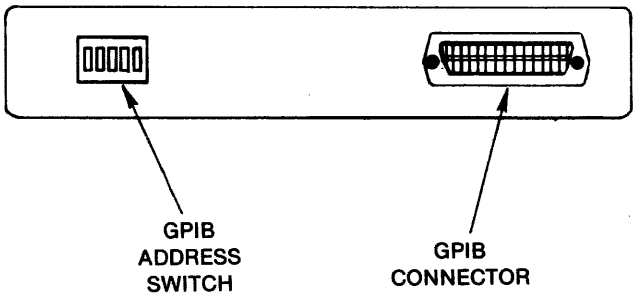


Figure 2-2. GPIB Panel

2.2.4 GPIB Card Address

For instruments on the General Purpose Interface Bus (GPIB), ensure that the GPIB address is correct. The GPIB address can be changed by the switch on the rear of the instrument (see figure 2-2) by simply setting the multiple section switch located on the rear panel according to table 2-2. The switch sections are labeled from 1 thru 5 and their open position noted (OPEN = Binary "0" in table 2-2). To verify the address, press ADR on the front panel. The device number (decimal) will be displayed as: "GPIB = (0, 1—30)".

Table 2-2. GPIB Address Codes

	Address								
	ASCII		Binary*					Hexa-decimal	
Device	Listen	Talk	5	4	3	2	1	Listen	Talk
0	(space)	@	0	0	0	0	0	20	40
1	!	A	0	0	0	0	1	21	41
2	"	B	0	0	0	1	0	22	42
3	#	C	0	0	0	1	1	23	43
4	$	D	0	0	1	0	0	24	44
5	%	E	0	0	1	0	1	25	45
6	&	F	0	0	1	1	0	26	46
7	'	G	0	0	1	1	1	27	47
8	(	H	0	1	0	0	0	28	48
9	)	I	0	1	0	0	1	29	49
10	*	J	0	1	0	1	0	2A	4A
11	+	K	0	1	0	1	1	2B	4B
12	,	L	0	1	1	0	0	2C	4C
13	—	M	0	1	1	0	1	2D	4D
14	•	N	0	1	1	1	0	2E	4E
15	/	O	0	1	1	1	1	2F	4F
16	0	P	1	0	0	0	0	30	50
17	1	Q	1	0	0	0	1	31	51
18	2	R	1	0	0	1	0	32	52
19	3	S	1	0	0	1	1	33	53
20	4	T	1	0	1	0	0	34	54
21	5	U	1	0	1	0	1	35	55
22	6	V	1	0	1	1	0	36	56
23	7	W	1	0	1	1	1	37	57
24	8	X	1	1	0	0	0	38	58
25	9	Y	1	1	0	0	1	39	59
26	:	Z	1	1	0	1	0	3A	5A
27	;	[	1	1	0	1	1	3B	5B
28	<	\	1	1	1	0	0	3C	5C
29	=	]	1	1	1	0	1	3D	5D
30	>	↑	1	1	1	1	0	3E	5E
			Switch Settings 0 = Open						

*The 6th and 7th bits which define the ASCII codes are used to specify whether a listen or talk address is being sent. Bits 1 thru 5 are matched against the rear panel address switch.

NOTE

Address 31 is not allowed.

2.2.5 Initial Checkout and Operation Verification

The equipment and procedures in tables 2-3 and 2-4 are recommended for incoming inspection and for testing the instrument after repair. However, additional after repair tests or calibation (Section 6) may be necessary for certain circuits.

Operation verification includes the following procedures.

1. Self Test: Verifies the operation of ROM, RAM and microprocessor circuits. This test occurs automatically each time power is turned on.
2. Open Loop Test: Sine wave output is visually checked for correct frequency and visible irregularities.
3. Functional Test: Verifies triangle and square waveforms.
4. Sync Out Test: Verifies presence of sync signal.
5. Amplitude Accuracy Test: Verifies amplitude accuracy for dc and ac operation.
6. Frequency Accuracy Test: Verifies frequency accuracy.
7. Harmonic Distortion Test: Verifies that harmonic distortion is with specification.
8. Spurious Test: Verifies that spurious are within specification.
9. Interface Test: Verifies remote programming capabilities.

Before making an initial checkout, review power and signal connection requirements (paragraphs 2.2.1 and 2.2.2) and ensure the availability of test equipment equivalent to that listed in table 2-3. An acceptance test record sheet (table 2.5) may be reproduced for recording checkout test results.

Table 2-3. Equipment Required for Incoming Inspection and Operation Verification

Instrument	Critical Specifications	Model Recommended
Oscilloscope	100 MHz vertical bandwidth	Tektronix 465
Voltmeter	0.1 to 10V ranges 6 digit resolution ±0.1% accuracy	Dana 5900
Frequency Counter	20 MHz capability 8 digit resolution ±2 count resolution	Dana 8015B
Distortion Analyzer	Fundamental frequencies to 10k Harmonics to 3 MHz 50 μV sensitivity	HP331A
Spectrum Analyzer	1 to 80 MHz range ±0.5 dB amplitude accuracy Noise >70 dB below reference	HP141T, HP8552B, and HP8553B
Calculator	IEEE 488-1975 compatible	HP9825

Table 2-4. Operation Verification

Step	Test	Tester and Setup	Program	Desired Results
1	Self Test	None.	Power ON	172B displays "SELF TEST"; then in <5s, "WAVETEK 172B".
2	Open Loop	Oscilloscope. Connect to 172B 50Ω OUT with a 50Ω load at the scope input. Set for 2V/div, horizontal 0.1 μs/div.	FREQ 10E6 AMPL DEF 0 AMPL 10 FUNC 0 MODE 0 OUTP 0 SYM 0 OFST 0 EXEC	1 cycle/div sine wave, 10V p-p.

Table 2-4. Operation Verification (Continued)

Step	Test	Tester and Setup	Program	Desired Results
3	Functional		FUNC 1 FREQ 5E6 EXEC	1 cycle/2 div triangle wave, 10V p-p.
4			FUNC 2 EXEC	1 cycle/2 div square wave, 10V p-p.
5			FUNC 4 OFST 2 EXEC	2 Vdc with no waveform.
6		Oscilloscope. Set horizontal to 2 μs/div.	FREQ 99.9E3 OFST 0 AMPL 5 SYM 2 FUNC 2 EXEC	+2.5V for 2 μs; −2.5V for 8 μs.
7			SYM 8 EXEC	+2.5V for 8 μs; −2.5V for 2 μs.
8	Sync Out	Oscilloscope. Connect to 172B SYNC OUT.		Pulse at same frequency and symmetry as 50Ω OUT signal.
		NOTE: Allow 1 hour warm-up before performing the following tests.		
9	Amplitude Accuracy	Voltmeter. Set to Vrms. Connect to 172B 50Ω OUT with no 50Ω load.	FREQ 999 AMPL DEF 1 AMPL 5.29 OUTP 1 SYM 5 FUNC 0 OFST 0 MODE 0 EXEC	5.283 to 5.316 Vrms.
10			AMPL 0.9 EXEC	0.897 to 0.903 Vrms.
11		Set voltmeter to dc.	FUNC 4 OFST 7.49 EXEC	7.46 to 7.52 Vdc.
12	Frequency Accuracy	Frequency Counter. Connect to 172B 50Ω OUT.	FREQ 12.9999E6 AMPL 1 OFST 0 FUNC 2 EXEC *Standard 172B:* MODE 0 EXEC *Option 002:* MODE 3 EXEC	Standard 172B: 12.6 to 13.4 MHz. Option 002: 12.9998 to 13.0000 MHz.
13			FREQ 1E6 EXEC	Standard 172B: 0.97 to 1.03 MHz. Option 002: 0.99999 to 1.00001 MHz.
14			FREQ 99.999E3 EXEC	Standard 172B: 96.9 to 103 kHz. Option 002: 99.998 to 100.000 kHz.

Table 2-4. Operation Verification (Continued)

Step	Test	Tester and Setup	Program	Desired Results
15	Harmonic Distortion	Distortion Analyzer. Connect to 172B 50Ω OUT. Set distortion meter to null, then to % distortion.	FREQ 3000 AMPL 5.29 FUNC 0 OUTP 1 EXEC	Total harmonic distortion under 0.5% (−46 dB).
16	Spurious	Spectrum Analyzer. Sweep from 0 to 100 MHz; video filter set to 10 kHz.	FREQ 10 AMPL 1 OUTP 0 EXEC	All discrete spurious −50 dBm or less.
17	Interface	Calculator. Connect to 172B GPIB connector. Set 172B rear panel address switch to 00001. Press 172B ADR key and verify GPIB address "1" on the display.	Calculator: 0: dim A$[100] 1: red 701,A$ 2: rem 7 3: clr 701 4: rds(701)→r1 5: stp	172B displays: "172B CLEARED R".
18			Calculator: 6: wrt 701,"....F10E3A 5D0P1I" 7: stp	172B displays: "FR 10E3 AM 5 OFS 0 RL".
19			172B: CMD RCL key	172B displays: "....F10E3A5D0P1IMJR RL" in last 22 characters.
20			Calculator: 8: wrt 701,"F1E9T1I" 9: stp	172B displays: "FR 10E3 AM 5 OFS 0 QRL".
21			Calculator: 10: red 701,A$ 11: dsp A$ 12: stp	Calculator displays: "E 1 F" setting error, frequency. 172B displays: "FR 10E3 AM 5 OFS 0 QRT".
22			Calculator: 13: wrt 701,"T2" 14: red 701,A$ 15: dsp A$ 16: stp	Calculator displays: "P E" (error poll). 172B displays: "TALK RESPONSE 2 SELECTED RT".
23			Calculator: 17: rds(701)→r2 18: dsp char(r2) 19: wrt 701,"'172B GPIB TEST COMPLETE'" 20: stp	172B displays: "172B GPIB TEST COMPLETE RL".

Table 2-5. Acceptance Test Record
(for reproduction)

Location _____

QA Inspector _____

Date _____

		Acceptable (✓)
A	Self Test and Functions (steps 1 through 8)	_____
B	Amplitude Accuracy	
	(9) value _____ Vrms	_____
	(10) value _____ Vrms	_____
	(11) value _____ Vdc	_____
C	Frequency Accuracy	
	(12) value _____ MHz	_____
	(13) value _____ MHz	_____
	(14) value _____ kHz	_____
D	Distortion	
	(15) value _____ %	_____
	(16)	_____
E	Interface-GPIB Operation (steps 17 through 23)	_____

SECTION 3
OPERATION

3.1 DATA ENTRY

Using the Model 172B is quite straight forward and is best understood by trial and error method while the microprocessor "converses" with you during operation, informing you what was programmed, what is possible to program and when an error is made. The example of data entry given in table 3-1 will give you the feel of using the 172B. Appendix B gives a summary of programming commands.

The details of power on, command structure and programming are given in paragraphs 3.2 and 3.3. Operation in each mode is discussed in paragraph 3.4. Front panel keyboard and readout are discussed in paragraph 3.5. Program functions peculiar to the GPIB are discussed in paragraph 3.6. These functions are in strict accordance to ground rules set forth in IEEE Standard 488-1975. The operation of the stored program facility is discussed in paragraph 3.7.

3.2 POWER

Power is turned on and off with a front panel pushbutton. When power is turned on, wait approximately 8 seconds before programming (for front panel option, wait until "WAVETEK MODEL 172B" is displayed). When the power is turned on, the generator automatically performs a self test routine. "SELF TEST" is displayed at this time. When testing is completed, "WAVETEK MODEL 172B" is displayed. At least two seconds must elapse between power OFF and power ON for proper reinitialization of logic. When the power comes on, the output is automatically disabled to allow loading of a program; line transients on the output are avoided. The generator must get an execute command to provide and output. (Refer to paragraph 3.3.8.)

Table 3-1. Example of Front Panel Data Entry

Instruction	Front Panel Entry (Press Keys)	Front Panel Display	Equivalent Program Entry
1. Power on.	OFF (becomes ON)	"SELF TEST", then within a few seconds, "WAVETEK MODEL 172B".	None
2. Check instrument address.	ADR	The state of the GPIB address switches will be displayed: GPIB = 1, 2, 3, or . . 30 (decimal address and ASCII listen and talk characters). (Refer to paragraph 2.2.4 to change addresses.)	G
3. Check initial conditions:			
Output and load	OUTP	OUTPUT OFF, 50 OHM LOAD OUT (2)	P
Amplitude	AMPL	AMPLITUDE 1 VOLT P-P	A
Offset	OFST	OFFSET 0 VOLTS	D
Frequency	FREQ	FREQUENCY 1 KILOHERTZ	F
Symmetry	SYM	SYMMETRY 50% (0)	S

Table 3-1. Example of Front Panel Data Entry (Continued)

Instruction	Front Panel Entry (Press Keys)	Front Panel Display	Equivalent Program Entry
Function	FUNC	FUNCTION IS SINE (0)	C
Mode	MODE	MODE IS CONTINUOUS (0)	B
4. Look at this signal by connecting the output to an oscilloscope with a 50Ω cable.	OUTP 1	LOAD 1	P1
5. Display a more descriptive readout of programming (for display only, not necessary in the programming sequence).	OUTP	OUTPUT ON, 50 OHM LOAD IN (1)	P
6. Execute the programming (it will now be available to the oscilloscope).	EXEC	FR 1E3 AM 1 OFS ϕ (this FR_AM_OFS_ format always comes on with EXEC; in this case, frequency of 1 kHz, amplitudeof 1V p-p and offset of 0V is output).	I
7. Look at the equivalent program character string.	CMD RCL	GPADFSCBP1IR (these are the equivalent program entries; see the last column in this table).	R
8. Reprogram the instrument:			
Ramp waveform	FUNC 1	FUNCTION 1	C1
	SYM 2	SYMMETRY	S2
5.1 kHz	FREQ 5 • 1 EXP 3	FREQUENCY 5.1E3	F5.1E3
14.9V p-p	AMPL 1 4 • 9	AMPLITUDE 14.9	A14.9
Offset −1.2 Vdc	OFST − 1 • 2	OFFSET −1.2	D−1.2
9. Initiate these new settings:	EXEC	WARNING: CLIPPING OR SYNTHESIZER ERROR (with the amplitude of 14.9V p-p and offset of −1.2 Vdc, peaks are 6.25V and −8.65V. Maximum allowable are ±7.5V; the negative peak will be clipped at −7.5V).	I
10. Change amplitude to 12.6V p-p.	AMPL 1 2 • 6	AMPLITUDE 12.6	A12.6
11. Initiate these settings.	EXEC	FR 5.1E3 AM 12.6 OFS −1.2 (no clipping occurs).	I

Refer to paragraph 3.5 for complete front panel data.

3.3 BASIC COMMAND STRUCTURE

The Model 172B is programmed by sending ASCII coded characters (refer to Appendix A) to the microprocessor via one of the two possible input ports (keyboard or GPIB) shown in figure 3-1. If input characters are present on more than one input port, they are read first from the GPIB and then from the keyboard. Thus, if the GPIB port is continuously supplied with characters, then no characters will ever be read from the keyboard.

Characters used to program the 172B are divided into classes:

1. Alphabetic characters — the characters A thru Z, except E.

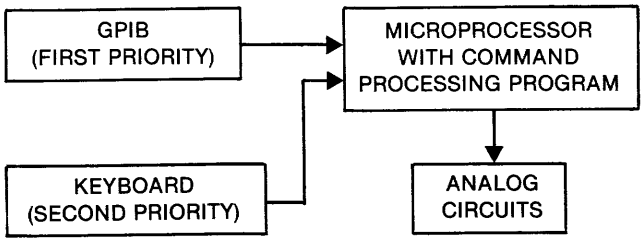


Figure 3-1. Instrument Processing Flow Diagram

2. Numeric characters — the characters 0 thru 9, E, −, decimal point (.).

3. Special character — Quote (').

4. Terminator character — initially the ASCII line feed character (LF). This can be changed by programming.

5. Nonprogramming characters — any character not in one of the above classes.

The alphabetic characters are used to select *actions* or *settings*. An action is a sequence of events which happens immediately when the character which selects it is read by the microprocessor. A setting is a numeric value which may be changed by programming. Table 3-2 lists the alphabetic characters and table 3-3 lists the numeric characters used.

To program an action, simply program the proper alphabetic character from either enabled port. The action will then take place, but only if the instrument is in the *enabled* state at the moment when that character is read by the microprocessor. (Refer to REN, paragraph 3.6.1.)

To examine the current value of a setting, simply program the proper alphabetic character from either input port. The current value will then be displayed on the front panel. This occurs whether or not the instrument is enabled. If the character programmed does not correspond to a legal setting in the instrument, nothing happens.

The numeric characters are used to program new setting values. To change a setting to a new value, first program the alphabetic character which selects the desired setting (F = frequency, etc.). The instrument must be enabled at this time, or it will not allow the new value to be entered. Next, program the new value using numeric characters; the instrument must be

Table 3-2. Alphabetic Characters Used in Model 172B*

ASCII Character	Keyboard Key	Action (A) or Setting (S)	Comments
A	AMPL	S	Amplitude
B	MODE	S	Mode
C	FUNC	S	Function
D	OFST	S	Offset and dc voltage
F	FREQ	S	Frequency
G	ADR	A	Display GPIB address
I	EXEC	A	Execute
J	TRIG	A	Trigger
M	STOR	S	Memorize program (refer to paragraph 3.7.1)
O	GET	A	GET mode
P	OUTP	S	50Ω load and output on/off
Q	SRQ	S	SRQ enable (refer to paragraph 3.6.5)
R	CMD RCL	A	Display last 37 programming input characters
S	SYM	S	Symmetry
T	TLK	S	Talk message specify (refer to paragraph 3.6.4)
U	LAST	A	Steps to previous numbered stored setting
V	AMPL DEF	S	Specify amplitude units (refer to paragraph 3.3.2.1)
W	NEXT	A	Steps to next higher numbered stored setting
X	TRM	S	Specify terminator character (refer to paragraph 3.6.6)
Y	RCL	S	Recall stored program (refer to paragraph 3.7.2)
Z	—	S	Same as Y**

*Characters not listed are not used.
**For compatibility with previous instruments.

enabled for these as well. Any sequence of characters (called the argument of the setting) which gives the new value is acceptable. For example, all of the sequences in table 3-4 will cause the value 100 to be programmed.

The numbers to the left of the "E" are the mantissa; the digits to the right (only two are allowed) are the exponent. The result value is the mantissa times 10 to the exponent power.

Only one decimal point and one "E" (keyboard EXP) are allowed per number; additional ones are ignored. The sign toggle character may appear any number of times. It causes the sign of the mantissa (if "E" has not been programmed) or the exponent (if "E" has been programmed) to be reversed (if negative, then positive, and vice versa) each time it appears. Any number of nonprogramming characters may be interspersed with the numeric characters, as they have no effect. If an undesired value is entered, the CLR key can be used to erase it.

Table 3-3. Numeric Characters Used

ASCII Character	Keyboard Key	Function
0	0	Numeric digit
1	1	Numeric digit
2	2	Numeric digit
3	3	Numeric digit
4	4	Numeric digit
5	5	Numeric digit
6	6	Numeric digit
7	7	Numeric digit
8	8	Numeric digit
9	9	Numeric digit
.	.	Decimal point
–	+/–	Toggle sign
E	EXP	Indicates multiplication by 10 raised to a power

Several parameters require codes for specific selections; for example, the function codes of 0 thru 7 to select sine, triangle or square waves, etc. Refer to table 3-5 for parameter codes.

Since the number input format is so general, the microprocessor must be told when the last numeric character has been entered so it can evaluate the number. This is done by programming either an alphabetic, special or terminator character. When this is done, the new value is first tested to see if it is a legal value for the setting being changed. If it is not legal, an error message is displayed on the front panel, and the setting value is not changed. If it is legal, the new value is entered into the instrument's memory; however, it is not sent to the analog circuits. That can be done only by programming the "I" action (EXEC key on the front panel) or the Group Execute Trigger (GET).

When a new value is entered into the instrument memory, it is rounded to the number of significant digits specified by the setting being changed, as specified by table 3-6. Review table 3-1 for examples of command structure.

Table 3-4. Examples of Value Programming

ASCII	Keyboard	Standard Notation
100	100	100
0100	0100	100 (leading zeros are ignored)
1E2	1 EXP 2	1×10^2
.01E4	.01 EXP 4	$.01 \times 10^4$
.01E304	.01 EXP 304	$.01 \times 10^4$ (last two exponent digits only are used)
1000E-1	1000 EXP +/– 1	1000×10^{-1}
1E-2-	1 EXP +/– 2 +/–	1×10^2 (two minus signs cancel)
1E.2	1 EXP .2	1×10^2 (decimal points in exponent are ignored)

Table 3-5. Codes

Function (C) Codes	
Sine	0
Triangle	1
Square	2
DC	4
+ Pulse	6
– Pulse	7

Mode (B) Codes	
Continuous	0
Triggered	1
Gated	2
Synthesized (option)	3
Triggered Haverwave	4
Gated Haverwave	5
External Phase Lock	6

Output Load (P) Codes	
Load Out, Output On	0
Load In, Output On	1
Load Out, Output Off	2
Load In, Output Off	3

Symmetry (S) Codes	
50%	0,5 or 50
10% - 90%	1-9 or 10-90

Ampl (V) Codes	
V p-p into 50Ω	0
Vrms	1
dBm	2

Talk (T) Codes	
Status	0
Error Status	1
Service Request Status	2
Value of Setting	4

GET (O) Codes	
Select Previous Numbered Stored Setting and Trigger	-1
Trigger on GET	0
Select Next Numbered Stored Setting and Trigger	1

Table 3-6. Round Offs

Letter	Setting Name	Number of Digits
A	Amplitude	3 if setting is less than 10 4 if setting is greater than or equal to 10 *For example:* *1.5 (not rounded, has only 2 digits)* *1.853 (1.85)* *96.56E-1 (9.66)* *14.997 (15.00), illegal ampl*
O	Offset	3
F	Frequency	If synthesizer is installed: 5 if setting is less than 10 MHz 6 if setting is greater than or equal to 10 MHz If synthesizer option is not installed: 3 if setting is less than 10 MHz 4 if setting is greater than or equal to 10 MHz
S	Symmetry	1
All other settings		Nearest integer

3.3.1 Frequency

"F" followed by its argument denotes frequency in hertz. The argument value may be between 1.000×10^{-4} and 1.29999×10^{7}, fixed or floating. Refer to table 3-6 for round offs. In addition, the special argument value of zero is permitted. When this is programmed, the frequency magnitude is set to zero, but the range is left at its previously programmed value. This facility allows calibration and wide ranging analog voltage controlled frequency sweeps.

3.3.2 Amplitude

3.3.2.1 Amplitude Definition

"V" followed by its argument selects the amplitude programming mode. The argument may be 0, 1 or 2. Round off is to one digit.

0 Selects volts peak-to-peak into 50Ω

1 Selects Vrms

2 Selects dBm

3.3.2.2 All Waveforms

"A" followed by its argument denotes amplitude (in volts peak-to-peak into 50Ω, in Vrms or in dBm, depending on the amplitude mode code (refer to paragraph 3.3.2.1). The argument value may be between 1.00×10^{-3} and 1.499×10^{1} (1 mVrms to 5.3 Vrms, −56 to 27.4 dBm), fixed or floating. Round off is to 3 digits to 10V p-p and to 4 digits from 10 to 15V p-p. A minus sign in the mantissa will invert the waveform.

NOTE

When offset is used, three digit resolution of offset or amplitude may be reduced in some cases. (Refer to paragraph 3.3.3.)

3.3.2.3 Pulses

The positive and negative pulses are special cases of the offset square wave. The pulses are square waves that the microprocessor automatically offsets, so that the negative peak in + pulse mode and the positive peak in the − pulse mode are always at zero volts, regardless of the amplitude programmed. With this in mind, the rules and notation used in paragraphs 3.3.2.2 and 3.3.3 are applicable to the pulses.

3.3.3 Offset and DC Voltage

"D" followed by its argument denotes offset (or, with no waveform, dc voltage) value in volts. (Offset is in volts regardless of amplitude mode.) The argument may be between −7.49 and 7.49 and may be a fixed or floating point. Round off is to 3 digits. The combined waveform and offset cannot exceed ±7.5V peak. As offset is increased, it is usually necessary to decrease the waveform peak-to-peak amplitude to stay within the peak limit; otherwise, waveform clipping will result.

The amplitude and offset are not completely independent of one another, because they share a common output amplifier and attenuator (see figure 3-2). In certain cases it may be necessary to decrease the number of digits of resolution of amplitude or offset in order to prevent clipping in the output amplifier or to make the programmed value of offset (or amplitude) appear at the output despite an unfavorable attenuator setting necessitated by a larger value of amplitude (or offset).

The sum of amplitude and offset control the output amplifier and attenuator. The output amplifier is limited

to ±7.5 volts peak and a 3 digit input (X.XX), and the attenuator can operate at only one value, $\times 10^{0}$, $\times 10^{-1}$, $\times 10^{-2}$ or $\times 10^{-3}$.

If the *absolute peak value* at the amplifier is ever 7.50 or greater, logic decreases the amplifier input (amplitude + offset) by a factor of 10 and, to maintain the same value, decreases attenuation by a factor of 10 also.

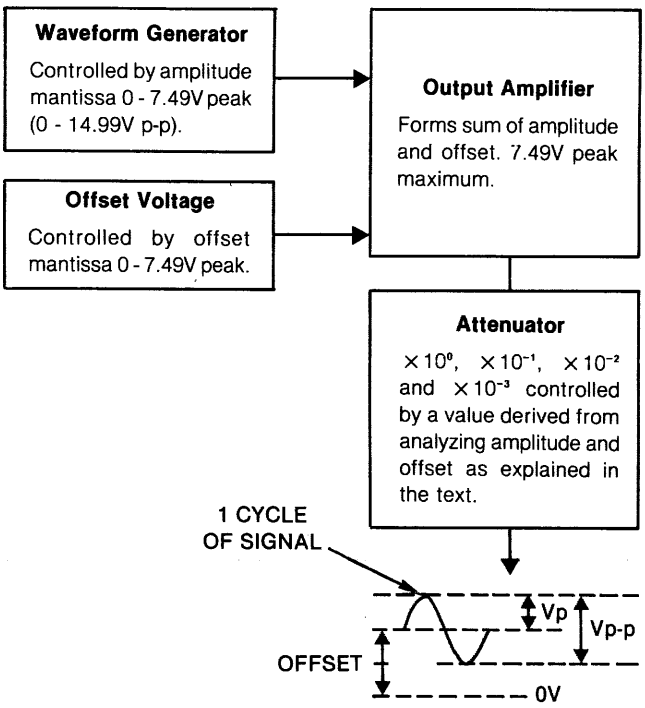


Figure 3-2. Hardware Diagram of Amplitude and Offset Generation

To determine if there is clipping or loss of resolution, perform the following calculation (amplitude in volts peak-to-peak).

1. Add the absolute value of the desired offset value to ½ the absolute value of the desired amplitude. If the sum exceeds 7.49, clipping will occur. If not, go on to step 2 to determine if loss of resolution will occur.

2. Write the larger of the absolute amplitude or absolute offset in the form $N.NN \times 10^{x}$, where N.NN is between 1.00 and 9.99.

3. Take the sum of amplitude and offset computed in step 1 and write it in the form $MM.MM \times 10^{x}$, where x is the exponent computed in step 2. If MM.MM is greater than 7.49, then one digit of resolution must be lost from both amplitude and offset in order to prevent the output amplifier from clipping.

4. Perform this step, if step 3 did not result in a loss of resolution. Write the amplitude or offset, whichever is smaller in absolute value, in the form $YY.YYZZZ \times 10^{x}$, where x is the exponent computed in step 2. If any of the digits in ZZZ are nonzero, then resolution is lost, because only YY.YY can be used to program the waveform generator circuits.

Example A

Ampl = −3.43
Offset = 4.25

Step 1 *4.25 + 1.72 = 5.97. There is no clipping.*

Step 2 *Absolute offset is larger.*
$4.25 = 4.25 \times 10^{0}$. Therefore, x = 0.

Step 3 *5.97 = 5.97×10^{0}. Therefore, there is no loss of resolution in either parameter.*

Step 4 *Absolute amplitude is smaller.*
$-3.43 = 3.43000 \times 10^{0}$. Therefore, there is no loss of resolution anywhere.

Example B

Ampl = .0964
Offset = .720

Step 1 *.720 + .0482 = .7682. There is no clipping.*

Step 2 *.720 = 7.20×10^{-1}. x = −1.*

Step 3 *.7682 = 7.682×10^{-1}. Since 7.682 exceeds 7.49, there will be a loss of one digit of resolution in both amplitude and offset. This means that the offset will be .720 and the amplitude will be .096 (not .0964).*

Step 4 *Not required.*

Example C

Ampl = 2.58
Offset = .123

Step 1 *.123 + 1.29 = 1.413. There is no clipping.*

Step 2 *Absolute amplitude is larger.*
$2.58 = 2.58 \times 10^{0}$. Therefore, x = 0.

Step 3 *1.413 = 1.413×10^{0}. No loss of resolution so far.*

Step 4 *Absolute offset is smaller.*
$.123 = 0.12300 \times 10^{0}$. YY.YY = 00.12, ZZZ = 300. Therefore, one digit is lost in the offset, which will be .120, not .123.

3.3.4 Function

"C" followed by its argument denotes waveform selection. The argument may be one of the following. Round off is to nearest integer.

0 Selects sine wave

1 Selects triangle wave

2 Selects square wave

4 Selects dc voltage

6 + pulse

7 – pulse

3.3.5 Mode

"B" followed by its argument selects instrument mode. The argument may be 0 to 6. Round off is to one digit. The following modes are illustrated in figure 3-3.

0 Selects continuous. The generator runs continuously with parameters as programmed.

1 Selects triggered. The generator is quiescent until a negative going TTL pulse is fed to the TRIG IN BNC, the TRIG key is pressed, a "J" is programmed or a GET is programmed, which causes one cycle of the selected waveform to be generated.

2 Selects gated. The generator is quiescent until a negative going TTL pulse is fed to the TRIG IN BNC, which causes the generator to run for the duration of the pulse.

3 Selects synthesized (an option). The generator is phase locked to a frequency synthesizer for 5½ digit frequency resolution. (Refer to paragraph 1.2 for signal accuracy and purity.)

4 Selects triggered haverwave. As for triggered except the quiescent level is at the negative peak voltage (can be offset or inverted for desired level).

5 Selects gated haverwave. As for triggered haverwave except the generator runs continuously for the duration of the TTL level pulse fed to the TRIG IN BNC.

6 Selects external phase lock. When programmed within 2% of the TTL-level 10 Hz to 13 MHz signal present at the ϕ LOCK IN BNC, the generator phase locks to that reference signal.

Figure 3-3 shows the waveforms and their phase relationship relative to the sync output and two controlling input signals: trigger and phase reference. The waveforms are sine, triangle and square plus their inverted forms. In the continuous mode, a trigger input has no effect, and in trigger and gated modes, phase reference input has no effect.

In triggered and gated modes, notice that square waveforms do not change state immediately upon being triggered. Trigger duration has no effect on triggered output, but does on gated output. The cycle count on the gated sine wave shows that when the gate signal ends in the shaded area; that is, between the positive peak of cycle 2 and positive peak of cycle 3, cycle 3 will be completed. In the haverwave modes, waveforms start at a peak value; all other waveforms are normally symmetrical about signal ground. Notice the symmetry control effects shown in one series of waveforms. Symmetry may be set at any multiple of 10% from 10 to 90%. Fifty percent is normal symmetry.

3.3.6 Load and Output

"P" followed by its argument selects the output and internal 50Ω load status. The argument may be 0 to 3. Round off is one digit.

0 Disconnects the internal load and connects the generator directly to the outside circuit.

1 Connects the internal load and connects the generator to the outside circuit.

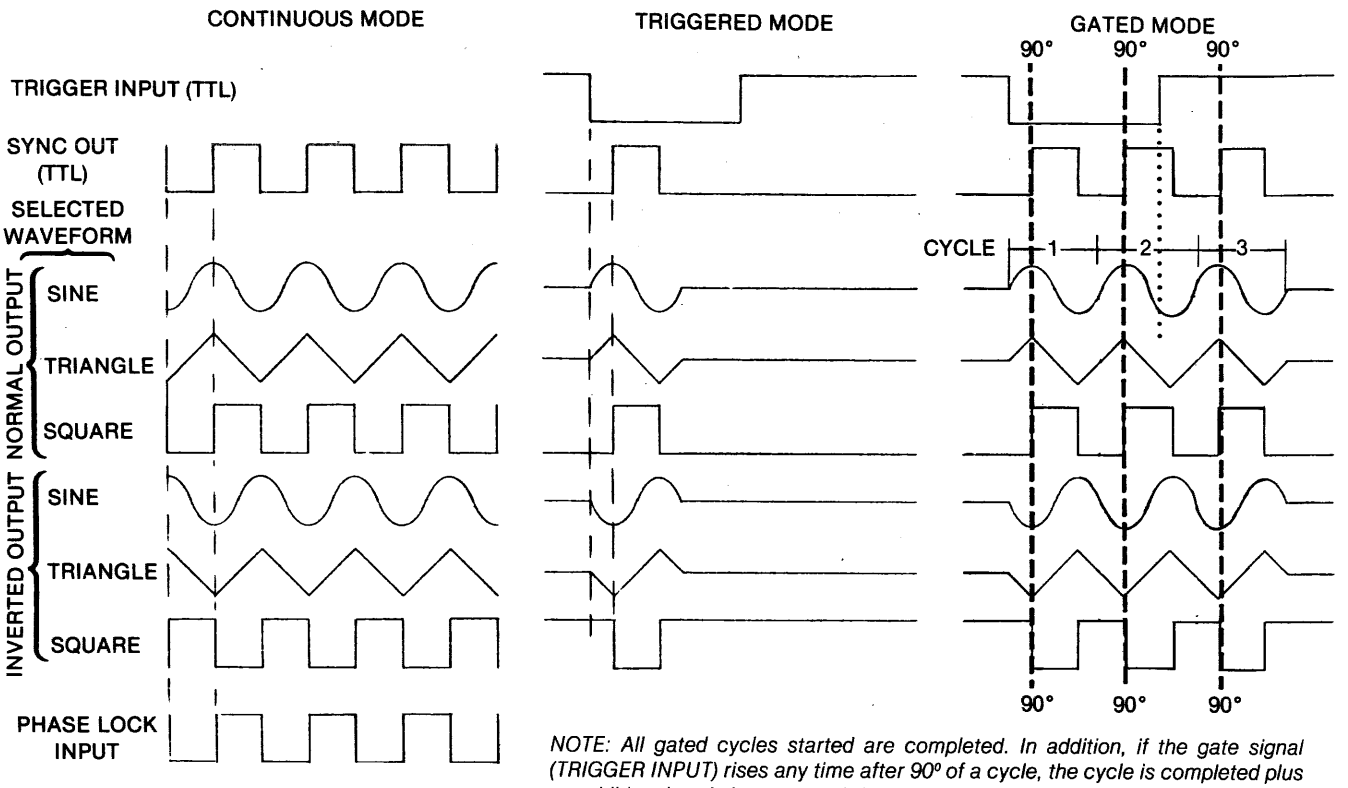
2 Disconnects generator output and disconnects internal load.

3 Disconnects generator output and connects internal load to the outside circuit.

3.3.7 Symmetry

"S" followed by its argument controls the percent of on, or active, time of the total time for the selected signal. Symmetry operates on frequencies up to 999,990 Hz. Round off is to one digit.

The argument may be 0 to 9 or 10 to 90. Round off one digit. The effect of symmetry control is illustrated in figure 3-1.



NOTE: All gated cycles started are completed. In addition, if the gate signal (TRIGGER INPUT) rises any time after 90° of a cycle, the cycle is completed plus an additional cycle is generated. As shown, the gate signal rises after 90° of cycle 2, therefore, cycle 3 is generated.

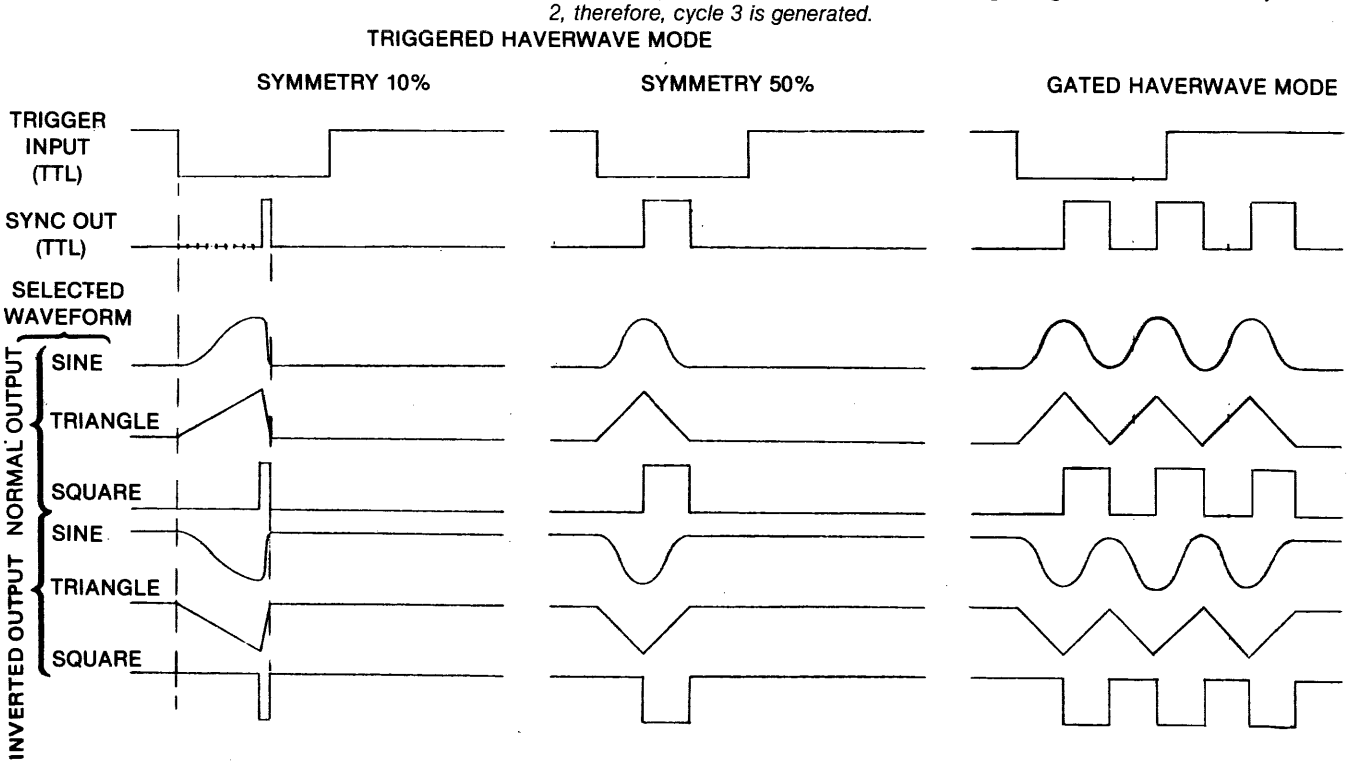


Figure 3-3. Waveforms for Each Mode

0, 5 or 50 selects 50%

1 or 10 selects 10%

2 or 20 selects 20%

9 or 90 selects 90%

3.3.8 Executing the Program

"I" without an argument transfers the programmed values to the waveform generator circuits; that is, executes the program. No waveform changes can be made except with this command. This action also checks the following groups of parameters for consistency.

1. Amplitude and offset — an error is signalled if their combined values are so high that clipping occurs in the output amplifier.

2. Frequency and mode — an error is signalled if the mode is synthesized and the frequency is below 10 Hz.

NOTE

Individually valid programmed setting values are sent to the waveform generator circuits whether or not a consistency error is found.

Execution of a program can also be commanded with the GPIB Group Execute Trigger (GET) command. In this case no error checking is done.

3.3.9 GPIB Address

"G" without an argument causes the address to be displayed. The address (0 to 30) is set by a set of switches on the rear panel.

3.3.10 Trigger

"J" without an argument causes a trigger pulse to be sent to the analog circuits when in triggered or triggered haverwave mode. This has the same effect as applying a trigger pulse to the TRIG BNC, pressing the keyboard TRIG or programming a GET.

3.3.11 Command Recall

"R" without an argument will display the last 37 characters sent to the instrument. These characters are not returned to the controller over the GPIB. The display uses a 64 character subset of the full 128 character ASCII code: character codes 20_{16} thru $5F_{16}$. The other characters are displayed as the first set of 64; they are mapped into the first set by their six least significant digits. This function is used for troubleshooting. This character has additional stored program functions. (Refer to paragraph 3.7.2.)

3.3.12 Errors

When a nonlegitimate argument is programmed, an error message is generated. If an error occurs in a programmed setting, the previous value is retained. If the error was caused by programming from the front panel, an error display will appear on the front panel display. If the error was caused via the GPIB, a service request will be made if service request is enabled (refer to paragraph 3.6.5).

3.4 OPERATING MODES

3.4.1 Initial Conditions

At power on, the instrument is set as follows: 1 kHz, 1V p-p, continuous, symmetrical sine wave with the output off and the internal 50Ω load not in the circuit.

3.4.2 Operating as a Basic Waveform Generator

When operating as a basic waveform generator, the generator runs continuously with parameters as programmed.

1. Make rear panel 50Ω OUT and SYNC OUT connections for signal and sync, as required.

2. Refer to paragraph 3.6 if programming remotely.

3. The output must be programmed on (P0 or P1). (Refer to paragraph 3.3.6.) The mode must be continuous (B0). (Refer to paragraph 3.3.5.)

4. Program the desired waveform, symmetry, frequency, amplitude and offset. (Refer to paragraphs 3.3.1 through 3.3.4 and 3.3.7.)

5. Execute the program. (Refer to paragraph 3.3.8.)

3.4.3 Operating as a Triggered or Gated Generator

See figure 3-3 for mode and waveform illustrations.

Triggered — The generator is quiescent until a negative going TTL pulse is fed to the TRIG IN

Triggered (Cont)	BNC, the TRIG key is pressed or a "J" or GET is programmed, which causes one cycle of the selected waveform to be output.
Gated	As for triggered, except the generator runs continuously for the duration of the TTL level pulse fed to the TRIG IN BNC.
Triggered Haverwave	As for triggered except the quiescent level is at the negative peak voltage (can be offset or inverted for desired level).
Gated Haverwave	As for triggered haverwave except the generator runs continuously for the duration of the TTL level pulse fed to the TRIG IN BNC.

1. Make rear panel 50Ω OUT and SYNC OUT connections for signal and sync, as required.
2. Refer to paragraph 3.6 if programming remotely.
3. The output must be programmed on (P0 or P1). (Refer to paragraph 3.3.6.) The mode must be triggered (B1), triggered haverwave (B4), gated (B2) or gated haverwave (B5). (Refer to paragraph 3.3.5.)
4. Program the desired waveform, symmetry, frequency, amplitude and offset. (Refer to paragraphs 3.3.1 through 3.3.4 and 3.3.7.)
5. Execute the program. (Refer to paragraph 3.3.8.) The generator has no output until a trigger signal is applied.
6. If triggering with a TTL signal at the TRIG IN BNC or gating, apply a TTL low at the TRIG IN BNC for one cycle of waveform (triggered or triggered haverwave mode) or a burst of waveform for the duration of the TTL low (gated or gated haversine mode). If triggering at the front panel, press TRIG. If triggering on the bus, program a "J" or a GET.

3.4.4 Operating as a Voltage Controlled or Frequency Modulated Generator

VCG operation is the same as the basic waveform operation (refer to paragraph 3.4.2) plus the connection of a VCG voltage source to the VCG (FM) IN connector. Input impedance is 5 kΩ. Input is disabled when mode is synthesized or external phase lock.

The VCG input, either dc or ac, can be used to externally control the frequency of the 50Ω OUT signal. A positive voltage applied to the VCG IN connector will increase the generator frequency, and a negative voltage will decrease the frequency within the range of operation.

Figure 3-4 illustrates the voltage required to change the programmed frequency to a desired output frequency. For example, if 500 Hz is programmed frequency, a 2.5 volt VCG input will change the frequency to 1 kHz. Frequency can only be changed within a range and is limited in each range according to figure 3-5. Range is defined as an exponent of the ×10 multiplier (see figure 3-5).

For wide range sweeping with a zero to a positive sweep voltage, use the special zero-frequency capability. Set frequency mantissa to zero (F0I) to set a frequency under the lower defined limits of figure 3-5. The range remains as the last frequency range set.

3.4.5 Operating as a Frequency Synthesizer (an Option)

The generator with synthesizer option is phase locked to a frequency synthesizer for 5½ digit frequency resolution. (Refer to paragraph 1.2 for signal accuracy and purity.)

1. Make 50Ω OUT, SYNC OUT, REF IN and REF OUT connections for signal and sync, as required.

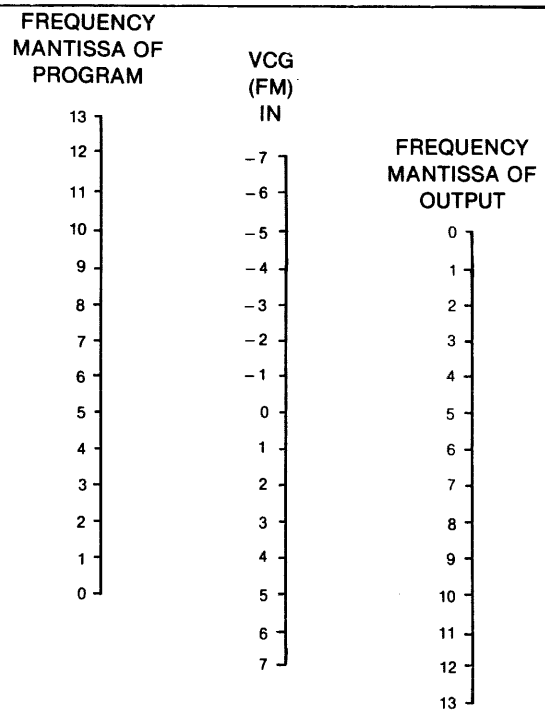
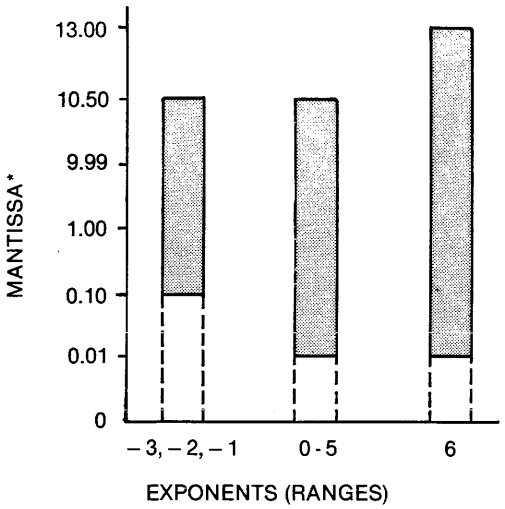


Figure 3-4. VCG (FM) Nomograph



*When program is stated with one digit to the left of the decimal (or two digits to the left of the decimal for values ≥10 in the 10^6 range).

Figure 3-5. VCG Range Limits

2. If an external 10 MHz reference is to be used, apply the signal to REF IN. (This signal is then available at REF OUT.) To use an external reference signal, apply a sine or square wave within ±3 ppm of 10.0 MHz, 1 to 10 Vrms and 50±8% duty cycle to the REF IN BNC.

3. Refer to paragraph 3.6 if programming remotely.

4. The output must be programmed on (P0 or P1). (Refer to paragraph 3.3.6.) The mode must be synthesized (B3). (Refer to paragraph 3.3.5.)

5. Program the desired waveform, symmetry, frequency, amplitude and offset. (Refer to paragraphs 3.3.1 through 3.3.4 and 3.3.7.)

6. Execute the program. (Refer to paragraph 3.3.8.)

3.4.6 Operating as a DC Voltage Source

DC voltage output amplitude is programmed as offset. Attenuation can be programmed directly in this mode.

1. Refer to paragraph 3.6 if programming remotely.

2. The output must be programmed on (P0 or P1). (Refer to paragraph 3.3.6.) The function must be DC (C4). (Refer to paragraph 3.3.4.)

3. Program offset for the desired dc amplitude. (Refer to paragraph 3.3.3.)

4. Execute the program. (Refer to paragraph 3.3.8.)

3.4.7 Operating as a Phase Lock Generator

When programmed within 2% of the TTL level 10 Hz to 13 MHz signal present at the ϕ LOCK IN BNC, the generator phase locks to that reference signal.

1. Refer to paragraph 3.6 if programming remotely.

2. The output must be programmed on (P0 or P1). (Refer to paragraph 3.3.6.) The mode must be external phase lock (B6). (Refer to paragraph 3.3.5.) Program the frequency to within 2% of the external reference frequency.

3. Program the desired waveform, symmetry, amplitude and offset. (Refer to paragraphs 3.3.1 through 3.3.4 and 3.3.7.)

4. Apply the 10 Hz to 13 MHz reference signal to the ϕ LOCK IN BNC.

5. Execute the program. (Refer to paragraph 3.3.8.)

3.5 FRONT PANEL OPTION

3.5.1 Keyboard and Display

Keyboard controls are listed in tables 3-2 and 3-3. Readout for the key functions are listed in table 3-7. Readout is literal and in two slightly different modes; for example, for frequency, amplitude and offset. When FREQ, AMPL or OFST keys are pressed, as for an inquiry as to status, the words MICROHERTZ, MILLIVOLTS, etc., are used, whereas when the operator starts keying in the parameter argument, no unit of measure is displayed. Coded parameters, such as symmetry, function, mode and output, show their programmed argument in parentheses.

3.5.2 Display

The single quote character (') is used to cause a string of characters to be displayed on the front panel self-scan display. This is accomplished by first programming a single quote, then the characters to be displayed, followed either by another single quote or by the terminator character. When the second quote or the terminator is programmed, the first 37 characters programmed after the first quote are displayed on the front panel. If fewer than 37 characters are programmed, then blanks are added to fill the display.

Examples (∧ indicates a blank character):

Table 3-7. Key and Readout

Key	Readout (lower case words added for understanding only)
ADR	GPIB = (Decimal Address, ASCII listen character and ASCII talk character)
AMPL DEF	AMPLITUDE IN VOLTS PEAK-TO-PEAK (0) or AMPLITUDE IN VRMS (1) or AMPLITUDE IN DBM (2)
CMD RCL	Lists last 37 characters programmed (refer to tables 3-2 and 3-3)
OUTP	OUTPUT ON, 50 OHM LOAD OUT (0) or OUTPUT ON, 50 OHM LOAD IN (1) or OUTPUT OFF, 50 OHM LOAD OUT (2) or OUTPUT OFF, 50 OHM LOAD IN (3)
FREQ	FREQUENCY ____ MICROHERTZ or ____ MILLIHERTZ or ____ HERTZ or ____ KILOHERTZ or ____ MEGAHERTZ
AMPL	AMPLITUDE ____ MILLIVOLTS or ____ VOLTS
OFST	OFFSET ____ MILLIVOLTS or ____ VOLTS
SYM	____ % SYMMETRY (0, 1, 2, - - - or 9)
FUNC	FUNCTION IS SINE (0) or TRIANGLE (1) or SQUARE (2) or DC (4) or + PULSE (6) or − PULSE (7)
MODE	MODE IS CONTINUOUS (0) or TRIGGERED (1) or GATED (2) or SYNTHESIZED (3) or TRIGGERED HAVERWAVE (4) or GATED HAVERWAVE (5) or EXTERNAL PHASE LOCK (6)

Key	Readout (lower case words added for understanding only)
EXEC	FR (frequency) AM (amplitude) OFS (offset)
TRIG	172 TRIGGERED
CLR ENTY	Clears any unexecuted setting of the last parameter entered
SRQ	SRQ ENABLED or SRQ NOT ENABLED
TLK	TALK RESPONSE (0, 1, 2 or 4) selected
TRM	TERMINATOR IS: (ASCII character) (decimal value)
+/−	"−" or blank (implies "+")
GET	PREVIOUS STORED SETTING ON GET (−1) or EXECUTE AND TRIGGER ON GET (0) or NEXT STORED SETTING ON GET (1)
STOR	SETTING ___ STORED or SETTING ___ DELETED (1 through 240)
RCL, NEXT, LAST	SETTING ___ RECALLED

NOTE: The three right-most characters of the display will show the status of the GPIB interface: a "Q" after an error has occurred, an "R" when in remote control, and a "T" for Talk or an "L" for Listen.

Three Programmed Inputs

1. 'THIS^IS^A^29^CHARACTER STRING'
2. 'THIS^STRING^IS^TOO^LONG^TO^DISPLAY^ENTIRELY'
3. '' (no character in string)

The Resulting Displays

1. THIS^IS^A^29^CHARACTER^STRING^^^^^^^^^^
2. THIS^STRING^IS^TOO^LONG^TO^DISPLAY^EN
3. (blank display)

3.6 GPIB INTERFACE

The GPIB interface is an implementation of IEEE Standard 488-1975. It supports the following interface functions: Source Handshake (SH1), Acceptor Handshake (AH1), Talker (T6), Listener (L4), Service Request (SR1), Remote Local (RL1), Device Clear (DC1) and Device Trigger (DT1). Devices connected to the GPIB can have one or more of the three capabilities: talk, listen and control. The talk capability allows a device to send data (such as voltmeter or counter readings) out over the bus. The listen capability allows a device to receive data (such as device programming information or a printer receiving data to be printed) from the bus. The control capability allows a device to control the flow of data over the bus. Although there may be more than one device connected to the GPIB with control capability, only one device at a time may exercise that capability on the bus. One device's control capability must be active at all times; this device is called the controller.

Programming examples are given in Appendix C.

Table 3-8. GPIB Lines and Commands

Bus Lines	
DIO1 - DIO8	Data In/Out Lines
ATN	Attention
DAV	Data Available
NRFD	Not Ready For Data
NDAC	Not Data Accepted
EOI	End Or Identify
REN	Remote Enable
SRQ	Service Request
IFC	Interface Clear
GPIB Commands	
Listen Address	
Talk Address	
Secondary Address	
Universal Commands	
DCL	Device Clear
SPE	Serial Poll Enable
SPD	Serial Poll Disable
Addressed Commands	
GTL	Go To Local
SDC	Selective Device Clear
GET	Group Execute Trigger

3.6.1 Bus Lines Defined

The GPIB consists of 16 signal lines, as shown in table 3-9. Their functions are:

DIO1-DIO8 — These eight lines (Data In/Out) are used to send commands and data encoded as 8 bit binary numbers (bytes).

ATN — This line (Attention) is operated only by the controller. It specifies whether the information on lines DIO1-DIO8 is data (false) or a command (true). Whenever ATN is set true, no activity is allowed on the bus except for controller-originated messages; additionally, every device connected to the bus is required to receive and process every command sent by the controller.

DAV, NRFD, NDAC — These are the "handshake" lines (Data Valid, Not Ready For Data and Not Data Accepted) which regulate the transmission of information over the lines DIO1-DIO8. For each command or data byte transferred, a complete handshake cycle must occur. This handshake is designed to hold up the bus until the slowest device has accepted the information.

EOI — When ATN is false, this line (End Or Identify) indicates that the data on lines DIO1-DIO8 is (true) or is not (false) the last byte of a data message. When the 172B receives a data byte with EOI true, it automatically supplies a terminator character (refer to paragraph 3.6.6) following the data byte. When the 172B transmits the last byte of a message (which is always a terminator character), it also sets EOI true.

REN — This line (Remote Enable) is used to control whether devices on the GPIB are in local or remote mode. In local mode, devices respond to front panel commands and do not respond to GPIB originated commands. In remote mode, the situation is reversed: GPIB originated commands are obeyed, while front panel commands are ignored. A device enters the remote state whenever it receives its listen address (refer to paragraph 3.6.2.1) at the same time as REN is in the remote state. The device then stays in the remote mode until either the REN line is put in the local state or the device receives a Go-To-Local (GTL) command or the LOCAL front panel key is pressed while the interface is not in the local lockout state (refer to paragraph 3.6.2.4d).

SRQ — This line (Service Request) is used by the devices on the bus to signal the controller that they need attention. (Refer to paragraph 3.6.5 for 172B Service Request Enable.) Since the SRQ line is common to all devices, additional tests must be made to determine which devices are signalling. The Serial Poll capability is usually employed to accomplish this.

IFC — This line (Interface Clear) is used by the controller to reset the interface logic in all devices connected to the bus to a known initial state.

3.6.2 GPIB Commands

Commands are sent over lines DIO1 - DIO8 with ATN true. They are divided into five classes.

3.6.2.1 Listen Addresses

Listen addresses are used to command a device to read any data bytes transmitted over lines DIO1 - DIO8. There are 31 different available addresses (hexadecimal codes 20 thru 3E, ASCII codes "SP" thru ">"). A 32nd address, called unlisten (hexadecimal 3F, ASCII "?"), is used to command all devices not to read data bytes. The 172B listen address is selected by the rear panel DIP switch, which specifies the lower 5 bits of the address. (Refer to table 2-2.)

3.6.2.2 Talk Addresses

Talk addresses are used to command a device to transmit data over lines DIO1 - DIO8 whenever ATN is false. There are 31 different available addresses (hexadecimal codes 40 thru 5E, ASCII codes "@" thru "^"). A 32nd address, called untalk (hexadecimal 5F, ASCII "_") is used to command all devices to cease talking. The lower 5 bits of the 172B talk address are selected by the same rear panel DIP switch used to select the listen address. Thus, if the 172B listen address is hexadecimal 21 (ASCII "!"), the talk address is hexadecimal 41 (ASCII "A").

3.6.2.3 Secondary Addresses

Secondary addresses are used following a talk or listen address to provide the ability to address more than the 31 devices provided for by simple talk or listen addresses. Secondary addresses are ignored by the 172B.

3.6.2.4 Universal Commands

Universal commands are used to command a device to perform designated actions. Universal commands are recognized at all times. Universal commands performed by the 172B are:

1. Device Clear (DCL) — resets the following settings to the power on state.

AMPLITUDE	1 VOLT
OFFSET	0 VOLTS
FREQUENCY	1 kHz
MODE	CONTINUOUS
FUNCTION	SINE
LOAD	OUTPUT OFF, LOAD OUT
SYMMETRY	50%

This information is also set into the waveform generating circuitry.

2. Serial Poll Enable (SPE) — causes the instrument to engage in a serial poll by responding with the serial poll status byte when addressed as a talker. Data line DIO7 will be on, if service is being requested on the SRQ line (in particular, the status byte will be an "E", if service is being requested, zero, if not). When the status byte is read, it is reset to zero, and the SRQ line is released (of course, it may still be held down by other devices). The status byte is also available by reading the 172B talk message number 2. When this message is read, the status byte is reset to 0 and SRQ released as for the serial poll.

3. Serial Poll Disable (SPD) — removes the instrument from the serial poll mode activated by the SPE command.

4. Local Lockout (LLO) — causes the GPIB interface to enter a state where the front panel LOCAL key is inoperative. Once in this state, the only way to take the interface out of it is to put the REN line in the local state (refer to paragraph 3.6.1). Local lockout must be sent to the 172B to totally disable front panel modification of the state of the instrument.

3.6.2.5 Addressed Commands

Address commands are used to command a device to perform designated actions. Addressed commands are recognized only when the instrument is addressed as a listener. Addressed commands performed by the 172B are:

1. Go To Local (GTL) — commands the 172B to go to the local mode (refer to paragraph 3.6.1 for explanation of REN line).

2. Selective Device Clear (SDC) — causes the same action as for Device Clear (DCL) command (refer to paragraph 3.6.2.4).

3. Group Execute Trigger (GET) — causes the same actions as specified by the GET mode ("O") argument (refer to paragraph 3.6.7). If the 172B's microprocessor is idle (i.e., not processing a previously sent programming string), a GET command will be completed within 2 ms of receipt. Otherwise, it will not be done until current programming is processed.

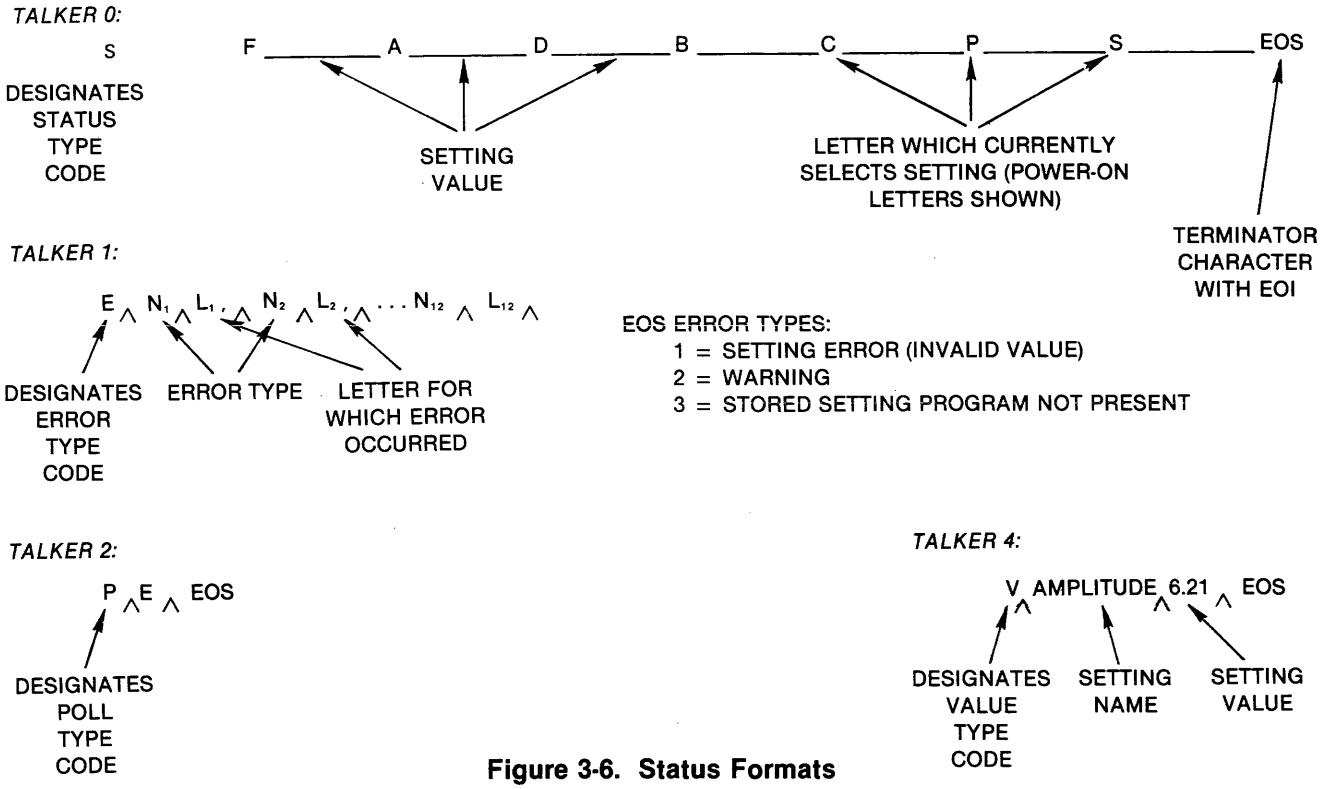


Figure 3-6. Status Formats

3.6.3 GPIB Data Transfers

The 172B will both accept programming characters and transmit status information over the bus. To program the instrument, first send the listen address (with ATN on), followed by the programming data (in ASCII, with ATN off). The instrument microprocessor accepts the data as fast as possible, until either 64 characters are received or there is a pause during the transfer of data. At that time, the entire string of received characters is scanned by the microprocessor, which carries out the programming instructions contained in it. While this is happening, the instrument can accept an additional 64 characters of data over the bus; if more are sent, the bus will hang until the microprocessor completes a scan and accepts the next 64 character string. Whenever the microprocessor finishes scanning a string, it puts a display on the front panel which reflects the state of input processing at that point. If the EOI line is asserted while sending a character to the 172B, the currently programmed terminator character will be put into the input string following the character with the EOI.

To read a message from the 172B, first send the talk address (with ATN on) over the bus. The instrument will then send the message currently selected by the Talk Message Select (T) setting. The last character of this message will be the currently programmed terminator character with the EOI line asserted.

3.6.4 Talker

"T" followed by its argument sets the particular type of status message sent by the 172B when asked to talk on the GPIB (see Appendix C, example 2). The argument may be 0 thru 4, except 3. Round off is to one digit. The argument codes are:

0 Status message will give currently programmed waveform setting values. These will be the same as the values controlling the analog circuits if no new values were programmed since the last execute action. If this message is sent back to the 172B as programming input at a later time, it will restore the frequency, amplitude, offset, mode, function, output and symmetry settings to the values they had when the message was read from the 172B. (See figure 3-6.)

1 Status message will give a list of the first 12 errors since the last time this message was read from the instrument. After this message is read, the list of errors is cleared to blanks, so that a subsequent read will get only "E" until another error happens.

2 Status message contains the status byte which describes why the instrument is requesting service on the GPIB. It is the same byte which is read by a serial poll. Reading this message also turns off the service request if it was on. In the standard instrument, the only value defined for this byte is E for error.

4 Status message gives the current value (if any) of the setting selected by the last alphabetic character sent to the 172B. If that character selects an action or a nonexistent setting, the response is a blank character.

3.6.5 Service Request Enable

"Q" followed by its argument suppresses or enables service requests. The argument may be 0 or 1. Round off is to one digit. The argument code is:

0 Suppresses all service requests.

1 Enables all service requests.

3.6.6 End of String or Terminator Specification

"X" followed by its argument designates a new End Of String (EOS), or terminator, character. The argument is the decimal value of the ASCII character that is to be the new terminator: an EOS character recognized by the 172B. Any ASCII character is accepted.

The terminator character has two uses. During output, it is appended to the end of every response to a talk request on the GPIB. During input, it signals the end of a group of programming characters. Since it is always recognized, even in a quoted string, it can be used to insure that the instrument is in a known state, so that following programming characters will be interpreted correctly.

At power on time, the EOS character is the line feed control character, ASCII character (LF) 10_{10}. When the 172B issues a talk message, the EOS character is the last byte sent. In addition, the End Or Identify (EOI) line is pulled low (END message) during the EOS character transmission. If the GPIB controller does not look for the END message (EOI line low), and it does not recognize the Line Feed (LF) as a string terminator, a new EOS character will be needed. For example, to change the EOS character from an LF to a Carriage Return (CR), program an "X13".

3.6.7 GET Mode

"O" followed by its argument selects what actions occur when a Group Execute Trigger (GET) command is sent to the 172B. The argument may be 0, 1, or −1.

0 Upon receipt of GET, the programmed waveform values are transferred to the waveform generator circuits, and then the microprocessor sends a trigger pulse if the mode is triggered or triggered haverwave. This is the same sequence of events that would occur if an Execute, then a Trigger action ("IJ") were programmed, except that no error checking is done.

1 Upon receipt of GET, the stored setting next in sequence after the last stored setting accessed is recalled if it exists (refer to paragraph 3.7.2). Then the actions described above for code 0 are performed. This is the same sequence of events that would occur if a Next Setting, an Execute and a Trigger action ("WIJ") were programmed, except that no error checking is done.

−1 Upon receipt of GET, the stored setting previous in sequence before the last stored setting accessed is recalled if it exists (refer to paragraph 3.7.2). Then the actions described for code 0 are performed. This is the same sequence of events that would occur if a Previous Setting, an Execute and a Trigger action ("UIJ") were programmed, except that no error checking is done.

3.6.8 LOCAL Key

Pressing the front panel LOCAL key switches the GPIB interface to the local mode if it is not in the local lockout mode. The "R" (remote) character on the right side of the display will go off when this key is pressed. This allows manual intervention in sequences of GPIB programming. If it is desired to totally prevent front panel alteration of the instrument's state, the GPIB interface must be put into the local lockout mode (refer to paragraph 3.6.2.4, item 4.).

3.7 STORED PROGRAMS

Up to 240 different states of the instrument can be stored in and recalled from Random Access Memory (RAM). The programs (groups of seven settings) stored in RAM are lost if instrument power is turned off. Each progrm contains information specifying instrument frequency, amplitude, offset, mode, function, symmetry and load; all other instrument settings are unaffected.

3.7.1 Storing Programs

Programs may be stored by keyboard or a command received over the GPIB interface. To store a program, first program the seven settings (frequency, amplitude, etc.) which are remembered in a program to the desired value, if not already programmed. Then press the STOR key or program the letter "M", followed by a number between 1 and 240, which identifies the particular program. The previous program with that number assigned, if there was one, is erased by the entry of the new settings. In any case, the current values of the frequency, amplitude, mode, function, symmetry and load settings are stored into the selected program. When a program is stored, the settings are tested for consistency in the same manner as with an Execute command (refer to paragraph 3.3.8). The program is always stored whether or not errors were detected.

3.7.2 Recalling Programs

The information stored in a program may be recovered either from the front panel or by a command over the GPIB. To recall from the front panel, press the RCL key, followed by the number of the desired program. When the next nonnumeric key is pressed, the seven settings stored in the selected program are transferred to the display memory and the analog scratch pad memory. Then data is available to be sent to the analog circuitry of the instrument, or, if desired, it may be examined and possibly altered by use of the front panel keys. Recalling a program over the GPIB is a similar process. First, a "Y" character is programmed, followed by the number of the desired program. When the number is terminated, the program information is transferred to the display and analog scratch pad memories, as above. To preserve compatibility with previous models, the CMD RCL key ("R") and "Z" also access stored programs, acting like the letter "Y".

The identifying numbers of programs in RAM range from 1 through 240. If the number of a program which does not exist or an illegal identifying number is programmed, an error will result.

Pressing the NEXT key or programming "W" causes the program next in sequence after the last program accessed to be recalled. This provides an automatic way to recall a sequence of programs. However, the programs need not be numbered consecutively. If there is no program following the last program accessed, an error occurs.

Pressing the LAST key or programming "U" causes the program previous in sequence before the last program accessed to be recalled. This action works like the NEXT ("W") action previously described, except that programs are recalled in descending numeric order.

3.7.3 Recalling Stored Settings for External Storage

To save existing stored instrument settings, the settings stored at each address must be recalled to the analog scratch pad memory and placed on the GPIB as a status talk message, where they may be recorded on magnetic tape or whatever.

Program a status talk message (T0). Program a recall of the first stored settings (YX where X is 1 - - - 240). Place the scratch pad memory contents on the GPIB by sending the 172B talk address with ATN on. Thereafter, program "W" to call up the next stored settings. Continue the process until all settings are transmitted. (Refer to Appendix C, example 3.)

3.7.4 Deleting Programs

To delete a program, program the letter "M" followed by a *minus* sign and the number of the program to be removed. When the number is terminated, the program is removed from storage; there is no other effect.

3.7.5 High Speed Recall

When the GET mode ("O") setting is set to either 1 or −1, a sequence of programs may be recalled in either ascending or descending order at high speed by sending Group Execute Trigger (GET) commands to the instrument (refer to paragraph 3.6.7). In this mode of operation, the next (or previous) program is recalled and executed, and the waveform circuits are triggered, all within 2 ms of receiving the GET command. (Refer to Appendix C, example 4.)

SECTION 4
CIRCUIT DESCRIPTION

4.1 INTRODUCTION

The major components of the Model 172B are shown in figures 4-1, 4-2 and 4-3. The blocks in figure 4-3 correspond to actual assemblies. Each circuit board is shown as a block diagram in subsequent figures.

The analog portion of the 172B consists of a function generator (VCG, Triangle Generator and Function/Preamp boards), output amplifier with offset and attenuator (Attenuation board) and an optional frequency synthesizer (1st Digit/Mixer, 2nd and 3rd Digit and 4th and 5th Digit/Reference boards). The synthesizer is controlled by logic to produce some multiple of the desired output frequency; its output is within the 1 to 13 MHz range. In synthesizer mode, this frequency is divided down to the desired frequency, by logic control, at the function generator. The function generator is then phase locked to it. In function generator mode, the frequency may be controlled by VCG voltage as well as logic, and, in external phase lock mode, phase lock occurs when the 172B frequency remains within 2% of the external signal frequency.

The digital portion of the 172B consists of the bus and front panel inputs to the microprocessor (Microprocessor and Memory RAM boards) and its output to the analog portion of the 172B. The GPIB input is interfaced to the microprocessor by the GPIB board. The microprocessor also controls the front panel readout and sends status and error messages on the GPIB.

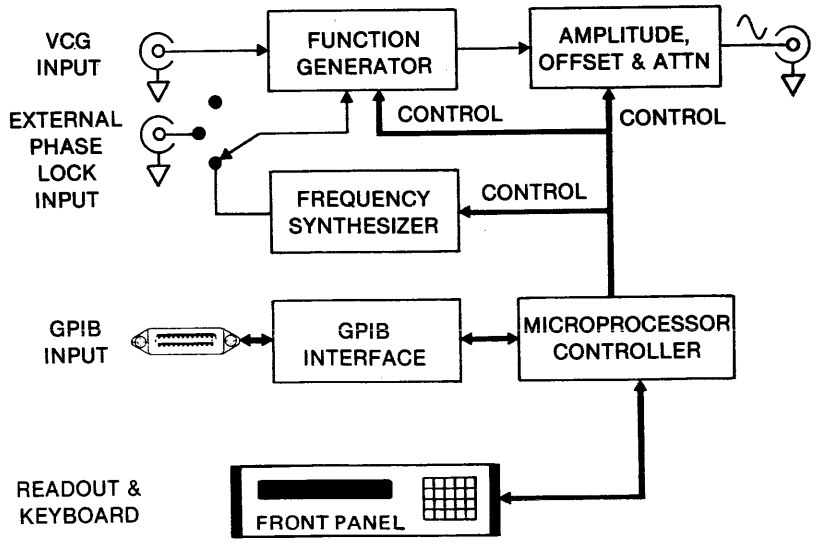
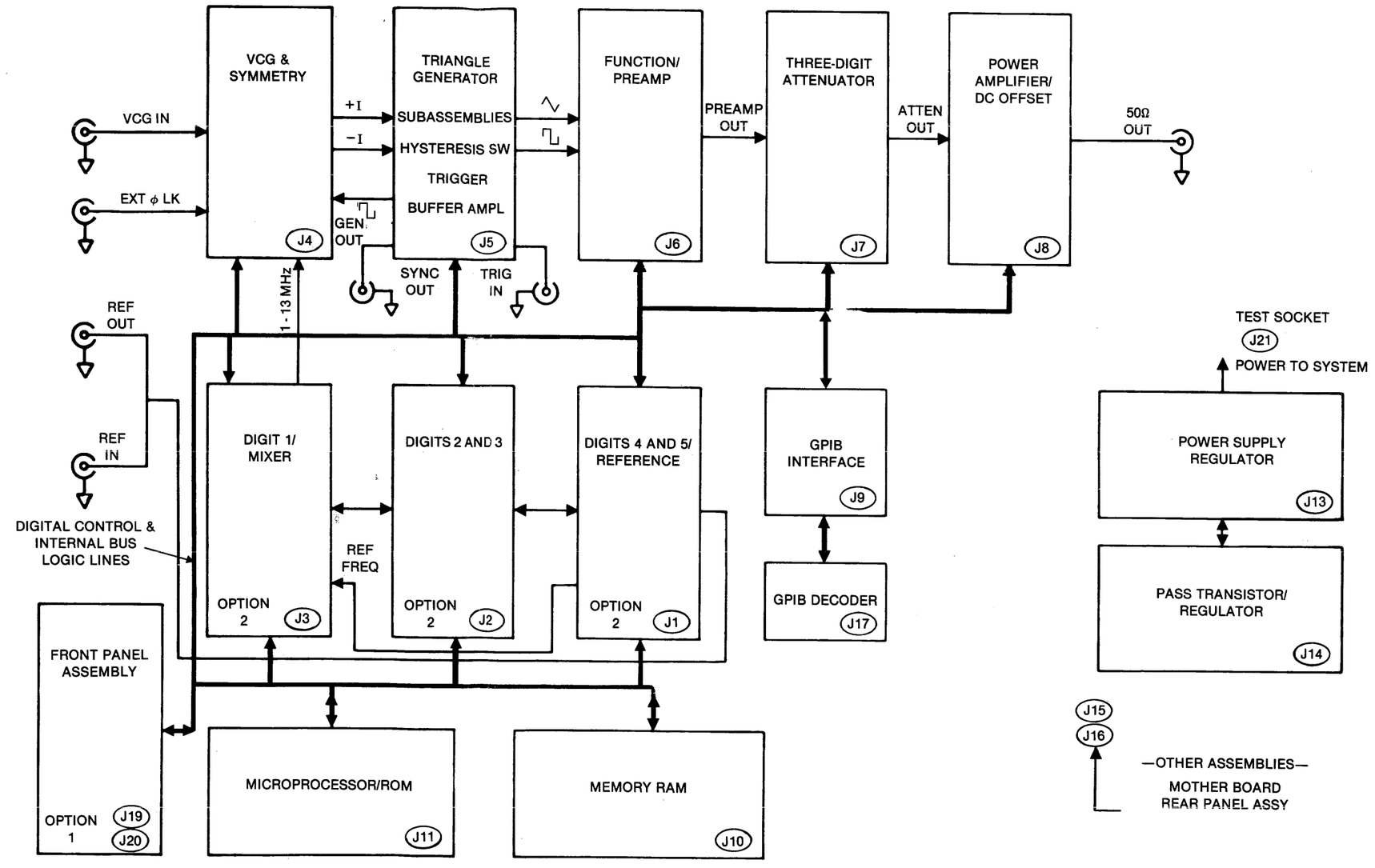
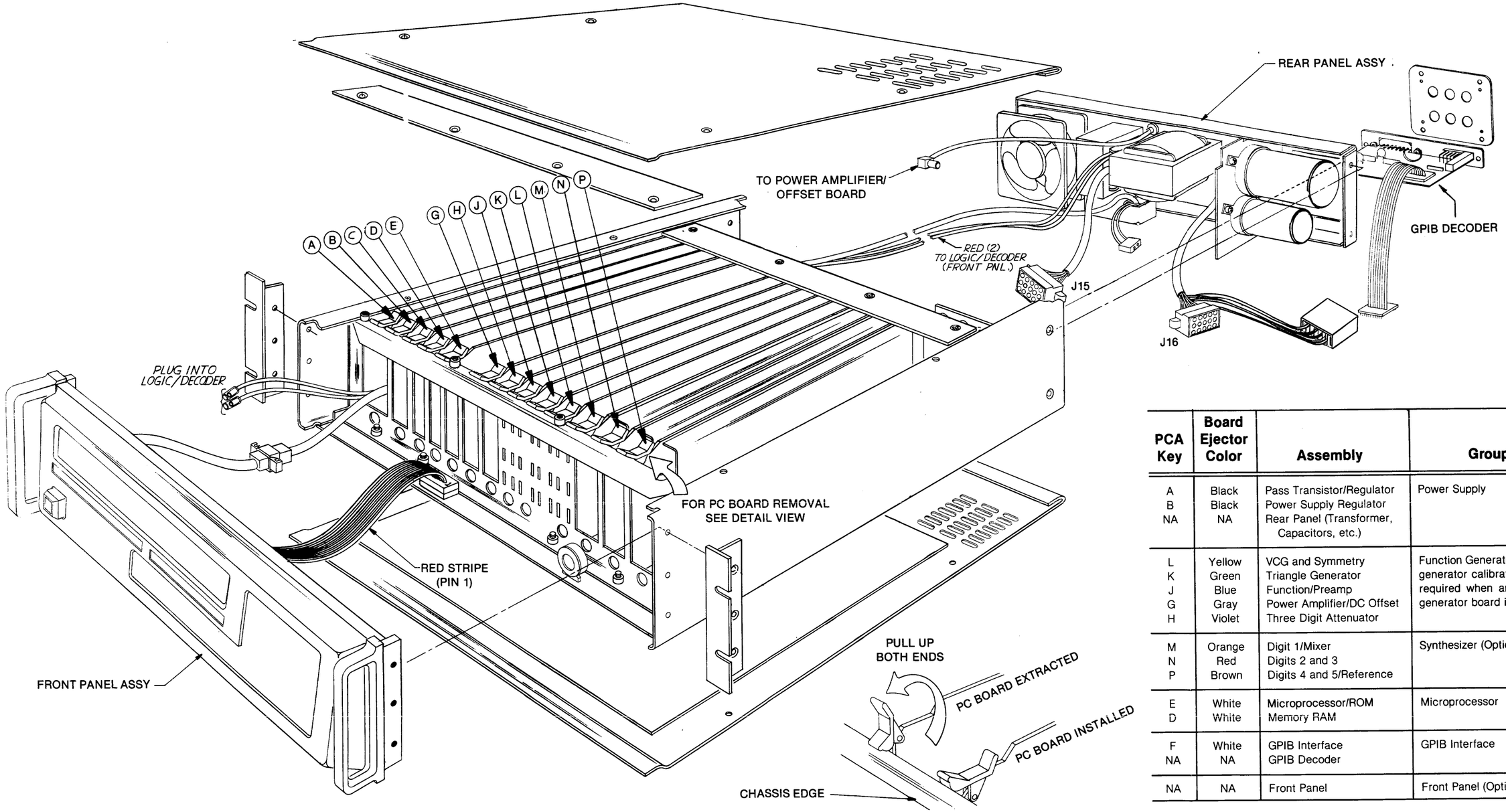


Figure 4-1. Overall Block Diagram





PCA Key	Board Ejector Color	Assembly	Group
A	Black	Pass Transistor/Regulator	Power Supply
B	Black	Power Supply Regulator	
NA	NA	Rear Panel (Transformer, Capacitors, etc.)	
L	Yellow	VCG and Symmetry	Function Generator (function generator calibration usually required when any function generator board is replaced)
K	Green	Triangle Generator	
J	Blue	Function/Preamp	
G	Gray	Power Amplifier/DC Offset	
H	Violet	Three Digit Attenuator	
M	Orange	Digit 1/Mixer	Synthesizer (Option 002)
N	Red	Digits 2 and 3	
P	Brown	Digits 4 and 5/Reference	
E	White	Microprocessor/ROM	Microprocessor
D	White	Memory RAM	
F	White	GPIB Interface	GPIB Interface
NA	NA	GPIB Decoder	
NA	NA	Front Panel	Front Panel (Option 001)

Figure 4-2. Circuit Board Location

4.2 VCG AND SYMMETRY

The purpose of the VCG and Symmetry board (see figures 4-3 and 4-4) is to provide positive and negative currents to the Triangle Generator board that are proportional in amplitude to the desired three digits of frequency; and then proportional, positive current to negative current, according to the desired waveform symmetry.

The input to the VCG and Symmetry board is internal bus logic, VCG (Voltage Controlled Generator) voltage from the VCG (FM) BNC and the synthesizer signal which may be from 1 to 13 MHz, which is some power of ten multiple of the programmed frequency. The logic is controlled by programmed mode, frequency range and the three-digit frequency value.

The frequency of the generator is determined by the rate of charge and discharge of the "range" capacitance on the Triangle Generator board (see figure 4-5) by the positive and negative currents. The entire range of frequencies from 0.1 mHz to 13 MHz is achieved by selecting a capacitance, then varying the current from low to high. When near maximum current is reached, a smaller capacitance is selected and the current increased from low to high again. Each set of capacitance determines a frequency range. This scheme is used until 1 MHz is reached. From 1 through 13 MHz, an additional boost in current is used in lieu of a change in capacitance. (Symmetry control is inhibited on this range.) This boost is logic controlled (see figure 4-4), as is switching in individual alignment resistors for each range. See frequency range blocks on the diagram. Internal bus control logic from the microprocessor also selects three digits of frequency within a range and determines whether or not external voltage (VCG) will be allowed to share in the control of the frequency of the generator. If in synthesizer or phase lock mode, VCG is not allowed. The input VCG voltage, if allowed, is combined with the other voltages at the digital to analog amplifier to drive the current generators.

Programming the symmetry selects the resistances which control the balance between the positive and negative current generators.

In phase lock or synthesizer mode, the analog voltage that controls the current generators is supplemented with the error voltage required to maintain phase lock with an external signal or phase lock with the synthesizer circuits. This error voltage is generated by phase detecting the difference between the square wave from the triangle generator hysteresis switch and the external signal or the synthesizer signal, whichever was selected by mode logic. The generator square wave will be in phase with the external input and the sine wave 90° out of phase when external phase lock is selected. The external signal and the generator signal must be within 2% of frequency for phase lock to occur. The compared synthesizer frequency is always within 2% of the generator frequency. The synthesizer itself has a range of only 1 to 12.999 MHz; hence, the divide by N circuit prior to the phase detector.

If the generator frequency is in the 10^6 range, no division is required; however, for each lower range a division must occur prior to phase detection and phase locking of the generator to the synthesizer:

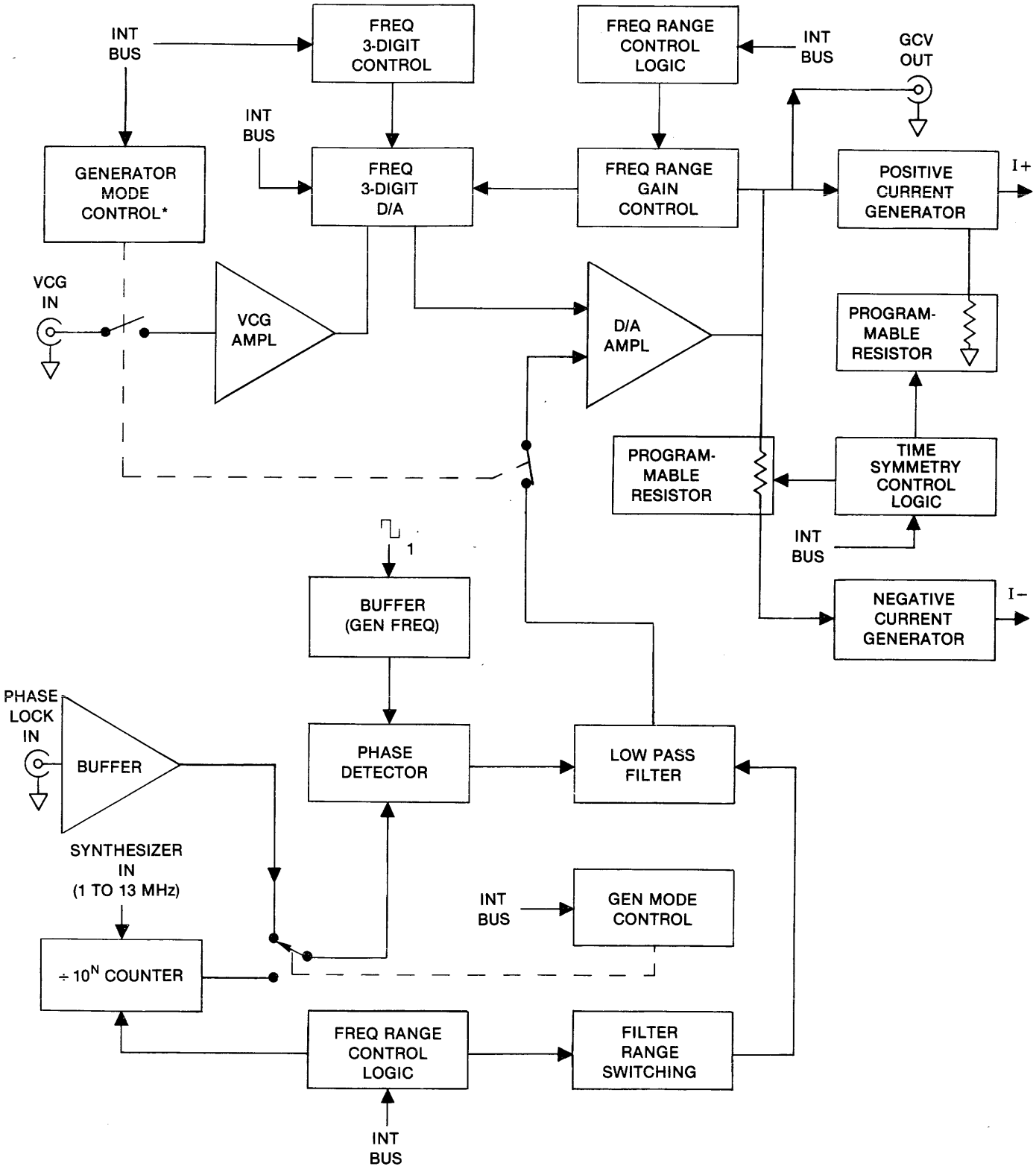
Range	N
10^6	1
10^5	10^1
10^4	10^2

etc.

The purpose of the Triangle Generator board (see figures 4-3 and 4-5) is to produce both the triangle and square waveforms at the frequency determined by the currents from the VCG and Symmetry board. The generator will free run or will turn on and off in response to a trigger or gate voltage, depending on the mode selected.

Input to the board is trigger voltage applied at the TRIG IN BNC, internal bus control logic and positive and negative currents proportional to the programmed frequency and symmetry from the VCG and Symmetry board. Output is the triangle and square waveforms to the Function/Preamp board and a sync signal based on the square wave to the SYNC OUT BNC. Triggered output starts at the normal 0° waveform phase or, when in haverwave modes, −90° phase.

The diode switch, which is controlled by the hysteresis switch, is used to switch the positive or negative current to the timing capacitor selected by the frequency range logic. When the positive current is switched into the timing capacitor, the voltage across the capacitor will rise linearly to generate the triangle rise transition. When the current is negative, the voltage across the timing capacitor will fall linearly to produce the fall transition of the triangle.



*Selects Phase Lock, Synthesizer or VCG

Figure 4-4. VCG and Symmetry Block Diagram

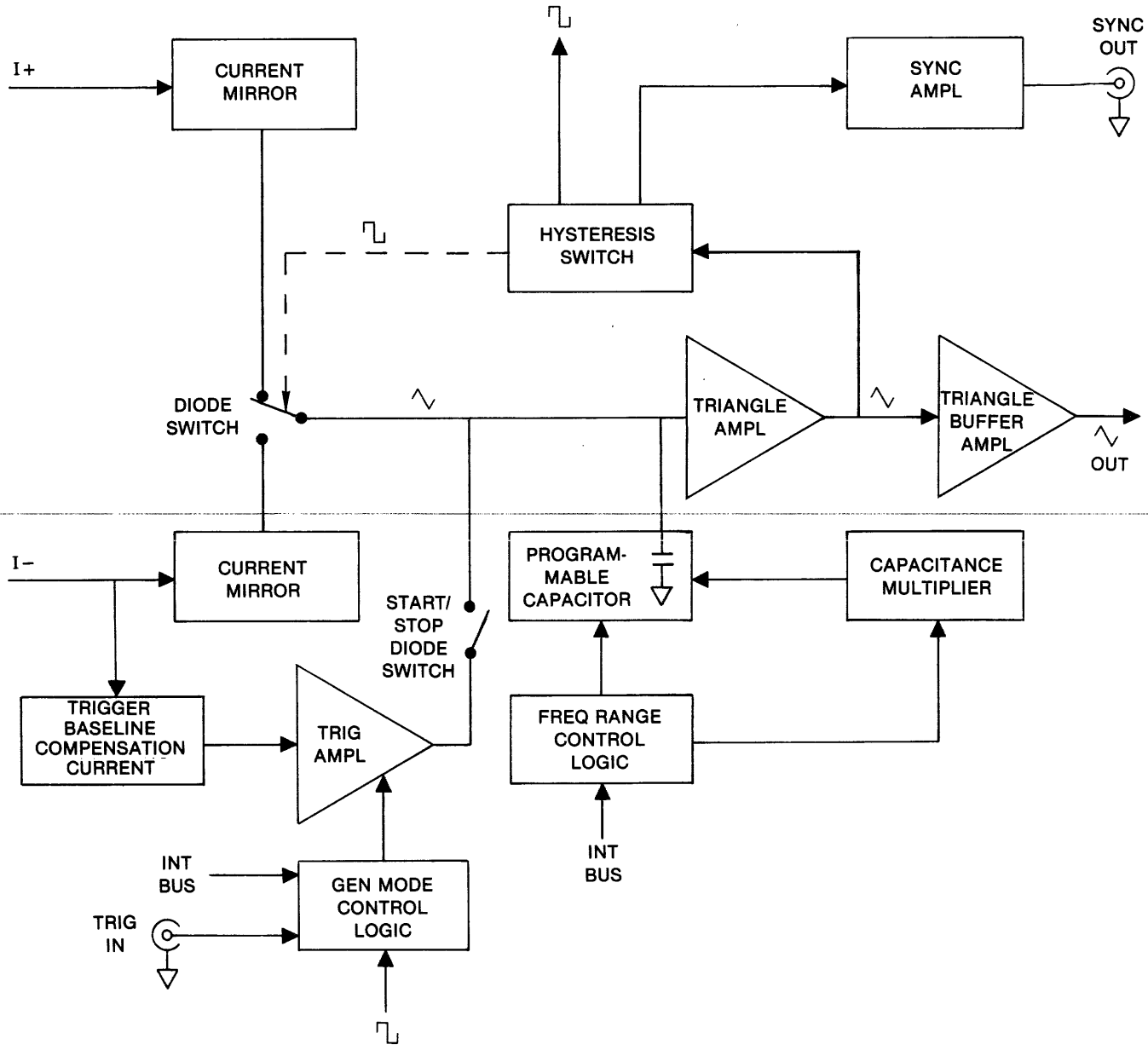


Figure 4-5. Triangle Generator Block Diagram

The triangle amplifier output is fed to the hysteresis switch and to the $\wedge\!\!\vee$ buffer amplifier. The $\wedge\!\!\vee$ buffer is fed to the Function/Preamp board (see figure 4-6). The hysteresis switch has two voltage limit points ($+1.25$ and -1.25) at its input.

During the time the output voltage of the triangle amplifier is rising, the output voltage of the hysteresis switch is positive, but when the output voltage of the triangle amplifier reaches $+1.25$V, it triggers the hysteresis switch, causing the hysteresis switch output to switch negative. Once the control voltage into the diode gate becomes negative, it switches the positive current out and the negative current in to the timing capacitor, so that the direction in the voltage change across the capacitor reverses, starting a linear decrease of the waveform. When the decreasing voltage reaches -1.25V, the hysteresis switch output switches back to positive, reversing the process. This action generates the triangle waveform. Since the hysteresis switch output is a square wave, the result is simultaneous generation of a square wave and a triangle wave at the same frequency.

The frequency is range controlled by selecting various capacitance and finely controlled by the charging currents. Symmetry of the waveforms is controlled by the degree of imbalance between positive and negative currents. To avoid the use of very large capacitors for the low frequency ranges, a capacitance multiplier circuit simulates a larger capacitor by a proportional decrease in charging current.

The enabling of generator operation is controlled by allowing or preventing the selected timing capacitor to charge. For continuous operation, the trigger amplifier maintains a positive level above the positive peak developed by the charging capacitors. This reverse biases (turns off) the start/stop diode switch, preventing the trigger amplifier from affecting continuous operation.

When in trigger mode, the trigger amplifier outputs some level below the positive peak charging level, the diode switch is forward biased (turned on) holding the charging level constant and preventing the capacitor from charging to the positive peak. This stops operation and holds the output at a dc level called the trigger baseline, the level from which a waveform cycle starts and where it will stop. Normally, this is midway between the peaks. In the haverwave mode and for square and pulse functions, it is at the negative peak level.

When the charging level is being held, the negative current generator still varies its output with corresponding frequency control inputs. These varying currents must be taken up through the diode switch to keep the timing capacitors from varying their charge, and thus the trigger baseline. The baseline compensation circuit monitors the output from the negative current generator to control the trigger amplifier, and thus the necessary compensating current through the diode switch.

The generator mode control circuit determines whether the trigger control logic is to be "fired" for just one cycle, or is to be held on for the duration of the trigger input during gated mode or is to be held on continuously during continuous mode. When in gated mode, the trigger signal is directly coupled for controlling the trigger control logic. In the trigger mode, the trigger signal is capacitively coupled to provide a leading edge spike to "fire" the trigger control logic. The trigger control logic determines that after a waveform starts, it always stops at a complete cycle at the same phase at which it started. The trigger control logic latches the trigger amplifier for an enabling output from the time the cycle starts to when the negative peak of the last cycle is reached (just one cycle in the trigger mode). Upon reaching the negative peak, the timing capacitor wants to continue charging positive again as usual, but stops upon reaching the trigger baseline. A square wave from the hysteresis switch synchronizes the last negative peak time for unlatching the trigger amplifier.

4.4 FUNCTION/PREAMP

The Function/Preamp board (see figure 4-3 and 4-6) creates a sine waveform and selects the output function as one of the following:

Sine wave
Triangle wave
Square wave
Inverted (with respect to sync) sine wave
Inverted (with respect to sync) triangle wave
Inverted (with respect to sync) square wave
No signal

The input to the Function/Preamp board is the buffered triangle wave and square waveform from the Triangle Generator board and the internal bus logic. Output is the selected function or dc, which goes to the Three-Digit Attenuator board (see figure 4-7).

The triangle wave is processed by nonlinear diode networks to produce a sine wave, and the square wave is precisely clipped. All three waveforms, triangle, sine and square, are present for function selection by logic. The selected waveform, or no waveform, is amplified and presented in both normal and inverted form for final logic selection.

4.5 THREE-DIGIT ATTENUATOR

The Three-Digit Attenuator board (see figures 4-3 and 4-7) accurately controls the amplitude of the output signals from the Function/Preamp board and within the particular range setting.

The input is the internal bus logic and the signal selected by the Function/Preamp board. The output is the attenuated signal sent to the Power Amplifier/DC Offset board. The logic sets the attenuation network to accurately produce an amplitude expressed as XX.X.

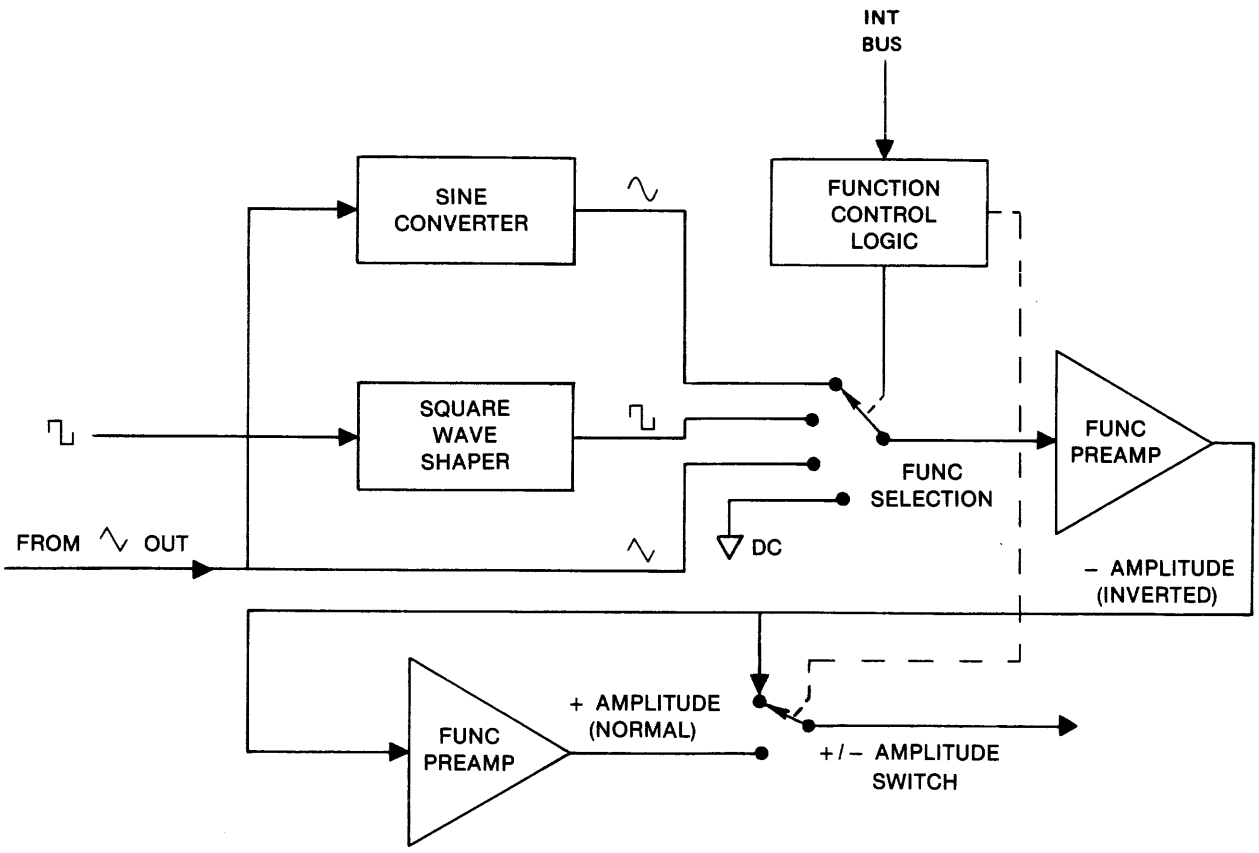


Figure 4-6. Function/Preamp Block Diagram

4.6 POWER AMPLIFIER/DC OFFSET

As controlled by logic, the Power Amplifier/DC Offset board (see figures 4-3 and 4-7) amplifies the three-digit attenuated signal by the amount corresponding to the amplitude range value; dc offsets the signal, connects or disconnects the signal from the output BNC and connects or disconnects an internal load termination. The input to the board is the three-digit accurate signal (X.XX) from the Three-Digit Attenuator board and internal bus logic. The output is the finally processed signal to the output BNC connector.

The three-digit signal is amplified and offset (if required) at the power amplifier circuit. The three-digit value of offset (X.XX) is logic controlled as is the positive or negative direction of offset. The sum of offset and signal amplitude is amplified to 15 volts peak (30V p-p), then attenuated to the logic controlled range value. The range value is logic selected to be the greater of amplitude or offset programmed range. The output signal is then output and loaded according to control logic.

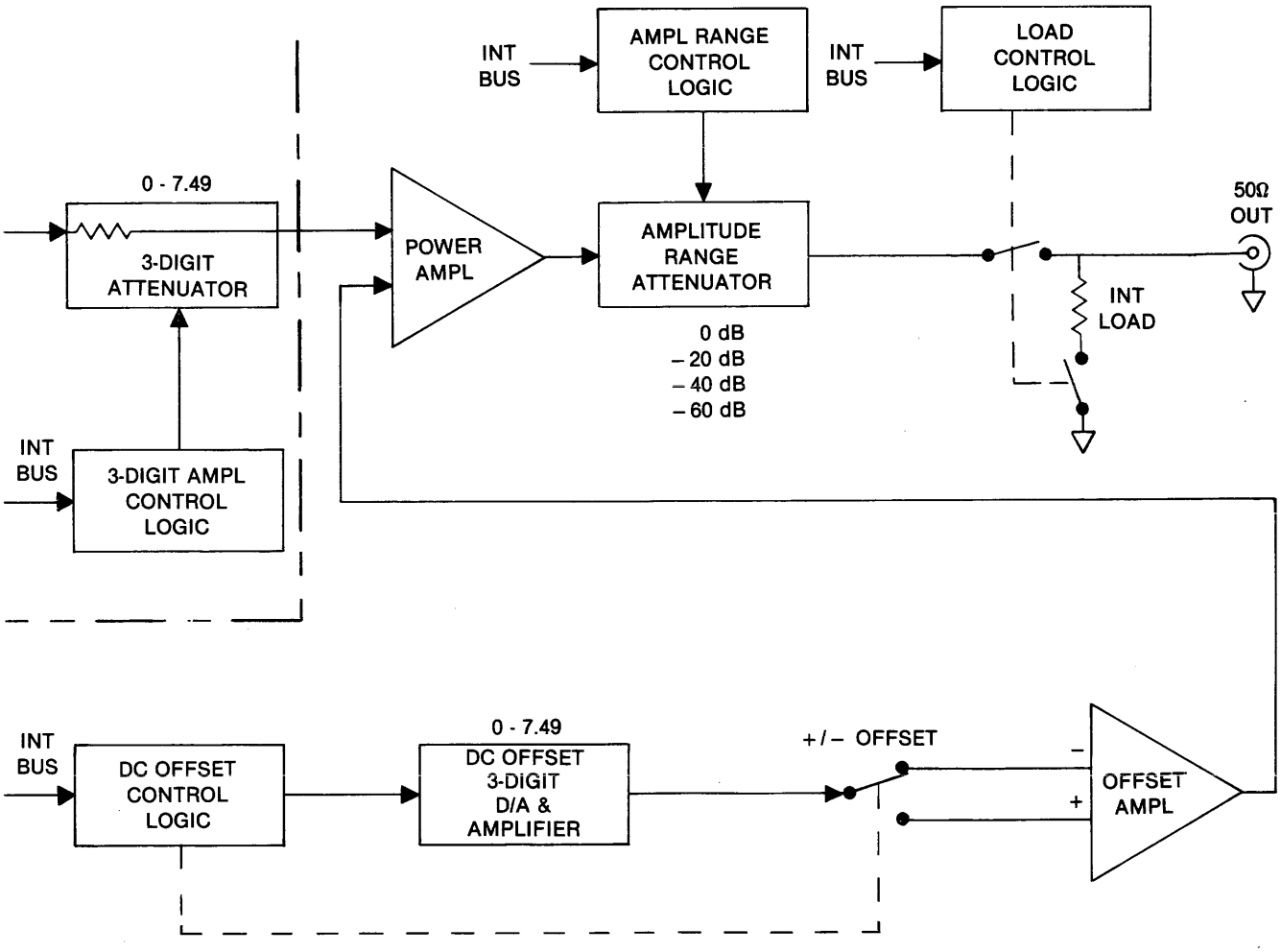


Figure 4-7. Three-Digit Attenuator and Power Amplifier/DC Offset Block Diagram

4.7 SYNTHESIZER (An Option)

The synthesizer (see figure 4-3: Digit 1/Mixer, Digits 2 and 3, Digits 4 and 5/Reference boards) provides 1 to 12.999 MHz with five-digit accuracy. The function generator circuit is phase locked to multiples of the synthesizer output for waveform functions with five-digit frequency accuracy. Four phase locked loops (PLL's) are connected together along with a mixing system and a reference section of the required fixed frequencies to make up the synthesizer. These sections are packaged as Digit 1/Mixer board, Digits 2 and 3 board and Digits 4 and 5/Reference board.

Figure 4-8 is the block diagram of a simple PLL. The output frequency is to be exactly some multiple of the reference frequency (f_r). The output frequency of the voltage controlled Variable Frequency Oscillator (VCO) is divided by a digital counter circuit. The output frequency of the divide by N($\div$ N) is compared with the reference frequency (f_r) by a frequency phase detector. If the frequency and/or phase of the two signals differ, an error voltage is generated which causes the VCO to change its frequency, moving in the proper direction to correct for the error. There is an integrator/Low Pass Filter (LPF) between the phase detector output and the VCO to eliminate high frequencies out of the detector and to insure loop stability. The output frequency is the reference frequency multiplied by the $\div$ N ratio.

Figure 4-9 is a block diagram of the digit 1 PLL of the five-digit synthesizer. The output of this loop goes from 35 to 47 MHz, as the most significant digit of the synthesizer output frequency is varied from 0 to 12 MHz. This block diagram is different from figure 4-8 in that there is a fixed $\div$ 2 ahead of the programmable divider. This makes the total $\div$ N ratio twice that of the programmable divider alone. If the total synthesizer output is required to be 10,000 MHz, then the digit 1 loop output will be 45 MHz. The number 10 will be loaded into the programmable divider in Binary Coded Decimal (BCD) form by the logic interface portion of the 172B. The programmable divider translates this number 10 into the divider ratio 45 with a PROM look-up table. The programmable divider ratio 45, together with the fixed divide by 2, gives a total $\div$ N of 90. The 500 kHz reference frequency multiplied by 90 gives an output frequency of 45 MHz. The programmable divider alone, and a 1 MHz reference frequency, would give the same results; the $\div$ 2 is used to allow a lower maximum operating frequency for the programmable divider.

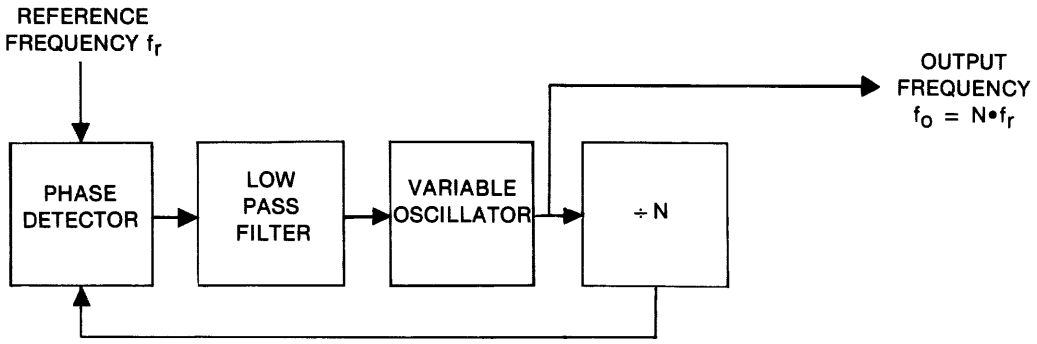


Figure 4-8. Simple Phase Lock Loop Block Diagram

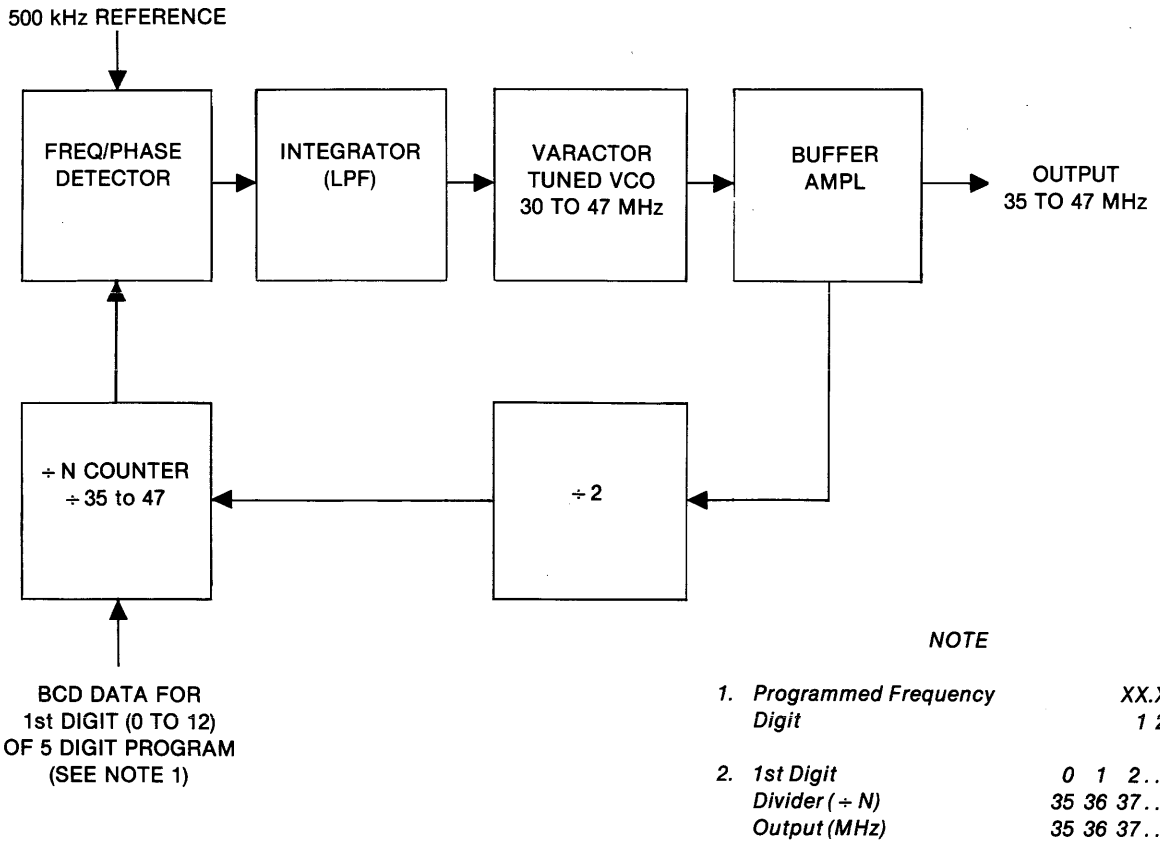


Figure 4-9. Digit 1 PLL (Part of Digit 1/Mixer Board) Block Diagram

Figure 4-10 shows a slightly more complex PLL. In this loop, the VCO output is translated to a different frequency range before being divided by the ÷N counter. A bandpass filter follows a mixer to select either the resulting sum or difference frequency. This form of loop causes the VCO output to be different from N times the reference frequency by a fixed offset. Mathematically expressed, $f_O = Nf_r \pm f_m$.

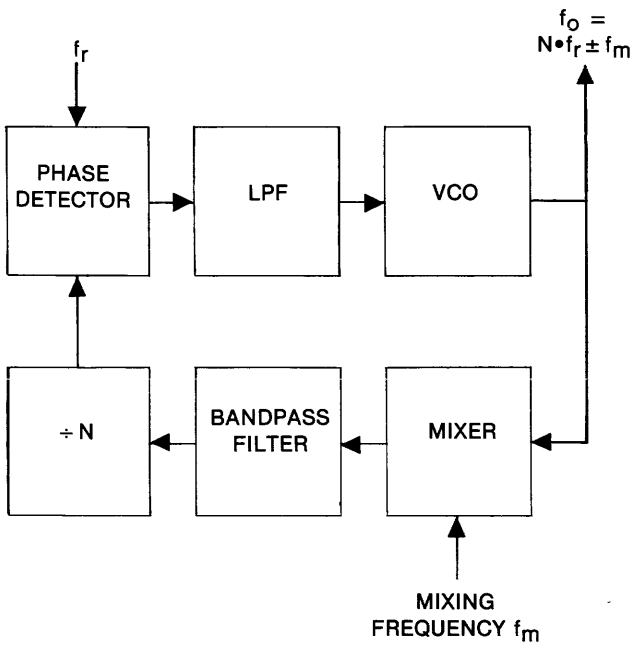


Figure 4-10. PLL With Mixer Block Diagram

Figure 4-11 shows the block diagram for digits 4 and 5 PLL. A fixed frequency of 60.0 MHz from the reference subsection is mixed with the 40 to 50 MHz VCO. The difference frequency (10 to 20 MHz) is passed through a 30 MHz low pass filter into a buffer amplifier. The amplified signal drives the divide by N counter, which divides the input frequency by a number ranging from 100 to 199, depending on the frequency setting of digits 4 and 5. The ÷N output is compared with a 100 kHz signal from the reference board in the phase detector. If there is a phase error, the phase detector will output a voltage pulse to the integrator which will change its output in the proper direction to reduce the VCO frequency error towards zero. The 4.01 to 50 MHz VCO output is divided by 100 to provide the desired 401 to 500 kHz output. The final 401 to 500 kHz output varies in 1 kHz steps as the ÷N ratio varies from 100 to 199. To obtain 500 kHz out, the required VCO frequency is 50 MHz. This mixes with the 60.0 MHz reference to produce a 10.0 MHz difference frequency. Digits 4 and 5 will both be zero in the case of a 500 kHz output, so the ÷N ratio will be 100. Dividing 10 MHz difference frequency by 100 will produce 100 kHz to compare with the 100 kHz reference. If digits 4 and 5 are set to 99, the ÷N becomes 199, and the VCO will be forced to 40.1 MHz, which will mix with 60 MHz to produce a 19.9 MHz difference frequency. The 40.1 MHz VCO will be divided by 100 to form the 401 kHz output.

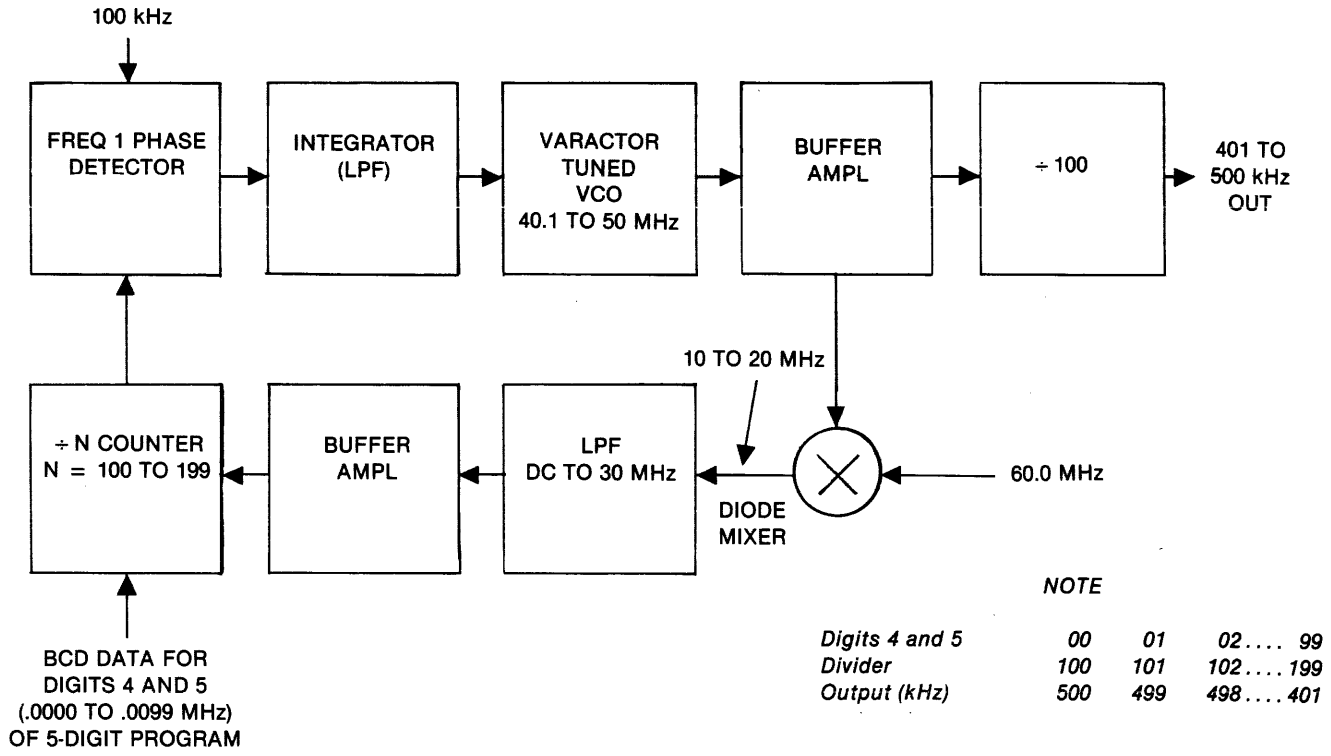


Figure 4-11. Digits 4 and 5 PLL (Part of Digits 4 and 5/Reference Board) Block Diagram

Figure 4-12 shows the digits 2 and 3 PLL. This loop is almost identical to the digits 4 and 5 PLL. The offset frequency is 60.401 to 60.500 MHz instead of 60.0 MHz and the ÷ N counter ratio varies between 105 to 204 instead of 100 to 199. The VCO output is divided by 10 instead of 100, to form a 4 to 5 MHz output. If digits 4 and 5 are 00, the translation loop output to this loop will be 60.500 MHz. If digits 2 and 3 are 00, the ÷ N ratio is 105. Under these conditions, the required VCO frequency is 50.0 MHz. This mixes with 60.5 MHz to produce a 10.5 MHz difference, which is divided by 105 in the ÷ N to give a 100 kHz signal for the phase detector. Thus, the final output, after division, will be 5.0000 MHz. If digits 4 and 5 are set to 99, the translation loop output is 60.401 MHz. In this case, the VCO output has to be 49.901 MHz to satisfy the loop conditions, and the final output will be 4.9901 MHz. If digits 2 and 3 are also set for 99, the ÷ N ratio will be 204, and a 40.001 MHz signal will be required from the VCO to mix with the 60.401 MHz to produce the 20.400 MHz difference frequency into the ÷ N. In this case, the final output will be 4.0001. Thus, the output of this loop is seen to track changes in digits 4 and 5, as well as digits 2 and 3, which control the loop directly.

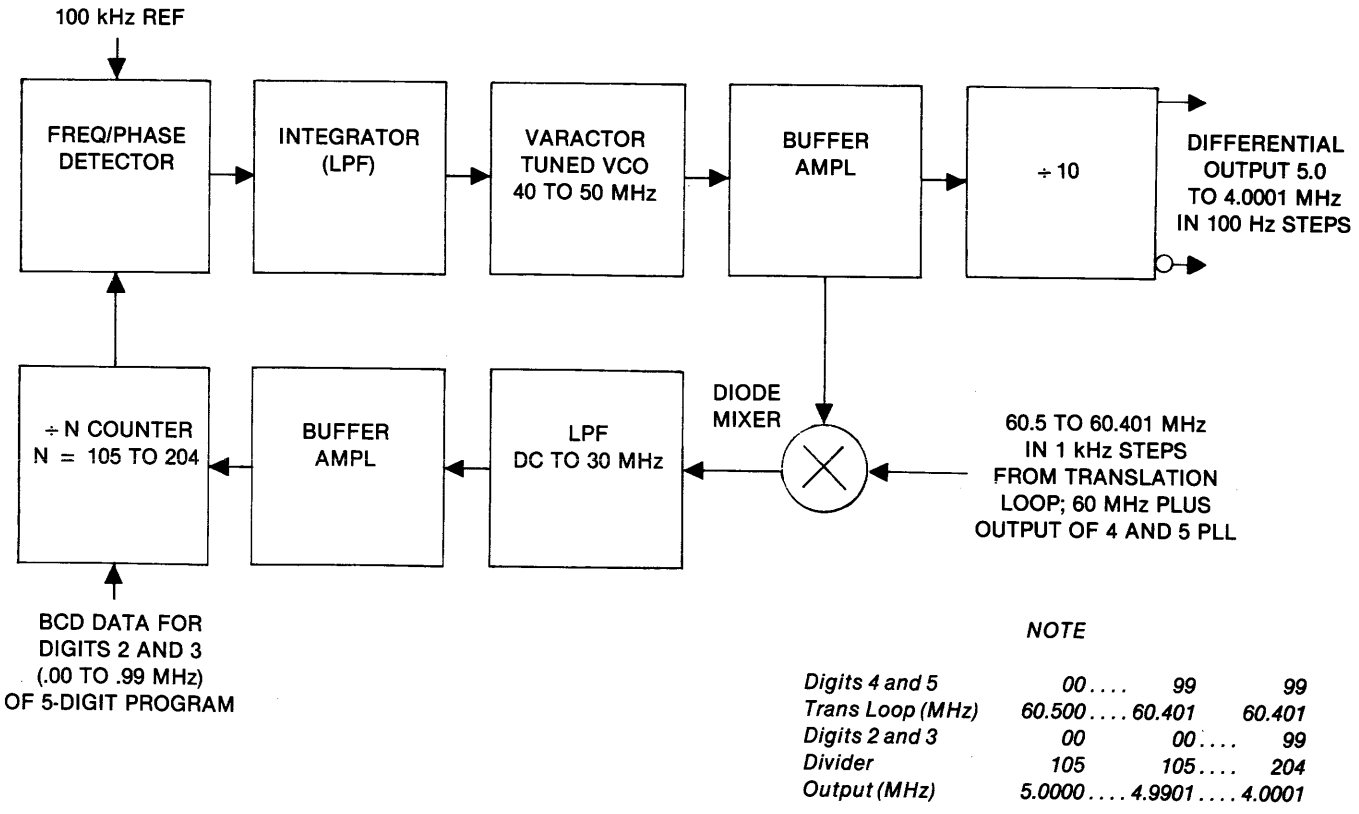


Figure 4-12. Digits 2 and 3 PLL (Part of Digits 2 and 3 Board) Block Diagram

Figure 4-13 is a block diagram of the translation loop. Its function is to produce a signal 60 MHz higher than the 401 to 500 kHz signal from digits 4 and 5 PLL (i.e., 60.401 to 60.500 MHz). In this loop there is no divide by N. The VCO output is mixed with a 60.0 MHz reference frequency and the difference frequency is selected by a low pass filter, buffered and applied directly to the frequency phase detector for comparison with the digits 4 and 5 output. The phase detector output drives the integrator to a voltage which sets the VCO to the proper frequency.

Figure 4-14 shows the mixer subsection and how the different loops connect together. As previously described, the digits 4 and 5 loop output is shifted upward to 60.401 to 60.500 MHz to drive the digits 2 and 3 loop. The output of the 2 and 3 loop varies from 4.0001 to 5.0000 MHz as a function of digits 2, 3, 4 and 5. This output is mixed with a 30.0 MHz signal in a double balanced modulator, and the sum of the two signals is selected by a 34 to 35 MHz bandpass filter. The output of this filter is mixed with the digit 1 loop output, 35 to 47 MHz, in a diode mixer and the difference frequency selected by a low pass filter. Take a frequency of 12.3456 MHz as an example. Digits 4 and 5 are set to 5 and 6, respectively. The output of the digits 4 and 5 PLL will be 444 kHz, and the translation loop will shift this up to 60.444 MHz. Digits 2 and 3 are set to 3 and 4; therefore, the output of the digits 2 and 3 PLL will be 4.6544 MHz, and, after mixing with 30.0 MHz, this will be 34.6544 MHz. Digit 1 is 12, so the output of the digit 1 PLL will be 47 MHz. This 47 MHz is mixed with 34.6544 and the difference is taken to form a 12.3456 MHz signal. This is the synthesizer section output which is then passed to the function generator. If the generator is set to the 1 to 13 MHz range, the function generator is phase locked directly to this signal. If the generator is on a lower range, the synthesizer output is divided by some power of 10 before the generator is locked to it.

Figure 4-15 is the block diagram of the reference subsystem. All reference frequencies are derived from a single, high stability, 10 MHz crystal controlled oscillator. This signal is multiplied by 3 to produce the 30 MHz reference, and this is then multiplied by 2 to form the 60 MHz reference. The 10 MHz is also divided by 20 to form a 500 kHz digital signal and this is divided by 5 to form a 100 kHz reference. If it is necessary to lock the synthesizer to an external 10 MHz system clock, the external clock is fed to a level detector/buffer amplifier. The output of the buffer amplifier and the internal 10 MHz oscillator are both fed to a phase detector, which in turn is fed to an integrator/low pass filter. If the external clock input is greater than 1 volt, a relay is closed automatically, connecting the integrator output to a variable capacitor for fine tuning the crystal oscillator. This locks the internal oscillator to the external system clock.

The block diagrams of figures 4-16 through 4-18 are printed circuit board oriented, showing which functions are related to what boards.

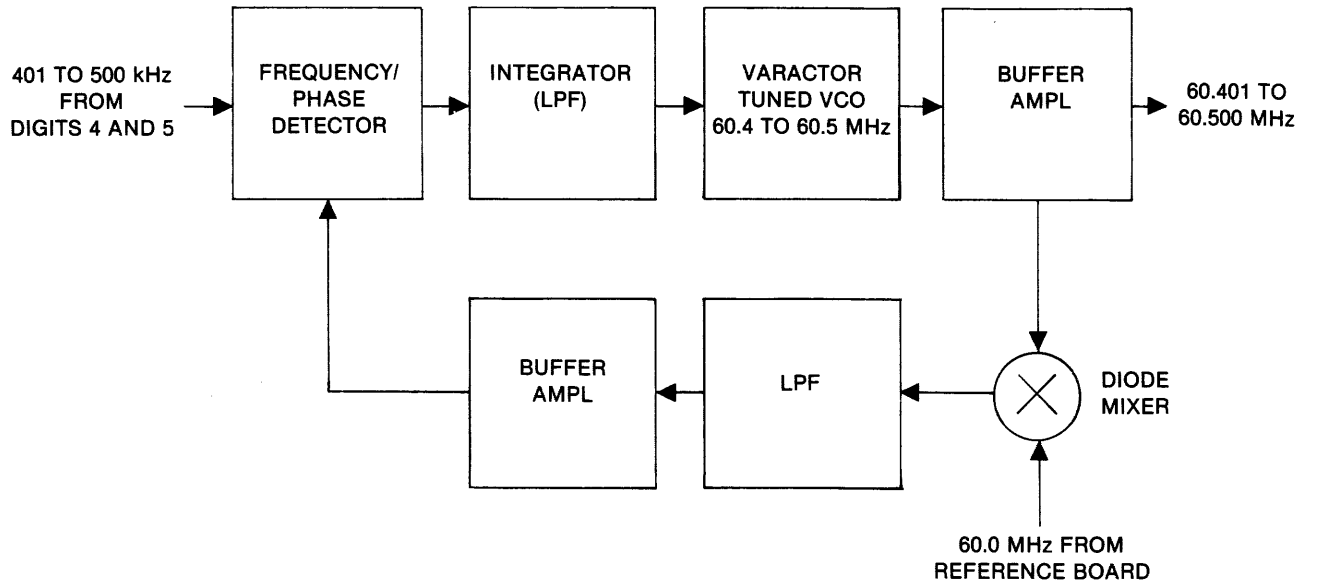


Figure 4-13. Translation Loop (Part of Digits 2 and 3 Board) Block Diagram

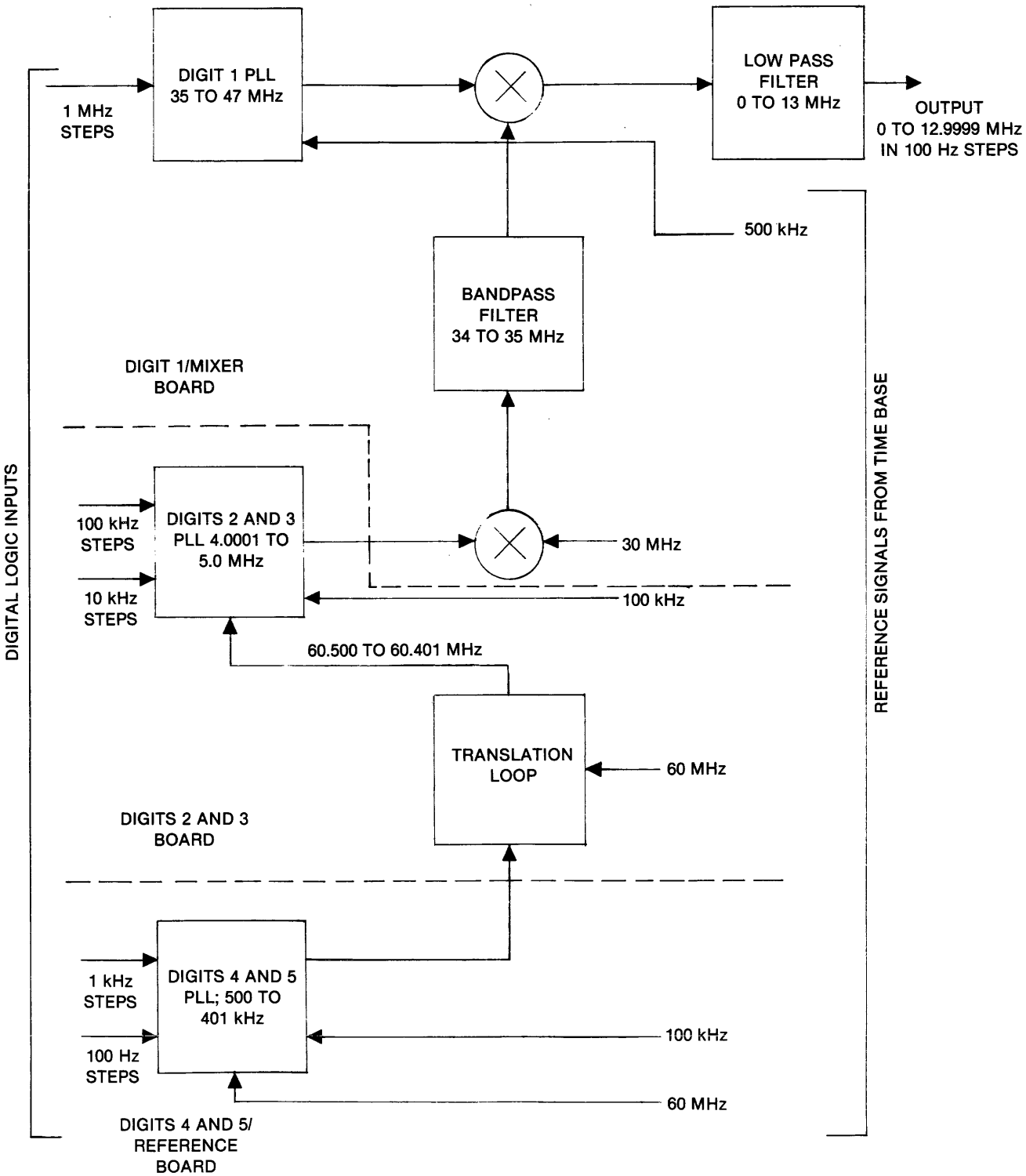


Figure 4-14. Synthesizer Block Diagram

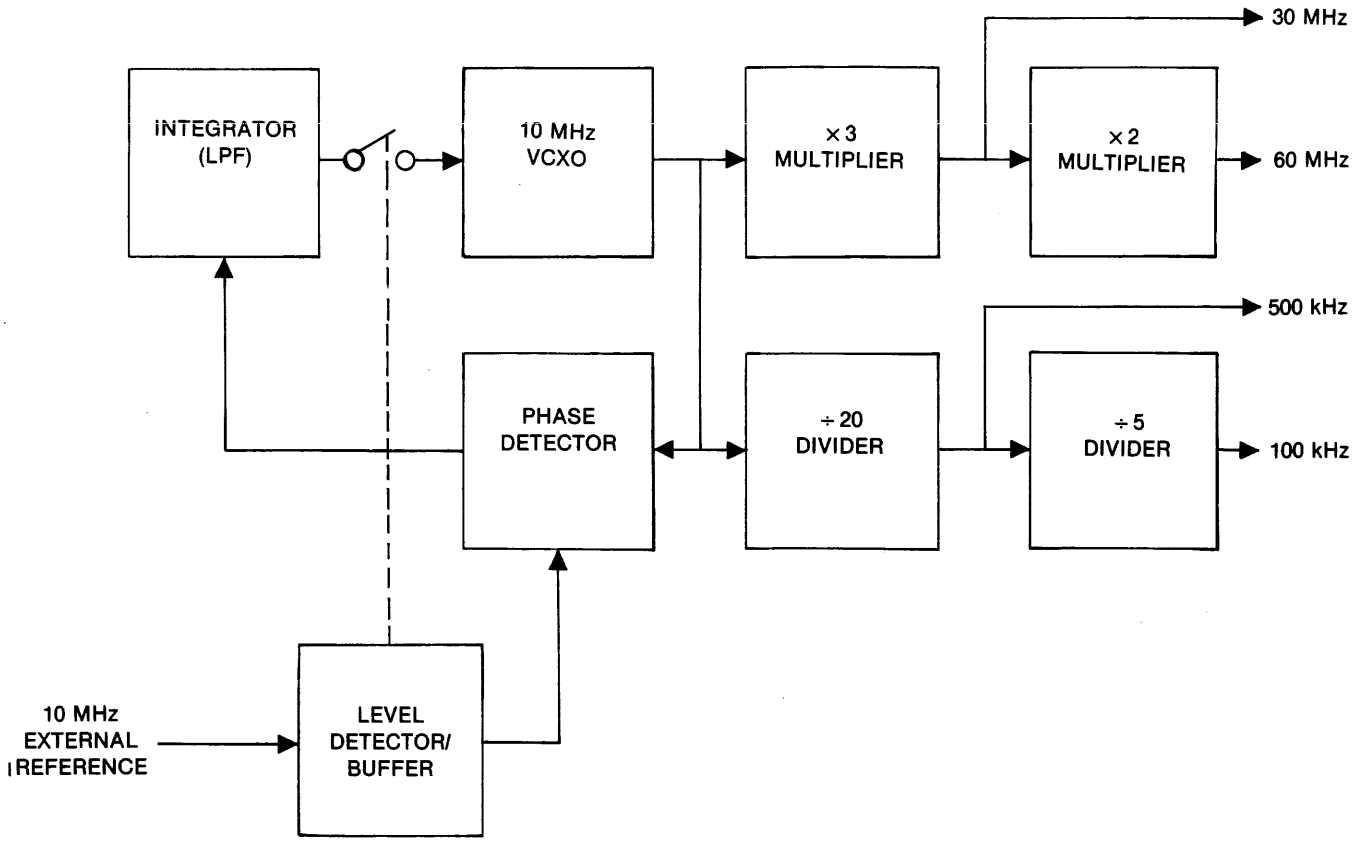


Figure 4-15. Reference Subsystem (Part of Digits 4 and 5/Reference Board) Block Diagram

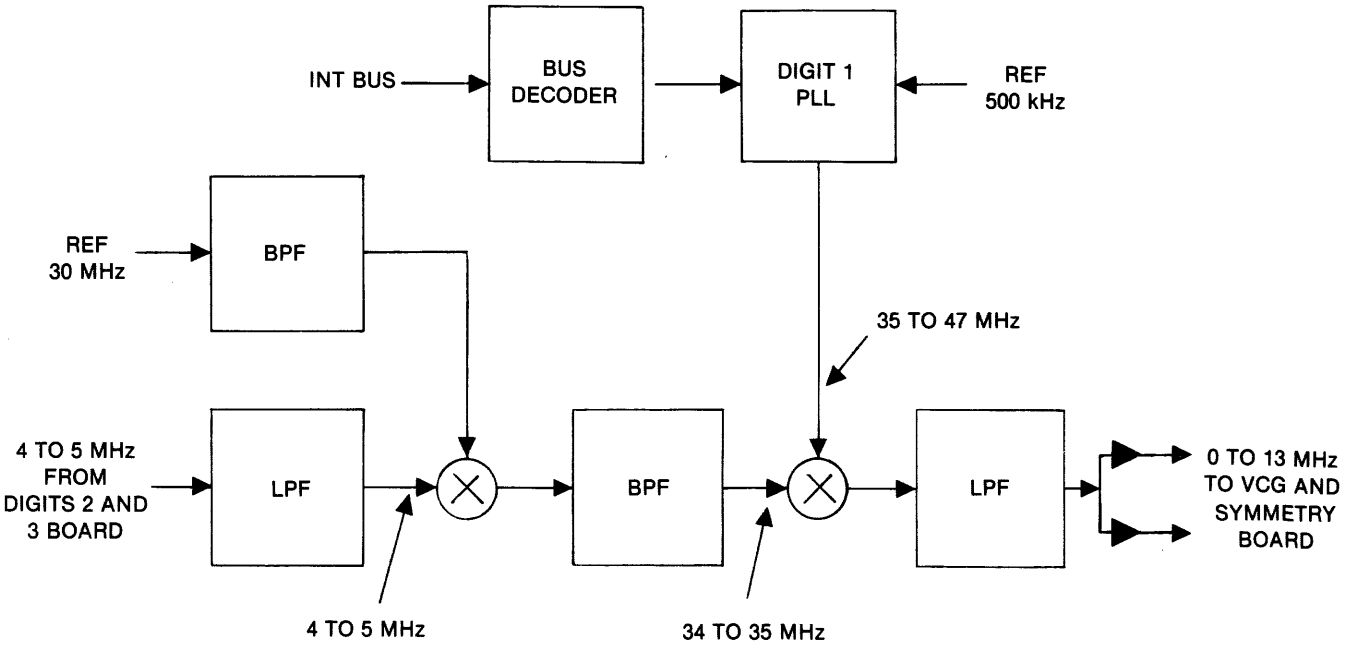


Figure 4-16. Digit 1/Mixer Block Diagram

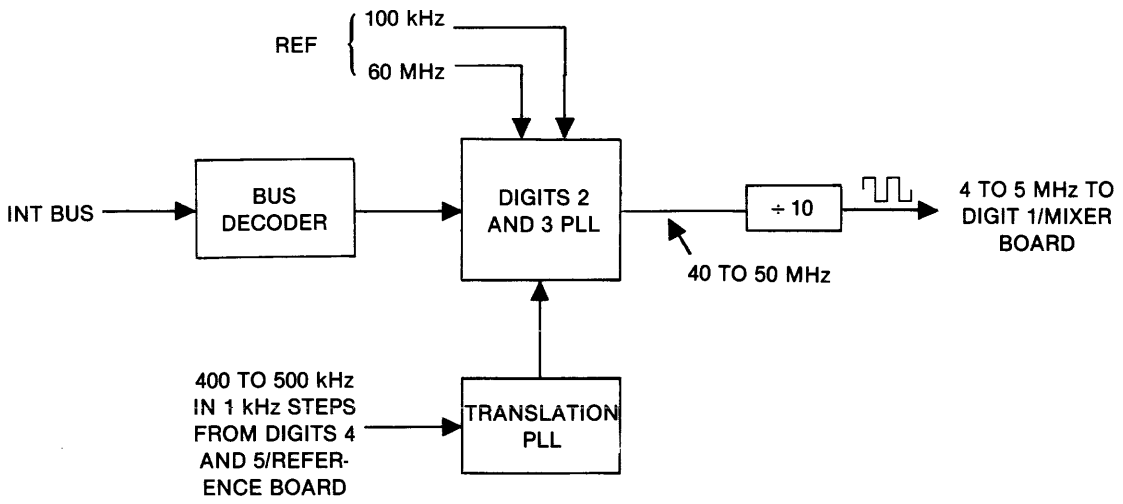


Figure 4-17. Digits 2 and 3 Block Diagram

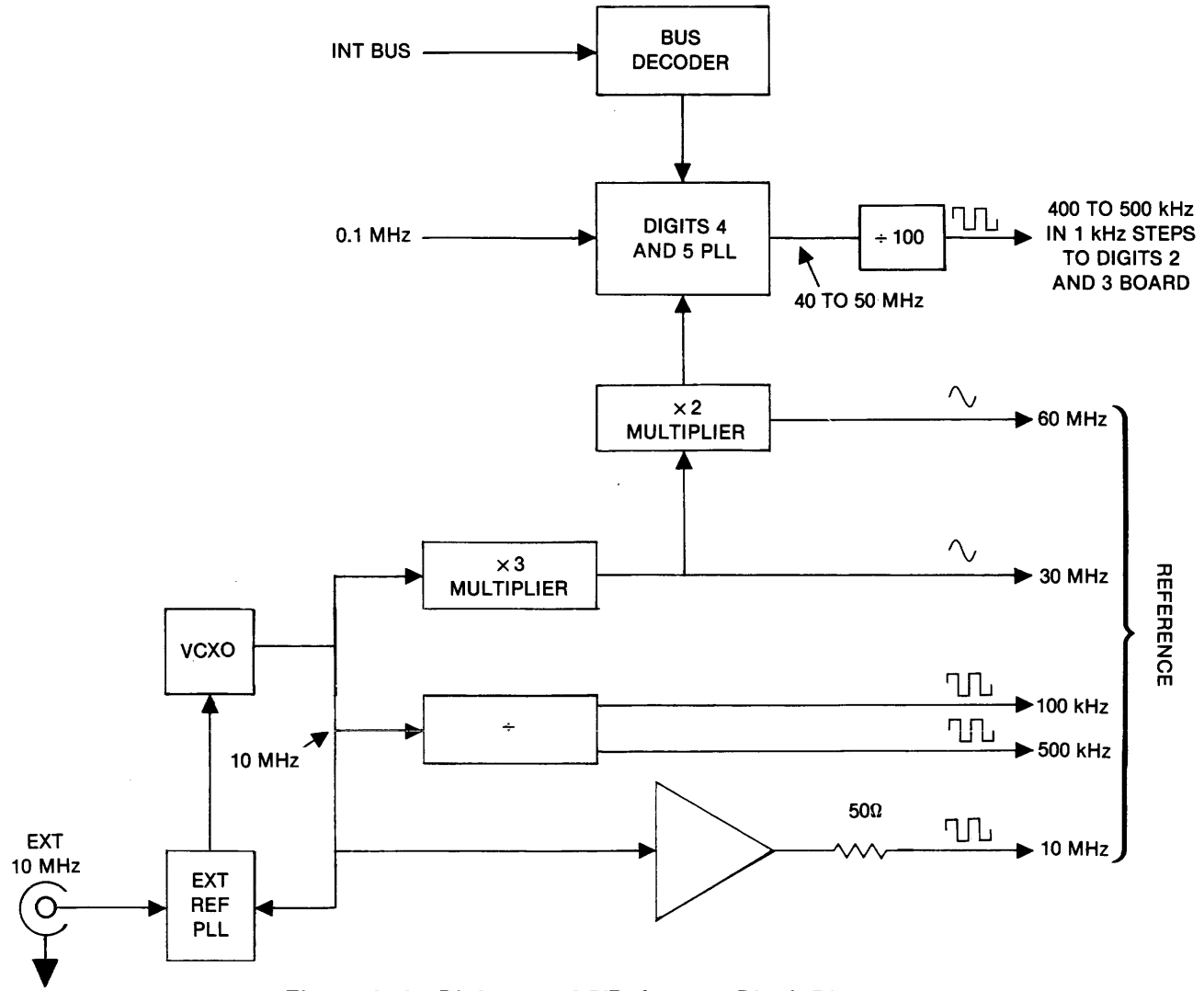


Figure 4-18. Digits 4 and 5/Reference Block Diagram

4.8 FRONT PANEL OPTION

The front panel (Option 001) contains a 46 key keyboard and a 40 character alphanumeric display to allow the user to manually program the 172B and to learn its status under both manual and remote programming. The front panel also contains the power on/off switch. The front panel assembly is connected electrically by two cables. One cable is on the power switch and can be disconnected near the front panel. The other cable carries the keyboard and display signals and is plugged into the mother board at connector J20. The front panel assembly consists of three subassemblies: the keyboard, the self-scan display and a PC board which interfaces to the microprocessor in the 172B. The microprocessor accesses the keyboard and display just as if they were read and write memory locations.

4.8.1 Keyboard

The keyboard itself consists of 46 printed circuit switches arranged in a 6 × 8 crosspoint array. The keyboard matrix is scanned by a keyboard encoder chip. When a contact closure is detected, the encoder stops scanning, provides a delay for contact bounce, latches a binary code onto its data output lines and provides a data ready strobe pulse. The output data is a binary number between 0 and 63 corresponding to the key depressed. When the keyboard contact closure is released, the encoder resumes scanning for the next closure. Periodically, the microprocessor, under program control, reads the encoder data output lines. The keyboard address is decoded on the microprocessor board and brought to the front panel as the keyboard out line. When this line is true, the encoder output is gated onto the 172B data bus lines, to be read by the microprocessor. The data ready strobe also triggers a 100 ms, 3 kHz audible tone each time a key is depressed.

4.8.2 Display

The display is a gas discharge device consisting of seven rows common to all character spaces, and 283 columns which are enabled consecutively, to display 40 characters on a 5 × 7 dot matrix, with two blank columns between characters. The display consists of a display panel and a driver board.

The information displayed on the front panel is stored in a Random Access Memory (RAM) located on the front panel PC board. Each character location on the display has a separate memory address into which the microprocessor can write. The six lower order address lines from the 172B address bus are used by the RAM as the display space addresses 0 through 39; the higher order address bits are decoded on the microprocessor board and brought to the front panel as the display enable line. When this line is true, the word appearing on the data lines 0 through 5 is written into RAM at the address appearing on corresponding address lines. Whenever the RAM is not being written into, its contents are being read to the display. The display requires a 20 kHz clock signal, valid data inputs for each particular character space, as that space is being scanned, and scan disable and reset signals to start each scan of the panel.

4.9 MICROPROCESSOR (Microprocessor and Memory RAM Boards)

The microprocessor (see figure 4-19) acts as the central processing unit, receiving information from the GPIB, the keyboard and the 172B subsystems and acting on these inputs as dicated by the software. Software directs the processor to address the subsystems and issue commands and data which direct the 172B to output the desired signals.

Software refers to a sequence of commands executed by the internal microprocessor. This sequence of instructions stored in ROM commands the microprocessor to perform according to the 172B specification. The microprocessor is powerless without a program to run; therefore, the software is one of the most vital elements of the digital section. All information transfer takes place under the control or supervision of the software. Programs are composed of machine language instructions, messages and tables that provide sequencing information.

Program data from the ROM temporary data from the RAM and input data from the keyboard or GPIB are hooked up to the microprocessor through an interconnection bus on the mother board. Data from the microprocessor software is sent to the rest of the instrument via a scratch pad memory. Table 4-1 indicates the format of the contents of the scratch pad.

The two boards of the microprocessor section (microprocessor and memory RAM) may be installed in locations C, D or E (see figure 4-1). The cards receive and drive a 43 wire data bus terminated on the mother board.

4.9.1 Microprocessor Board

This board contains an eight bit processor, software in ROM, buffers, decoders and two I/O ports. Figure 4-19

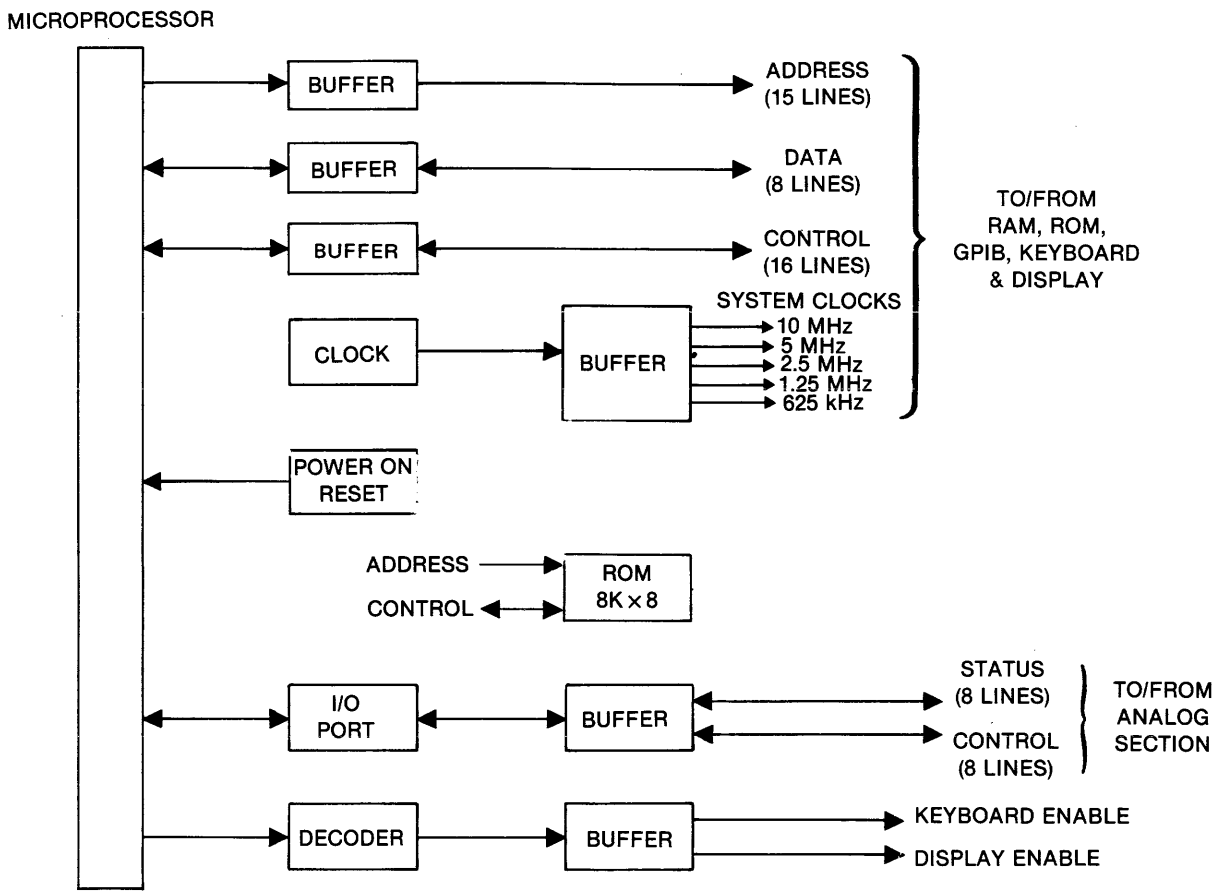


Figure 4-19. Microprocessor Board Block Diagram

shows the basic blocks of the microprocessor. Address lines are buffered to the mother board. Eight bidirectional data lines are received and driven to the mother board. Control signals necessary to describe the transaction are buffered to the mother board. Ten megahertz clock pulses are generated and buffered to the mother board. Clocks are available down to 625 kHz for other processor cards. All these signals are common to the processor section, but are not carried to the analog sections of the instrument (function generator and synthesizer).

Integrated circuit memories on ROM support the basic program in the 172B.

An I/O port generates eight control lines sent to the analog section of the instrument. These control lines are used to provide the microprocessor a facility to trigger the instrument or provide other control functions as options.

Eight status lines are sent to the microprocessor to indicate that a synthesizer has been installed and if the synthesizer is phase locked.

4.9.2 Memory RAM Board

The memory RAM board (see figure 4-20) contains 4096 eight bit bytes of volatile storage composed of eight 4K × 1 dynamic RAM chips. Refresh logic is located on this board with the logic necessary to arbitrate between a refresh cycle and a microprocessor cycle. In addition, the RAM board contains a 16 byte read/write scratch pad memory that transmits all data to the analog section of the instrument in 5 μs.

The RAM address is set to 6000_{16} through $6FFF_{16}$. A read or write is initiated by the microprocessor by using an operation request within the address space 6000_{16} to $6FFF_{16}$. If a refresh cycle is not in progress, data are accepted or presented depending upon the transaction requested on the data bus and an operation acknowledge is asserted. Data are latched until accepted and the microprocessor has removed the operation request signal.

The RAM stores up to 240 complete instrument settings. The contents of the RAM are lost whenever power is shut down.

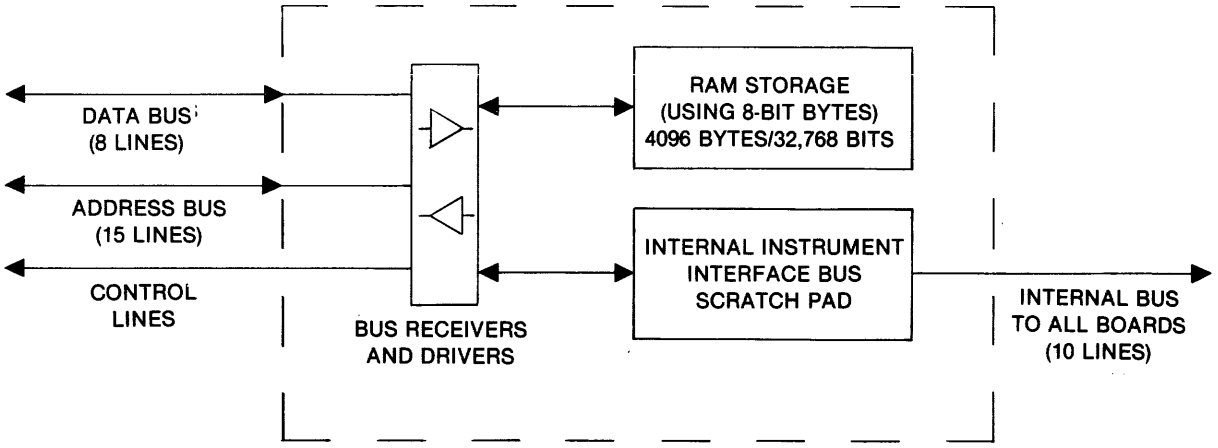


Figure 4-20. RAM (Random Access Memory) Writable and Readable for Data Storage Block Diagram

The RAM card includes a 16 byte scratch pad memory containing the data to be sent to the analog sections of the instrument. Data are transferred at a rate of four BCD characters per microsecond along with four address lines to all analog modules. Each line is terminated on the mother board. Scratch pad locations are accessed by the microprocessor and filled with properly formulated data for each analog module. Table 4-1 indicates the location of the data transferred to analog modules. All data are coded in four bit BCD digits. There is frequency and amplitude overranging in the most significant digits, as indicated by 12_{10} and 14_{10}, respectively, in table 4-1.

These values may differ from those transmitted to the instrument from a controller. The microprocessor selects its method of getting the output, then fills the scratch pad with properly formatted data. Data are sent to analog modules only when an execute command or GET is received.

4.9.3 Data Format

The internal data format for control parameters is as follows.

1. Offset — Three digits of offset are transferred with an allowable value in the range of 0 ± 7.49. The amplitude range digit will determine the actual voltage range selected.

2. Frequency — Five digits of frequency plus one range digit and sign are transferred within 2 μs. The function generator receives three digits from scratch pad locations 4 and 5 and one range digit plus sign bit. The synthesizer receives all five digits, but does not store the range digit. The most significant digit may be overranged to 12 on the 10^6 range for a maximum frequency of 12.9999 MHz. The range digit is the power-of-ten multiplier required (the decimal point follows the most significant digit).

3. Amplitude — Three digits of amplitude are transferred to the attenuator module and one digit to the power amplifier attenuator. Sign bits for amplitude and range digits are also transferred.

   The MSD of amplitude may be overranged to a value of 14.99 by transferring a 14 in the most significant digit on the top range (10^0). Therefore, the amplitude value can extend from 0 to 999 and be overranged to 14.99. All digits are BCD coded, sign-magnitude fashion (3 digits). An asserted sign bit indicates a negative value. The value is not complemented if the sign bit is set.

4. Symmetry — A one digit value from 0 to 9 selects the symmetry required. Zero and five select 50%, while digits 1 through 9 select symmetries at 10% intervals.

Table 4-1. Scratch Pad Memory Format

Data Sending Sequence	Address				Sign Bit		Data Byte								
	Group		Byte												
	A3	A2	A1	A0	S	Description	D7	D6	D5	D4	Description	D3	D2	D1	D0	Description
0	OFFSET (00)	0	0	0	0 1	+OFFSET −OFFSET	0	0	0	0 ↓ 1	DC OFFSET MSD 0 - 7_{10}	0	0	0	0 ↓ 1	DC OFFSET MD 0 - 9_{10}
1		0	0	1							NOT USED	0	0	0	0 ↓ 1	DC OFFSET LSD 0 - 9_{10}
2		0	0	1	0						NOT USED					NOT USED
3		0	0	1	1						NOT USED					NOT USED
4	FREQUENCY (01)	0	1	0	0		0	0	0	0 ↓ 1	FREQUENCY MSD (5) 0 - 12_{10}	0	0	0	0 ↓ 1	FREQUENCY DIGIT (4) 0 - 9_{10}
5		0	1	0	1	0 1 FREQ MULT + FREQ MULT −	0	0	0	0 ↓ 1	FREQUENCY DIGIT (3) 0 - 9_{10}	0	0	0	0 ↓ 0	FREQ MULT $10^{-4} \rightarrow 10^{0} \rightarrow 10^{+6}$
6		0	1	1	0		0	0	0	0 ↓ 1	FREQUENCY DIGIT (2) 0 - 9_{10}	0	0	0	0 ↓ 1	FREQUENCY DIGIT (1) 0 - 9_{10}
7		0	1	1	1						NOT USED					NOT USED
8	AMPLITUDE (10)	1	0	0	0	0 1 NORMAL INVERTED (OUTPUT)	0	0	0	0 ↓ 1	AMPLITUDE MSD 0 - 14_{10}	0	0	0	0 ↓ 1	AMPLITUDE MD 0 - 9
9		1	0	0	1	0 AMPL MULT + AMPL MULT −	0	0	0	0 ↓ 1	AMPLITUDE LSD 0 - 9_{10}	0	0	0	0 ↓ 0	AMPL MULT $10^{0} \rightarrow 10^{-3}$ 0 dB → − 60 dB
A		1	0	1	0						NOT USED					NOT USED
B		1	0	1	1						NOT USED					NOT USED
C	MODE (11)	1	1	0	0						**Function**					**Mode**
							0	0	0	0	SINE	0	0	0	0	CONTINUOUS
							0	0	0	1	TRIANGLE	0	1	0	0	GATED
							0	0	1	0	SQUARE	0	1	0	1	TRIGGERED
							0	1	0	0	DC	0	1	1	0	GATED HVRSN
												0	1	1	1	TRIG HVRSN
												1	0	0	0	SYNTHESIZE*
												1	0	0	1	EXT LOCK

Table 4-1. Scratch Pad Memory Format (Continued)

Data Sending Sequence	Address				Sign Bit		Data Byte								
	Group		Byte												
	A3	A2	A1	A0	S	Description	D7	D6	D5	D4	Description	D3	D2	D1	D0	Description
D	MISCELLANEOUS (11)	1	1	0	1						Symmetry					Load: Output / Load
							0	0	0	0	50%					
							0	0	0	1	10%			0	0	OFF / OUT
							0	0	1	0	20%			0	1	OFF / IN
							0	0	1	1	30%			1	0	ON / OUT
							0	1	0	0	40%			1	1	ON / IN
							0	1	0	1	50%					
							0	1	1	0	60%					
							0	1	1	1	70%					
							1	0	0	0	80%					
							1	0	0	1	90%					
E		1	1	1	0						NOT USED					NOT USED
F		1	1	1	1						NOT USED					NOT USED

*Option

5. Function — A one digit value selects the requested function. These values differ from those used to command the instrument from the keyboard or the GPIB.

6. Mode — A one digit value selects one of seven modes. These values differ from those used to command the instrument from the keyboard or the GPIB.

7. Load — A one digit value selects the load and enables the output. These values also differ from those used to command the instrument from the keyboard or GPIB.

4.10 GPIB/MICROPROCESSOR INTERFACE

The GPIB/microprocessor interface allows the instrument to be remotely programmed by a minicomputer, calculator, etc., via the General Purpose Interface Bus (GPIB). The GPIB interface is an implementation of IEEE Standard 488-1975. It supports the following 488-1975 defined interface functions: Source Handshake (SH1), Acccepter Handshake (AH1), Talker (T6), Listener (L4), Service Request (SR1), Remote Local (RL1), Device Clear (DC1) and Device Trigger (DT1). This bus transfers messages in bit parallel and byte serial fashion. The bus has 16 signal lines, and they are:

8 Data lines (DIO1 through DIO8)

5 Control lines (ATN, IFC, SRQ, EOI and REN)

3 Handshake lines (NRFD, NDAC and DAV)

These lines are defined in paragraph 3.6, as is operation with the GPIB.

The GPIB/microprocessor interface does the following three functions:

1. Detects the My Listen Address (MLA) and My Talk Address (MTA).

2. Does the proper listen handshake when either attention (ATN) is true, or the listen latch is set, and transfers messages when the talk latch is set.

3. Provides isolation through optical couplers.

In order to reduce the number of opto-isolators, the messages are transferred in bit serial fashion through two Universal Asynchronous Receiver/Transmitters (UART). (See figure 4-21.) All 16 GPIB lines are buffered and terminated through bus transceivers. The UART and status outputs are connected to the microprocessor data line via tri-state buffers.

The operation of the UART is fairly simple. Each UART consists of two independent sections called receiver

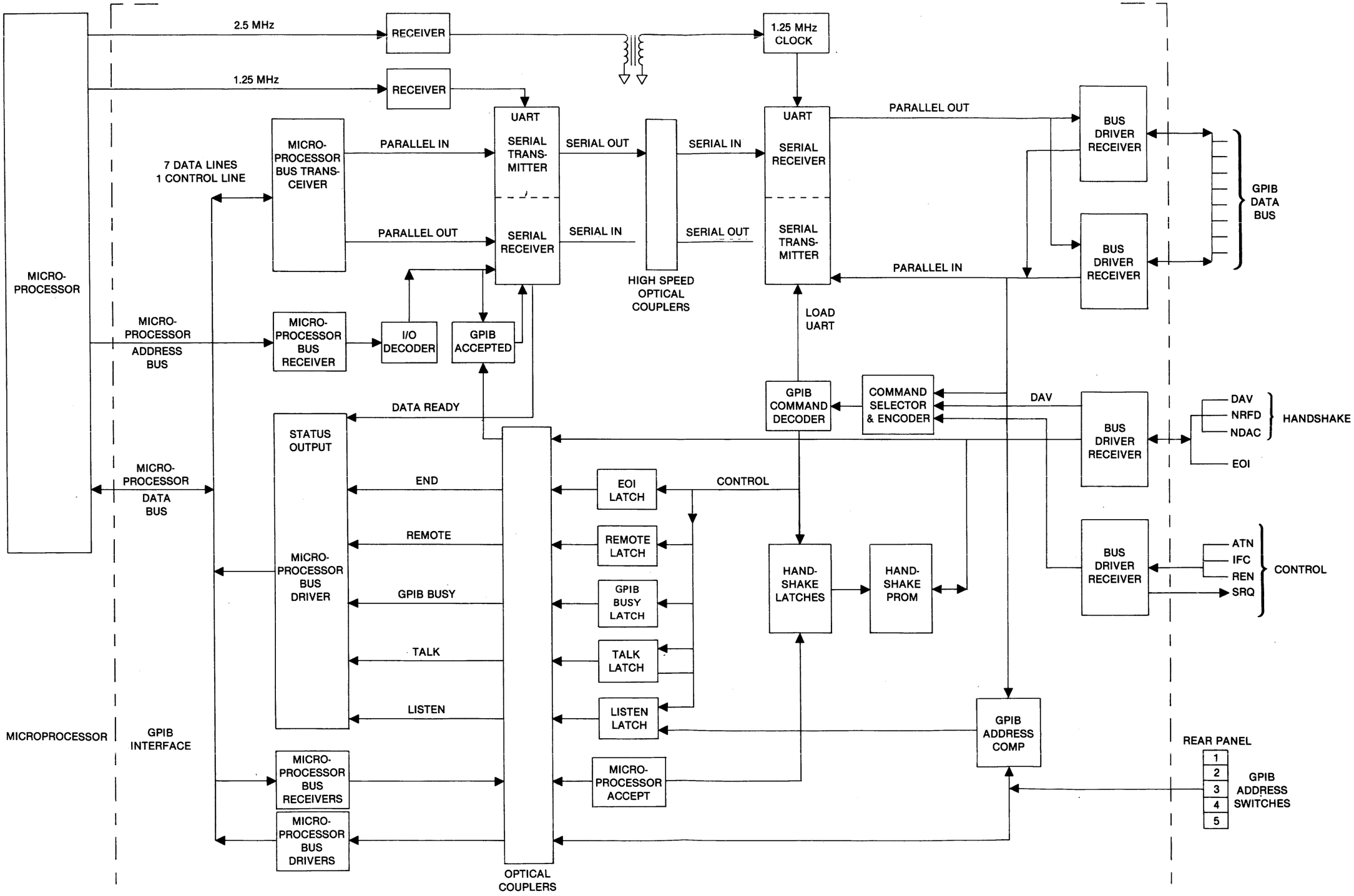


Figure 4-21. GPIB/Microprocessor Interface Block Diagram

and transmitter, and both of them may operate simultaneously. The UARTs are primarily used to convert parallel information into serial and serial information into parallel. The receiver receives its information in serial and converts it into an 8 bit parallel byte, whereas the transmitter converts an 8 bit parallel byte into bit serial output. The transfer rate of the serial output is determined by the clock frequency of the UART. Here the UART clock frequency is set at 1.25 MHz.

The interface completely insulates the microprocessor from GPIB and hence the microprocessor is relieved from the GPIB transactions. The microprocessor constantly monitors the status outputs from the interface and takes actions according to that. There are six status bits tied to the microprocessor data bus: Data Ready, GPIB Busy, End, Remote, Talk and Listen.

4.10.1 Data Ready

The Data Ready bit informs the microprocessor that the UART has received valid data from the GPIB. Only when this bit is true will the microprocessor read the byte from the UART.

4.10.2 GPIB Busy

The GPIB Busy bit is used during the talk mode to find out whether GPIB has accepted the data byte sent through the UART. Any time the microprocessor wants to send a byte via GPIB, first it checks that the Talk status bit is true and then it checks that GPIB Busy status bit is false. If the GPIB Busy status is false, then the microprocessor will load a byte into the UART and cause the GPIB Busy signal to go high (true). This prevents the microprocessor from loading any more bytes into the UART. The byte loaded into the UART is transmitted serially across the optocoupler to the GPIB side of the UART. When all the 8 bits of the byte are present, the data valid (DAV) line is set low. When the listener on the GPIB senses the DAV line is low, he accepts the byte by raising the data accepted (NDAC) signal high. The NDAC signal is received and causes the GPIB Busy signal to go low (false). Once the GPIB Busy signal goes low, the microprocessor can transmit another byte in the same manner.

4.10.3 End

The End bit is monitored by the microprocessor any time it reads a byte from the UART. If this bit is true, then the microprocessor assumes that it has received the last byte of the message sequence and treats it as a terminating character.

4.10.4 Remote

The Remote bit indicates to the microprocessor whether the 172B is in remote control or local control.

4.10.5 Talk

The Talk bit will be set any time the 172B receives its assigned talk address. When the microprocessor senses this bit as true, it sends the appropriate talk message.

4.10.6 Listen

The Listen bit will be sent any time the 172B receives its assigned listen address. When the microprocessor senses this bit as true, it prepares to receive the data bytes through the UART.

4.10.7 Service Request

Service Request (SRQ) is a bit sent by the microprocessor to the GPIB when it wants to talk. The controller will eventually cause a talk status bit to be generated and allow the microprocessor to place a talk byte on the interface.

4.11 POWER SUPPLY

The power supply consists of the Pass Transistor board, the Power Supply Regulator board and the rear panel mounted transformer. The pass transistor board contains power transistors plus three IC regulators for the power supplies, while rectifier, regulator, reference and sensing circuits are on the regulator board.

The +24 volt voltage reference is a zener diode, and the −24 volt supply, in turn, uses the +24 volts as reference. (See figure 4-22.) The regulator sections are current limiting stages, which limit the power supply current under supply overload conditions. The + and −15 volt supplies (not shown in figure 4-22) operate in the same manner.

The +12, −5 and isolated +5 volt supplies (not shown in figure 4-22) use IC regulators located on the pass transistor board. The ground reference for the isolated +5 volt supply is isolated from common ground. System ground, isolated +5 volt ground and chassis ground are isolated from one another.

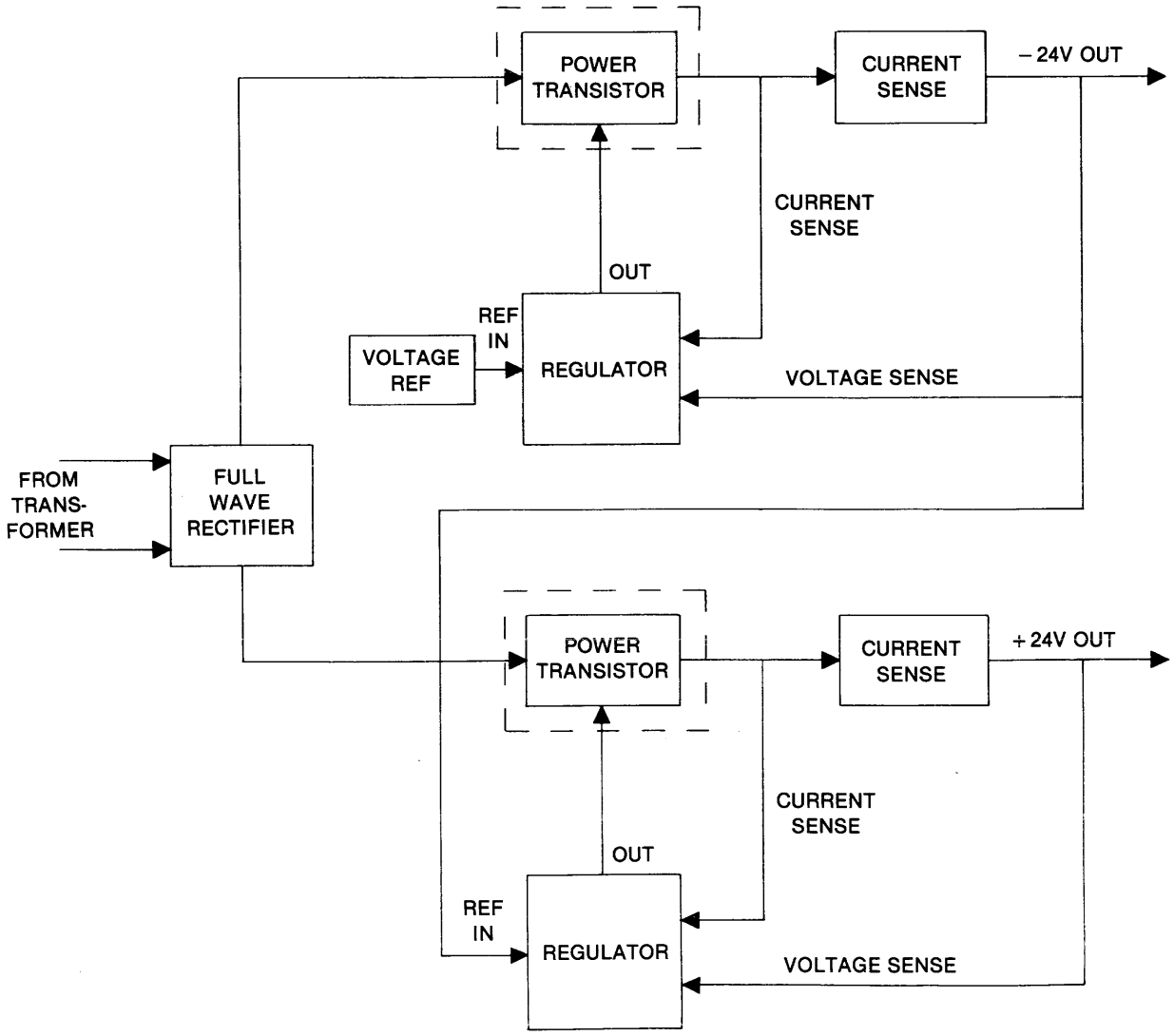


Figure 4-22. Power Supply Block Diagram

SECTION 5
TROUBLESHOOTING

5.1 INTRODUCTION

Faults may be isolated to circuit board, power supply or front panel. Familiarize yourself with the 172B by reviewing the operating procedures in this manual as well as the circuit descriptions. Successful fault isolation depends upon a thorough knowledge of the correct instrument operation.

Major groups of the various assemblies are shown in table 5-1. Fault isolation is discussed in the following paragraphs in terms of these groups. The locations of boards and assemblies called out in table 5-1 are shown in figure 4-1.

Table 5-1. Assembly Guide

Board Ejector Color	Assembly	Group
Black Black NA	Pass Transistor/Regulator Power Supply Regulator Rear Panel (Transformer, Capacitors, etc.)	Power Supply
Yellow Green Blue Gray Violet	VCG and Symmetry Triangle Generator Function/Preamp Power Amplifier/DC Offset Three Digit Attenuator	Function Generator (function generator calibration usually required when any function generator board is replaced)
Orange Red Brown	Digit 1/Mixer Digits 2 and 3 Digits 4 and 5/Reference	Synthesizer (Option 002)
White White	Microprocessor Memory RAM	Microprocessor
White NA	GPIB Interface GPIB Decoder	GPIB Interface
NA	Front Panel	Front Panel (Option 001)

5.2 POWER SUPPLY

In case the generator is malfunctioning, power supply voltage is always the first thing to be checked. Test points for all power supplies are on top edge of the power supply and regulator board. Table 5-2 shows the supply distribution to each PC board.

If the power supply voltage is found to be lower than normal, it indicates there is an overloaded or short circuit condition in the system. Turn off the generator immediately to avoid further damage. Remove all PC boards that use the overloaded supply. Use an ohmmeter to find the board having a short circuit condition by measuring the impedance between the ground and the supply line. If this is not successful, do the following. (This procedure is not recommended for the +5V supply.)

1. Monitor the supply voltage with a voltmeter at the Power Supply Regulator board.
2. From table 5-2, locate all the PC boards related to the overloaded supply.
3. Remove one of the boards and turn on the generator just long enough to make a voltage reading from the voltmeter.
4. If the supply voltage was back to normal, the removed board was the defective board.
5. If supply voltage is not back to normal after all the PC boards have been tested, possibly the regulator board itself is defective.

5.3 FUNCTION GENERATOR

If the generator is malfunctioning, first check the power supply voltages (refer to paragraph 5.2). Because some problems are due to the system being out of calibration, calibrate the function generator before troubleshooting (refer to paragraph 6.3). Troubleshoot using table 5-3.

Table 5-2. Power Distribution

Board Ejector Color	Assembly	Power at Assembly Pin Number												
		+5	+, −5 +, −12 COM	−5	+5 ISO	GND ISO	+12	−12	+15	+, −15 +, −24 −250 COM	−15	+24	−24	−250
Yellow	VCG and Symmetry	19,20	22-24						33,34	26-28	30,31	43	41	
Green	Triangle Generator	19,20	22-24						33,34	26-28	30,31			
Blue	Function/Preamp	19,20	22-24						33,34	26-28	30,31			
Gray	Power Amplifier/ DC Offset	19,20	22-24						33,34	26-28	30,31	39,40	36,37	
Violet	Three Digit Attenuator	19,20	22-24											
Orange	Digit 1/Mixer	19,20	22-24	50					33,34	26-28	30,31			
Red	Digits 2 and 3	19,20	22-24	50					33,34	26-28	30,31			
Brown	Digits 4 and 5/ Reference	19,20	22-24	50					33,34	26-28	30,31			
White	Microprocessor	49-52	1,2,99, 100											
White	Memory RAM	49-52	1,2,99, 100	53			3							
White	GPIB Interface	49-52	1,2,99, 100	63,78	62,77									
NA	GPIB Decoder				P17-20	P17-19								
NA	Front Panel	J1-23 J2-1,2	J1-21 J2-3,4					J1-7 J2-24						J1-26

Table 5-3. Function Generator Troubleshooting

NOTE: This information is for frequency problems apparent while the generator is in open loop, continuous mode.

Symptom	Further Observation	Probable Cause	Cure
1. Frequency accuracy out of spec. Problem has to do with the three digit setting.	1. Problem always happens at the same setting(s), between 1.00 and 9.99 of every frequency decade.	1. Frequency D/A converter. 2. Frequency data latch. 3. Internal bus.	Replace VCG board.
	2. All frequencies too high or too low. Waveform time symmetry normal.	1. VCG gain control. 2. Triangle peak voltage too high or too low.	Replace VCG board or Triangle Generator board.
	3. Waveform time symmetry also out of spec.	Current generator.	Replace VCG board.
	4. Problem happens only at 1 to 13 MHz, or 100 kHz to 1 MHz. Also refer to Symptom 5.	Frequency compensation components.	Replace Triangle Generator board.
	5. Triangle waveform also distorted.	1. Frequency range switch. 2. Component connected to the triangle amplifier input.	Replace Triangle Generator board.

Table 5-3. Function Generator Troubleshooting (Continued)

NOTE: This information is for frequency problems apparent while the generator is in open loop, continuous mode.

Symptom	Further Observation	Probable Cause	Cure
2. Frequency accuracy out of spec. Problem has to do with the range multiplier.	1. Out of spec at one particular frequency decade, but greater than 0.999 Hz.	1. Frequency range switches or capacitors. 2. Frequency range data latch or decoder.	Replace Triangle Generator board.
	2. Less than 0.999 Hz.	1. Capacitance multiplier. 2. Frequency range data latch or decoder.	Replace Triangle Generator board.
3. Time symmetry out of spec.	1. Triangle waveform also nonlinear.	1. Frequency range switches. 2. Component connected to the triangle amplifier input.	Replace Triangle Generator board.
	2. Triangle waveform linear.	1. Current generator. 2. Current mirror circuit.	Replace Triangle Generator board.
	3. Time symmetry problem only at frequency 0.999 Hz or less.	Capacitance multiplier circuit.	Replace Triangle Generator board.
4. Low frequency (<100 kHz) sine distortion out of spec.	1. Time symmetry also out of spec.	Refer to Symptom 3 for time symmetry problem.	Replace Triangle Generator board.
	2. Nonlinear triangle waveform.	Refer to Symptom 1(5).	Replace Triangle Generator board.
	3. Triangle waveform appears to be good.	Sine converter circuit.	Replace Function/ Preamp board.
	4. All waveforms are badly distorted.	Preamp or power amplifier.	Replace Function/ Preamp board or Power Ampl/Offset board.
5. High frequency (>100 kHz) sine distortion out of spec.	1. Frequency accuracy out of spec at frequency >1 MHz.	1. Current generator is saturated. 2. Current mirror circuit is saturated. 3. Refer to Symptom 1(4).	Replace VCG board or Triangle Generator board.
	2. Square wave has excess overshoot or slow rise time.	Preamp or power amplifier.	Replace Function/ Preamp board or Power Ampl/Offset board.
	3. Square wave ok, but badly distorted triangle.	Triangle amplifier No. 1 or No. 2.	Replace Triangle Generator board.
	4. Otherwise.	Sine converter.	Replace Function/ Preamp board.

Table 5-3. Function Generator Troubleshooting (Continued)

NOTE: This information is for frequency problems apparent while the generator is in open loop, continuous mode.

Symptom	Further Observation	Probable Cause	Cure
6. Amplitude accuracy out of spec at 1 kHz.	1. All waveform amplitudes out of spec between 1V p-p and 15V p-p.	1. Three digit attenuator. 2. Internal bus.	Replace Attenuator board.
	2. Ratio is not correct when amplitude is ranging from 9.99, 0.999, 0.0999 to 0.00999V p-p.	1. Output attenuator. 2. Attenuator control logic. 3. Internal bus.	Replace Power Ampl/ Offset board.
	3. Inverting output ("−" amplitude) ok, but not normal output ("+" amplitude).	1. Noninverting amplifier. 2. Relay.	Replace Function/ Preamp board.
	4. Square wave amplitude out of spec.	Square wave shaper circuit.	Replace Function/ Preamp board.
	5. Triangle wave amplitude out of spec.	Gain control resistors.	Replace Function/ Preamp board.
	6. Excess amplitude roll off at high frequency.	1. Frequency compensation components. 2. Frequency compensation components in power amplifier.	Replace Function/ Preamp board. Replace Power Ampl/ Offset board.
7. DC offset problem.		1. DC offset circuit. 2. Offset control logic. 3. Internal bus.	Replace Power Ampl/ Offset board.
8. Trigger and gate problem.		Trigger logic and trigger amplifier.	Replace Triangle Generator board.
9. No waveform output at 50Ω OUT.	1. Voltage at 50Ω OUT is saturated to maximum positive or negative. SYNC OUT is normal.	1. Power amplifier. 2. Function/preamp.	Replace Power Ampl/ Offset board. Replace Function/ Preamp board.
	2. SYNC OUT is normal and dc voltage at 50Ω OUT is normal when dc voltage is selected.	Waveform switching relay and control logic.	Replace Function/ Preamp board.
	3. No SYNC OUT when continuous mode is selected.	1. Triangle generator loop. 2. Current mirror circuit. 3. Current generator.	Replace Triangle Generator board. Replace VCG board.
	4. Generator runs if diode CR15 in Hysteresis Switch subassy of Triangle Generator board is removed.	1. Trigger circuit. 2. GEN MODE control logic.	Replace Triangle Generator board.
10. Output waveform is not the waveform programmed.	No other programming error.	1. Function selecting relay. 2. Function control logic. 3. Internal bus.	Replace Function/ Preamp board.
11. Generator frequency does not lock to external frequency.	1. Phase not locked at all frequencies.	1. Generator frequency is not within ±2% of external frequency. 2. Phase detector or filter. 3. Input circuit.	Change the generator frequency. Replace VCG board.
	2. No phase lock at a frequency range.	Loop filter selection circuit.	Replace VCG board.

5.4 INTERNAL DATA BUS

All the internal programming data sent to the function generator and the frequency synthesizer sections are sent in multiplex fashion through the 14 internal bus lines. It takes only one defective bus receiver, 74LS139 or 74LS175, to hang up an entire line. A defective receiver can cause incorrect generator responses everywhere.

When the bus is not sending data, no EXECUTE command, the voltage at each bus is biased to approximately +3 volts. If the bus voltage is greater than +4 volts, or less than +2 volts, there is a defective bus receiver or driver on the line. The defective component can be located by removing one board at a time. The bus voltage will be back to normal when the defective board is removed. Table 5-4 gives the bus location.

Table 5-4. Internal Data Bus Location

Description	Bus Line	Pin No.*
Strobe	STRB	1
	A3	2
Data	A2	3
Group	A1	4
	A0	5
Sign	S	6
	D7	7
	D6	8
	D5	9
Data	D4	10
Byte	D3	11
	D2	12
	D1	13
	D0	14

NOTE

Table 4-2 describes the data content of each line on the internal data bus.

*PC-to-Mother board connector (Function Generator or Synthesizer boards).

5.5 SYNTHESIZER

When the 172B output frequency is incorrect in the synthesizer mode, the problem may be on one of the three synthesizer boards, or, it may be in the function generator section. The following checks in table 5-5 can be made external to the 172B with a frequency counter.

NOTE

Tests in the synthesizer mode are done on the 1 to 13 MHz range for two reasons. The natural output of the synthesizer is 1 to 13 MHz, so there is less chance of confusion; and the frequency counter will give high resolution readings with minimum gate time on this range.

Table 5-5. Synthesizer Troubleshooting

Symptom	Discussion
1. The function generator output frequency is correct on the 1 to 12.9999 MHz range, but is not correct on one or more lower ranges.	1. This indicates the synthesizer subassembly is functioning properly, and the problem is on the VCG board where the main function generator is phase locked to the synthesizer output. 2. When a particular range and all lower ranges do not work, and all higher ranges do work, the problem is in the decade digital divider string on the VCG board.
2. The output frequency is wrong on the 1 to 12.9999 MHz range, but one or more of the lower ranges works.	Check the open loop frequency (continuous mode, B0). If this frequency is greater than 4% from the programmed frequency, the function generator frequency may be outside the capture range of the function generator phase lock loop (PPL). (Refer to paragraph 5.3.)
3. There is no change in frequency switching between continuous (B0) and synthesized (B3) modes.	The VCG board is not receiving the digital command to switch into the synthesized mode. Check the front panel to make sure the display is not indicating a programming error. If there is no programming error, refer to Internal Data Bus, paragraph 5.4. Frequency must be greater than 10 Hz.
4. The 172B does not operate properly in synthesized mode, but does in external phase lock (B6) mode (with the proper external signal provided).	The main generator phase lock circuitry is operating properly and the problem is likely to be in the synthesizer section. Refer to Symptom 6. A good frequency source for the external phase lock check is the 10 MHz reference output available on the rear panel of the 172B. A different frequency such as 1 MHz may be available from the frequency counter used for testing.
5. The synthesized frequency is off by a small, constant percentage error at all frequencies.	The error is in the synthesizer time base, which is an adjustment located on the Digits 4 and 5/Reference PC board; adjust or replace the board.
6. There is a failure within the synthesizer.	1. An indication of the specific failure location can be obtained by a careful study of the actual output frequencies for a range of input frequencies. For example: Programmed frequencies from 1.0000 MHz to 1.0067 MHz work properly. Programmed frequencies from 1.0068 MHz to 1.0099 MHz give an output frequency of 1.0067. This pattern then repeats: 1.0100 thru 1.0167 work properly and 1.0168 thru 1.0199 give an output of 1.0167 MHz. This pattern also repeats at any other frequency: the first three digits work properly and the fourth and fifth digit work properly when programmed between 00 and 67. Armed with these data, and a knowledge of the synthesizer structure (refer to the synthesizer block diagrams in Section 4), you may deduce the problem lines within the digits 4 and 5 PLL located on the Digits 4 and 5/Reference PC board, or the translation loop located on the Digits 2 and 3 Translation Loop PC board. With these particular symptoms, it is likely the Voltage Controlled Oscillator (VCO) frequency has shifted in the translation loop or digits 4 and 5 loop, and can be corrected with a simple calibration adjustment. Determining which of these two possible loops are bad requires going inside the 172B and measuring the actual output of digits 4 and 5. If spare boards are available, substitution will reveal which of the two is defective faster than making on board measurements. 2. Another example: All programmed frequencies from 1.0000 thru 1.0099 MHz measure 1.0154 MHz; all programmed frequencies from 1.0100 thru 1.0199 measure 1.0254 MHz; all programmed frequencies from 1.0200 thru 1.0299 MHz measure 1.0354 MHz, etc. Again, the indications are that the digit 2, 3 loop and all following stages are operating correctly because the synthesizer follows each 10 kHz change in programmed frequency even though the output frequency is not correct. The digit 4, 5 loop or the translation loop is functioning incorrectly and outputting a single frequency instead of following the programming changes. Again with these symptoms, one of the two loops may have a defective component or the oscillator natural frequency may have shifted more than the loop can correct for, and repair consists of a simple calibration adjustment. Refer to the synthesizer calibration procedure.

5.6 MICROPROCESSOR

When microprocessor problems are suspected, always check the +5, −5 and +12V power supplies (refer to paragraph 5.2). If all voltages are present, use table 5-6 to troubleshoot. Replace board assemblies one at a time, until the problem is eliminated.

5.7 GPIB INTERFACE

Because the 172B has more than one programming channel (GPIB and front panel), it is relatively easy to isolate interface problems. (Refer to table 5-7.)

5.8 FRONT PANEL

The front panel assembly contains circuitry for two distinct functions; display and keyboard, both communicating with the microprocessor through the data and address busses. Because of the intimate relationship of the front panel and microprocessor, it can be difficult to isolate a problem to a particular area. (Refer to table 5-8 for troubleshooting hints.)

Table 5-6. Microprocessor Troubleshooting

Symptom	Possible Cure
1. 172B will not power up.	1. Replace RAM board. 2. Replace Microprocessor board.
2. 172B powers up, but gives ERROR when key is pressed.	1. Replace RAM board. 2. Replace Microprocessor board.
3. 172B powers up with ERROR in left margin.	1. Replace Microprocessor board. 2. Replace RAM board.
4. 172B powers up and reads different GPIB address other than the setting.	1. Check the isolated +5V (refer to paragraph 5.2). 2. Replace GPIB Interface board.
5. 172B will not talk or listen on GPIB.	1. Correct the listen address setting on rear panel. 2. Check the isolated +5V (refer to paragraph 5.2). 3. Replace GPIB Interface board.
6. While running, 172B resets itself and displays "WAVETEK MODEL 172B".	1. Replace Microprocessor board. 2. Replace RAM board.

Table 5-7. GPIB Interface Troubleshooting

Symptom	Discussion
1. When addressed as a listener or talker, the 172B does not display an L or T on the right-hand corner of the display.	Find the GPIB listen and talk addresses by pushing the ADR key. They will be displayed. Program the controller to send the listen address. (The HP 9825 controller message is wrt 7xx, where xx is the 172B address.) L, or RL, should appear on the right-hand corner of the display; if not, the malfunction is in the GPIB Interface board. The talk address problem is similarly dealt with.
2. Displayed parameter values differ from GPIB programmed values.	Use the CMD RCL key to display the programming received by the post-interface circuits. If this differs from GPIB programmed values, duplicate the programming by using the front panel controls. Correct display isolates the malfunction to the GPIB Interface board.

Table 5-8. Front Panel Troubleshooting

CAUTION: There is high voltage (−250 volts) present in the front panel.

Symptom	Discussion
1. When power is first turned on, the front panel readout displays "SELF TEST". After a short delay, the microprocessor commands the front panel to display "WAVETEK 172B". The message is not displayed.	If this message never appears, the problem can be on any of the digital boards. Most likely it is not a front panel problem. While a front panel failure could cause the front panel not to accept data, it is much more likely the microprocessor never reached the portion of the operating program that causes the initial display. Replace the Microprocessor and Memory RAM boards one at a time. Test the 172B with each replacement.
2. After the turn-on delay, the initial random characters are replaced by another meaningless display.	The microprocessor is reaching the front panel. Examine this message carefully for clues as to the possible problem; for example, "V@VDTDJ062B" instead of "WAVETEK 172B" would indicate the "1" bit of the data word was hung in a false condition. This could be occurring in the front panel bus receivers, memory or in the display component itself. Another type of failure mode might be "WAWATETE1717" indicating a hung "2" bit on the address lines driving the memory IC. In any case, the malfunction is most likely in the front panel.
3. The display is missing portions of characters or characters are jittering in position.	The problem is most likely the display component, although the −250V regulator could be causing the flicker. Replace the front panel.
4. The keyboard "beeps" normally when a key is depressed, but the processor ignores it (no response on the display).	The problem may be in the front panel or in the microprocessor. Command the 172B via the GPIB and check for proper operation. If the 172B cannot be commanded by any means, the problem is most likely not in the front panel. A front panel address or data bus driver or receiver could fail in a manner to permanently hang a bus line, preventing the microprocessor from operating properly. Unplug the front panel from the mother board (J20), with power off. Turn power back on and again try to command the 172B via GPIB. If the 172B runs properly, the problem is in the front panel.
5. The keyboard fails to "beep", but commands the 172B properly.	The problem is in the circuitry associated with the audio sounder. Replace the front panel.
6. The keyboard neither beeps or commands the 172B, but 172B works properly with the GPIB interface.	The problem is with the keyboard encoder, or the keyboard membrane switch itself. Replace the front panel.

SECTION 6
CALIBRATION

6.1 INTRODUCTION

The following four calibration procedures may be used to totally align the 172B periodically, or they may be used individually to calibrate the functional group to which they apply. Individual procedures would be used in the case of a circuit board replacement or for out-of-spec operation of a particular functional group.

The completion of these calibration procedures returns the instrument to correct calibration. All limits and tolerances given in these procedures are calibration guides and should not be interpreted as instrument specifications. Instrument specifications are given in section 1 of this manual.

The functional groups are shown in table 5-1 with a listing and location of individual assemblies within the groups. The microprocessor group and the GPIB group require no calibration. The calibration procedures included herein are:

Periodic calibration of all groups is needed because of component aging, which depends on the instrument on-time and environment. Use three months as an initial calibration period. If possible, keep records of parameter values and increase the time between calibrations as the records indicate.

In any case, the power supplies should be verified or adjusted before attempting any other calibration procedure or fault isolation.

The air inlet for the instrument cooling fan contains a filtering screen that must be cleaned periodically. To clean, remove the screen retainer and screen (at the rear of the instrument). Vacuum or wash and dry the screen as necessary or annually.

6.2 POWER SUPPLY CALIBRATION/ VERIFICATION

Verify that line selector (refer to paragraph 2.2.1) matches the line voltage. Use a Dana 5900 DVM or equivalent to perform the procedures given in table 6-1.

6.3 FUNCTION GENERATOR CALIBRATION

Use the test equipment listed here, or equivalent, to perform the procedures given in table 6-2.

1. Frequency Counter: Dana Model 8110
2. DVM: Dana 5900
3. Distortion Analyzer: HP Model 334A
4. Oscilloscope: Tektronix Model 7904 with
   a. Dual Trace Amplifier 7A26
   b. Dual Time Base 7B92
   c. Differential Comparator 7A13
5. 50 Ohm 5W Termination: Tektronix 011-0099-00
6. Scope Probe: Tektronix P6101
7. Probe Tip BNC Adapter: Tektronix 013-0034-02

6.4 SYNTHESIZER CALIBRATION/VERIFICATION

Use the test equipment listed here, or equivalent, to perform the procedures given in table 6-3. If the verification portion of table 6-3 indicates that the synthesizer does not require calibration, only items No. 1 and No. 4 will be required as test equipment.

1. Frequency Counter: Dana 8110
2. RF Millivoltmeter: Boonton 92C
3. DVM: Dana 5900
4. 172B Extender Board: Wavetek

6.5 FRONT PANEL CALIBRATION

1. Repeatedly press any front panel switch to obtain an audio tone.
2. Adjust R15 on the front panel PC board for the greatest volume.

CAUTION

There are exposed high voltage points (250 volts) in the display section.

Table 6-1. Power Supply Calibration/Verification Procedures

Step	Check	Tester	Cal Points	Program	Adjust	Desired Results	Remarks
1	+15V	DVM in dc mode	TP7 (gnd) TP6	Power ON (initial setup)	R24	+15.0 Vdc ±20 mV	All test points and adjustments are located on power supply regulator bd.
2	−15V		TP8			−15.0 Vdc ±100 mV	Verify.
3	+12V		TP10			+12.0 Vdc ±350 mV	
4	−5V		TP11			−5.0 Vdc ±100 mV	
5	+5V (iso)		TP14 (gnd) TP13			+5.0 Vdc ±200 mV	
6	+24V		TP3 (gnd) TP5		R10	+24.0 Vdc ±200 mV	
7	−24V		TP4			−24.0 Vdc ±200 mV	Verify.
8	+5V (logic)		TP15 (gnd) TP12		R58	+5.0 Vdc ±100 mV	

Table 6-2. Function Generator Calibration Procedures

Step	Check	Tester	Cal Points	Program	Adjust	Desired Results	Remarks
1	Trigger Baseline	DVM in dc mode	TP1 (function/ preamp bd)	FREQ: 9.99E2 FUNC: 4 OUTP: 1 MODE: 1 AMPL: −10 EXEC	R54 (triangle gen bd)	0V ±10 mVdc	999 Hz, inverted, 10V p-p, dc, trig mode. Allow 1 hour warm-up.
2	Symmetry Zero		TP2 (triangle gen bd)		R124 (triangle gen bd)	0V ±1 mVdc	
3	Inverted Zero		TP3 (function/ preamp bd)		R53 (function/ preamp bd)	0V ±2 mVdc	
4	Standard Zero		TP2 (function/ preamp bd)		R79 (function/ preamp bd)		
5	Offset Inverted Zero		TP4 (pwr ampl/ offset bd)		R75 (pwr ampl/ offset bd)	0V ±5 mVdc	
6	Offset Standard Zero		TP2 (pwr ampl/ offset bd)		R72 (pwr ampl/ offset bd)		

Table 6-2. Function Generator Calibration Procedures (Continued)

Step	Check	Tester	Cal Points	Program	Adjust	Desired Results	Remarks
7	Power Amplifier Zero		50Ω OUT (rear panel)		R53 (pwr ampl/ offset bd)	0V ±1 mVdc	
8	Positive Triangle Peak	Scope with comparator	TP1 (function/ preamp bd)	FUNC: 2 MODE: 0 EXEC	R79 (triangle gen bd)	+2V ±10 mVp	cont mode.
9	Negative Triangle Peak				R76 (triangle gen bd)	−2V ±10 mVp	
10	1000:1 Symmetry	2 channel scope with 50Ω load	50Ω OUT (rear panel)	OUTP: 0 FREQ: 1E4 EXEC FREQ: 0 EXEC R28 (VCG bd): ccw	R58, R75 (VCG bd)	5 ±0.5 ms on each ½ cycle (100 ±10 Hz) (use scope with 1 ms/div sweep)	, no internal load (load at scope). 10 kHz range, 0 Hz; R58 and R75 settings must be done in sequence.
11	Bottom Symmetry			FREQ: 1E2 EXEC	R33 (VCG bd)	Symmetry ±0.1% (10 μs)	
12	Top Symmetry			FREQ: 9.99E2 EXEC	R67 (VCG bd)	Symmetry ±0.1% (1 μs)	
13	High Frequency Symmetry			FREQ: 1E5 EXEC	R72 (VCG bd)	Symmetry ±0.3% (30 ms)	Repeat steps 11 - 13 until all settings are in tolerance.
14	Bottom Frequency	Counter		FREQ: 1E2 EXEC	R28 (VCG bd)	100 ±1 Hz	
15	Top Frequency			FREQ: 9.99E2 EXEC	R21 (VCG bd)	999 ±5 Hz	Repeat steps 14 and 15 until all settings are in tolerance.
16	Frequency		50Ω OUT (rear panel)	FREQ: 12.99E6 EXEC	C41 (triangle gen bd)	12.99 MHz ±50 kHz	Check over 1 - 12.99 range and distribute the error. Verify 1E6 (±5%) and 1E7 (±4%).
17				FREQ: 9.99E5 EXEC	R22 (VCG bd)	999 ±5 kHz	
18				FREQ: 9.99E4 EXEC	C44 (triangle gen bd)	99.9 kHz ±500 Hz	
19				FREQ: 9.99E3 EXEC	R20 (VCG bd)	9.99 kHz ±50 Hz	
20				FREQ: 9.99E1 EXEC	R18 (VCG bd)	0.01001s ±50 μs (50 μs)	
21				FREQ: 9.99 EXEC	R17 (VCG bd)	0.1001s ±0.5 ms (0.5 ms)	
22				FREQ: 9.99E-1 EXEC	R120 (triangle gen bd)	1.001s ±5 ms (5 ms)	

Table 6-2. Function Generator Calibration Procedures (Continued)

Step	Check	Tester	Cal Points	Program	Adjust	Desired Results	Remarks
23	HF Aberrations	2 channel scope with 50Ω load		FREQ: 1E6 EXEC	C12 (pwr ampl/ offset bd)	Best	<5% overshoot
24	Sine	Scope with comparator & distortion analyzer; load removed		FREQ: 9.99E2 FUNC: 0 OUTP: 1 EXEC	R11 (function/ preamp bd)	+5V ±20 mVdc at positive peak	Internal load, 999 Hz output. Center R45 on pwr ampl/offset bd.
25					R9 (function/ preamp bd)	−5V ±20 mVdc at negative peak	
26					R107 (function/ preamp bd)	Symmetrical residue	Connect scope to distortion analyzer output.
27					R1 (function/ preamp bd)	Minimum distortion (0.15% typ)	After this step, repeat steps 24 thru 26 once.
28	Negative Sine Unity Gain	DVM in ac mode			R45 (pwr ampl/ offset bd)	3.535V ±3 mVrms	
~~29~~	~~Positive~~ Sine Unity Gain			~~AMPL: 10~~ EXEC	~~R95~~ (function/ preamp bd)	~~3.535V ±3 mVrms~~	
30	Gain			FUNC: 1 EXEC	R5 (function/ preamp bd)	2.775V ±3 mVrms	With average responding DVM. Otherwise, use comparator to set peaks to ±5 Vp ±20 mV.
31	Positive peak	DVM in dc mode	50Ω OUT (rear panel)	FUNC: 2 FREQ: 0.1 EXEC	R36 (function/ preamp bd)	+5 Vp ±10 mV	Slow output, internal load.
32	Negative peak				R43 (function/ preamp bd)	−5 Vp ±10 mV	
33	+DC Offset Gain			FUNC: 4 OFST: +7.49 EXEC	R62 (pwr ampl/ offset bd)	+7.49V ±20 mVdc	+7.49 Vdc output, internal load.
34	−DC Offset Gain					−7.49V ±20 mVdc	Verify.
35	Haver Baseline			FUNC: 1 OFST: 0 AMPL: 10 MODE: 5 FREQ: 999 EXEC	R37 (triangle gen bd)	−5V ±50 mVdc	Gated havertriangle baseline output.

Table 6-3. Synthesizer Calibration/Verification

Step	Check	Tester	Cal Points	Program	Adjust	Desired Results	Remarks
1	Time Base	Counter	REF OUT (rear panel)	Power ON (initial settings)	L2 (digits 4 & 5 bd)	10.00000 MHz ± 50 Hz	Allow 1 hour warm-up.
2	Verify 12.9999E6		50Ω OUT (rear panel)	FREQ: 12.9999E6 FUNC: 2 AMPL: 10 OUTP: 1 MODE: 3 EXEC		12.99990 MHz ± 65 Hz	Verify.
3	Verify 10.9999E6			FREQ: 10.9999E6 EXEC		10.99990 MHz ± 55 Hz	
4	Verify 9.9999E6			FREQ: 9.9999E6 EXEC		9.99990 MHz ± 50 Hz	
5	Verify 999 Hz			FREQ: 999 EXEC		999.000 Hz ± 5 mHz	
6	Verify 10 Hz			FREQ: 10 EXEC		**10.00000 Hz ± 500 μHz**	It is normal for this reading to show some cycle-to-cycle jitter.

This completes the verification portion of this procedure. If negative results were obtained, complete the calibration procedure before attempting fault isolation.

7	30 MHz Multiplier	RF milli-voltmeter	TP3 (digits 4 & 5 bd)	Power ON (initial settings)	L3 (digits 4 & 5 bd 30 MHz MULT)	Maximum reading	Place digits 4 & 5 bd on the extender bd. Remove shield. Connect probe gnd lead to board common as near TP3 as possible.
8	60 MHz Multiplier		TP4		L4 (digits 4 & 5 bd	Maximum reading	*Note: Turn instrument power OFF while removing or replacing boards.*
9	Digits 4 & 5 VCO	DVM	Junction CR1/C3	FREQ: 10.9999E6 EXEC	L1 (digits 4 & 5 bd 40 MHz VCO)	1.70 Vdc	Connect DVM ground to board common.
10	Translation Loop VCO		Terminal VC on 60.4 MHz Module		C1	1.30 Vdc	Replace digits 4 & 5 bd and place digits 2 & 3 bd on the extender bd (2 if possible). Connect DVM ground to 60.4 MHz module common. C1 is the trimmer capacitor protruding from the underside of the 60.4 MHz module.
11	Digits 2 & 3 VCO		Terminal VC on 40 MHz module (digits 2 & 3 bd)		L1	3.50 Vdc	Connect DVM gnd to 40 MHz module case. L1 is accessible thru a hole in top of the 40 MHz module.

Table 6-1. Power Supply Calibration/Verification Procedures (Continued)

Step	Check	Tester	Cal Points	Program	Adjust	Desired Results	Remarks
12	Digit 1 VCO		Pin VC on 35 MHz module A1 (digit 1/ mixer)	FREQ: 1.0000E6 EXEC		3.46 Vdc	Replace digits 2 & 3 bd and place digit 1/mixer on the extender bd. L1 is accessible thru a hole in top of the 35 MHz module.
13	Output Mixer	RF milli-meter	TP2	FREQ: 5.8500E6 EXEC	L7 (30 MHz BPF)	Maximum reading	
14			TP3		L11, L12 (input mixer)		
15			TP4		L13, L14 (34.5 MHz BPF)		After this step, reinstall digit 1/mixer board.

SECTION 7
PARTS AND SCHEMATICS

7.1 DRAWINGS

The following assembly drawings, parts lists and schematics are in the arrangement shown below.

7.2 ORDERING PARTS

When ordering spare parts, please specify part number, circuit reference, board, serial number of unit and the function performed.

The part numbers for printed circuit boards are etched on the boards just as the circuits are. When the boards are loaded with components the boards are considered **assemblies** and stamped with **assembly** numbers. These same numbers are found in the parts lists. Each printed circuit **assembly** has its own parts list; the parts list number is the **assembly** number. The printed circuit board will appear as a component in the parts list.

7.3 ADDENDA

Under Wavetek's product improvement program, the latest designs are incorporated into each instrument as quickly as development and testing permit. Because of the time needed to prepare manuals, it is not always possible to include the most recent changes. Whenever this occurs, addendum pages are prepared and inserted.

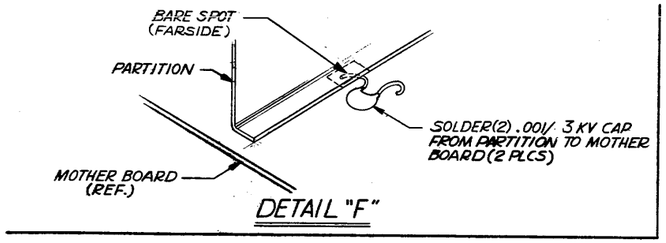
Drawing	Drawing No.
Chassis Assembly	0102-00-0726
Chassis Parts List	1101-00-0726
Front Panel Assembly	0102-00-0968
Front Panel Parts List	1101-00-0968
Front Panel Logic Schematic	0103-00-0938
Front Panel Logic Assembly	0101-00-0938
Front Panel Logic Parts List	1100-00-0938
Rear Panel Schematic	0104-00-0792
Rear Panel Assembly	0102-00-0792
Rear Panel Parts List	1101-00-0792
GPIB Decoder Schematic	0103-00-0554
GPIB Decoder Assembly	0101-00-0554
GPIB Decoder Parts List	1100-00-0554
Mother Board Assembly	0101-00-0717
Mother Board Parts List	1100-00-0717
Signal Routing on Mother Board	——
Pass Transistor/Regulator Schematic	0103-00-0713
Pass Transistor/Regulator Assembly	0101-00-0713
Pass Transistor/Regulator Parts List	1100-00-0713
Power Supply Regulator Schematic	0103-00-0712
Power Supply Regulator Assembly	0101-00-0712
Power Supply Regulator Parts List	1100-00-0712

Drawing	Drawing No.
Memory RAM Schematic	0103-00-0708
Memory RAM Assembly	0101-00-0708
Memory RAM Parts List	1100-00-0708
Microprocessor Schematic	0103-00-0699
Microprocessor Assembly	0101-00-0699
Microprocessor Parts List	1100-00-0699
GPIB Interface Schematic	0103-00-0685
GPIB Interface Assembly	0101-00-0685
GPIB Interface Parts List	1100-00-0685
Power Amplifier/DC Offset Schematic	0103-00-0710
Power Amplifier/DC Offset Assembly	0101-00-0710
Power Amplifier/DC Offset Parts List	1100-00-0710
Power Amplifier Subassembly No. 1 Assembly	0101-00-0591
Power Amplifier Subassembly No. 1 Parts List	1208-00-0591
Power Amplifier Subassembly No. 2 Assembly	0101-00-0592
Power Amplifier Subassembly No. 2 Parts List	1208-00-0592
Power Amplifier Subassembly No. 3 Assembly	0101-00-0593
Power Amplifier Subassembly No. 3 Parts List	1208-00-0593

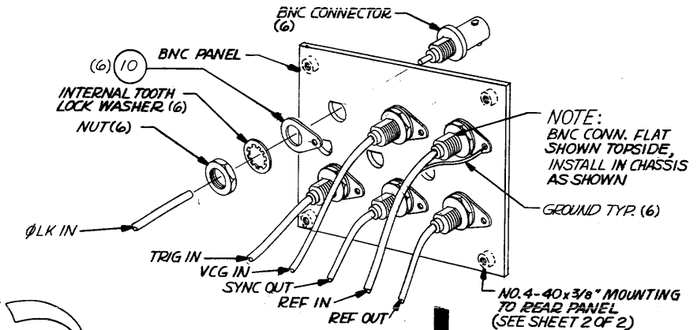
Drawing	Drawing No.
3 Digit Attenuator Schematic	0103-00-0715
3 Digit Attenuator Assembly	0101-00-0715
3 Digit Attenuator Parts List	1100-00-0715
Function/Preamp Schematic	0103-00-0707
Function/Preamp Assembly	0101-00-0707
Function/Preamp Parts List	1100-00-0707
Triangle Generator Schematic	0103-00-0714
Triangle Generator Assembly	0101-00-0714
Triangle Generator Parts List	1100-00-0714
Hysteresis Switch, Triangle Generator Assembly	0101-00-0558
Hysteresis Switch, Triangle Generator Parts List	1208-00-0558
Trigger, Triangle Generator Assembly	0101-00-0559
Trigger, Triangle Generator Parts List	1208-00-0559
Buffer Amplifier, Triangle Generator Assembly	0101-00-0560
Buffer Amplifier, Triangle Generator Parts List	1208-00-0560
VCG and Symmetry Schematic	0103-00-0711
VCG and Symmetry Assembly	0101-00-0711
VCG and Symmetry Parts List	1100-00-0711

Drawing	Drawing No.
Digit 1/Mixer Schematic	0103-00-0706
Digit 1/Mixer Assembly	0101-00-0706
Digit 1/Mixer Parts List	1100-00-0706
35/40 MHz VCO Module, Digit 1/Mixer Schematic	0104-00-0519
35/40 MHz VCO Module, Digit 1/Mixer Assembly	0102-00-0519
35/40 MHz VCO Module, Digit 1/Mixer Parts List	1206-00-0519
Digits 2 & 3 Schematic	0103-00-0704
Digits 2 & 3 Assembly	0101-00-0704
Digits 2 & 3 Parts List	1100-00-0704
60.4 MHz VCO Module, Digits 2 & 3 Schematic	0103-00-0520
60.4 MHz VCO Module, Digits 2 & 3 Assembly	0102-00-0520
60.4 MHz VCO Module, Digits 2 & 3 Parts List	1206-00-0520
Digits 4 & 5/Reference Schematic	0103-00-0705
Digits 4 & 5/Reference Assembly	0101-00-0705
Digits 4 & 5/Reference Parts List	1100-00-0705

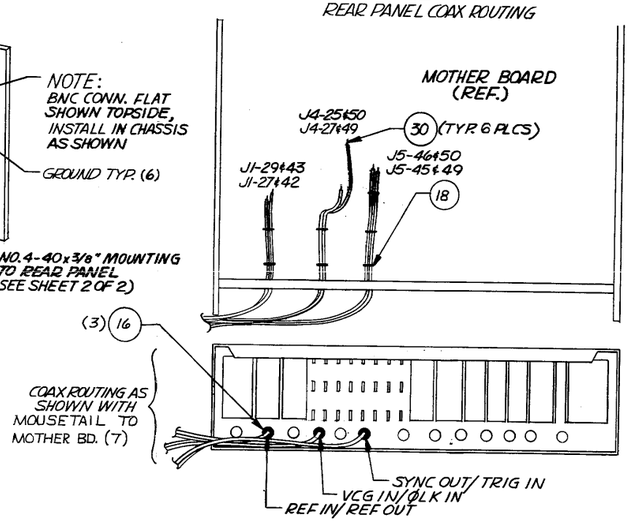
REV	ECN	BY	DATE	APP

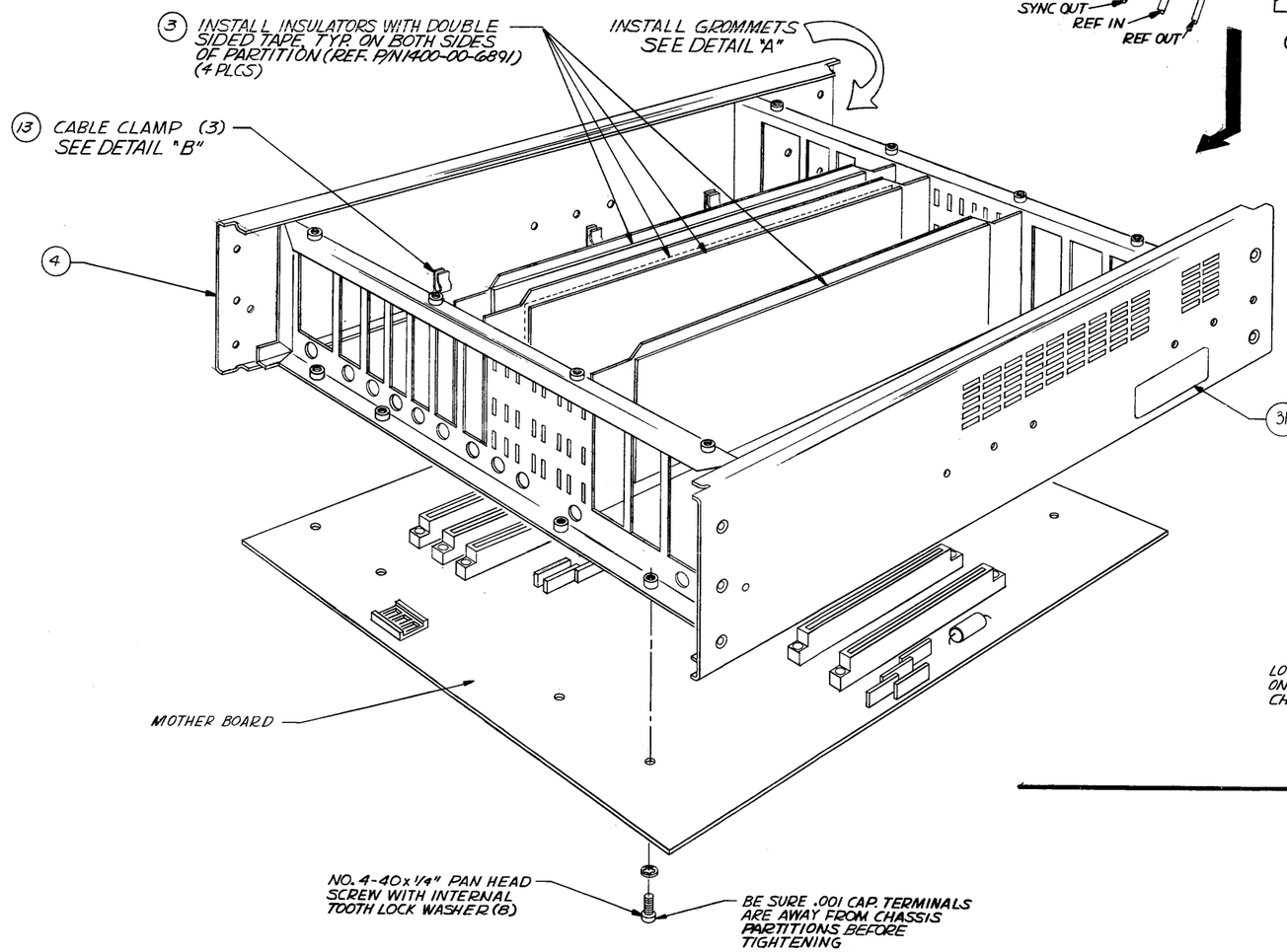


DETAIL "F"



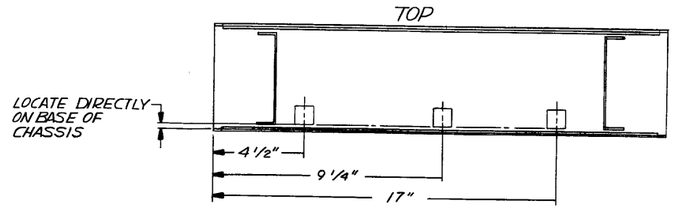
DETAIL "A"
REAR PANEL COAX ROUTING





FUNCTION	COAX	SHIELD	COLOR	LENGTH (IN)
REF. IN	J1-29	J1-27	GRN	14"
REF. OUT	J1-43	J1-42	GRN/WHT	13"
VCG IN	J4-25	J4-27	RED/WHT	24"
ØLK IN	J4-50	J4-49	BLK	15½"
SYNC OUT	J5-46	J5-45	BLU/WHT	17"
TRIG IN	J5-50	J5-49	BLU	17½"

DETAIL "B"
CABLE CLAMP LOCATION



REV	ECN	BY	DATE	APP
G	2785	fma	9/17/14	
H	3553	DC	21-83	
/	3777 CLASS III	SC	9-28-83	

F	ECN 21416	D COOPER	10-20-80
E	ECN #2131	L. EARHART	5-5-80
D	# 1917	[illegible]	7-17-79
C	ECN # 1941	D. COOPER	5-26-79
B	ECN # 1877	[illegible]	2-28-79

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN D. COOPER	DATE 7-25-79	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR	SHT	TITLE ASSEMBLY CHASSIS
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1° XX ±.030		
	DO NOT SCALE DWG	MODEL NO. 172	DWG NO. 0102-00-0726 REV H
	SCALE	CODE IDENT 23338	SHEET 1 OF 2

REV	ECN	BY	DATE	APP

NO. 6-32 x 3/8" FLAT HEAD CAD. PLATE SCREW (TOP AND BOTTOM COVERS 8 PLCS.)

NO. 4-40 x 3/8" FLAT HEAD SCREW (4 PLCS. EA. END)

(29) (32) (19) (2) (20)

A B C D E G H J K L M N P

TO POWER AMP BOARD

JF2S RECEPTACLE TO PASS TRANSISTOR BOARD (REF. JF2P PLUG)

REAR PANEL ASSY.

BNC PANEL MTG. 4-40 x 3/8" PHD. SCREW WITH INT. TOOTH LOCK WASHER (4)

REF. 6-32 x 3/8 (4)

BNC PANEL INSTALLATION
1. REMOVE PLATE
2. DRESS BNC PANEL TO REAR SLOT (BNC FLAT TOPSIDE)
3. INSTALL BNC PANEL TO PLATE
4. INSTALL PLATE BACK ON REAR PANEL AND TIGHTEN

J15 (REF.)

J16 (REF.)

J49 (REF.)

NO. 6-32 x 3/8" FLAT HEAD SCREW (CAD. PLATE) (4 PLCS.)

(1) BNC PANEL (REF.)
(6) (2)
(15) (4)

(34) (2) SEE DETAIL "C"
PLACE BLOCK INSIDE CHASSIS AND POSITION "UNDER" MOTHER BD. FOR SUPPORT, AS SHOWN.

MOTHER BD. (REF.)

FOR P.C. BOARD REMOVAL SEE DETAIL VIEW "D"

SEE DETAIL VIEW "E"

RED STRIPE (PIN 1)

NO. 4-40 x 3/8" FLAT HEAD SCREW WITH SPLIT LOCK WASHER AND NUT (2 PLCS. EA. SIDE)

NO. 6-32 x 1/2" FLAT HEAD SCREW (6 PLCS.)

FRONT PANEL ASSY.

CAUTION: FIT SHIELD IN BOTTOM COVER WITH DOUBLE SIDED TAPE IN SAME POSITION AS MOTHER BD.

(33)

(5)

P.C. BOARD LEGEND

BD. KEY AND TITLE	BD. NO	EJECTOR AND RETAINER COLOR	RETAINER ITEM NO.
(A) PASS TRANSISTOR		BLACK	(44)
(B) POWER SUPPLY REG.		BLACK	(44)
(C) MICRO P.		WHITE	(35)
(D) GPIB		WHITE	(35)
(E) RAM		WHITE	(35)
(G) POWER AMP/DC OFFSET		GREY	(43)
(H) DIGIT 3 ATTENUATOR		VIOLET	(42)
(J) FUNCTION PRE-AMP		BLUE	(41)
(K) TRIANGLE GENERATOR		GREEN	(40)
(L) VCG		YELLOW	(39)
(M) DIGIT 1/ MIXER		ORANGE	(38)
(N) DIGIT 2 AND 3		RED	(37)
(P) DIGIT 4 AND 5 / REF.		BROWN	(36)

MOTHER BOARD (REF.)

TAPE SCOTCH "27" GLASS CLOTH ELECTRICAL TAPE, 3/4"

SUPPORT PAD

CHASSIS (REF.)

DETAIL "C"
APPLY INSULATION TAPE TO SUPPORT PAD ALLOWING FOR 1/16" OVERHANG ON 3 SIDES. PLACE PAD INSIDE CHASSIS AND POSITION "UNDER" MOTHER BD. FOR SUPPORT AS SHOWN.

(9) (2 PLCS.)

MOTHER BOARD (REF.)

DETAIL "E"
CONN HOLD DOWN

PULL-UP TYP. BOTH ENDS

P.C. BD. EXTRACTED

P.C. BD. INSTALLED

CHASSIS EDGE (REF.)

DETAIL "D"
TYP. P.C. BD. REMOVAL

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN D. COOPER	DATE 7-25-77	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR Tom DeLuga	SEPT 8'77	TITLE ASSEMBLY CHASSIS
FINISH WAVETEK PROCESS	RELEASE APPROV		
	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1° XX ±.030		
	DO NOT SCALE DWG	MODEL NO. 172	DWG NO. 0102-00-0726 REV H
	SCALE	CODE IDENT 23338	SHEET 2 OF 2

REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG, CHASSIS	0102-00-0726	WVTK	0102-00-0726	1
1	BNC BD	1400-00-6021	WVTK	1400-00-6021	1
2	MTG. BKT	1400-00-6332	WVTK	1400-00-6332	2
3	INSULATOR REF: 3200-03-0001	1400-00-6891	WVTK	1400-00-6891	4
4	CHASSIS	115-1575	CALMK	1400-00-7770	1
5	INSULATOR, BOTT	1400-00-7830	WVTK	1400-00-7830	1
34	SUPPORT PAD	1400-00-9173	WVTK	1400-00-9173	2
20	RETAINER PLATE	1400-00-9183	WVTK	1400-00-9183	1
19	RETAINER PLATE	1400-00-9240	WVTK	1400-00-9240	1
29	LABEL, REAR SUPPORT	1400-00-9780	WVTK	1400-00-9780	1
31	LABEL, REAR SUPPORT	1400-01-0010	WVTK	1400-01-0010	2
32	COVER, TOP	115-1575-94C	CALMK	1400-01-1002	1
33	COVER, BOTTOM	115-1575-93C	CALMK	1400-01-1012	1
NONE	CAP, CER, .001MF, 3KV	DD30-102	CRL	1500-01-0205	2
6	BNC CONN	UG657/U	AMPH	2100-01-0003	6
9	LOCK, SOCKET	CA-24-200-DL	CA	2100-03-0046	2
10	SOLDER LUG	1497	SMITH	2100-04-0012	6

WAVETEK PARTS LIST	TITLE CHASSIS	ASSEMBLY NO. 1101-00-0726 PAGE: 1	REV J

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
30	CONN	60598-8	AMP	2100-05-0017	6
35	GUIDE, BOARD	115-287	CALMK	2100-06-0004	6
36	CARD GUIDE, BROWN	115-287 BROWN	CALMK	2100-06-0007	2
37	CARD GUIDE, RED	115-287 RED	CALMK	2100-06-0008	2
38	CARD GUIDE, ORANGE	115-287 ORANGE	CALMK	2100-06-0009	2
39	CARD GUIDE, YELLOW	115-287 YELLOW	CALMK	2100-06-0010	2
40	CARD GUIDE, GREEN	115-287 GREEN	CALMK	2100-06-0011	2
41	CARD GUIDE, BLUE	115-287 BLUE	CALMK	2100-06-0012	2
42	CARD GUIDE, VIOLET	115-287 VIOLET	CALMK	2100-06-0013	2
43	CARD GUIDE, GREY	115-287 GREY	CALMK	2100-06-0014	2
44	CARD GUIDE, BLACK	115-287 BLACK	CALMK	2100-06-0015	4
14	TY-WRAP	TY-523M	TB	2800-00-0006	4
13	WIRE MOUNT, ADHESIVE	6025-08-BLK	GRAHL	2800-00-0024	3
15	STANDOFF, SWAGE .125 H, .250 DIA 4-40, .093 MAT'L	6911-2-3C	LYNTR	2800-03-0003	4
16	GROMMET, RUBBER	91117	SMITH	2800-10-0004	3
18	MOUSETAIL	2829-75-2	RUBTK	2800-12-0005	7

WAVETEK PARTS LIST	TITLE CHASSIS	ASSEMBLY NO. 1101-00-0726 PAGE: 2	REV J

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	CABLE, 4 COND, 209A	8722	BELDN	6001-70-0007	1

WAVETEK PARTS LIST	TITLE CHASSIS	ASSEMBLY NO. 1101-00-0726 PAGE: 3	REV J

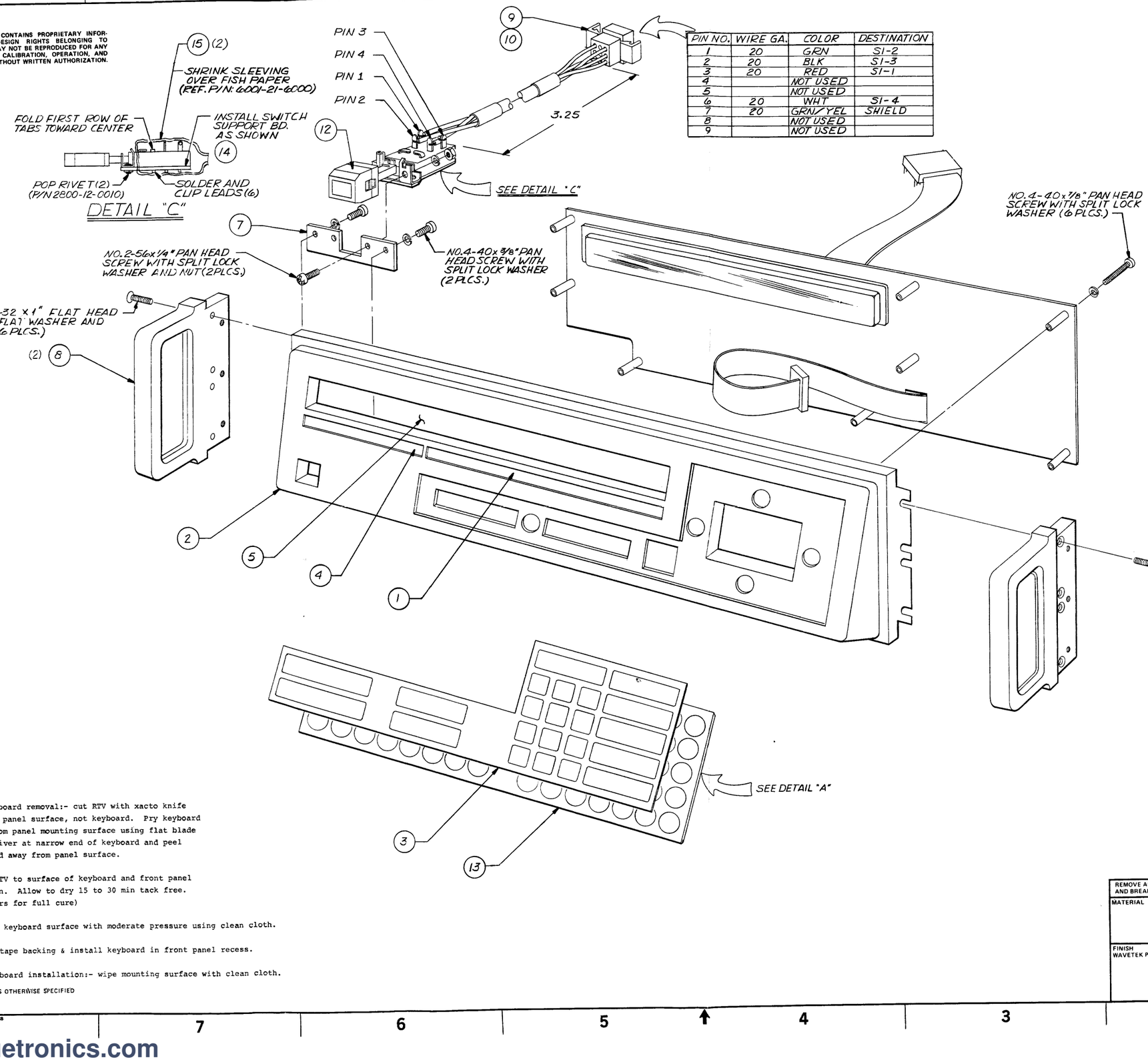
NOTE UNLESS OTHERWISE SPECIFIED

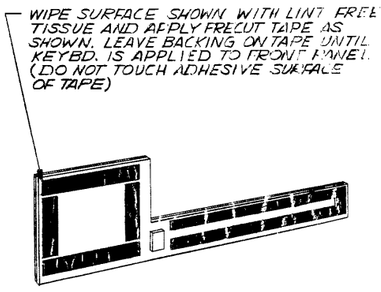
REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST CHASSIS
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ± 1 XX ± .030		
	DO NOT SCALE DWG		MODEL NO 172B / DWG NO 1101-00-0726 / REV J
	SCALE		CODE IDENT 23338 / SHEET 1 OF 1

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-3894

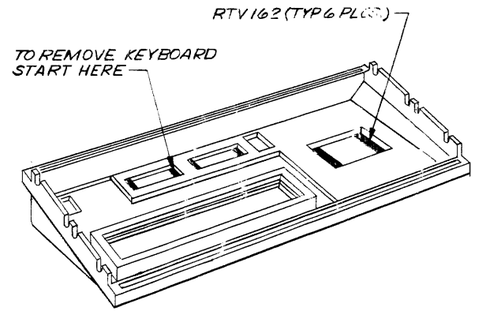
REV	ECN	BY	DATE	APP
	2982 CL III	fmc	7/20/81	

PIN NO.	WIRE GA.	COLOR	DESTINATION
1	20	GRN	S1-2
2	20	BLK	S1-3
3	20	RED	S1-1
4		NOT USED	
5		NOT USED	
6	20	WHT	S1-4
7	20	GRN/YEL	SHIELD
8		NOT USED	
9		NOT USED	





DETAIL "A"



DETAIL "B"
KEYBOARD INSTALLATION
SEE NOTES 1 THRU 4

5. For keyboard removal:- cut RTV with xacto knife against panel surface, not keyboard. Pry keyboard away from panel mounting surface using flat blade screwdriver at narrow end of keyboard and peel keyboard away from panel surface.

4. Apply RTV to surface of keyboard and front panel as shown. Allow to dry 15 to 30 min tack free. (24 hours for full cure)

3. Burnish keyboard surface with moderate pressure using clean cloth.

2. Remove tape backing & install keyboard in front panel recess.

1. For keyboard installation:- wipe mounting surface with clean cloth.

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN L. COOPER	DATE 6-20-80	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR R.E. Schultz	9-17-81	TITLE ASSEMBLY FRONT PANEL
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1° XX ±.030		MODEL NO.
	DO NOT SCALE DWG		DWG NO. 0102-00-0968 REV
	SCALE		CODE IDENT 23338 SHEET 1 OF 1

BISHOP GRAPHICS/ACCUPRESS RECORDER NO. A-3864

REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG, FRONT PANEL	0102-00-0968	WVTK	0102-00-0968	1
2	FRONT PANEL FROM: 1400-00-7031	1400-00-7030	WVTK	1400-00-7030	1
5	LENS, READOUT REF: 3200-03-0007	1400-00-7680	WVTK	1400-00-7680	1
7	BRKT, SWITCH MTG.	1400-00-7703	WVTK	1400-00-7703	1
4	PLATE, NAME	1400-00-8240	WVTK	1400-00-8240	1
15	INSULATOR, PWR SWITCH REF: 1600-99-0001	1400-00-8370	WVTK	1400-00-8370	2
3	OVERLAY, KEYBOARD	1400-00-9790	WVTK	1400-00-9790	1
1	I.D., INSTRUMENT	1400-00-9800	WVTK	1400-00-9800	1
8	HANDLE, WHITE FROM: 1400-00-6951	1400-01-3152	WVTK	1400-01-3152	2
14	SWITCH SUPPORT BD	1700-00-0750	WVTK	1700-00-0750	1
9	PLUG, 9PIN	03-06-2091	MOLEX	2100-02-0011	1
16	SOLDER LUG	1485-6	SMITH	2100-04-0025	1
10	PIN, MALE	02-06-2103	MOLEX	2100-05-0003	5
12	SWITCH, POWER	5102-00-0006	WVTK	5102-00-0006	1
13	KEYBOARD	2SMD200P75079	CRL	5108-00-0003	1

WAVETEK PARTS LIST	TITLE ASSY, FRONT PANEL	ASSEMBLY NO. 1101-00-0968 PAGE: 1	REV

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	CABLE, 4 COND, 20GA	8722	BELDN	6001-70-0007	1

WAVETEK PARTS LIST	TITLE ASSY, FRONT PANEL	ASSEMBLY NO. 1101-00-0968 PAGE: 2	REV

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST ASSY, FRONT PANEL
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		MODEL NO. 172B / DWG NO. 1101-00-0968 / REV
	DO NOT SCALE DWG		CODE IDENT 23338 / SHEET 1 OF 1
	SCALE		

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-3954

REV	ECN	BY	DATE	APP

BUSS INTERFACE CIRCUIT

CONNECTOR J2-

+5V
DBUS 5/ (B6)
DBUS 3/ (B6)
DBUS 4/ (B6)
DBUS 1/ (B6)
DBUS 2/ (B6)
DBUS 0/ (B6)
-12V
N/C

LS368 U1
8T95 U2
U3 MMC6810AL
LS00 U4

DISPLAY TIMING CIRCUIT

+5V
R25 10K
BLANK/
7402 U9
U10 LS163
U11 LS163
U13 LS163
LS00 U14
U30-3 (2B8)
U12 LS138
BCD1
BCD2
BCD3
RESET
RESET/
SERI (2D2)
250 KHz
R26 10K SIP
R1,R2,R3,R4,R5 10K (5)
LS04 U15
LDA/
LDB/
LDC/
LDD/
LDE/

KEYBOARD ENCODER

CONNECTOR J3-

LS240 U6
LS368 U7
U5 AY-5 3600 PRO
J2-6 (D8)
J2-9 (D8)
J2-8 (D8)
J2-11 (C8)
J2-10 (D8)
J2-12 (C8)
U20-23
U20-1
U20-2
U20-3
U20-4
U20-5
(2D8)
DATA READY STROBE
FREQ COUNT (≈50KHz)
C1 47PF
R6 100K
C10 .022
R8 1K
U8 LS74
J2-5 DBUS/
J2-7 KBOUT/
R7 10K

MASTER CLOCK

Y1 4MHz CRYSTAL
C2 220PF
C3 330PF
L1 5.6 µH
R10 1K
R11 10K
R12 2K
LS04
U17 LS163
MCLK
CR1
D51 BEEPER QMB-06
Q1 2N3903
R9 1K
4093 U18
U19 14040

3. ALL DIODES ARE FD6666.
2. ALL RESISTORS ARE IN OHMS.
1. ALL CAPACITORS ARE IN MICROFARADS.

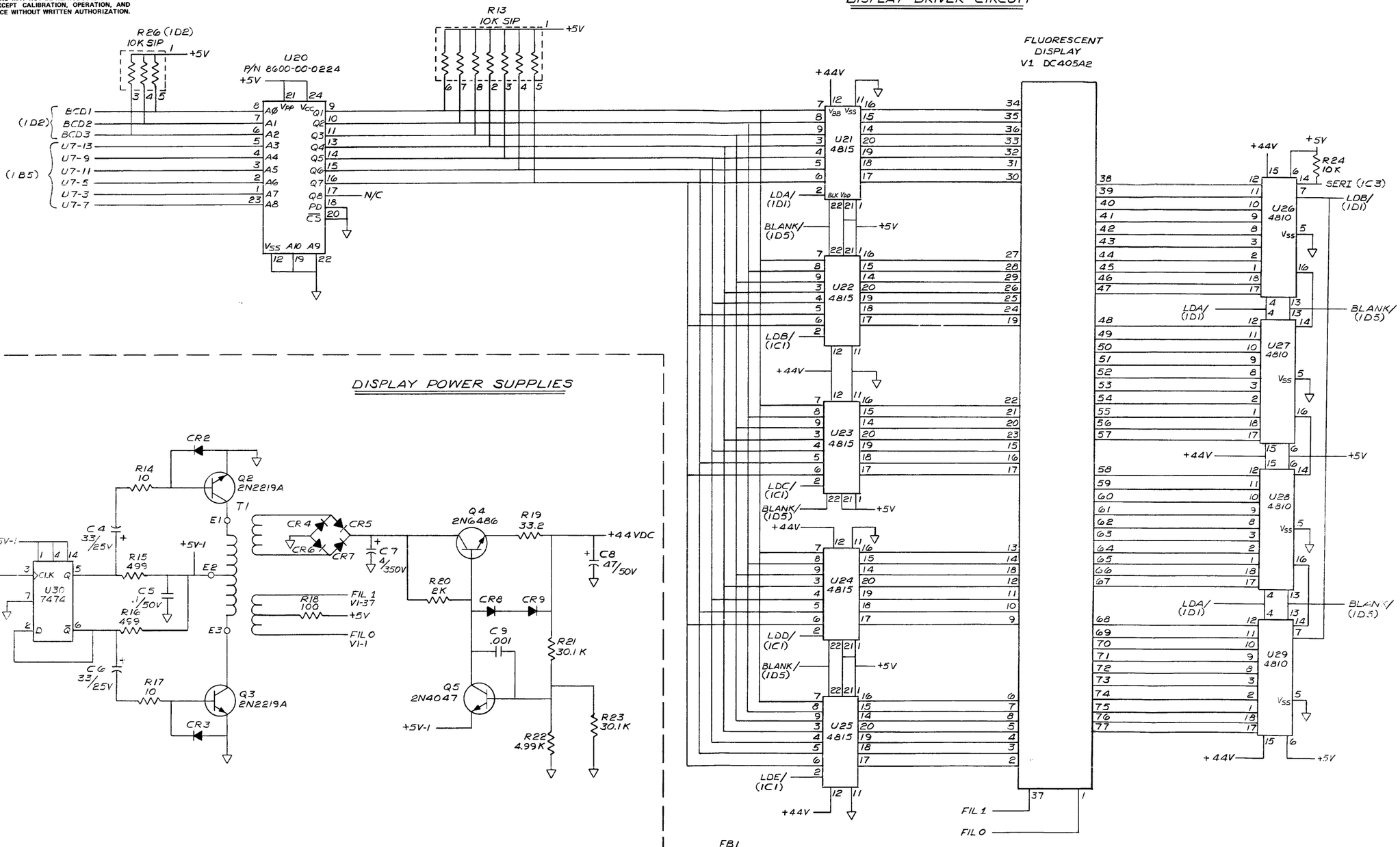
NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN S. CHERMACK	DATE 5-14-81	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR	9-17-81	TITLE SCHEMATIC LOGIC/DECODER BD
FINISH WAVETEK PROCESS	RELEASE APPROVD		
	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1° .XX ±.030		
	DO NOT SCALE DWG	MODEL NO. 172B	DWG NO. 0103-00-0938 REV
	SCALE	CODE IDENT 23338	SHEET 1 OF 2

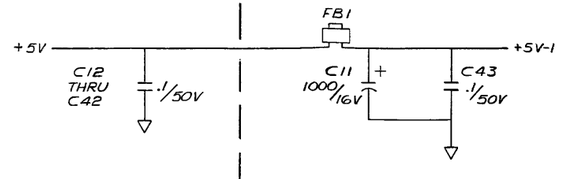
BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-3804

REV	ECN	BY	DATE	APP

DISPLAY DRIVER CIRCUIT

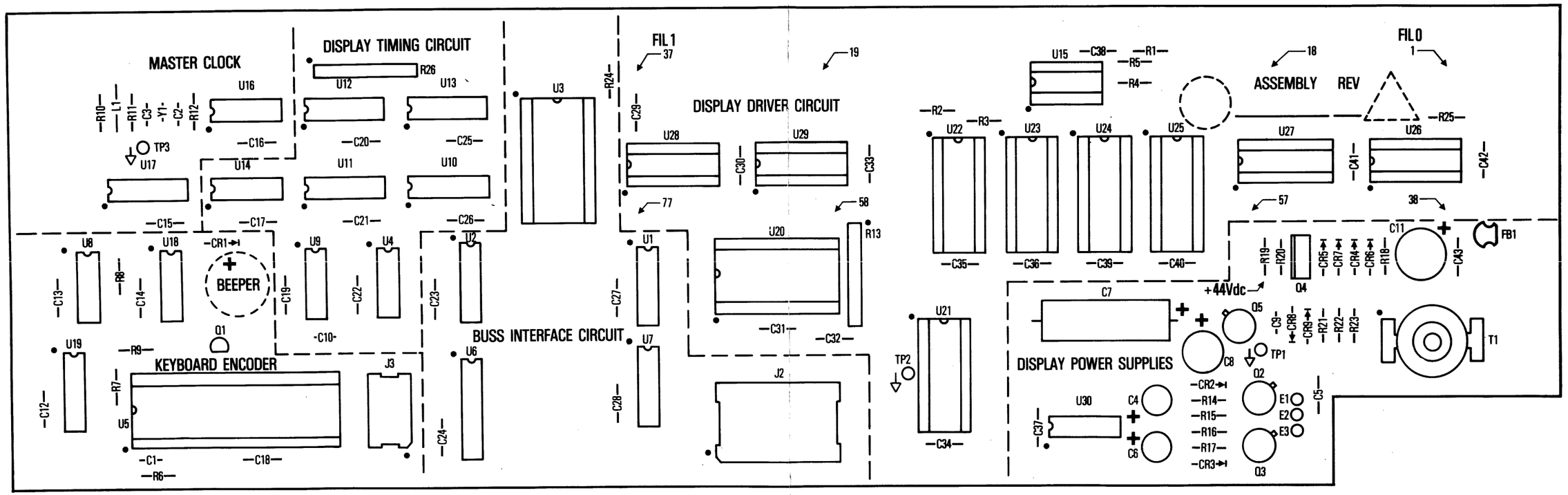


DISPLAY POWER SUPPLIES



NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN S.CHERMACK	DATE 5-14-81	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR Ed Schutt	9-17-81	TITLE SCHEMATIC LOGIC/DECODER BD
FINISH WAVETEK PROCESS	RELEASE APPROV'd		
	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1° .XX ±.030		
	DO NOT SCALE DWG	MODEL NO. 172B	DWG NO. 0103-00-0933 REV
	SCALE	CODE IDENT 23338	SHEET 2 OF 2



REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE PCA LOGIC/DECODER
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		
	DO NOT SCALE DWG		MODEL NO 172 B / DWG NO 0101-00-0938 / REV
	SCALE		CODE IDENT 23338 / SHEET OF

REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG, LOGIC/ DECODER BOARD	0101-00-0938	WVTK	0101-00-0938	1
NONE	SCHEMATIC, LOGIC/ DECODER BOARD	0103-00-0938	WVTK	0103-00-0938	1
NONE	TRANSFORMER	172B-0050	WVTK	1204-00-0050	1
C9	CAP, CER, .001MF, 1KV	DD-102	CRL	1500-01-0211	1
C12 C13 C14 C15 C16 C17 C18 C19 C20 C21 C22 C23 C24 C25 C26 C27 C28 C29 C30 C31 C32 C33 C34 C35 C36 C37 C38 C39 C40 C41 C42 C43 C5	CAP, CER, MON, .1MF, 50V	CAC03Z5U104Z050A	CORNG	1500-01-0405	33
C10	CAP, CER, .022MF, 25V	HY-525	SPRAG	1500-02-2309	1
C3	CAP, CER, 330PF, 1KV	DD-331	CRL	1500-03-3111	1
C1	CAP, CER, 47PF, 1KV	DD-470	CRL	1500-04-7011	1
C2	CAP, MICA, 220PF, 500V	DM15-221J	ARCO	1500-12-2100	1
C7	CAP, ELECT, 4MF, 350V	TVA-1601	SPRAG	1500-30-4005	1
C11	CAP, ELECT, 1000MF/16V RADIAL LEAD, SP .20	CRE SERIES 1000/16	CAPAR	1500-31-0211	1
C4 C6	CAP, ELECT, 33MF, 25V RADIAL LEAD, SP .14	CLE-L SERIES 33/25	CAPAR	1500-33-3002	2
C8	CAP, ELECT, 47MF, 50V	CRE SERIES 47/50	CAPAR	1500-34-7003	1

WAVETEK PARTS LIST | TITLE PCA, LOGIC/DECODER BD | ASSEMBLY NO. 1100-00-0938 | PAGE: 1 | REV

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	TRANSIPAD	10123N	METRS	2800-11-0003	3
DS1	BEEPER	GMB-06	STMIC	3000-00-0085	1
FB1	BALUN CORE	2873000902	FARIT	3100-00-0002	1
R18	RES, MF, 1/8W, 1%, 100	RN55D-1000F	TRW	4701-03-1000	1
R10 R8 R9	RES, MF, 1/8W, 1%, 1K	RN55D-1001F	TRW	4701-03-1001	3
R1 R11 R2 R24 R25 R3 R4 R5 R7	RES, MF, 1/8W, 1%, 10K	RN55D-1002F	TRW	4701-03-1002	9
R6	RES, MF, 1/8W, 1%, 100K	RN55D-1003F	TRW	4701-03-1003	1
R14 R17	RES, MF, 1/8W, 1%, 10	RN55D-10R0F	TRW	4701-03-1009	2
R12 R20	RES, MF, 1/8W, 1%, 2K	RN55D-2001F	TRW	4701-03-2001	2
R21 R23	RES, MF, 1/8W, 1%, 30.1K	RN55D-3012F	TRW	4701-03-3012	2
R19	RES, MF, 1/8W, 1%, 33.2	RN55D-33R2F	TRW	4701-03-3329	1
R15 R16	RES, MF, 1/8, 1%, 499	RN55D-4990F	TRW	4701-03-4990	2
R22	RES, MF, 1/8W, 1%, 4.99K	RN55D-4991F	TRW	4701-03-4991	1
R13 R26	RES MODULE	4310R-101-103	BOURN	4770-00-0008	2
CR1 CR2 CR3 CR4 CR5 CR6 CR7 CR8 CR9	DIODE	1N4148	FAIR	4807-02-6666	9
Q2 Q3	TRANS	2N2219A	NSC	4901-02-2191	2

WAVETEK PARTS LIST | TITLE PCA, LOGIC/DECODER BD | ASSEMBLY NO. 1100-00-0938 | PAGE: 3 | REV

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
	RADIAL LEAD, SP .20				
NONE	LOGIC/DECODER BOARD	1700-00-0938	WVTK	1700-00-0938	1
L1	CHOKE, 5.6MH	1537-30	DELVN	1800-00-0015	1
NONE	SKT, IC, 24PIN	DILB-24P-108	BURND	2100-03-0029	2
NONE	SKT, IC, 40PIN	DILB-40P-108	BURND	2100-03-0030	1
NONE	SOCKET, 14 PIN	C8814-01	TI	2100-03-0032	1
NONE	SKT, IC, 22 PIN	DILB-22P-108	BURND	2100-03-0035	5
1	SKT, IC, 24 PIN	CA-24SPU-10SD	CA	2100-03-0045	1
2	LOCK, SOCKET	CA-24-200-DL	CA	2100-03-0046	1
NONE	SOCKET, 18 PIN	DIBL-18P-108	BURND	2100-03-0050	4
TP1 TP2 TP3	BUSS BAR STANDOFF	2110-001	ARTWR	2100-05-0024	3
Y1	CRYSTAL, 4MHZ	180-502	WVTK	2300-99-0004	1
V1	DISPLAY, FLOUR. (40 CHARACTER)	DC405A2	ITRON	2400-03-0010	1
NONE	SPACER, SWAGE .500 H, .250 DIA .150DIA THRU, .062MTL	6310-1/2-2-C	LYNTR	2800-04-0015	4
NONE	SPACER, SWAGE .750 H, .250 DIA .150DIA THRU, .062MTL	6310-3/4-2-C	LYNTR	2800-04-0016	4

WAVETEK PARTS LIST | TITLE PCA, LOGIC/DECODER BD | ASSEMBLY NO. 1100-00-0938 | PAGE: 2 | REV

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
Q1	TRANS	2N3903	NSC	4901-03-9030	1
Q5	TRANS	2N4047	FAIR	4901-04-0470	1
Q4	TRANS	2N6486	MOT	4901-06-4860	1
J3	CABLE ASSY	CA-D14IDSP-E-CD-005	CA	6002-00-0003	1
J2	CABLE ASSY	CA-D24IDPP-E-CD-012	CA	6002-00-0004	1
U2	IC	8T95	SIG	8000-08-9500	1
U18	IC	CD4093BE	RCA	8000-40-9300	1
U26 U27 U28 U29	IC, DISPLAY DRIVER	UCN4810A	SPRAG	8000-48-1000	4
U21 U22 U23 U24 U25	IC, DISPLAY DRIVER	UCN4815A	SPRAG	8000-48-1500	5
U3	IC	MLM6810AL	MOT	8000-68-1000	1
U14 U4	IC	74LS00	TI	8000-74-0010	2
U9	IC	7402	TI	8000-74-0200	1
U15 U16	IC	74LS04	TI	8000-74-0410	2
U30	IC	7474	TI	8000-74-7400	1
U8	IC	74LS74	TI	8000-74-7410	1
U19	IC	14040	RCA	8001-40-4000	1
U5	IC	AY-5-3600PRO	GI	8005-36-0000	1

WAVETEK PARTS LIST | TITLE PCA, LOGIC/DECODER BD | ASSEMBLY NO. 1100-00-0938 | PAGE: 4 | REV

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
U12	IC	74LS138	TI	8007-41-3810	1
U10 U11 U13 U17	IC	74LS163	SIG	8007-41-6310	4
U6	IC	74LS240	TI	8007-42-4010	1
U1 U7	IC	74LS368	TI	8007-43-6810	2
U20	IC, PROGRAMMED REF: 8000-27-1600	8600-00-0224	WVTK	8600-00-0224	1

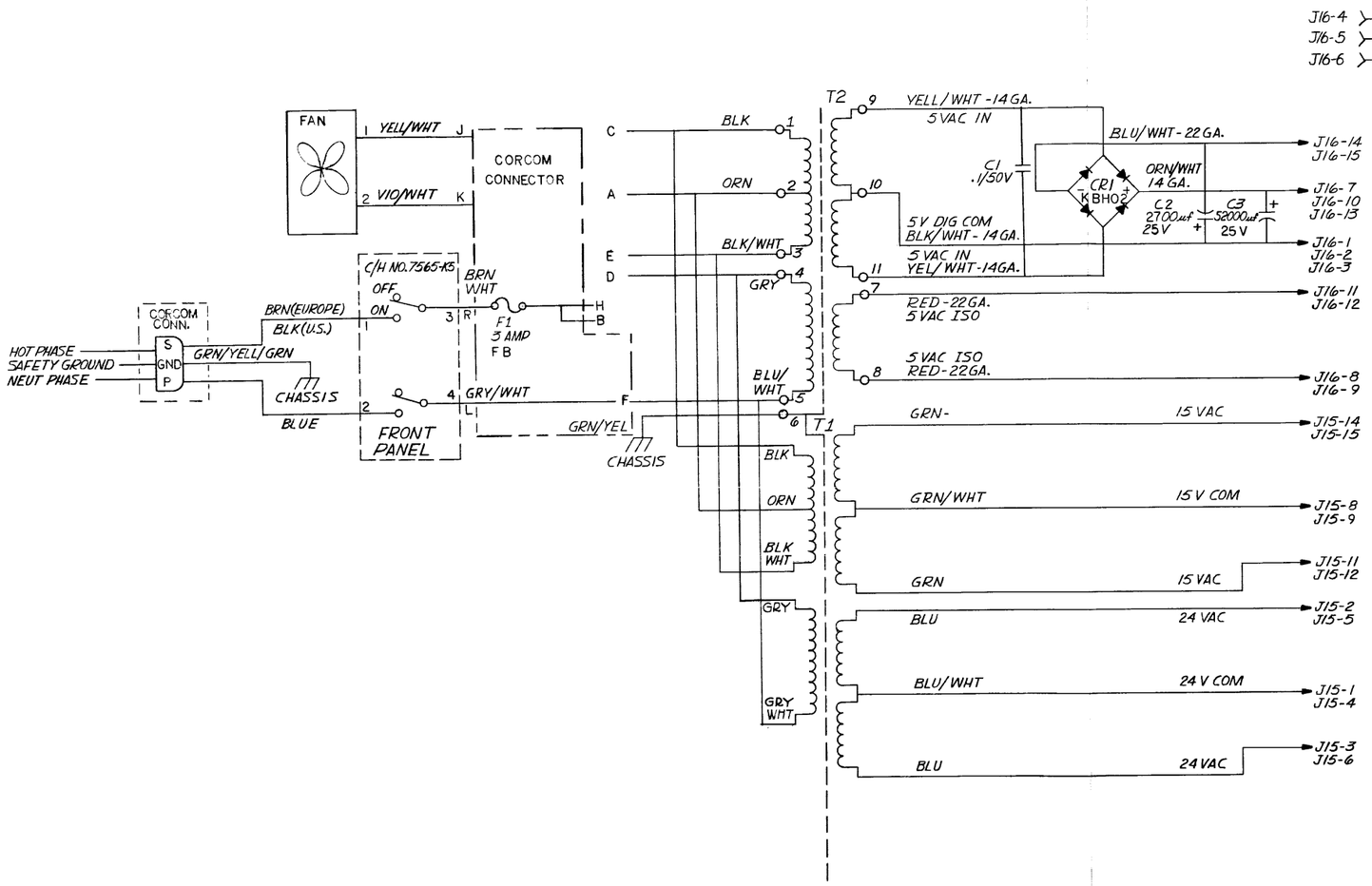
WAVETEK PARTS LIST | TITLE PCA, LOGIC/DECODER BD | ASSEMBLY NO. 1100-00-0938 | PAGE: 5 | REV

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST PCA, LOGIC/DECODER BD
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ±1 XX ± .030		MODEL NO. 172B / DWG NO. 1100-00-0938 / REV
	DO NOT SCALE DWG		CODE IDENT 23338 / SHEET 1 OF 1
	SCALE		

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-3894

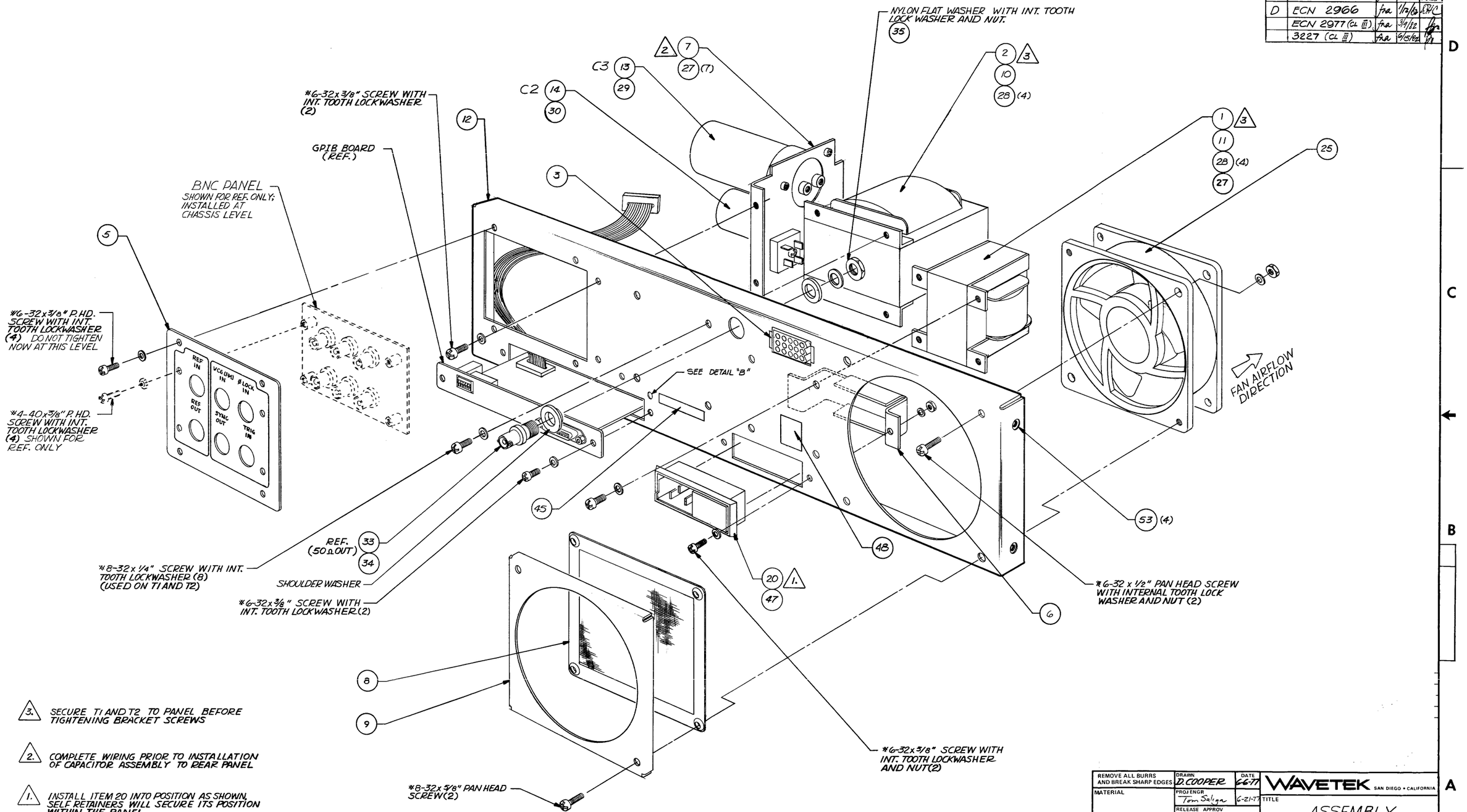
REV	ECN	BY	DATE	APP
A	ECN 2785	fra	9/7/78	



NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN D. COOPER	DATE 6-9-76	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PGM ENGR / RELEASE APPROV		TITLE SCHEMATIC POWER SUPPLY AND REGULATOR REAR PANEL
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1° .XX ±.030		
	DO NOT SCALE DWG		MODEL NO.
	SCALE		DWG NO. 0104-0C-0792 REV A
	CODE IDENT 23338		SHEET 1 OF 1

REV	ECN	BY	DATE	APP
A	ECN # 2132	LJTE	5-5-81	
B	ECN # 2375	DC	10/20/81	
C	ECN 2785	fna	9/17/82	
D	ECN 2966	fna	11/12/82	
	ECN 2977 (CL III)	fna	3/9/83	
	3227 (CL III)	fna	9/15/83	



3. SECURE T1 AND T2 TO PANEL BEFORE TIGHTENING BRACKET SCREWS

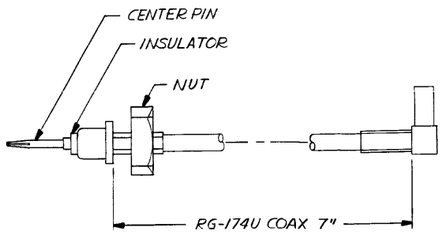
2. COMPLETE WIRING PRIOR TO INSTALLATION OF CAPACITOR ASSEMBLY TO REAR PANEL

1. INSTALL ITEM 20 INTO POSITION AS SHOWN. SELF RETAINERS WILL SECURE ITS POSITION WITHIN THE PANEL

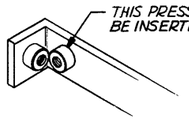
NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN D. COOPER	DATE 6-6-77	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR Tom Saliga	6-21-77	TITLE ASSEMBLY REAR PANEL
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1° .XX ±.030		
	DO NOT SCALE DWG	MODEL NO.	DWG NO. 0102-00-0792 REV D
	SCALE	CODE IDENT 23338	SHEET 1 OF 3

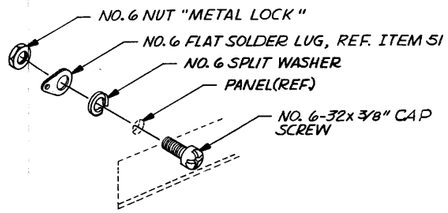
REV	ECN	BY	DATE	APP



DETAIL "C"
COAX DETAIL

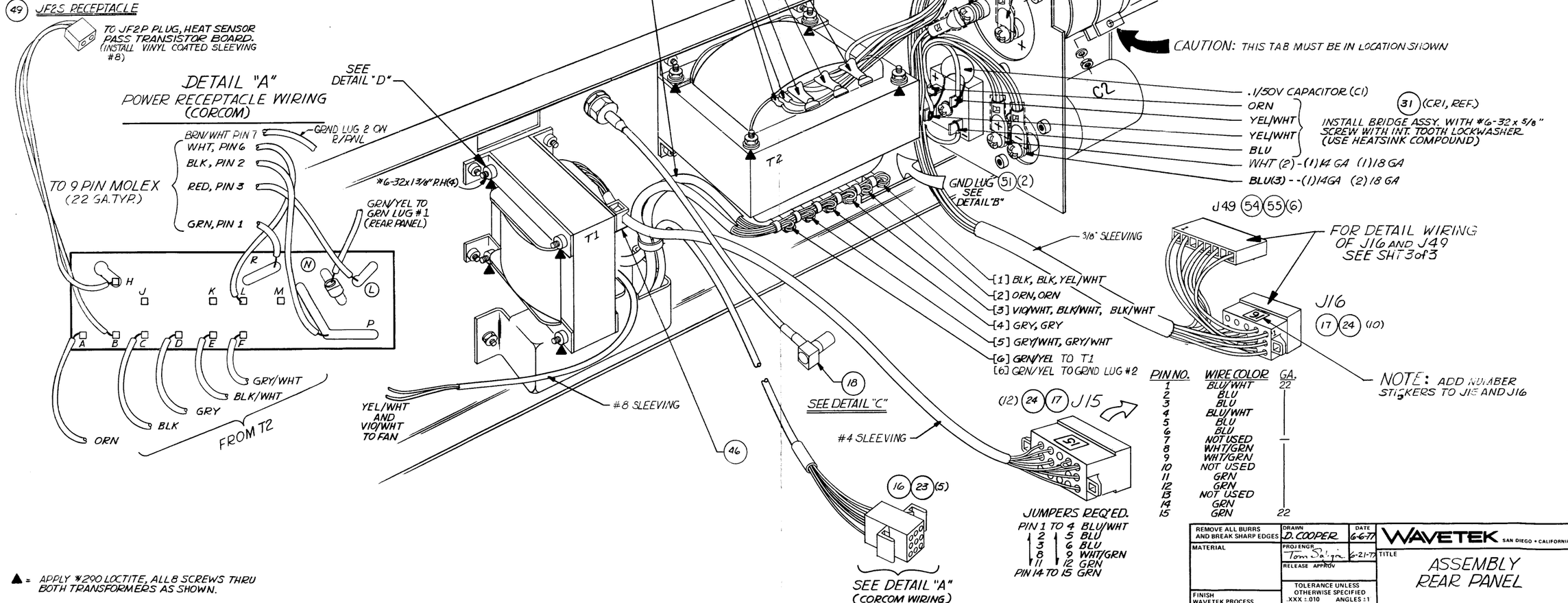


DETAIL "D"
TRANSFORMER BRACKET



DETAIL "B"
TYP. GROUND LUG STACK-UP
(3 PLACES)

NOTE: ALL CONNECTORS TO BE MECHANICALLY SECURE TO CHASSIS PRIOR TO SOLDERING GROUND WIRES TO LUGS.



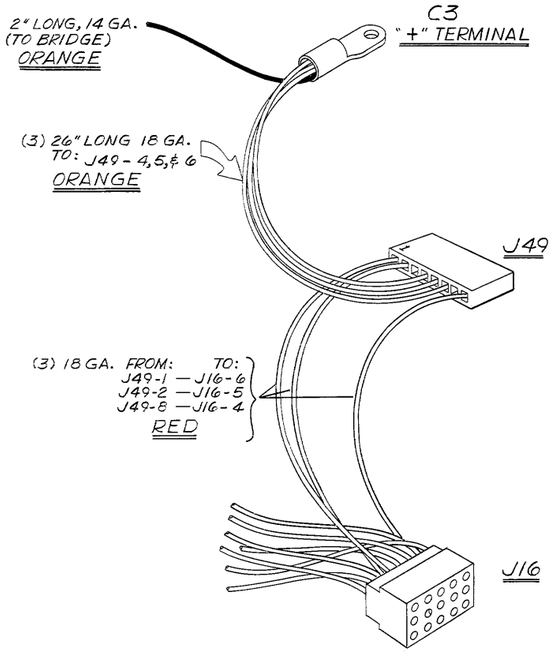
PIN NO.	WIRE COLOR	GA.
1	BLU/WHT	22
2	BLU	
3	BLU	
4	BLU/WHT	
5	BLU	
6	BLU	
7	NOT USED	
8	WHT/GRN	
9	WHT/GRN	
10	NOT USED	
11	GRN	
12	GRN	
13	NOT USED	
14	GRN	
15	GRN	22

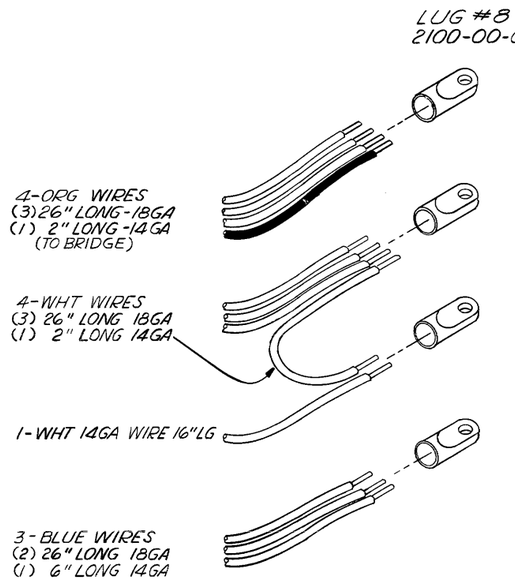
▲ = APPLY #290 LOCTITE, ALL 8 SCREWS THRU BOTH TRANSFORMERS AS SHOWN.

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN D. COOPER	DATE 6-6-77	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR Tom Salyer	6-21-77	TITLE ASSEMBLY REAR PANEL
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1 .XX ±.030		MODEL NO.
	DO NOT SCALE DWG		DWG NO. 0102-00-0792 REV D
	SCALE		CODE IDENT 23338 SHEET 2 OF 3

REV	ECN	BY	DATE	APP





J49
WIRING

PIN NO.	DESTINATION	COLOR	GA.
1	J16-6	RED	18
2	J16-5	RED	18
3	NOT USED		
4	"+" C3	ORN	18
5	"+" C3	ORN	18
6	"+" C3	ORN	18
7	NOT USED		
8	J16-4	RED	18

J16
WIRING

PIN NO.	DESTINATION	COLOR	GA.
1		WHT	18
2		WHT	18
3		WHT	18
4	J49-8	RED	18
5	J49-2	RED	18
6	J49-1	RED	18
7	NOT USED		
8	NOT USED		
9		RED	22
10	NOT USED		
11	NOT USED		
12		RED	22
13	NOT USED		
14		BLU	18
15		BLU	18

NO JUMPERS USED

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN RO FIFER	DATE 3-17-78	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: ASSEMBLY REAR PANEL
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1° .XX ±.030		
	DO NOT SCALE DWG		MODEL NO. / DWG NO. 0102-00-0792 / RF D
	SCALE		CODE IDENT 23338 / SHEET 3 OF 3

REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
33	BNC CONN	KC-19-152	KING	2100-01-0006	1
16	CONN, 9PIN	03-06-1091	MOLEX	2100-02-0010	1
3	CONN, 15PIN	03-09-1151	MOLEX	2100-02-0012	1
17	PLUG, 15PIN	03-09-2151	MOLEX	2100-02-0013	2
54	CONN HOUSING	1-87025-6	AMP	2100-02-0077	1
NONE	CONNECTOR	JF2S	WINCH	2100-02-0081	1
20	RECEPTACLE	6VJ1	CORCM	2100-03-0026	1
22	LUG	35	ILSCO	2100-04-0018	4
51	SOLDER LUG	1485-6	SMITH	2100-04-0025	2
23	PIN, FEMALE	02-06-1103	MOLEX	2100-05-0002	5
24	PIN, MALE	02-09-2118	MOLEX	2100-05-0003	22
55	CONN PINS	87027-3	AMP	2100-05-0047	6
18	CONN	27-843	AMPH	2100-07-0009	1
47	LABEL, RECEPT	85-1505	CORCM	2400-04-0001	1
NONE	FUSE, 3A, 250V	312003	LITFU	2400-05-0018	1
8	FAN FILTER	5502	PAMOT	2600-01-0005	1
25	FAN, MODIFIED	2600-99-0002	WVTK	2600-99-0002	1

WAVETEK PARTS LIST | TITLE REAR PANEL ASSY | ASSEMBLY NO. 1101-00-0792 | PAGE: 2 | REV C

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG REAR PANEL	0102-00-0792	WVTK	0102-00-0792	1
NONE	SCHEMATIC REAR PANEL	0104-00-0792	WVTK	0104-00-0792	1
2	TRANSFORMER	172B-0035	WVTK	1204-00-0035	1
NONE	TRANSFORMER	172B-0054	WVTK	1204-00-0054	1
6	SHIELD, PWR	1400-00-6210	WVTK	1400-00-6210	1
7	BRKT	1400-00-7043	WVTK	1400-00-7043	1
9	SCREEN COVER	1400-00-7523	WVTK	1400-00-7523	1
11	BRKT, XFMR	1400-00-7543	WVTK	1400-00-7543	4
10	BRKT, XFMR, MTG	1400-00-7783	WVTK	1400-00-7783	2
5	BNC MTG PLATE	1400-00-7790	WVTK	1400-00-7790	1
12	REAR PANEL	1400-00-7810	WVTK	1400-00-7810	1
48	LABEL, OPTION	1400-00-8880	WVTK	1400-00-8880	1
45	I.D. LABEL	1400-00-9090	WVTK	1400-00-9090	1
52	IPOLYESTER FILM REF: 1600-99-0002	1400-01-3191	WVTK	1400-01-3191	2
C1	CAP, CER, MON, .1MF, 50V	CAC03Z5U104Z050A	CORNG	1500-01-0403	1
14	CAP, ELECT, 2700MF, 25V	91C25HA272	MEPCO	1500-32-7202	1
13	CAP, ELEC, 52000MF, 15V	FAHM52000-15-B3	CDE	1500-35-2301	1

WAVETEK PARTS LIST | TITLE REAR PANEL ASSY | ASSEMBLY NO. 1101-00-0792 | PAGE: 1 | REV C

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
	FROM: 2600-00-0005				
46	TIE MOUNT	TM-256C	PANDT	2800-00-0005	1
NONE	TY-WRAP	TY-523M	TB	2800-00-0006	20
27	INSERT # 6	74-11-106-13	SOTCO	2800-09-0017	12
28	INSERT #8	74-11-108-13	SOTCO	2800-09-0018	8
29	CAP, MTG, BKT	FJMR	STM	2800-12-0006	1
30	CAP, MTG, BKT	FHMR-2	STM	2800-12-0007	1
53	NUT, PRESS, 6-32	S-632-1	PEM	2800-16-0014	4
34	WASHER, SHOULDER	2668	SMITH	2800-27-0004	1
35	NYLON FLAT WASHER	2264-N-385	AMTOM	2800-28-0005	1
40	SLEEVING, BLK 3/8 IN.	SLEEVING, BLACK 3/8"	NATBR	3000-00-0024	2
41	SLEEVING, BLACK #4	SLEEVING, BLACK #4	NATBR	3000-00-0025	2
42	SLEEVING, BLACK #8	SLEEVING, BLACK #8	NATBR	3000-00-0026	2
31	BRIDGE ASSY 30 AMP	MDA990-1	MOT	4899-00-0010	1
NONE	CABLE, 4 COND, 20GA	8722	BELDN	6001-70-0007	1

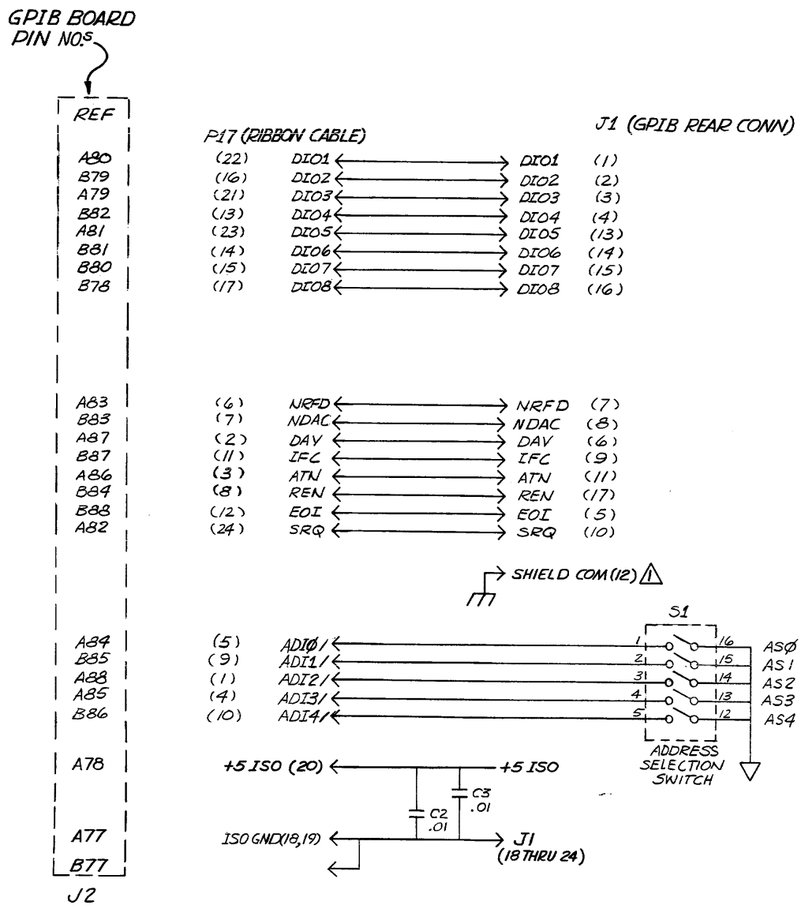
WAVETEK PARTS LIST | TITLE REAR PANEL ASSY | ASSEMBLY NO. 1101-00-0792 | PAGE: 3 | REV C

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST REAR PANEL ASSY
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		
	DO NOT SCALE DWG		MODEL NO 172B / DWG NO 1101-00-0792 / REV C
	SCALE		CODE IDENT 23338 / SHEET 1 OF 1

BISHOP GRAPHICS/ACCUPRESS RECORDER NO. A-3994

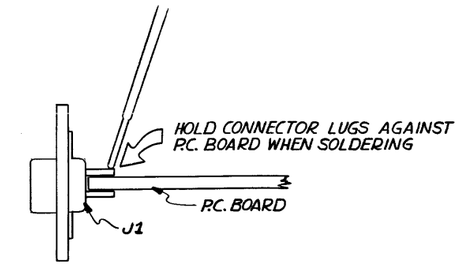
REV	ECN	BY	DATE	APP
A	"P17 WAS "J1", J1 WAS "J2," "NDAC" WAS "NDAC," "ADIØ" THRU "ADI4" WAS "AOIØ" THRU "AOI4"	TLF	6-30-77	
B	ECN 1687	RO	3-23-78	
C	ECN 2487	LOU	1-19-81	



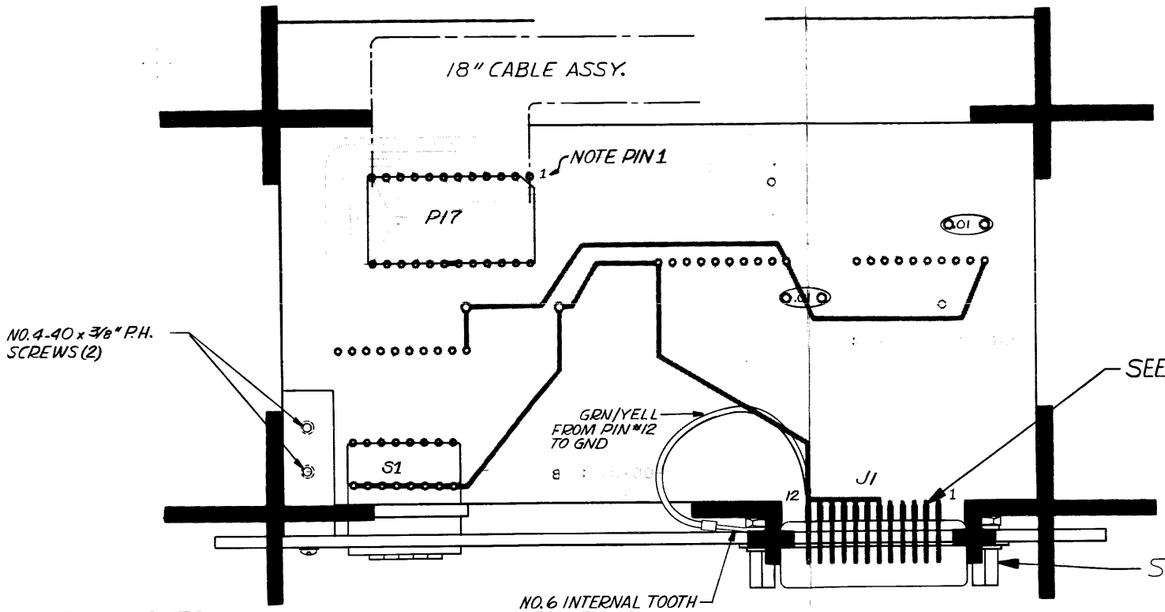
⚠ GREEN WIRE TO CHASSIS GROUND

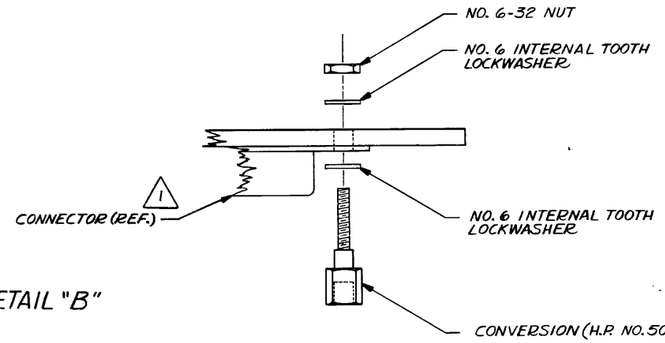
NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN T. FOSTER	DATE 5/6/77	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL —	PROJ ENGR Tom Salyer	SEPT 6'77	TITLE SCHEMATIC - GPIB DECODER
FINISH WAVETEK PROCESS —	RELEASE APPROV		
	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1° .XX ±.030		
	DO NOT SCALE DWG	MODEL NO.	DWG NO. 0103-00-0554 REV C
	SCALE —	CODE IDENT 23338	SHEET 1 OF 1

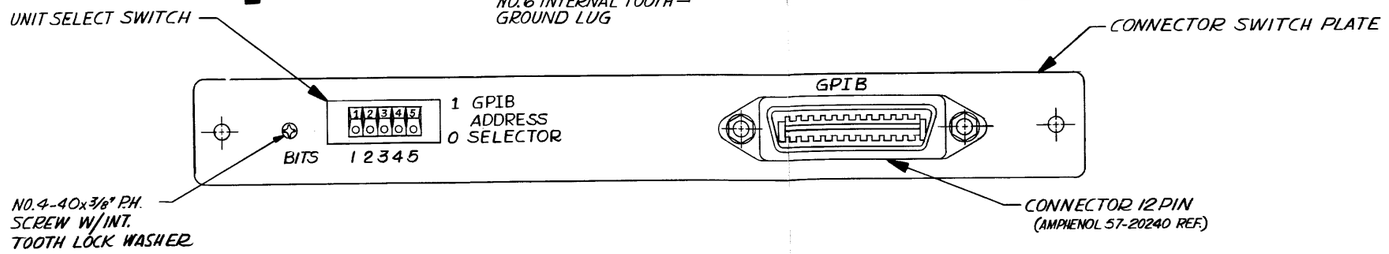


DETAIL "B"
LUG SOLDERING TO P.C. BD.





DETAIL "A"
H.P. CONVERSION NO. 5060-0138
HP-IB



1 REMOVE FLOATING HARDWARE FROM CONNECTOR FLANGE

NOTES: UNLESS OTHERWISE SPECIFIED.

K	# 2487	LOU	1-19-81
J	# 2129	LITE	4-30-80
H	# 2039		8-28-79
G	ECN 1693	JC	11-10-78
F	ECN 1687	RS	7-28-78

DRAWN D. COOPER 11-8-76
PROJ ENGR Tom Salga SEPT 6 '77
RELEASE APPROV

WAVETEK

ASSEMBLY
GPIB DECODER

0101-00-0554 K

SHEET 1 OF 1

REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG DECODER	0101-00-0554	WVTK	0101-00-0554	1
NONE	SCHEMATIC DECODER	0103-00-0554	WVTK	0103-00-0554	1
NONE	CONN. BLOCK	157-314	WVTK	1400-00-3043	1
NONE	CONN PLATE	1400-00-6610	WVTK	1400-00-6610	1
C2 C3	CAP,CER,MN,.01MF,50V	CAC02Z5U103Z100A	CORNG	1500-01-0310	2
NONE	DECODER	1700-00-0554	WVTK	1700-00-0554	1
J1	CONN	57-20240	AMPH	2100-02-0060	1
NONE	SOCKET	516-AG7D	AUGAT	2100-03-0034	1
NONE	TERM,LOCK LUG	1414-6	SMITH	2100-04-0009	1
NONE	JACK SCREW	408-146475	AMPH	2800-23-0008	2
S1	SWITCH PC	500-105	DUNCN	5179-00-0001	1
P17	INTERCONNECT CABLE	CA-D24P02-26-1TT-016	CA	6002-00-0002	1

WAVETEK PARTS LIST	TITLE PCA,GPIB REAR INTERF	ASSEMBLY NO. 1100-00-0554 PAGE: 1	REV H

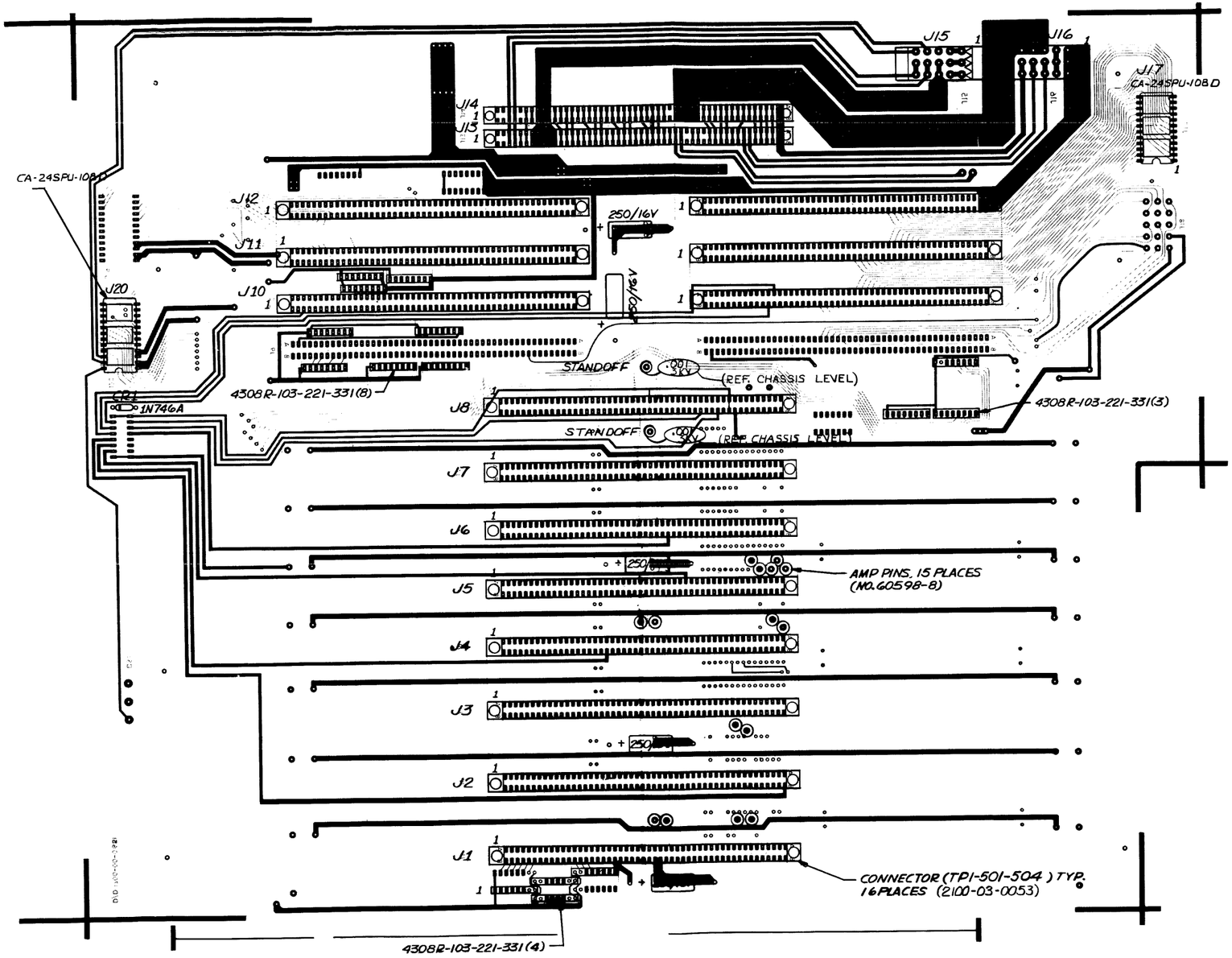
NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST PCA, GPIB REAR INTERF
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1 .XX ±.030		MODEL NO 172B / DWG NO. 1100-00-0554 / REV H
	DO NOT SCALE DWG		CODE IDENT 23338 / SHEET 1 OF 1
	SCALE		

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-3894

DESIGNER'S FORMAT PRINTING, INC. 1987

REV	ECN	BY	DATE	APP
B	ECN 1689	RO	3-14-78	
C	ECN 1844	RO	11-16-76	
D	ECN 1941	DC	3-22-79	
E	ECN 2131	LJTE	5-1-80	



NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN D. COOPER	DATE 9-4-77	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR Tom Saliga	Sept 6'77	TITLE ASSEMBLY MOTHER BOARD
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1° .XX ±.030		
	DO NOT SCALE DWG		MODEL NO. / DWG NO. 0101-00-0717 / REV E
	SCALE		CODE IDENT 23338 / SHEET 1 OF 1

REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG MOTHER	0101-00-0717	WVTK	0101-00-0717	1
C1 C2 C3 C4 C5	CAP, ELECT, 250MF, 16V	500D257G016DF7	SPRAG	1500-32-5101	5
NONE	MOTHER BOARD	1700-00-0651	WVTK	1700-00-0651	1
J15 J16	CONN, 15PIN	03-09-1151	MOLEX	2100-02-0012	2
J17 J20	SKT, IC, 24 PIN	CA-24SPU-10SD	CA	2100-03-0045	2
NONE	CONN, EDGE CARD-GP	TP1-501-504	TEKA	2100-03-0053	16
NONE	PIN, FEMALE	02-09-1133	MOLEX	2100-05-0004	30
NONE	CONN	60598-8	AMP	2100-05-0017	17
NONE	STANDOFF, SWAGE .125 H, .250 DIA 4-40, .093 MAT'L	6911-2-3C	LYNTR	2800-03-0003	2
NONE	RES MODULE	4308R-103-221/331	BOURN	4770-00-0013	15
CR1	DIODE	1N746A	FAIR	4801-01-0746	1

WAVETEK PARTS LIST	TITLE PCA, MOTHER BD	ASSEMBLY NO. 1100-00-0717	REV B
		PAGE: 1	

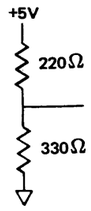
NOTE. UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE
	RELEASE APPROV		PARTS LIST PCA, MOTHER BD
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1 .XX ±.030		
	DO NOT SCALE DWG	MODEL NO 172B	DWG NO 1100-00-0717 REV B
	SCALE	CODE IDENT 23338	SHEET 1 OF 1

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-3894

Signal Routing on Mother Board

1. Terminators are on each line of the bus formed by pins 1 thru 15 of connectors J1 thru J8 and pins 33 thru 47 of connectors J10 thru J12. Typical terminator:



2. Terminators are on each line of the bus of pins 5 thru 29 of connectors J10 thru J12.

3. Terminators are on each line of the bus of pins 90 thru 99 of connectors J10 thru J12.

4. Capacitors on the mother board are tied to +5V on the positive side and grounded on the other side.

J1/Digits 4 and 5/Reference

B Side	Pin	A Side
C07	1	Strobe
C06	2	A3
C05	3	A2
C04	4	A1
C03	5	A0
C02	6	XSGN/
C01	7	D7
C00	8	D6
C17	9	D5
C16	10	D4
C15	11	D3
C14	12	D2
C13	13	D1
C12	14	D0
(SYNPR)		
C11	15	CI0
(LOCK 0)		(CAUTION 0)
SYN 45 1	16	SYN45 1
COM 45	17	COM 45
MC COM	18	MC0.5
+5V	19, 20	+5V
MC0.1	21	MC0.1
+5V	22	
GND	23, 24	GND
CLR0	25	CLR0
±15V	26	±15V
GND	27, 28	GND
REF IN	29	REF IN
−15V	30, 31	−15V
	32	
+15V	33, 34	+15V
	35	
	36	
	37	
MC30	38	MC30
MC30	39	MC30
	40	
	41	
INT 10	42	
REF OUT	43	
	44	
	45	
MC60 0	46	MC60 0
MC60	47	MC60
	48	
	49	
−5V	50	−5V

J2/Digits 2 and 3

B Side	Pin	A Side
C07	1	Strobe
C06	2	A3
C05	3	A2
C04	4	A1
C03	5	A0
C02	6	XSGN/
C01	7	D7
C00	8	D6
C17	9	D5
C16	10	D4
C15	11	D3
C14	12	D2
C13	13	D1
C12	14	D0
C11	15	CI0
SYN 45 1	16	SYN45 1
COM 45	17	COM 45
MC COM	18	MC0.5
+5V	19, 20	+5V
MC0.1	21	MC0.1
+5V	22	±5V
GND	23, 24	GND
CLR0	25	CLR0
±15V	26	±15V
GND	27, 28	GND
	29	
−15V	30, 31	−15V
	32	
+15V	33, 34	+15V
	35	
DIG 23 0	36	DIG 23 0
DIG 23 1	37	DIG 23 1
MC30	38	MC30
MC30	39	MC30
	40	
	41	
	42	
	43	
	44	
	45	
MC60	46	MC60
MC60	47	MC60
	48	
	49	
−5V	50	−5V

J3/Digit 1/Mixer

B Side	Pin	A Side
C07	1	Strobe
C06	2	A3
C05	3	A2
C04	4	A1
C03	5	A0
C02	6	XSGN/
C01	7	D7
C00	8	D6
C17	9	D5
C16	10	D4
C15	11	D3
C14	12	D2
C13	13	D1
C12	14	D0
C11	15	CI0
GND	16	XRD/
	17	
MC COM	18	MC0.5
+5V	19, 20	+5V
	21	
+5V	22	±5V
GND	23, 24	GND
CLR0	25	CLR0
±15V	26	±15V
GND	27, 28	GND
	29	
−15V	30, 31	−15V
	32	
+15V	33, 34	+15V
	35	
DIG 23 0	36	DIG 23 0
DIG 23 1	37	DIG 23 1
MC30	38	MC30
MC30	39	MC30
	40	
	41	
	42	
	43	
	44	
	45	
SYNOB	46	SYNOB
SYNOA	47	SYNOA
	48	
	49	
−5V	50	−5V

J4/VCG and Symmetry

B Side	Pin	A Side
C07	1	Strobe
C06	2	A3
C05	3	A2
C04	4	A1
C03	5	A0
C02	6	XSGN/
C01	7	D7
C00	8	D6
C17	9	D5
C16	10	D4
C15	11	D3
C14	12	D2
C13	13	D1
C12	14	D0
C11	15	CI0
	16	
	17	
	18	
B	18	B
+5V	19, 20	+5V
	21	
GVC	22	±5V
+5V	23, 24	GND
VCG	25	VCG
±15V	26, 27, 28	±15V
GND	29	GND
−15V	30, 31	−15V
	32	
+15V	33, 34	+15V
	35	
I+	36	I+
COM	37	COM
CI	38	CI
COM	39	COM
I−	40	I−
−24V	41	−24V
	42	
+24V	43	+24V
GEN OUT	44	GEN OUT
COM	45	COM
SYNOB	46	SYNOB
COM	47	COM
SYNOA	48	SYNOA
COM	49	COM
⌀ LOCK IN	50	⌀ LOCK IN

J5/Triangle Generator

B Side	Pin	A Side
C07	1	Strobe
C06	2	A3
C05	3	A2
C04	4	A1
C03	5	A0
C02	6	XSGN/
C01	7	D7
C00	8	D6
C17	9	D5
C16	10	D4
C15	11	D3
C14	12	D2
C13	13	D1
C12	14	D0
C11	15	CI0
	16	
	17	
	18	
B	18	B
+5V	19, 20	+5V
	21	
±5V	22	±5V
GND	23, 24	GND
TRI	25	TRI
±15V	26	±15V
GND	27, 28	GND
	29	
−15V	30, 31	−15V
	32	
+15V	33, 34	+15V
	35	
I+	36	I+
COM	37	COM
CI	38	CI
COM	39	COM
I−	40	I−
COM	41	COM
	42	
COM	43	COM
GEN OUT	44	GEN OUT
COM	45	COM
SYNC OUT	46	SYNC OUT
COM	47	COM
MAN TRIG	48	MAN TRIG
COM	49	COM
TRIG IN	50	TRIG IN

J6/Function/Preamp

B Side	Pin	A Side
C07	1	Strobe
C06	2	A3
C05	3	A2
C04	4	A1
C03	5	A0
C02	6	XSGN/
C01	7	D7
C00	8	D6
C17	9	D5
C16	10	D4
C15	11	D3
C14	12	D2
C13	13	D1
C12	14	D0
C11	15	CI0
	16	
	17	
	18	
B	18	B
+5V	19, 20	+5V
	21	
±5V	22	±5V
GND	23, 24	GND
TRI	25	TRI
±15V	26, 27, 28	±15V
GND	29	GND
−15V	30, 31	−15V
	32	
+15V	33, 34	+15V
	35	
I+	36	I+
COM	37	COM
CI	38	CI
COM	39	COM
I−	40	I−
COM	41	COM
	42	
COM	43, 44, 45, 46	COM
	47	
PRE-AMP OUT	48, 49	PRE-AMP OUT
	50	

J7/3 Digit Attenuator

B Side	Pin	A Side
C07	1	Strobe
C06	2	A3
C05	3	A2
C04	4	A1
C03	5	A0
C02	6	XSGN/
C01	7	D7
C00	8	D6
C17	9	D5
C16	10	D4
C15	11	D3
C14	12	D2
C13	13	D1
C12	14	D0
C11	15	CI0
	16	
	17	
	18	
B	18	B
+5V	19, 20	+5V
	21	
±5V	22	±5V
GND	23, 24	GND
TRI	25	TRI
±15V	26, 27, 28	±15V
GND	29	GND
−15V	30, 31	−15V
	32	
+15V	33, 34	+15V
	35	
	36	
	37	
	38	
	39	
	40	
	41	
	42	
COM	43, 44, 45, 46	COM
	47	
PRE-AMP OUT	48, 49	PRE-AMP OUT
	50	

J8/Power Amplifier/DC Offset

B Side	Pin	A Side
C07	1	Strobe
C06	2	A3
C05	3	A2
C04	4	A1
C03	5	A0
C02	6	XSGN/
C01	7	D7
C00	8	D6
C17	9	D5
C16	10	D4
C15	11	D3
C14	12	D2
C13	13	D1
C12	14	D0
C11	15	CI0
GND	16	XRD/
	17	
	18	
B	18	B
+5V	19, 20	+5V
	21	
±5V	22	±5V
GND	23, 24	GND
A	25	A
±15V	26, 27, 28	±15V
GND	29	GND
−15V	30, 31	−15V
	32	
+15V	33, 34	+15V
	35	
−24V	36, 37	−24V
	38	
+24V	39, 40	+24V
	41	
−5V	42	−5V
	43	
±24 GND (±24 CT XFMR)	44, 45, 46, 47	±24 GND (±24 CT XFMR)
	48	
	49	
	50	

J20, Front Panel

1	+5V
2	
3	Common
4	
5	DBUS 7/
6	DBUS 5/
7	KB OUT/
8	DBUS 3/
9	DBUS 4/
10	DBUS 1/
11	DBUS 2/
12	DBUS 0/
13	WRP
14	DISPEN/
15	ABUS 0/
16	ABUS 2/
17	ABUS 1/
18	ABUS 4/
19	ABUS 3/
20	AUDIO
21	ABUS 5/
22	250 Volts ac
23	
24	−12 Volts

J17, I/O Lines

1	ADI2/
2	DAV
3	ATN
4	ADI3/
5	ADI0/
6	NRFD
7	NDAC
8	REN
9	ADI1/
10	ADI4/
11	IFC
12	EOI
13	DIO4
14	DIO6
15	DIO7
16	DIO2
17	DIO8
18	ISO GND
19	ISO GND
20	+5V ISO
21	DIO3
22	DIO1
23	DIO5
24	SRQ

No Connector

J10/Memory RAM

B Side	Pin	A Side
±5V GND	1, 2	±5V GND
+12V	3	+12V
	4	
DBUS0/	5	DBUS1/
DBUS2/	6	DBUS3/
DBUS4/	7	DBUS5/
DBUS6/	8	DBUS7/
	9	
OPACK/	10	OPREQ/
M/IO	11	E/NE
RD/WT	12	WRP
	13	RDMA/
INTREQ/	14	INTACK
FLAG/	15	SENSE/
MRST/	16	RUN/WAIT
WIOD/	17	RIOD/
	18	
OPREQ	19	WRPS
	20	
	21	
RDKYBD/, KBOUT/ KBIN/	22	DISPEN/
	23	
	24	
	25	
	26	
SYS CLK 5	27	SYS CLK 4
SYS CLK 3	28	SYS CLK 2
SYS CLK 1	29	SYS CLK 0
	30	
	31	
	32	
C07	33	STRB/
C06	34	A3/
C05	35	A2/
C04	36	A1/
C03	37	A0/
C02	38	XSGN/
C01	39	D7/
C00	40	D6/
CI7	41	D5/
CI6	42	D4/
CI5	43	D3/
CI4	44	D2/
CI3	45	D1/
CI2	46	D0/
CI1	47	CI0
	48	
+5V TTL	49, 50	+5V TTL
+5V TTL	51, 52	+5V TTL
-5V	53	-5V
	54	
	55	
	56	
	57	
	58	
	59	
	60	
	61	
+5V ISO COM	62	+5V ISO COM
+5V ISO	63	+5V ISO
	64	
	65	
	66	
MRST	67	MRST/
	68	
	69	
	70	
	71	
	72	
	73	
	74	
	75	
	76	
+5V ISO COM	77	+5V ISO COM
DIO8	78	+5V ISO
DIO2	79	DIO3
DIO7	80	DIO1
DIO6	81	DIO5
DIO4	82	SRQ
NDAC	83	NRFD
REN	84	
	85	
	86	ATN
IFC	87	DAV
EOI	88	
	89	
ABUS14/	90	ABUS15/
ABUS12/	91	ABUS13/
ABUS10/	92	ABUS11/
ABUS8/	93	ABUS9/
ABUS6/	94	ABUS7/
ABUS4/	95	ABUS5/
ABUS2/	96	ABUS3/
ABUS0/	97	ABUS1/
	98	
±5V GND	99, 100	±5V GND

J11/GPIB Interface (Same as J10)

J12/Microprocessor (Same as J10)

J13/Power Supply Regulator

B Side	Pin	A Side
OUT	1	IN
OUT	2	IN
±15V	3, 4	±15V
AC		AC
+12V	5, 6	+12V
±15, ±12 COM	7, 8, 9, 10, 11	±15, ±12 COM
B	12	B
C	13	C
E	14	E
−15V	15, 16	−15V
B	17	B
C	18	C
E	19	E
+15V	20, 21	+15V
B	22	B
C	23	C
E	24	E
−24V	25, 26	−24V
B	27	B
C	28	C
E	29	E
+24V	30, 31	+24V
±24 VAC	32, 33, 34	±24 VAC
±24 V COM	35, 36	±24 V COM
+5D	38	+5D
+5S	39	+5S
+5V	40, 41	+5V
+5V COM	42, 43	+5V COM
ISO AC From Xfmr	44, 45	ISO AC From Xfmr
−5V ISO IN	46, 47	−5V ISO IN
ISO COM ISO +5V	48, 49	ISO COM ISO +5V
−5V IN From Diode Bridge	50	−5V IN

J14/Pass Transistor/Regulator

B Side	Pin	
IN	1, 2	High Voltage
±15V	3	
AC	4	
	5	
+12V	6, 7	
±15V	8	
CT	9, 10	
B	11	
C	12, 13	
E	14	
	15	
B	16	
C	17, 18	
E	19, 20	
B	21	
C	22, 23	
E	24, 25	
B	26	
C	27, 28	
E	29, 30	
+5V IN TIP 29-C	31, 32, 33, 34, 35	To "+" of 18,000 µF
TIP 29-B	36	
TIP 35 E	37	
+5V	38, 39, 40, 41, 42, 43	
±5V COM	44, 45	
−5V	46	
ISO IN	47	
ISO COM	48	
ISO +5V	49	
−5V IN	50	

J15, 15V & 24V TRANSFORMER

1, 4	24V Common
2, 5	24 Vac (24V Winding)
3, 6	24 Vac
8, 9	15V Common
11, 12	15 Vac (15V Winding)
14, 15	15 Vac

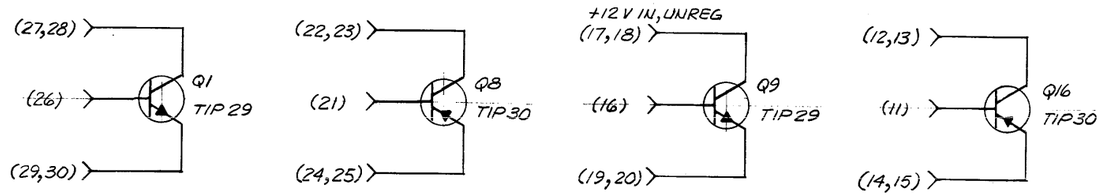
J16, 5V TRANSFORMER

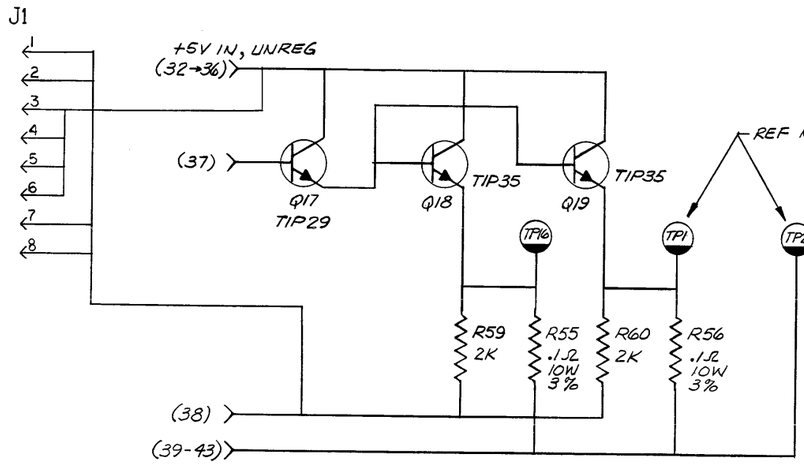
1, 2, 3	Digital Common
8, 9	5V ISO (AC Winding)
11, 12	5V ISO (AC Winding)
14, 15	−5V Unregulated

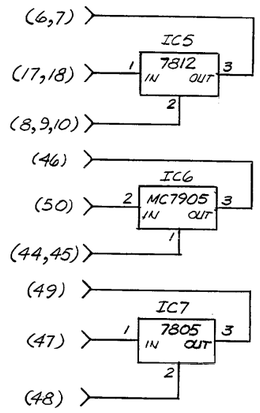
J49

4, 5, 6	+5V Unregulated

REV	ECN	BY	DATE	APP
A		TLF	6/24/77	
B	ECN 1687	RO	8/23/78	
C	ECN 1897	CC	4/25/79	







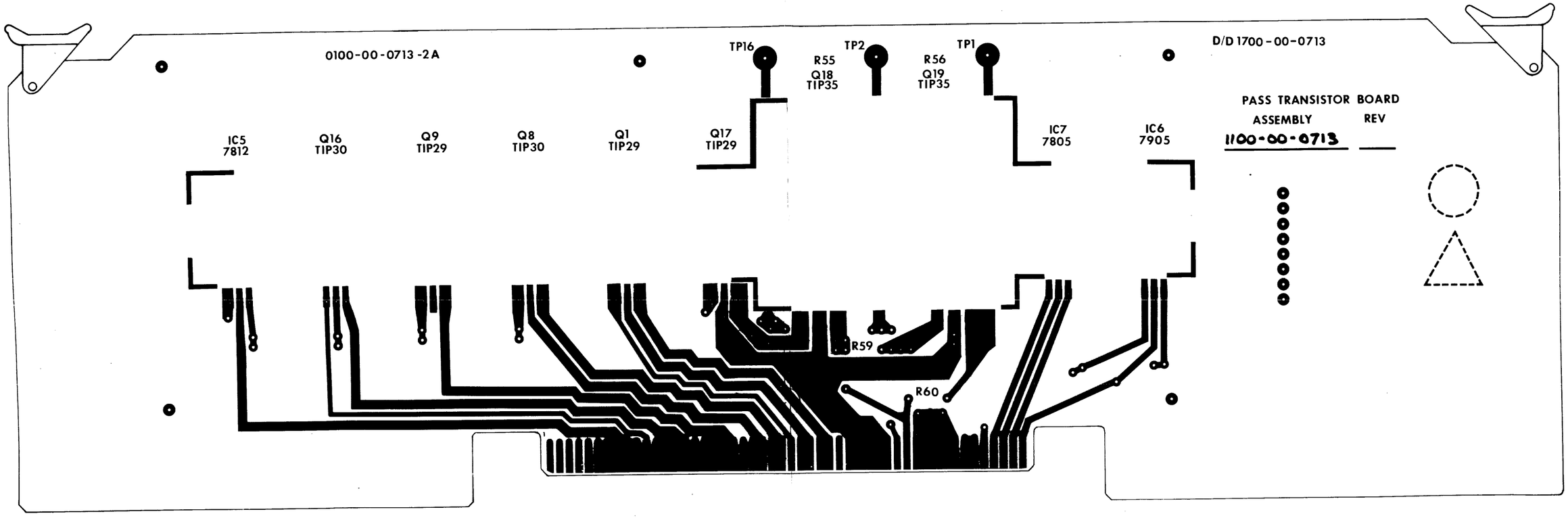
LAST DESIG USED: IC7, Q19, R60

3. I_L (+5V) $\cong$ ($V_{TP1} - V_{TP2}$) x 20 AMPS.
2. THIS SCHEMATIC IS REFERENCED ON THE POWER SUPPLY NO. 0103-00-0633.
1. ALL I/O PIN DESIGNATIONS ARE ON J14.

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN T. FOSTER	DATE 7-1-77	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR Tom Salga	DATE 7 SEPT '77	TITLE SCHEMATIC- PASS TRANSISTOR/REGULATOR
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1° .XX ±.030		
	DO NOT SCALE DWG	MODEL NO.	DWG NO. 0103-00-0713 REV C
	SCALE	CODE IDENT 23338	SHEET 1 OF 1

0103-00-0713



1100-00-0713

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PASS TRANSISTOR PCA
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ± 1 XX ± .030		
	DO NOT SCALE DWG		MODEL NO 1726 / DWG NO 0101-00-0713 / REV
	SCALE		CODE IDENT 23338 / SHEET 1 OF 1

REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG, REGULATOR	0101-00-0713	WVTK	0101-00-0713	1
NONE	SCHEMATIC, REGULATOR	0103-00-0713	WVTK	0103-00-0713	1
NONE	HEATSINK REF: 3200-06-0010	1400-00-7933	WVTK	1400-00-7933	1
NONE	REGULATOR BD	1700-00-0713	WVTK	1700-00-0713	1
J1	RIGHT ANGLE CONN	87632-8	AMP	2100-02-0078	1
NONE	CONNECTOR	JF2P	WINCH	2100-02-0082	1
NONE	CABLE CLAMP	832	SMITH	2800-00-0009	1
NONE	STANDOFF, SWAGE .125 H. .250 DIA 4-40, .093 MAT'L	6911-2-3C	LYNTR	2800-03-0003	5
NONE	PC BD EJECTOR	103 BLACK	CALMK	2800-07-0017	2
NONE	WASHER	B51547F015	MOT	2800-11-0015	10
NONE	LABLE, CAUTION	B500-8513472-1	BRADY	2800-29-0001	1
NONE	INSULATOR, MICA	64-21-023-106	ASHVL	3100-00-0006	7
NONE	MICA INSULATOR	10-21-023-212	TI	3100-00-0013	2
R59 R60	RES, MF, 1/8W, 1%, 2K	RN55D-2001F	TRW	4701-03-2001	2
R55 R56	RES, WW, 10W, 3%, .1 OHM	RH10-.1 OHM 3%	DALE	4702-77-0019	2
Q1 Q17 Q9	TRANS	TIP-29	TI	4902-00-0290	3

WAVETEK PARTS LIST	TITLE PCA, REGULATOR	ASSEMBLY NO. 1100-00-0713 PAGE: 1	REV E

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
Q16 Q8	TRANS	TIP-30	TI	4902-00-0300	2
Q18 Q19	TRANS	TIP-35	TI	4902-00-0350	2
NONE	THERMOSTAT (185°F)	3001-24-43/B-209	ELMWD	5100-00-0006	1
IC5	IC	MC7812CT	MOT	7000-78-1200	1
IC6	IC	MC7905CP	MOT	7000-79-0500	1
IC7	VOLTAGE REGULATOR	MA7805UC	FAIR	8000-78-0500	1

WAVETEK PARTS LIST	TITLE PCA, REGULATOR	ASSEMBLY NO. 1100-00-0713 PAGE: 2	REV E

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST PCA, REGULATOR
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ± 1 XX ± .030		
	DO NOT SCALE DWG	MODEL NO 172B	DWG NO 1100-00-0713 REV E
	SCALE	CODE IDENT 23338	SHEET 1 OF 1

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-3854

REV	ECN	BY	DATE	APP
A	ENG IMPRV	TLF	8/8/77	
B	ECN 1692, 1687	RO	3-13-78	
C	# 1908	Letterwich	2-6-79	

PASS TRANSISTOR BOARD (REF ONLY-0634) J14

J13 POWER SUPPLY BOARD

PASS TRANSISTOR BOARD J14 (REF ONLY - 0634)

+12IN UNREG (2C-7)

± 24 COM 35

+24V (30,31)

FD6666 CR5

3.01K R14

Q1 TIP29

Q9 TIP29

(27,28) (26) (29,30) (17,18) (16) (19,20)

(28) (27) (29) (18) (17) (19)

TP5 +24V

TP6 +15V

(20,21) +15V

(9,10,11)

Q2 2N2219A

R5 3.9Ω,5% ½W

R4 316Ω

Q3 2N3642

R47 2.49K

Q4 2N3642

R6 2.49K

10K R8

R1 1.5K

R7 12.1K

R9 10K

C6 .1 50V

C18 50uf 50V

R13 4.99K

R12 4.99K

C7 .01

CR6 IN4581

IC1 µA741

+24V ADJ R10 1K

R11 3.65K

Q10 2N2219A

R18 215Ω

R19 2.7Ω,5% ½W

Q11 2N3642

.1/20V C17

R22 8.25K

C20 100uf 16V

.1/20V C19

R26 2.49K

R15 499Ω

R16 3.01K

C15 .01

Q12 2N3642

R20 1K

IC3 µA741

+15V ADJ R24 1K

R25 4.99K

R17 1K

R21 4.64K

-15V

R23 6.19K

C21 .01

IN4581 CR12

TP7 15 COM

CR1 CR2 SCE-1 (2)

± 24VAC(32)

C1 .01

C2 .01

C4 500uf 50V

C.T. (36) ± 24 COM

± 24VAC(33)

C3 .01

C5 500uf 50V

CR3 SCE-1 (2) CR4

R2 1.5K

R27 12.1K

R28 10K

TP3 24 COM

R32 7.5K

R33 15K

C9 .1 50V

C10 50uf 50V

IC2 µA741

Q5 2N4248

R29 2.49K

2N4248 Q6

2.49K R3

R30 316Ω

Q7 2N2905A

R31 3.9Ω,5% ½W

R34 7.5K

R35 4.99K

TP4 -24V

CR7 FD666666

C14 .01

R36 3.01K

CR8 CR9 SCE-1 (4)

C8 1000uf 35V

C12 .01

CR10 CR11

C11 1000uf 35V

C13 .01

C16 .01

R37 499Ω

R38 3.01K

Q13 2N3638A

R39 1K

R41 4.64K

R42 1K

IC4 µA741

+15V

R44 4.99K

R45 10K *

Q14 2N3638A

R40 274Ω

Q15 2N2905A

*R46 10K

TP8 -15V

R43 2.7Ω,5% ½W

C22 .1/20V

C23 100uf 16V

(23) (22) (24) (25,26) -24V (7,8) (3) C.T. (4) +15VAC (13) -15DC (12) (14) (15,16) -15V

(22,23) (21) (24,25) (12,13) (11) (14,15)

TIP30 Q8

TIP30 Q16

SUPPLY	I LIMIT
+15	500 MA.
-15	560 MA.

LAST REF DES USED
C41
CR16
R62
IC8
Q19
TP16

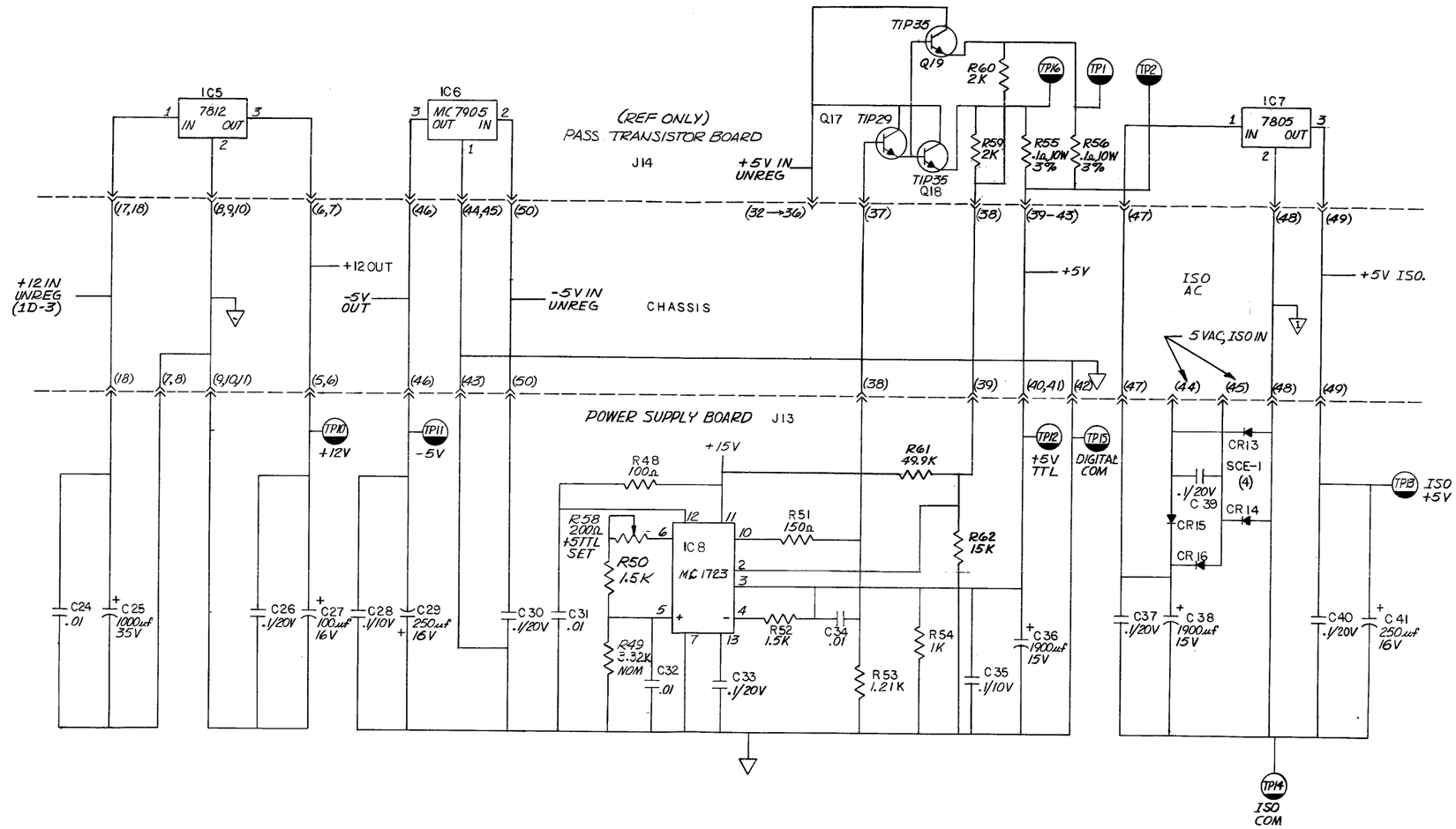
2 * MATCHED SET OF 10K #

1. ALL CAPACITANCE IS IN MICROFARADS

NOTE: UNLESS OTHERWISE SPECIFIED

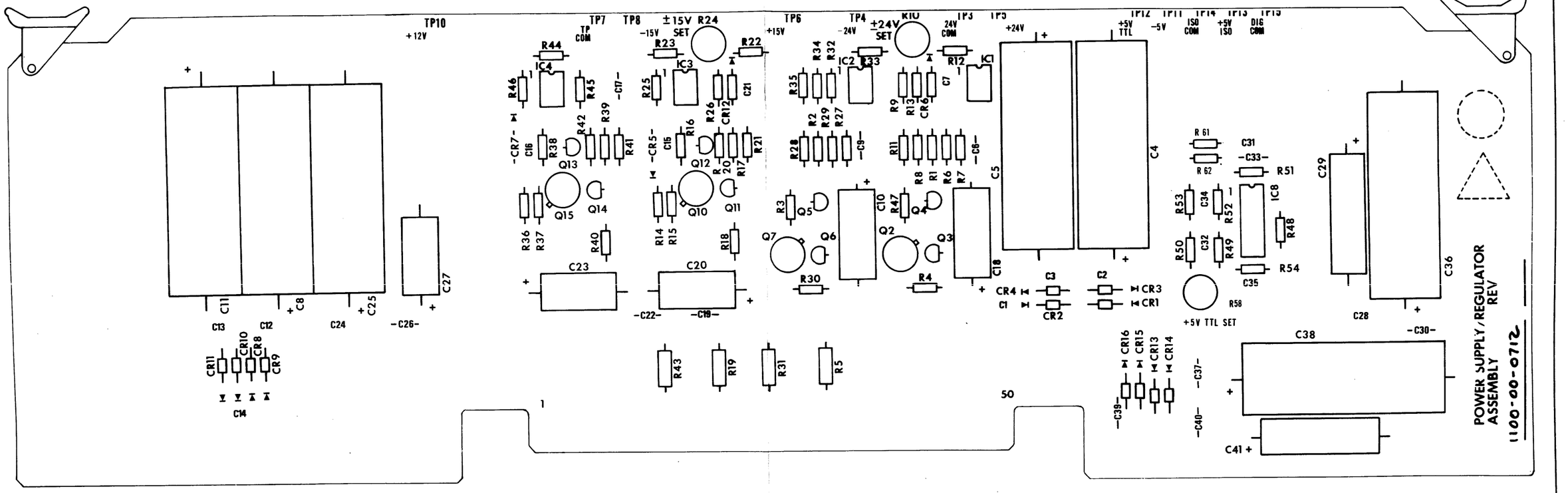
REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN D. COOPER	DATE 6-8-78	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR Tom Salga	SEPT 7'77	TITLE SCHEMATIC - POWER SUPPLY REGULATOR
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1° .XX ±.030		
	DO NOT SCALE DWG	MODEL NO.	DWG NO. 0103-00-0712 REV C
	SCALE	CODE IDENT 23338	SHEET 1 OF 2

REV	ECN	BY	DATE	APP



NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN D. COOPER	DATE 6-9-76	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL —	PROJ ENGR'G Tom Saliga	SEPT 7'77	TITLE SCHEMATIC - POWER SUPPLY REGULATOR
FINISH WAVETEK PROCESS —	RELEASE APPROV		
	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1° .XX ±.030		
	DO NOT SCALE DWG		MODEL NO.
	SCALE —		DWG NO. 0103-00-0712 REV .3C
			CODE IDENT 23338 SHEET 2 OF 2



1100-00-0712

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJENGR		TITLE: PWR SUPPLY REGULATOR PCA
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ·010 ANGLES 1 XX ·030		MODEL NO 1728 / DWG NO 0101-00-0712 / REV
	DO NOT SCALE DWG		CODE IDENT 23338 / SHEET 1 OF 1
	SCALE		

REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG, POWER SUPP	0101-00-0712	WVTK	0101-00-0712	1
NONE	SCHEMATIC, POWER SUP	0103-00-0712	WVTK	0103-00-0712	1
C1 C12 C13 C14 C15 C16 C2 C21 C24 C3 C31 C32 C34 C7	CAP, CER, MN, .01MF, 50V	CAC02Z5U103Z100A	CORNG	1500-01-0310	14
C17 C19 C22 C26 C28 C30 C33 C35 C37 C39 C40 C6 C9	CAP, CER, MON, .1MF, 50V	CAC03Z5U104Z050A	CORNG	1500-01-0405	13
C20 C23 C27	CAP, ELECT, 100MF, 16V	500D107G016DC7	SPRAG	1500-31-0101	3
C11 C25 C8	CAP, ELECT, 1000MF, 35V	39D10860350L6	SPRAG	1500-31-0212	3
C36 C38	CAP, ELECT, 1900MF, 15V	39D19860150L4	SPRAG	1500-31-9201	2
C29 C41	CAP, ELECT, 250MF, 16V	500D257G016DF7	SPRAG	1500-32-5101	2
C10 C18	CAP, ELECT, 50MF, 50V	500D506G050DD7	SPRAG	1500-35-0003	2
C4 C5	CAP, ELECT, 500MF, 50V	39D507G050GL4	SPRAG	1500-35-0103	2
NONE	POWER SUPPLY	1700-00-0712	WVTK	1700-00-0712	1
NONE	PIN, MALE	61182-2	AMP	2100-05-0020	12
NONE	PC BD EJECTOR	103 BLACK	CALMK	2800-07-0017	2
NONE	TRANSIPAD	10123N	METRS	2800-11-0003	4
R10 R24	POT, TRIM, 1K	91AR1K	BECK	4600-01-0209	2
R58	POT, TRIM, 200	91AR200	BECK	4600-02-0101	1

WAVETEK PARTS LIST | TITLE PCA, POWER SUPPLY | ASSEMBLY NO. 1100-00-0712 | PAGE: 1 | REV C

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R19 R43	RES, C, 1/2W, 5%, 2.7	RC20GF-2R7	STKPL	4700-25-0279	2
R31 R5	RES, C, 1/2W, 5%, 3.9	RC20GF-3R9	STKPL	4700-25-0399	2
R48	RES, MF, 1/8W, 1%, 100	RN55D-1000F	TRW	4701-03-1000	1
R17 R20 R39 R42 R54	RES, MF, 1/8W, 1%, 1K	RN55D-1001F	TRW	4701-03-1001	5
R28 R8 R9	RES, MF, 1/8W, 1%, 10K	RN55D-1002F	TRW	4701-03-1002	3
R53	RES, MF, 1/8W, 1%, 1.21K	RN55D-1211F	TRW	4701-03-1211	1
R27 R7	RES, MF, 1/8W, 1%, 12.1K	RN55D-1212F	TRW	4701-03-1212	2
R51	RES, MF, 1/8W, 1%, 150	RN55D-1500F	TRW	4701-03-1500	1
R1 R2 R50 R52	RES, MF, 1/8W, 1%, 1.5K	RN55D-1501F	TRW	4701-03-1501	4
R33 R62	RES, MF, 1/8W, 1%, 15K	RN55D-1502F	TRW	4701-03-1502	2
R18	RES, MF, 1/8W, 1%, 215	RN55D-2150F	TRW	4701-03-2150	1
R26 R29 R3 R47 R6	RES, MF, 1/8W, 1%, 2.49K	RN55D-2491F	TRW	4701-03-2491	5
R40	RES, MF, 1/8W, 1%, 274	RN55D-2740F	TRW	4701-03-2740	1
R14 R16 R36 R38	RES, MF, 1/8W, 1%, 3.01K	RN55D-3011F	TRW	4701-03-3011	4
R30 R4	RES, MF, 1/8W, 1%, 316	RN55D-3160F	TRW	4701-03-3160	2
R11 R49T	RES, MF, 1/8W, 1%, 3.65K	RN55D-3651F	TRW	4701-03-3651	2
R21 R41	RES, MF, 1/8W, 1%, 4.64K	RN55D-4641F	TRW	4701-03-4641	2

WAVETEK PARTS LIST | TITLE PCA, POWER SUPPLY | ASSEMBLY NO. 1100-00-0712 | PAGE: 2 | REV C

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R15 R37	RES, MF, 1/8, 1%, 499	RN55D-4990F	TRW	4701-03-4990	2
R12 R13 R25 R35 R44	RES, MF, 1/8W, 1%, 4.99K	RN55D-4991F	TRW	4701-03-4991	5
R61	RES, MF, 1/8W, 1%, 49.9K	RN55D-4992F	TRW	4701-03-4992	1
R23	RES, MF, 1/8W, 1%, 6.19K	RN55D-6191F	TRW	4701-03-6191	1
R32 R34	RES, MF, 1/8W, 1%, 7.5K	RN55D-7501F	TRW	4701-03-7501	2
R22	RES, MF, 1/8W, 1%, 8.25K	RN55D-8251F	TRW	4701-03-8251	1
R45 R46	RES, SET, 2-10K, 1/8W QTY: 2: 4701-03-1002	142-501-64A	WVTK	4789-00-0019	1
CR12 CR6	DIODE	1N4581	MICRO	4801-01-4581	2
CR1 CR10 CR11 CR13 CR14 CR15 CR16 CR2 CR3 CR4 CR8 CR9	DIODE	1N4002	FAIR	4801-02-0001	12
CR5 CR7	DIODE	1N4148	FAIR	4807-02-6666	2
Q10 Q2	TRANS	2N2219A	NSC	4901-02-2191	2
Q15 Q7	TRANS	2N2905A	NSC	4901-02-9051	2
Q13 Q14	TRANS	2N3638A	CARTR	4901-03-6381	2
Q11 Q12 Q3 Q4	TRANS	2N3642	FAIR	4901-03-6420	4
Q5 Q6	TRANS	2N4248	FAIR	4901-04-2480	2
IC1 IC2 IC3 IC4	IC	LM741CN	NSC	7000-07-4100	4

WAVETEK PARTS LIST | TITLE PCA, POWER SUPPLY | ASSEMBLY NO. 1100-00-0712 | PAGE: 3 | REV C

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
IC8	IC	MC1723CP	MOT	7000-17-2300	1

WAVETEK PARTS LIST | TITLE PCA, POWER SUPPLY | ASSEMBLY NO. 1100-00-0712 | PAGE: 4 | REV C

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST PCA, POWER SUPPLY
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		
	DO NOT SCALE DWG		MODEL NO 172B · DWG NO. 1100-00-0712 · REV C
	SCALE		CODE IDENT 23338 · SHEET 1 OF 1

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-3894

REV	ECN	BY	DATE	APP
F	ECN 1690	RO	3-1478	
G	ECN 1748	CW	6-1578	
H	ECN 1865	DC	11-2778	
J	ECN 1896	BC	1-79	
K	ECN 1941	DC	32279	

ICA5-11 (1B8) SYSCLK 2 2.5MHz

ICA6 ICB13 2D3 ICB13-11 ICB15-8

ICB11-5 (2C2) ENACK/

ICA10 74LS20

ICA12 74LS132

ICA5 74LS14

ICA3 LS175

ICA4 74LS151

ICB5 7438 OPACK/ BIO

RES/ B16

SCN/

ICA6 74LS132

A12 WRP

ICA1 74189

SCRATCH PADS

ICA2 74189

ABUSØ/ A0-0

ABUS1/ A1-0

ABUS2/ A2-0

ABUS3/ A3-0

ICB9 8T97

ICA18-7 (2B5)

ICA19-7 (2B5)

ICA21-7 (2B4)

ICA20-7 (2B4)

ICA17-7 (2B6)

ICA16-7 (2B4)

ICA15-7 (2B5)

ICA14-7 (2B6)

ICB1 8T26

ICB2 8T26

B5 DBUSØ/ DI0

A5 DBUS1/ DI1

B6 DBUS2/ DI2

A6 DBUS3/ DI3

B7 DBUS4/ DI4

A7 DBUS5/ DI5

B8 DBUS6/ DI6

A8 DBUS7/ DI7

MCE/ ICB10-7(1A6)

BDØ0/
BDØ1/
BDØ2/
BDØ3/
BDØ4/
BDØ5/
BDØ6/
BDØ7/

ICA7-11 (2D1)
ICA7-13 (2D1)
ICA7-15 (2D1)
ICA7-17 (2D1)
ICA7-9 (2C1)
ICA7-7 (2C1)
ICA7-5 (2C1)
ICA7-3 (2C1)

ICB8, 8T95 D0-0 A46
ICB8 D1-0 A45
ICB8 D2-0 A44
ICB8 D3-0 A43
ICB8 D4-0 A42
ICB8 D5-0 A41
ICB7, 8T95 D6-0 A40
ICB7 D7-0 A39
ICB7 S A38 (SIGN BIT)

INTERNAL DATA BUS

ICA6-13 (1D7) SYSCLK2 2.5 MHz

ICA5 74LS14

BOPREQ/ (2C3) ICA12-8

ABUSØ/
ABUS4/
ABUS5/
RD/WT
A94 ABUS7/
A11 E/NE
B94 ABUS6/
B11 M/IO

ICA11 74LS14

ICA10 74LS20

ICB10 74188

ADR/

ICB17-6 (2A3) RDMEM/

BOUT/

BIN/

STSCN/

LSGN/

SPWT/

MCE/ N/C

ICA6 74LS132

ICA5 74LS14

WE/ ICB17-7 (2A3)

ICA2-(1C5)

SPWT

R5 4.99K WRP

ICB3 74LS109

SCN/

ICB4 74LS161

SCN

TC

ICB6 7438

A0 A0-0 A37

A1 A1-0 A36

A2 A2-0 A35

A3 A3-0 A34

A4 STRB-0 A33

ICB5

SYSCLK 1 (B29) 5MHz

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN D. COOPER	DATE 8-5-77	WAVETEK SAN DIEGO + CALIFORNIA
MATERIAL	PROJ ENGR Tom Salga	SEPT 7'77	TITLE SCHEMATIC MEMORY RAM
FINISH WAVETEK PROCESS	RELEASE APPROV		
	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		
	DO NOT SCALE DWG		MODEL NO.
	SCALE		DWG NO. 0103-00-0708 REV K
			CODE IDENT 23338 SHEET 1 OF 2

REV	ECN	BY	DATE	APP

B29 SYSCLK1 5MHz

ICA5 74LS14 — SYSCLK1/ 5MHz

R6 4.99K +5V

ICB15 LS161 — ICB14 LS161 (15 NC)

ICB18 8ILS98 — ICB9 8T97

ERA/

CSEL/ ICB17-5(2A3) ICB13-5(2C3)

ICB13 LS74 — ICA6-11 (1D7) — A10-5 (1D5)

ICB12 LS174 (NC)

R1 4.99K +5 — ICA21-6 (2B4)

ICA7 8ILS98 — ICA9 LS175 — ICA8 LS175

DO0/ DO1/ DO2/ DO3/ DO4/ DO5/ DO6/ DO7/

BD00/ (1D2) BD01/ (1D2) BD02/ (1D2) BD03/ (1C2) BD04/ (1C2) BD05/ (1C2) BD06/ (1C2) BD07/ (1C2)

ICA12 74LS132 — RDMEM — ICA11

RDMEM/ ICB17-6 (2A3)

ICB11 74188 (E D C B A)

R8 +5V — EBA/ ICB18-19 (2B7)

ENACK/ ICA10-2(1D5)

ECE

ICA11 74LS14 — ECE/ — DECE/

OPREQ/ ICA10 (2B8) — ICA12 74LS132

BOPREQ/ ICB10-15 (1A6)

ICB13 LS74 — ICB16 LS161 — ICB12-3 (2D3)

ICA27 (2B8) SYSCLK4 6.25 KHz

C5 100PF — R2 100, 1/8W — R3 619Ω — CE1 ICA13-12 (2B6)

ICA13 MH0026 — C4 .1/50V — R4 1.5K — N/C

TP2 — A3, B3

C1 & C10 100µf 16V — C6,7,8,9 .1,50V

TP3 — A49,A50 A51,A52 B49,B50 B51,B52

C2 33µf 10V — TP1 TP5 — A1, A2 B1, B2 A99,A100 B99,B100

C3 33µf 10V — TP4

+12V -5V +5V GND

A53, B53

B97 ABUS0/ B96 ABUS2/ A96 ABUS3/ B95 ABUS4/ A95 ABUS5/ B94 ABUS6/ A94 ABUS7/ B93 ABUS8/ A93 ABUS9/ B92 ABUS10/ A92 ABUS11/

8ILS98 ICB19 — ICB18 8ILS98

A27 SYSCLK4 (2B2) — ICB16-2(2B3) — EBA/ ICB11-7 (2C3)

A10 OPREQ/ — ICA11-5 (2C4)

R11 +5V

ICA14 2680 — ICA15 2680 — ICA16 2680 — ICA17 2680 — ICA18 2680 — ICA19 2680 — ICA20 2680 — ICA21 2680

AD0 AD1 AD2 AD3 AD4 AD5 AD6 AD7 AD8 AD9 AD10 AD11

DI7 DI6 DI5 DI4 DI3 DI2 DI1 DI0

D07/ D06/ D05/ D04/ D03/ D02/ D01/ D00/

MSB LSB

ICA13-5 CE1 (2C1) — ICB17-7(2B3) WE/ EBA/

CE1 WE/ EBA/

DI0 ICB1-5 (1C7) — DO0/ ICA9-12 (2D1)

ICB17 74188 — R9 470 +5V

RDMEM/ ICA6-10 (1B5) — ICB12-4 (2D3) CSEL/

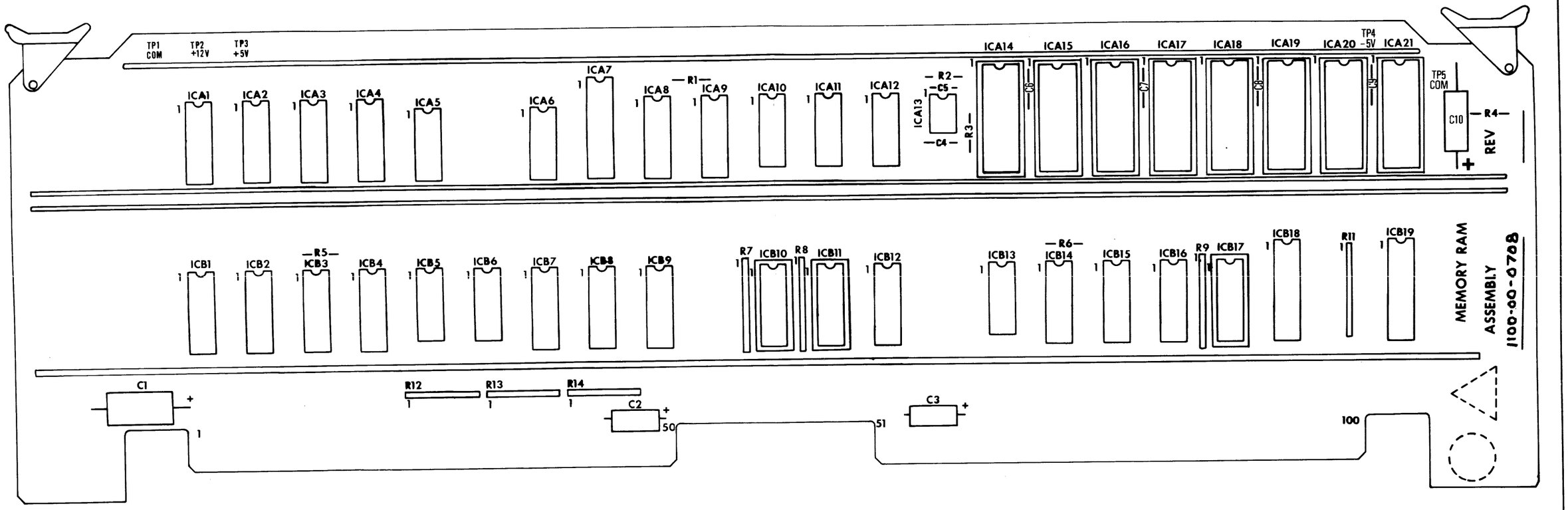
WE/ ICA6-4 (1A5) — ICA14-12 (2B6) — ICA11-9 (2C1) ICA7-19(2C1)

R9

B91 ABUS12/ A91 ABUS13/ B90 ABUS14/ B12 RD/WT M/IO/

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN D. COOPER	DATE 8-5-77	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR Tom Saliga	SEPT 7'77	TITLE: SCHEMATIC MEMORY RAM
FINISH WAVETEK PROCESS	RELEASE APPROV		
	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ± .010 ANGLES ±1° .XX ± .030		
	DO NOT SCALE DWG		MODEL NO. — DWG NO. 0103-00-0708 — REV K
	SCALE		CODE IDENT 23338 — SHEET 2 OF 2



1100-00-0708

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: MEMORY RAM PCA
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ± 1 XX ± .030		
	DO NOT SCALE DWG	MODEL NO 172 B	DWG NO 0101-00-0708 REV
	SCALE	CODE IDENT 23338	SHEET 1 OF 1

REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG, MEMORY RAM	0101-00-0708	WVTK	0101-00-0708	1
NONE	SCHEMATIC, MEMORY RAM	0103-00-0708	WVTK	0103-00-0708	1
C5	CAP, CER, 100PF, 1KV	DD-101	CRL	1500-01-0111	1
C4 C6 C7 C8 C9	CAP, CER, MON, .1MF, 50V	CAC03Z5U104Z050A	CORNG	1500-01-0405	5
C1 C10	CAP, ELECT, 100MF, 16V	500D107G016DC7	SPRAG	1500-31-0101	2
C2 C3	CAP, TANT, 33MF, 10V	150D336X9010B2	SPRAG	1500-73-3601	2
NONE	MEMORY RAM BD	1700-00-0708	WVTK	1700-00-0708	1
NONE	SKT, IC, 16PIN	DILB-16P-108	BURND	2100-03-0028	3
NONE	SKT, IC, 22 PIN	DILB-22P-108	BURND	2100-03-0035	8
NONE	PIN, MALE	61182-2	AMP	2100-05-0020	5
NONE	PC BD EJECTOR	103 WHITE	CALMK	2800-07-0008	2
R2	RES, MF, 1/8W, 1%, 100	RN55D-1000F	TRW	4701-03-1000	1
R4	RES, MF, 1/8W, 1%, 15K	RN55D-1502F	TRW	4701-03-1502	1
R1 R5 R6	RES, MF, 1/8W, 1%, 4.99K	RN55D-4991F	TRW	4701-03-4991	3
R3	RES, MF, 1/8W, 1%, 61.9	RN55D-61R9F	TRW	4701-03-6199	1
R11 R7 R8 R9	RES MODULE	4310R-101-471	BOURN	4770-00-0009	4
NONE	POWER BUSS BAR (LG)	6009-90-0004	WVTK	6009-90-0004	3
NONE	POWER BUSS BAR (ST)	6009-90-0005	WVTK	6009-90-0005	1

WAVETEK PARTS LIST | TITLE PCA, MEMORY RAM | ASSEMBLY NO. 1100-00-0708 | PAGE: 1 | REV J

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
ICA13	IC	MMH0026CP1	MOT	8000-00-2600	1
ICB1 ICB2	IC	8T26	SIG	8000-08-2600	2
ICB7 ICB8	IC	8T95	SIG	8000-08-9500	2
ICB9	IC	8T97	SIG	8000-08-9700	1
ICA14 ICA15 ICA16 ICA17 ICA18 ICA19 ICA20 ICA21	IC	2680	SIG	8000-26-8000	8
ICA11 ICA5	IC	74LS14	TI	8000-74-1410	2
ICA10	IC	74LS20	TI	8000-74-2010	1
ICB5 ICB6	IC	7438	TI	8000-74-3800	2
ICB13	IC	74LS74	TI	8000-74-7410	1
ICA7 ICB18 ICB19	IC	DM81LS98N	NSC	8000-81-9810	3
ICB3	IC	74LS109	SIG	8007-41-0910	1
ICA12 ICA6	IC	74LS132	TI	8007-41-3210	2
ICA4	IC	74LS151	TI	8007-41-5110	1
ICB14 ICB15 ICB16 ICB4	IC	74LS161	SIG	8007-41-6110	4
ICB12	IC	SN74LS174N	TI	8007-41-7410	1
ICA3 ICA8 ICA9	IC	74LS175	TI	8007-41-7510	3

WAVETEK PARTS LIST | TITLE PCA, MEMORY RAM | ASSEMBLY NO. 1100-00-0708 | PAGE: 2 | REV J

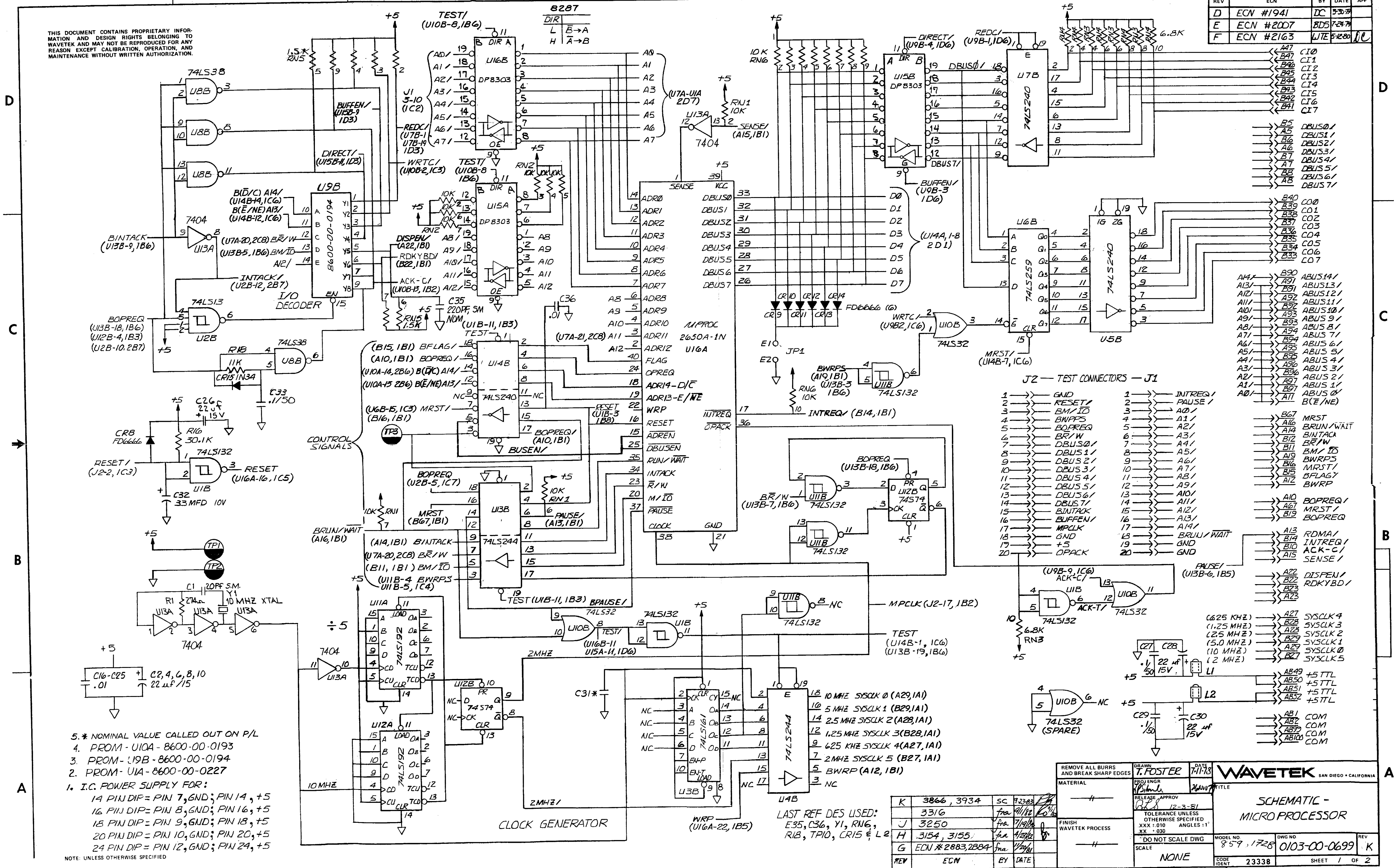
REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
ICA1 ICA2	IC	N74S189A	SIG	8007-41-8900	2
ICB10	IC, PROGRAMMED REF: 8007-41-8801	8600-00-0003	WVTK	8600-00-0003	1
ICB11	IC, PROGRAMMED REF: 8007-41-8801	8600-00-0004	WVTK	8600-00-0004	1
ICB17	IC, PROGRAMMED REF: 8007-41-8801	8600-00-0169	WVTK	8600-00-0169	1

WAVETEK PARTS LIST | TITLE PCA, MEMORY RAM | ASSEMBLY NO. 1100-00-0708 | PAGE: 3 | REV J

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST PCA, MEMORY RAM
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ± 1 XX ± .030		
	DO NOT SCALE DWG		MODEL NO 172B / DWG NO 1100-00-0708 / REV J
	SCALE		CODE IDENT 23338 / SHEET 1 OF 1

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-3864



REV	ECN	BY	DATE	APP
D	ECN #1941	DC		
E	ECN #2007	BDS		
F	ECN #2163	WTE		

5. * NOMINAL VALUE CALLED OUT ON P/L
4. PROM - U10A - 8600-00-0193
3. PROM - U9B - 8600-00-0194
2. PROM - U1A - 8600-00-0227
1. I.C. POWER SUPPLY FOR:
   14 PIN DIP = PIN 7, GND; PIN 14, +5
   16 PIN DIP = PIN 8, GND; PIN 16, +5
   18 PIN DIP = PIN 9, GND; PIN 18, +5
   20 PIN DIP = PIN 10, GND; PIN 20, +5
   24 PIN DIP = PIN 12, GND; PIN 24, +5

NOTE: UNLESS OTHERWISE SPECIFIED

LAST REF DES USED: E35, C36, Y1, RN6, R18, TP10, CR15 & L2

REV	ECN	BY	DATE
K	3866, 3934	SC	9-23-83
	3316	fra	
J	3250	fra	
H	3154, 3155	fra	
G	ECN #2883, 2884	fra	

REMOVE ALL BURRS AND BREAK SHARP EDGES

DRAWN T. FOSTER 7-11-78

WAVETEK SAN DIEGO • CALIFORNIA

TITLE: SCHEMATIC - MICRO PROCESSOR

TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 XX ±.030 ANGLES ±1°

DO NOT SCALE DWG

FINISH WAVETEK PROCESS

SCALE NONE

MODEL NO 859, 1728 — DWG NO 0103-00-0699 — REV K

CODE IDENT 23338 — SHEET 1 OF 2

REV	ECN	BY	DATE	APP

NOT USED

U16A EPROM 2716 (U16B 1D5) — U15A EPROM 2716 — U14A EPROM 2716 — U13A 2K x 8 ROM — U2A EPROM 2732 — U1A EPROM 2732 8600-00-0227 — U19A RAM 2114 — U18A RAM 2114 — U14A SHUNT

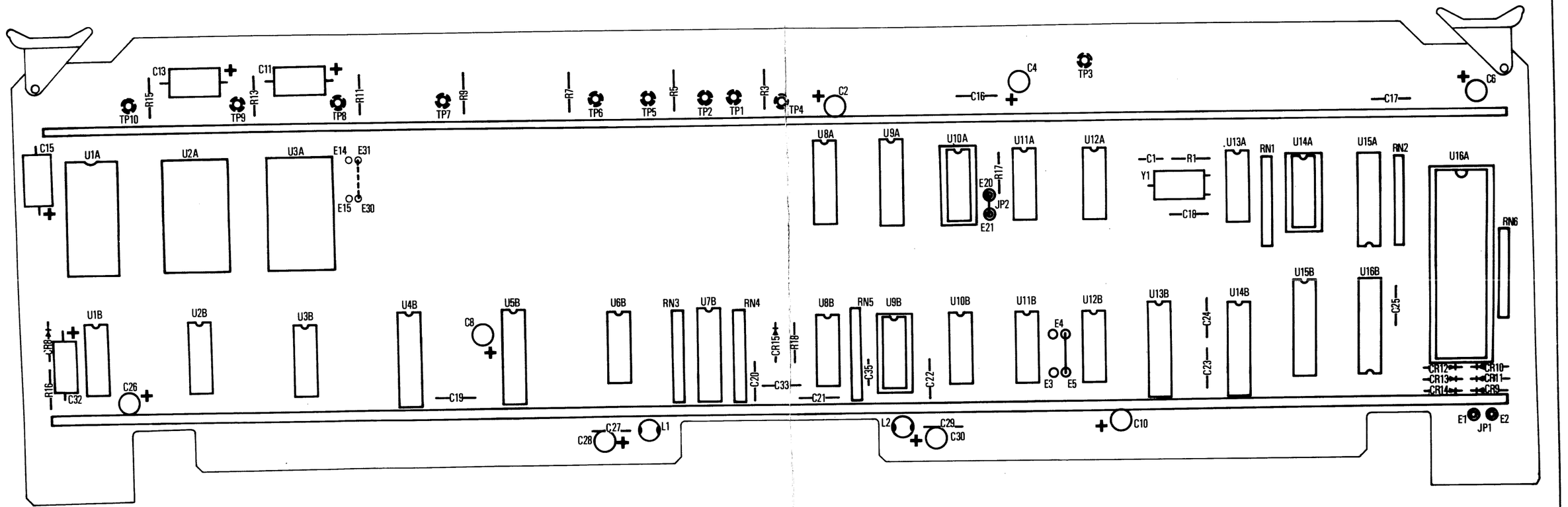
U2B 74LS13 — U1B 74LS132

U15A (8600-00-0193) U10A MEMORY DECODER

R3 R5 R7 R9 R11 R13 R15 (7) 4.99K — R17 4.99K

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN T. FOSTER	DATE 7-12-78	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL —	PROV'ENGR		TITLE: SCHEMATIC - MICRO PROCESSOR (EPROM MEMORY)
FINISH WAVETEK PROCESS —	RELEASE APPROV		
	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 .XX ±.030 ANGLES ±1°		
	DO NOT SCALE DWG	MODEL NO.	DWG NO. 0103-00-0699 REV K
	SCALE NONE	CODE IDENT 23338	SHEET 2 OF 2



1100-00-0699

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: MICROPROCESSOR PCA
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ± 1 XX ± .030		
	DO NOT SCALE DWG		MODEL NO 172B / DWG NO 0101-00-0699 / REV
	SCALE		CODE IDENT 23338 / SHEET 1 OF 1

REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	TRANSIPAD	10123N	METRS	2800-11-0003	2
1	SHUNT	435704-8	AMP	3000-00-0033	1
NONE	JUMPER	461-2871-01-03-10	CAMB	3000-00-0034	1
NONE	PINS, JUMPER	450-3704-01-03	CAMB	3000-00-0035	4
L1 L2	BALUN CORE	2873000902	FARIT	3100-00-0002	2
R18	RES, MF, 1/8W, 1%, 11K	RN55D-1102F	TRW	4701-03-1102	1
R1	RES, MF, 1/8W, 1%, 274	RN55D-2740F	TRW	4701-03-2740	1
R16	RES, MF, 1/8W, 1%, 30.1K	RN55D-3012F	TRW	4701-03-3012	1
R11 R13 R15 R17 R3 R5 R7 R9	RES, MF, 1/8W, 1%, 4.99K	RN55D-4991F	TRW	4701-03-4991	8
RN1 RN2 RN6	RES MODULE, 10K	4310R-101-103	BOURN	4770-00-0008	3
RN5	RES NETWK	785-1R1.5K	BECK	4770-00-0010	1
RN3 RN4	RES MODULE	4310R-101-682	BOURN	4770-00-0016	2
CR15	DIODE	1N34	FAIR	4804-01-0034	1
CR10 CR11 CR12 CR13 CR14 CR8 CR9	DIODE	1N4148	FAIR	4807-02-6666	7
NONE	POWER BUSS BAR (LG)	6009-90-0004	WVTK	6009-90-0004	2
U8A U9A	IC	2114	INTEL	8000-21-1400	2

WAVETEK PARTS LIST | TITLE PCA, M-PROC | ASSEMBLY NO. 1100-00-0699 | PAGE: 2 | REV H

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG, M-PROC	0101-00-0699	WVTK	0101-00-0699	1
NONE	SCHEMATIC, M-PROC	0103-00-0699	WVTK	0103-00-0699	1
C16 C17 C18 C19 C20 C21 C22 C23 C24 C25 C36	CAP, CER, MN, .01MF, 50V	CAC02Z5U103Z100A	CORNG	1500-01-0310	11
C27 C29 C33	CAP, CER, MON, .1MF, 50V	CAC03Z5U104Z050A	CORNG	1500-01-0405	3
C31T	CAP, CER, 56PF, 1KV	DD-560	CRL	1500-05-6001	1
C1	CAP, MICA, 20PF, 500V	DM15-200J	ARCO	1500-12-0000	1
C35T	CAP, MICA, 220PF, 500V	DM15-221J	ARCO	1500-12-2100	1
C10 C2 C26 C28 C30 C4 C6 C8	CAP, TANT, 22MF, 15V	196D226X9015KA1	SPRAG	1500-72-2601	8
C32	CAP, TANT, 33MF, 10V	150D336X9010B2	SPRAG	1500-73-3601	1
C11 C13 C15	CAP, TANT, 5.6MF, 35V	150D565X9035B2	SPRAG	1500-75-6502	3
NONE	M-PROC	1700-00-0699	WVTK	1700-00-0699	1
NONE	SKT, IC, 16PIN	DILB-16P-108	BURND	2100-03-0028	3
NONE	SKT, IC, 24PIN	DILB-24P-108	BURND	2100-03-0029	7
NONE	SKT, IC, 40PIN	DILB-40P-108	BURND	2100-03-0030	1
Y1	CRYSTAL, 10MHZ	590-502	WVTK	2300-99-0006	1
NONE	PC BD EJECTOR	103 WHITE	CALMK	2800-07-0008	2

WAVETEK PARTS LIST | TITLE PCA, M-PROC | ASSEMBLY NO. 1100-00-0699 | PAGE: 1 | REV H

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
U16A	IC	SCN2650AC2N40	SIG	8000-26-5001	1
U13A	IC	7404	TI	8000-74-0400	1
U2B	IC	SN74LS13N	TI	8000-74-1310	1
U10B	IC	74LS32	TI	8000-74-3210	1
U8B	IC	74LS38	TI	8000-74-3810	1
U12B	IC	74S74	TI	8000-74-7401	1
U15A U15B U16B	IC	DP8303	NAT	8000-83-0300	3
U11B U1B	IC	74LS132	TI	8007-41-3210	2
U3B	IC	74LS161	SIG	8007-41-6110	1
U11A U12A	IC	74LS192	TI	8007-41-9210	2
U14B U5B U7B	IC	74LS240	TI	8007-42-4010	3
U13B U4B	IC	74LS244	TI	8007-42-4410	2
U6B	IC	SN74LS259N	TI	8007-42-5910	1
U10A	IC, PROGRAMMED REF: 8007-41-8801	8600-00-0193	WVTK	8600-00-0193	1
U9B	IC, PROGRAMMED REF 8007-41-8801	8600-00-0194	WVTK	8600-00-0194	1
U1A	IC PROGRAMMED FROM 8000-27-3200	8600-00-0227	WVTK	8600-00-0227	1

WAVETEK PARTS LIST | TITLE PCA, M-PROC | ASSEMBLY NO. 1100-00-0699 | PAGE: 3 | REV H

NOTE: UNLESS OTHERWISE SPECIFIED

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-3864

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST PCA, M-PROC
FINISH WAVETEK PROCESS	RELEASE APPROV		
	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		MODEL NO 172B / DWG NO 1100-00-0699 / REV H
	DO NOT SCALE DWG		CODE IDENT 23338 / SHEET 1 OF 1
	SCALE		

REV	ECN	BY	DATE	APP
A		L	9/4/78	
B	ENG. UPDATE	RO	2-1-79	
C	#2063	BDS	11-20-79	
D	2565, 2566	LOU	11-6-81	
E	2904	fra	12/1/82	

(B28) SYSCLK3 (1.25MHz)
U1C (1/6) LS04
U2C LS240
R6 6.81K
U1B UART IM6402
TP1 GND
U3C REDEE0/
U3A (1/4) LS132
U3A (1/4) LS132
NC ANODE CATHODE NC
6N136 (TYP.)
Vcc VB Vo GND
R9 182Ω
U1A 6N 136
R7 10K
R8 100K
U10A (1/6) 7405
U15B-25 (2C8)
U4B (1/4) 7438
U2A 6N136
R10 182Ω
R11 10 K
U11A (1/4) LS132
U15B-20 (2C8)
μPACP U4A-3 (2C7)
R12 100K
TP3
ISO
TSRQ/ U12C-13 (2B2)
U5C3 4N26
R20 392Ω
R21 6.81K
(B7) DBUS4/
(A7) DBUS5/
(B16) RESET/
(B15) FLAG/
(B5) DBUS0/
(A5) DBUS1/
(B6) DBUS2/
(A6) DBUS3/
(B7) DBUS4/
(A7) DBUS5/
(B8) DBUS6/
(A8) DBUS7/
WRTEE0/
GPBUSY
U4C 74LS244
U5C2 4N26
U5C1 4N26
U5B LS05
R14 392Ω
R15 392Ω
R2 6.8K
BUSACP U3A-11 (2A6)
U4A (1/2) LS74
TP2
μPTALK U11A-11 (2B5)
U6C1 GN 136
U6C2 GN 136
R16 182Ω
R17 100K
R18 100K
R19 182Ω
REMOTE U8B-5 (2B6)
END U9A-6 (2A5)
ENDLB
U4B (1/4) 7438
U6B 6N136
R22 6.81K
R23 221Ω
R24 3.32K (NOM.)
R24 NOM RANGES FROM 3.32K TO 10K
R25 100K
U11A (1/4) LS132
U8C 74LS244
5V DIGITAL
4N26(5)
R47 392
R48 392
R49 392
R50 392
R51 392
R5 6.8K
U11C2
U11C3
U11C1
U10C1
U10C2
U15C-13 (2C4)
U15C-12 (2C4)
U15C-11 (2C4)
U15C-10 (2C4)
U15C-9 (2C4)
(B84) ADI0
(B85) ADI1
(A88) ADI2
(A85) ADI3
(B8G) ADI4
DBUS0/ (B5) U2C-11 (1B8)
DBUS1/ (A5) U2C-13 (1B8)
DBUS2/ (B6) U2C-15 (1B8)
DBUS3/ (A6) U2C-17 (1B8)
DBUS4/ (B7) U4C-18 (1B8)
DBUS5/ (A7) U2C-4 (1D8)
DBUS6/ (B8) U2C-6 (1B8)
DBUS7/ (A8) U2C-8 (1D8)
R1 1.5K
REDEE1/
REDEE0/
REDEE5/
REDEE2/, U9C-3 (2B8)
(A12) WRP
(B12) RD/WT
(B97) ABUS0/
(A97) ABUS1/
(B96) ABUS2/
U9B 8600-00-0163
TP5
U1C (1/6) LS04
U4B (1/4) 7438
OPACK/ (B10)
B95 ABUS4/
(A10) OPRE0/
(A11) E/NE
(B11) M/IO
(A95) ABUS5/
(B94) ABUS6/
(A94) ABUS7/
U7C LS05
U7D LS05
U3A LS132
R26 6.81K
R27 6.81K
R28 6.81K

NOTE 1. (CONT.) 5V = NORM 5V
ISO ▽ = ISO GND
▽ = NORM GND

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN D. COOPER	DATE 4-18-78	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJENGR		TITLE SCHEMATIC GPIB INTERFACE
FINISH WAVETEK PROCESS	RELEASE APPROV		
	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		
	DO NOT SCALE DWG	MODEL NO. 859	DWG NO. 0103-00-0685 REV. E
	SCALE	CODE IDENT 23338	SHEET 1 OF 2

REV	ECN	BY	DATE	APP

UNUSED

U1C 74LS04 · U17D 74LS05 · U4A (½) LS74 · U10A 505 · U5C1 LS00 · U13C1 74 LS74 · U7C 74LS05

SYSCLK 1 5MHz (B29) · U1C (1/6) LS04 · C30 .01 · T1 4T 2T · E3 E4 E2 E1 · C1 .01 · ISO · R30 15K · R29 1K · 5MHz · Q1 2N3903 · U17A (½) LS74 · 2.5 MHz · R32 6.81K · R31 6.81K · 1.25 MHz U15B-17 & 40 (2D8) · TNDAC U13B-2 (2B4) · LDU/, U15B-23 (2C7) · R33 6.81K · U14A · STRB1/ · U13A LS74 · TP12 · U16A (¼) MC14006B · R34 6.81K · CKDAV U9A-3 AND-11 (2B5) · U13A (⅙) LS04

1.25 U17A-9 MHz (2D5) · R39 6.81K · R38 6.81K · R37 6.81K · R3 2.2K · R36 6.81K · R35 6.81K · R52 6.81K · U15B UART IM 6402 · RDIO1/ RDIO2/ RDIO3/ RDIO4/ RDIO5/ RDIO6/ RDIO7/ RATN/ · U14C U15C U17C (2C3) · U10B-10 (2B3) · U11A-6 (2C3) · PACP · U10A-9 (1D2) · U11A-3 (1C2) · TDIO1/ TDIO2/ TDIO3/ TDIO4/ TDIO5/ TDIO6/ TDIO7/ · U16C U17C (2C2) · TEOI/ · DA, U16A-5 (2A5) · U14A-9 (2D6) · LDU/ · U14A ½ LS74 · LHOLD F/F · TLKADD/ · U15C1 LS00 · U13C1 (½) LS74 · STRB2/ · ACEPT/ · U13A (⅙) LS04 · EQUAL · U12B (¼) LS32 · MLA/ U8B-10 (2B6) · U15C 5 BIT COMP 93L24 · ADI0 ADI1 ADI2 ADI3 ADI4 (1C4) (1B4) · LISN/ U8B-8 (2B6) · C13 220Pf · U13A · U8A LS74 · TP7 · TALK · TALK/ U10B-2 (2A7) U10B-11 (2B3) · U12A (¼) LS08 · TK/FF · C14 100Pf · U5C1-2 (1B6) µPTALK · U11A (¼) LS132 · U8B-8 (2B6) LISN/ · U12A (¼) LS08 · U13C-7 (2C2) RNRFD · U13B 8600-00-0092 · HANDSHAKE · TNRFD · TNDAC · TDAV/ · TLKEN/ · DAVY/ · (LI+ATN)/ · DRDY · R4 2.2K · R3 2.2K · U16C · U17C · U13C · MC 3446 · DIO1 (A80) · DIO2 (B79) · DIO3 (A79) · DIO4 (B82) · DIO5 (A81) · DIO6 (B81) · DIO7 (B80) · DIO8 (B78) · DAV (A87) · NRFD (A83) · NDAC (B83) · EOI (B88) · RNRFD, U13B-10 (2B4) · RNDAC, U15A-3 (2A4) · REOI/, U9A-2 (2B5) · TDAV/ · TNRFD · TNDAC · LEOI/ · TNDAC, U14A-12 (2D6) · TLKEN/ · ISO · TP10 · TP9 · TP11 · RATN/ · RIFC/, U10B-13 (2A7) · RREN/, U13A-5 (2A7) · U12C · R46 1.21K · TSRQ/ U5C3-5 (1C4) · ATN (A86) · IFC (B87) · REN (B84) · SRQ (A82) · U9B (¼) LS08 · U15A (½) LS74 · TK HOLD F/F · U10B (⅓) LS11 · RATN/ U15B-33 (2C8) · TALK/ U8A-6 (2B6) · LISN/ · MC3446 · 5V ISO · C5 .01 · C6 .01 · C11 .01 · C15 .01 · C17 .01 · C18 .01 · C19 .01 · C20 .01 · C21 .01 · C22 .01 · C24 .01 · C25 33 · C27 33 · C29 33 · (A77) (A63) (A62) (A78) (B77) (B63) (B62) · C2 .01 · C3 .01µf · C4 .01µf · C7 .01µf · C8 .01µf · C9 .01µf · C23 .01µf · C26 33 · C28 33 · +5V · L1 · L2 · C33 22 15V · C34 22 15V · (A1) (A2) (A99) (A100) (B1) (B2) (B99) (B100) · (A49) (A50) (B49) (B50) (A51) (A52) (B51) (B52)

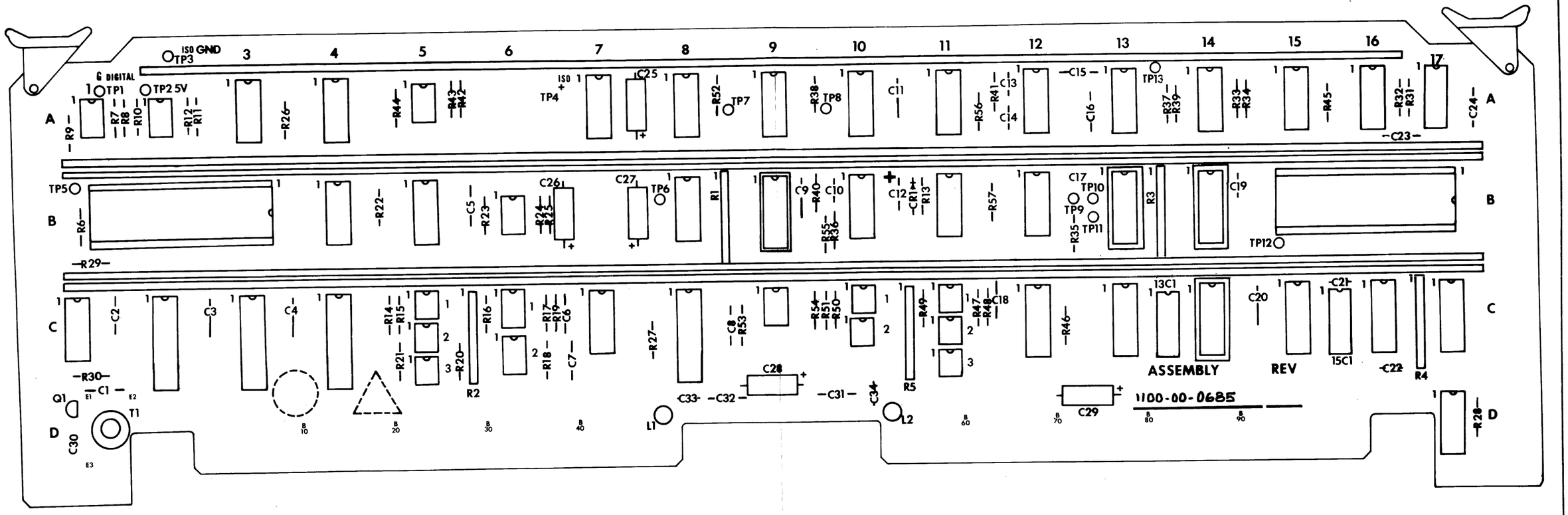
U9C 6N 136 · RTL/ · R53 100Ω · 5V · U9B-4 (1A2) REDEE2/ · R54 100K · R40 1.96K · C10 220Pf · TALK/ U8A-6 (2B5) · R55 4.99K · RREN/ U12C-9 (2C2) · C16 .01µf · U13A (⅙) LS04 · U7A LS00 · R56 10K · U11A LS132 · R41 1.96K · R57 4.99K · LOCK/ · U7A LS00 · RREN · U12C-7 (2B2) RIFC/ · U10B (⅓) LS11 · GTL/ U14B-6 (2C6) · U8B (½) LS74 · REMOTE U5B-11 (1B6) · REMOTE F/F · LISN F/F · U8B · LISN U14B-14 (2C5) · U12A-4 (2B4) · LISN/ (2B6) · U9A (½) LS74 · DAV F/F · RDAV/ U12B-12 (2C5) · U13A (⅙) LS04 · TP6 · TP4 · REOI/ U13C-15 (2C2) · CKDAV U13A-12 (2D5) · EOI F/F · END U5B-9 (1B6) · SHIFT REG · U16A (¼) MC14006B · DA U15B-19 (2C8) · RDY · RNDAC U13C-9 (2C2) · U15A (½) LS74 · ACEPT/ · U16A (½) MC14006B · R45 6.81K · U3A (¼) LS132 · BUSACP U4A-11 (1C6) · R42 10 K · U5A 6N 136 · R44 100Ω · R43 100K · U10A (⅙) 7405 · ACEPT

U14B 8600-00-0164 · U14C 8600-00-0165 · CMD DECODER · CMD SELECTOR · LISN U8B-9 2B6 U5B-3 (1C6) (¼) · U12B · U11B (¼) CD4093BE · RDAV/ U13A-3 (2B5) · LISBUSY · LSNADD/ · UNLISN/ · GTL/ U10B-5 (2A6) · TP13 · U11B (¼) CD4093BE · LLO F/F · R13 10K · CR1 FD666 · C12 33µf 20V · ISO

LAST REF. DES. USED:
C35 R58
TP13 T1
CR1 Q1
L2

1. "+" DENOTES ISO +5V (SEE SHT 2)
NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN D. COOPER	DATE 4-18-78	WAVETEK SAN DIEGO • CALIFORNIA	
MATERIAL	PROJ ENGR		TITLE SCHEMATIC GPIB INTERFACE	
FINISH WAVETEK PROCESS	RELEASE APPROV		TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1° .XX ±.030	
	DO NOT SCALE DWG		MODEL NO.	DWG NO. 0103-00-0685 REV E
	SCALE		CODE IDENT • 23338	SHEET 2 OF 2



1100-00-0685

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: GPIB INTERFACE PCA
	RELEASE APPROV		
FINISH: WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED: XXX ± .010 ANGLES ± 1; XX ± .030		
	DO NOT SCALE DWG		MODEL NO: 172B; DWG NO: 0101-00-0685; REV:
	SCALE		CODE IDENT: 23338; SHEET 1 OF 1

REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG INTERFACE	0101-00-0685	WVTK	0101-00-0685	1
NONE	SCHEMATIC, INTERFACE	0103-00-0685	WVTK	0103-00-0685	1
T1	TRANSFORMER	175-0024	WVTK	1204-00-0024	1
C14	CAP,CER,100PF,1KV	DD-101	CRL	1500-01-0111	1
C1 C11 C15 C16 C17 C18 C19 C2 C20 C21 C22 C23 C24 C3 C30 C4 C5 C6 C7 C8 C9	CAP,CER,MN,.01MF,50V	CAC02Z5U103Z100A	CORNG	1500-01-0310	21
C31 C32	CAP,CER,MON,.1MF,50V	CAC03Z5U104Z050A	CORNG	1500-01-0405	2
C10 C13	CAP,CER,220PF,1KV	DD-221	CRL	1500-02-2111	2
C33 C34	CAP,TANT,22MF,15V	196D226X9015KA1	SPRAG	1500-72-2601	2
C12 C25 C26 C27 C28 C29	CAP,TANT,33MF,10V	150D336X9010B2	SPRAG	1500-73-3601	6
NONE	GPIB INTERFACE	1700-00-0685	WVTK	1700-00-0685	1
NONE	SKT,IC,16PIN	DILB-16P-108	BURND	2100-03-0028	4
NONE	SKT,IC,40PIN	DILB-40P-108	BURND	2100-03-0030	2
NONE	PC BD EJECTOR	103 WHITE	CALMK	2800-07-0008	2
NONE	TRANSIPAD	10123N	METRS	2800-11-0003	2
L1 L2	BALUN CORE	2873000902	FARIT	3100-00-0002	2
R44 R53	RES,MF,1/8W,1%,100	RN55D-1000F	TRW	4701-03-1000	2

WAVETEK PARTS LIST | TITLE PCA, GPIB INTERFACE | ASSEMBLY NO. 1100-00-0685 | PAGE: 1 | REV D

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
CR1	DIODE	1N4148	FAIR	4807-02-6666	1
Q1	TRANS	2N3903	NSC	4901-03-9030	1
NONE	POWER BUSS BAR (LG)	6009-90-0004	WVTK	6009-90-0004	4
NONE	POWER BUSS BAR (ST)	6009-90-0005	WVTK	6009-90-0005	1
U10C1 U10C2 U11C1 U11C2 U11C3 U5C1 U5C2 U5C3	OPTO-COUPLER	4N26	MOT	7000-04-2600	8
U1A U2A U5A U6B U6C1 U6C2 U9C	IC	6N136	SPECT	7100-00-0001	7
U12C U13C U16C U17C	IC	MC3446P	MOT	8000-34-4600	4
U11B	IC	CD4093BE	RCA	8000-40-9300	1
U15B U1B	IC	IM6402CPL	INTSL	8000-64-0200	2
U15C1 U7A	IC	74LS00	TI	8000-74-0010	2
U13A U1C	IC	74LS04	TI	8000-74-0410	2
U10A	IC	7405	TI	8000-74-0500	1
U17D U5B U7C	IC	74LS05	TI	8000-74-0510	3
U12A	IC	74LS08	TI	8000-74-0810	1
U10B	IC	74LS11	TI	8000-74-1110	1
U12B	IC	74LS32	TI	8000-74-3210	1

WAVETEK PARTS LIST | TITLE PCA, GPIB INTERFACE | ASSEMBLY NO. 1100-00-0685 | PAGE: 3 | REV D

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R29	RES,MF,1/8W,1%,1K	RN55D-1001F	TRW	4701-03-1001	1
R11 R13 R42 R56 R7	RES,MF,1/8W,1%,10K	RN55D-1002F	TRW	4701-03-1002	5
R12 R17 R18 R25 R43 R54 R8	RES,MF,1/8W,1%,100K	RN55D-1003F	TRW	4701-03-1003	7
R46	RES,MF,1/8W,1%,1.21K	RN55D-1211F	TRW	4701-03-1211	1
R30	RES,MF,1/8W,1%,15K	RN55D-1502F	TRW	4701-03-1502	1
R10 R16 R19 R9	RES,MF,1/8W,1%,182	RN55D-1820F	TRW	4701-03-1820	4
R40 R41	RES,MF,1/8W,1%,1.96K	RN55D-1961F	TRW	4701-03-1961	2
R23	RES,MF,1/8W,1%,221	RN55D-2210F	TRW	4701-03-2210	1
R24T	RES,MF,1/8W,1%,3.32K	RN55D-3321F	TRW	4701-03-3321	1
R14 R15 R20 R47 R48 R49 R50 R51	RES,MF,1/8W,1%,392	RN55D-3920F	TRW	4701-03-3920	8
R55 R57	RES,MF,1/8W,1%,4.99K	RN55D-4991F	TRW	4701-03-4991	2
R21 R22 R26 R27 R28 R31 R32 R33 R34 R35 R36 R37 R38 R39 R45 R52 R6	RES,MF,1/8W,1%,6.81K	RN55D-6811F	TRW	4701-03-6811	17
R1	RES NETWK	785-1R1.5K	BECK	4770-00-0010	1
R3 R4	RES MODULE 2.2K	4310R-101-222	BOURN	4770-00-0011	2
R2 R5	RES MODULE	4310R-101-682	BOURN	4770-00-0016	2

WAVETEK PARTS LIST | TITLE PCA, GPIB INTERFACE | ASSEMBLY NO. 1100-00-0685 | PAGE: 2 | REV D

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
U4B	IC	7438	TI	8000-74-3800	1
U13C1 U14A U15A U17A U4A U8A U8B U9A	IC	74LS74	TI	8000-74-7410	8
U15C	IC	93L24PC	FAIR	8000-93-2410	1
U16A	IC	MC14006BCP	MOT	8001-40-0600	1
U11A U3A	IC	74LS132	TI	8007-41-3210	2
U2C U3C	IC	74LS240	TI	8007-42-4010	2
U4C U8C	IC	74LS244	TI	8007-42-4410	2
U13B	IC,PROGRAMMED REF: 8007-41-8801	8600-00-0092	WVTK	8600-00-0092	1
U9B	IC,PROGRAMMED REF: 8007-41-8801	8600-00-0163	WVTK	8600-00-0163	1
U14B	IC,PROGRAMMED REF: 8007-41-8801	8600-00-0164	WVTK	8600-00-0164	1
U14C	IC,PROGRAMMED REF: 8008-21-2601	8600-00-0165	WVTK	8600-00-0165	1

WAVETEK PARTS LIST | TITLE PCA, GPIB INTERFACE | ASSEMBLY NO. 1100-00-0685 | PAGE: 4 | REV D

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST PCA, GPIB INTERFACE
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		MODEL NO 172B / DWG NO 1100-00-0685 / REV D
	DO NOT SCALE DWG		CODE IDENT 23338 / SHEET 1 OF 1
	SCALE		

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-3894

REV	ECN	BY	DATE	APP
A	ADD R86	TLF	6/24/77	
B	ENG. IMPRVMT			
C	ECN 1707	RDV	4-17-78	
D	ECN 1843	BDS	11-11-78	

D2-Ø (12)
D3-Ø (11)
S-Ø (6)
D6-Ø (8)
D5-Ø (9)
D4-Ø (10)
D1-Ø (13)
D0-Ø (14)
A3-Ø (2)
A2-Ø (3)
STRB-Ø (1)
A1-Ø (4)
A0-Ø (5)

IC1 74LS139
IC2 74LS139

MSD DC OFFSET
IC3 74LS175
OSPØ (2A7)
OMSD4-1
OMSD2-1
OMSD1-1
(2B8)

MID DC OFFSET
IC4 74LS175
OMD8-1
OMD4-1
OMD2-1
OMD1-1
(2B8)

LSD DC OFFSET
IC5 74LS175
OLSD8-1
OLSD4-1
OLSD2-1
OLSD1-1
(2B8)

+5
CR18
R1 4.99 K
C54 33 µf

OUTPUT AMPLIFIER
+5V (19,20)
C1 .01µf
C2 .01µf
C3 .01µf
C4 .01µf
C5 .01µf
+C6 100µf 16V
C7 .1µf 20V
(22,23,24)

AMPL. RANGE
IC6 74LS175
AR1-1
AR2-1
ARSPØ
(2C3)

MODE 2
IC7 74LS175

R87 4.99K
R88 4.99K
IC15 *2
IC15 *4

FB6
J6-1
LOAD1 (A3)
C38 .01
FB7
J6-2
OUTEN1 (A4)
C39 .01

IN (2C4)
R2 *200Ω, ¾W 1%
R3 *
R4 *
R5 *
J3-3 P3-3
J3-4 P3-4
J3-1 P3-1
J3-2 P3-2

R6 450Ω, ¾W 0.1%
R8 450Ω, ¾W 0.1%
R10 450Ω, ¾W 0.1%
R7 55.55Ω 0.1%
R9 55.55Ω 0.1%
R13 55.55Ω 0.1%
R11 100Ω ¾W, 0.1%
R12 100Ω, ¾W 0.1%
K5 K6 K3 K4 K1 K2 K7 K8
E1 E2 E3 E4 E5
J1-1 OUT
PWR AMP SUB ASSY NO. 3
P9-1 J9-1
P9-2 J9-2
J8-6 P7-6

GND J2-4 P2-4
(2C1) +5V J2-1 P2-1
DB60-Ø (2C1) J2-2 P2-2
DB40-Ø (2C1) J2-3 P2-3
R14 4.99K
C8 .01
R15 4.99K
R81 10Ω
R82 10Ω
IC8 7416
PWR AMP SUB ASSY NO. 1

CR1 CR2 CR3 CR4 CR5 CR6 CR7 CR8
C52 .01
C53 .01
P4-1 J5-1
P4-4 J5-4
P4-3 J5-3
P4-2 J5-2
FB1 FB2 FB3 FB4
J8-1 P7-1
J8-5 P7-5
J8-2 P7-2
J8-4 P7-4
J8-3 P7-3
R83 10Ω
R84 10Ω
R85 10Ω
IC9 7416
P6-3 J6-3 DB20-Ø (2C1)
P6-4 J6-4
P6-2 J6-2 OUTEN1 (C3)
P6-1 J6-1 LOAD1 (C3)
PWR AMP SUB ASSY NO. 2

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN T. FOSTER	DATE 3-29-77	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR Tom Solga	SEPT 0'77	TITLE: SCHEMATIC POWER AMPLIFIER/ DC OFFSET
FINISH WAVETEK PROCESS	RELEASE APPROV		
	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ± .010 ANGLES ± 1° XX ± .030		MODEL NO. / DWG NO. 0103-00-0710 / REV D
	DO NOT SCALE DWG		
	SCALE		CODE IDENT 23338 / SHEET 1 OF 2

0103-00-0710

REV	ECN	BY	DATE	APP

OUTPUT POWER AMP.

(39,40) FB12 +24V — C9 .1 50V — C10 50µF 50V — R16 7.5K — R17 2.49K — R18 2.49K — R19 100 — CR9 1N4581 — R28 499K — C11 .01 — R27 100 — Q2 2N5139 — Q3 2N3903 — C18 .01 — C19 .01 — R29 49.9K — R31 4.99K — C16 .01 — R26 15K — R41 24.9K — C17 33pf — SIGNAL COMMON (26,27,28,41) — Q1 2N3638A — IC10 CA 3096AE — R52 499 — R53 PWR AMP OFFSET 20 — R54 7.5K — R42 499 — R43 33.2 — R44 4.99K — R55 392 — R56 100 — C25 .01 — C26 .01 — 2N5139 Q4 — -24V (36,37) FB5 — C23 .1 50V — C24 50µF 50V — ATTN. OUT

TRIM R20 — R21 150 — R25 21.5 — .1/50V C13 — 249 R24 — Q5 2N2905A NF-207 — ABB C12 3.5/13 pf — CR10 — CR12 — CR11 — R30 100 — C20 10pf — C21 5pf — R32 2K □ — ~GAIN — R33 12.1K — R45 100 — CR13 — CR14 — NF-207 — 2N3866 Q8 — R59 21.5 — C27 .1/50V — TRIM R57 — R58 200 — -24V

R22 10/5% — R23 10/5% — 61.9 R34 — Q6 2N2219A — R35 61.9 — Q7 2N4047 NF-209 — C14 .1 50V — C15 50 50V — C22 .01 — R36 249 — R37 15 — R38 15 — IN (1B7) — R39 15 — P.15 — R40 — CR15 — R47 61.9 — Q10 2N5160 NF-209 — R46 61.9 — 2N2905A Q9 — R60 10 5% — R61 10 5% — C28 .1 50V — C29 50 50V — TP1

+24V — -24V

+5V — R86 4.99K

(1CS) ARSPØ — (1CS) AR2-1 — (1CS) AR1-1 — +5V

IC14 — 74LS03 — FB8 — FB9 — FB10 — FB11

J6-3 — D820-Ø (1A4) — C40 .01

J2-1 — (1A7) — C41 .01

J2-3 — D840-Ø (1A7) — C42 .01

J2-2 — D860-Ø (1A7) — C43 .01

J4-1 — J5-1 — C44 .01

J4-2 — J5-2 — C45 .01

J4-3 — J5-3 — C46 .01

J7-1 — J8-1 — C47 .01

J7-2 — J8-2 — C48 .01

J7-3 — J8-3 — C49 .01

J7-4 — J8-4 — C50 .01

J7-5 — J8-5 — C51 .01

LAST REF DES. USED:
C54
CR18
K8
IC14
Q12
R88
FB12
P10
J9
TP4
E6

DC OFFSET

+15V (33,34) — DACMON (21A) — -15V (30,31) — OFSMON (21B)

IC11 AD563J D-C OFFSET D/A — MSB — LSB

(IC3) OMSD4-1 OMSD2-1 OMSD1-1 — (IC4) OMDB-1 OMD4-1 OMD2-1 OMD1-1 — (IC5) OLSD8-1 OLSD4-1 OLSD2-1 OLSD1-1

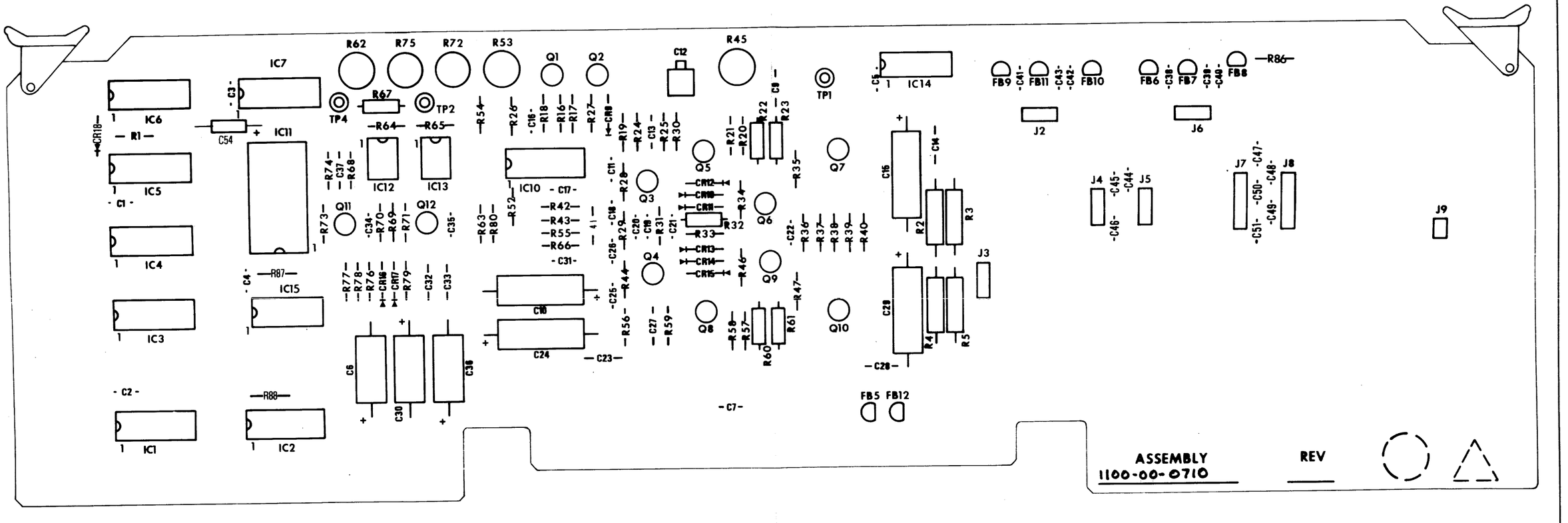
+15V — C30 100, 16V — R73 10 — R74 10 — C36 100 16V — C37 .1/20V — D-C GAIN — R62 200 — R63 10K — DACMON (B8) — R64 10K △ — R65 10K △ — R66 59 — C31 .01 — TP3 — TP2 — R80 10K — OFSMON (A8)

IC12 741 — R67 1M — R68 4.99K — C32 .1/20V — C33 .1/20V — R69 100K — 2N5462 Q11 — R70 4.99K — C34 .01 — C35 .01 — R71 4.99K — IC13 741 — R72 10K OFFSET ZERO TP2 — OFFSET ZERO TP4 R75 100K — R76 15K — CR16 — IC15 — 7416 — R77 15K — R78 15K — IC15 — Q12 2N5462 — CR17 — R79 100K — OSPØ (IC5)

NOTE: UNLESS OTHERWISE SPECIFIED

1. ALL RESISTORS IN OHMS 1/8W, 1%
2. ALL CAPACITORS IN MICROFARADS
3. □ = 0.1% 1/8W RES.
4. △ MATCHED SET # 4789-00-0019
5. ALL UNMARKED DIODES - FD6666

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN T. FOSTER	DATE 9-29-77	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR Tom Seliga	SEPT 8 '77	TITLE SCHEMATIC POWER AMPLIFIER DC OFFSET
FINISH WAVETEK PROCESS	RELEASE APPROV		
	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1° .XX ±.030		
	DO NOT SCALE DWG	MODEL NO.	DWG NO. 0103-00-0710 REV A
	SCALE	CODE IDENT 23338	SHEET 2 OF 2



1100-00-0710

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJENGR		TITLE: POWER AMPLIFIER PCA
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ·010 ANGLES ·1 XX ·030		MODEL NO 172B / DWG NO 0101-00-0710 / REV
	DO NOT SCALE DWG		
	SCALE		CODE IDENT 23338 / SHEET 1 OF 1

REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG, PWR AMPL	0101-00-0710	WVTK	0101-00-0710	1
NONE	SCHEMATIC, PWR AMPL	0103-00-0710	WVTK	0103-00-0710	1
1	PWR AMPL SUB ASSY #1	172-591	WVTK	1208-00-0591	1
2	PWR AMPL SUB ASSY #2	172-592	WVTK	1208-00-0592	1
3	PWR AMPL SUB ASSY #3	172-593	WVTK	1208-00-0593	1
NONE	SHIELD, RF	1400-00-7091	WVTK	1400-00-7091	2
NONE	SHIELD, RF	1400-00-7101	WVTK	1400-00-7101	2
NONE	SHIELD, RF	1400-00-7111	WVTK	1400-00-7111	2
NONE	SHIELD, RF	1400-00-7121	WVTK	1400-00-7121	1
NONE	SHIELD, RF	1400-00-7131	WVTK	1400-00-7131	1
NONE	COVER, RF SHIELD	1400-00-7143	WVTK	1400-00-7143	1
NONE	X, CORNER POST REF: 3200-02-0004	1400-00-7439	WVTK	1400-00-7439	7
NONE	T-CORNER POST REF: 3200-02-0004	1400-00-7449	WVTK	1400-00-7449	1
NONE	SHIELD, RF	1400-00-7451	WVTK	1400-00-7451	2
C21	CAP, CER, 5PF, 1KV	DD-050	CRL	1500-00-5011	1
C20	CAP, CER, 10PF, 1KV	DD-100	CRL	1500-01-0011	1
C1 C11 C16 C18 C19 C2	CAP, CER, MN, .01MF, 50V	CAC02Z5U103Z100A	CORNG	1500-01-0310	29

WAVETEK PARTS LIST | TITLE PCA, PWR AMPL | ASSEMBLY NO. 1100-00-0710 | PAGE: 1 | REV D

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	HEAT SINK	207	WAKE	2800-11-0001	2
NONE	TRANSIPAD	10123N	METRS	2800-11-0003	10
NONE	TRANSIPAD	10160	METRS	2800-11-0004	4
NONE	HEATSINK	209	WAKE	2800-11-0008	2
NONE	MOUSETAIL	2829-75-2	RUBTK	2800-12-0005	1
NONE	TAPE, DBL SIDED FOAM	4416-1/16"X 2"	3M	3000-00-0023	2
FB10 FB11 FB12 FB5 FB6 FB7 FB8 FB9	BALUN CORE	2873000902	FARIT	3100-00-0002	8
R45	POT, TRIM, 100	91AR100	BECK	4600-01-0103	1
R72	POT, TRIM, 10K	91AR10K	BECK	4600-01-0315	1
R75	POT, TRIM, 100K	91AR100K	BECK	4600-01-0402	1
R53	POT, TRIM, 20	91AR20	BECK	4600-02-0000	1
R62	POT, TRIM, 200	91AR200	BECK	4600-02-0101	1
R22 R23 R60 R61	RES, C, 1/2W, 5%, 10	RC20GF-100	STKPL	4700-25-0100	4
R32	RES, MF, 1/8W, .1%, 2K	RN55E-2001B	MEPCO	4701-02-2001	1
R19 R27 R30 R56	RES, MF, 1/8W, 1%, 100	RN55D-1000F	TRW	4701-03-1000	4
R63 R80	RES, MF, 1/8W, 1%, 10K	RN55D-1002F	TRW	4701-03-1002	2
R69 R79	RES, MF, 1/8W, 1%, 100K	RN55D-1003F	TRW	4701-03-1003	2

WAVETEK PARTS LIST | TITLE PCA, PWR AMPL | ASSEMBLY NO. 1100-00-0710 | PAGE: 3 | REV D

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R16 R54	RES, MF, 1/8W, 1%, 7.5K	RN55D-7501F	TRW	4701-03-7501	2
R67	RES, MF, 1/4W, 1%, 1M	RN60D-1004F	TRW	4701-13-1004	1
R64 R65	RES, SET, 2-10K, 1/8W QTY: 2: 4701-03-1002	142-501-64A	WVTK	4789-00-0019	1
R2 R3 R4 R5	RES, MF, 3/4W, .1%, 200	ML212-200	CADDO	4799-00-0047	4
CR9	DIODE	1N4581	MICRO	4801-01-4581	1
CR10 CR11 CR12 CR13 CR14 CR15 CR16 CR17 CR18	DIODE	1N4148	FAIR	4807-02-6666	9
Q6	TRANS	2N2219A	NSC	4901-02-2191	1
Q5 Q9	TRANS	2N2905A	NSC	4901-02-9051	2
Q1	TRANS	2N3638A	CARTR	4901-03-6381	1
Q8	TRANS	2N3866	MOT	4901-03-8660	1
Q3	TRANS	2N3903	NSC	4901-03-9030	1
Q7	TRANS	2N4047	FAIR	4901-04-0470	1
Q2 Q4	TRANS	2N5139	FAIR	4901-05-1390	2
Q10	TRANS	2N5160-18	MOT	4901-05-1600	1
Q11 Q12	TRANS	2N5462	MOT	4901-05-4620	2
NONE	CABLE, COAX, 26AWG	RG 174/U	ITT	6001-40-0001	1

WAVETEK PARTS LIST | TITLE PCA, PWR AMPL | ASSEMBLY NO. 1100-00-0710 | PAGE: 5 | REV D

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
C22 C25 C26 C3 C31 C34 C35 C38 C39 C4 C40 C41 C42 C43 C44 C45 C46 C47 C48 C49 C5 C50 C51					
C13 C14 C23 C27 C28 C32 C33 C37 C7 C9	CAP, CER, MON, .1MF, 50V	CAC03Z5U104Z050A	CORNG	1500-01-0405	10
C17	CAP, CER, 33PF, 1KV	DD-330	CRL	1500-03-3011	1
C30 C36 C6	CAP, ELECT, 100MF, 16V	500D107G016DC7	SPRAG	1500-31-0101	3
C10 C15 C24 C29	CAP, ELECT, 50MF, 50V	500D5060S0DD7	SPRAG	1500-35-0003	4
C12	CAP, VAR, 3.5-13PF250V	300422-411	TRIKO	1500-51-3010	1
C54	CAP, TANT, 33MF, 10V	150D336X9010B2	SPRAG	1500-73-3601	1
NONE	PWR AMPL, OFFSET BD	1700-00-0710	WVTK	1700-00-0710	1
NONE	SKT, IC, 24PIN	DILB-24P-108	BURND	2100-03-0029	1
NONE	TERM	2010B1	USECO	2100-05-0011	12
TP1 TP2 TP4	CONN	60598-8	AMP	2100-05-0017	3
4	CONN PIN, MALE UOM-EA PIN	CAS36SP-100-230-730	CA	2100-05-0031	34
NONE	CONN	27-843	AMPH	2100-07-0009	1
J1	CONN	27-3	AMPH	2100-07-0012	1
4	PC BD EJECTOR	103 GRAY	CALMK	2800-07-0016	2

WAVETEK PARTS LIST | TITLE PCA, PWR AMPL | ASSEMBLY NO. 1100-00-0710 | PAGE: 2 | REV D

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R73 R74	RES, MF, 1/8W, 1%, 10	RN55D-10R0F	TRW	4701-03-1009	2
R33	RES, MF, 1/8W, 1%, 12.1K	RN55D-1212F	TRW	4701-03-1212	1
R21	RES, MF, 1/8W, 1%, 150	RN55D-1500F	TRW	4701-03-1500	1
R26 R76 R77 R78	RES, MF, 1/8W, 1%, 15K	RN55D-1502F	TRW	4701-03-1502	4
R37 R38 R39 R40	RES, MF, 1/8W, 1%, 15	RN55D-15R0F	TRW	4701-03-1509	4
R58	RES, MF, 1/8W, 1%, 200	RN55D-2000F	TRW	4701-03-2000	1
R25 R59	RES, MF, 1/8W, 1%, 21.5	RN55D-21R5F	TRW	4701-03-2159	2
R24 R36	RES, MF, 1/8W, 1%, 249	RN55D-2490F	TRW	4701-03-2490	2
R17 R18	RES, MF, 1/8W, 1%, 2.49K	RN55D-2491F	TRW	4701-03-2491	2
R41	RES, MF, 1/8W, 1%, 24.9K	RN55D-2492F	TRW	4701-03-2492	1
R43	RES, MF, 1/8W, 1%, 33.2	RN55D-33R2F	TRW	4701-03-3329	1
R55	RES, MF, 1/8W, 1%, 392	RN55D-3920F	TRW	4701-03-3920	1
R42 R52	RES, MF, 1/8, 1%, 499	RN55D-4990F	TRW	4701-03-4990	2
R1 R28 R31 R44 R68 R70 R71 R86 R87 R88	RES, MF, 1/8W, 1%, 4.99K	RN55D-4991F	TRW	4701-03-4991	10
R29	RES, MF, 1/8W, 1%, 49.9K	RN55D-4992F	TRW	4701-03-4992	1
R66	RES, MF, 1/8W, 1%, 59	RN55D-59R0F	TRW	4701-03-5909	1
R34 R35 R46 R47	RES, MF, 1/8W, 1%, 61.9	RN55D-61R9F	TRW	4701-03-6199	4

WAVETEK PARTS LIST | TITLE PCA, PWR AMPL | ASSEMBLY NO. 1100-00-0710 | PAGE: 4 | REV D

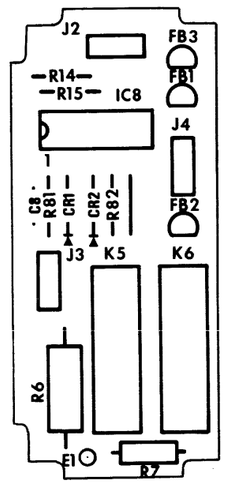
REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
IC11	IC	AD563J	ANDEV	7000-05-6300	1
IC12 IC13	IC	LM741CN	NSC	7000-07-4100	2
IC10	IC	CA-3096AE	RCA	7000-30-9600	1
IC14	IC	74LS03	TI	8000-74-0310	1
IC15	IC	7416	SIG	8000-74-1600	1
IC1 IC2	IC	74LS139	SIG	8007-41-3910	2
IC3 IC4 IC5 IC6 IC7	IC	74LS175	TI	8007-41-7510	5

WAVETEK PARTS LIST | TITLE PCA, PWR AMPL | ASSEMBLY NO. 1100-00-0710 | PAGE: 6 | REV D

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST PCA, PWR AMPL
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1 .XX ±.030		
	DO NOT SCALE DWG		MODEL NO. 172B / DWG NO. 1100-00-0710 / REV D
	SCALE		CODE IDENT 23338 / SHEET 1 OF 1

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-3894



1208-00-0591

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROTENGR		TITLE ASSEMBLY POWER AMPLIFIER SUB. ASSY. NO. 1
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX .010 ANGLES 1 XX .030		
	DO NOT SCALE DWG		MODEL NO 172 / DWG NO 0101-00-0591 / REV
	SCALE		CODE IDENT 23338 / SHEET OF

REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG PWR AMPL#1	0101-00-0591	WVTK	0101-00-0591	1
NONE	SCHEMATIC, PWR AMPL	0103-00-0710	WVTK	0103-00-0710	1
C8	CAP, CER, MN, .01MF, 50V	CAC02Z5U103Z100A	CORNG	1500-01-0310	1
NONE	PWR AMPL BD #1	1700-00-0591	WVTK	1700-00-0591	1
J2 J3 J4	CONN	22-17-2042	MOLEX	2100-02-0065	3
NONE	TRANSIPAD	10123N	METRS	2800-11-0003	3
FB1 FB2 FB3	BALUN CORE	2873000902	FARIT	3100-00-0002	3
K6	RELAY, REED, FORM-A	RA3019-1051	ETROL	4500-00-0007	1
K5	RELAY, FORM A MERCURY	4500-00-0012	WVTK	4500-00-0012	1
R7	RES, MF, 1/8W, .1%, 55.5	RN55E55R5B	MEPCO	4701-02-5559	1
R81 R82	RES, MF, 1/8W, 1%, 10	RN55D-10R0F	TRW	4701-03-1009	2
R14 R15	RES, MF, 1/8W, 1%, 4.99K	RN55D-4991F	TRW	4701-03-4991	2
R6	RES, MF, 3/4W, .1%, 450	ML212-450	CADDO	4799-00-0046	1
CR1 CR2	DIODE	1N4148	FAIR	4807-02-6666	2
NONE	WIRE, WIREWRAP 24GA. KYNAR INSULATION	UL1422 W/W WIRE WHT	BRDRX	6000-52-4009	1
IC8	IC	7416	SIG	8000-74-1600	1

WAVETEK PARTS LIST

TITLE
PWR AMPL SUB ASSY #1

ASSEMBLY NO.
1208-00-0591

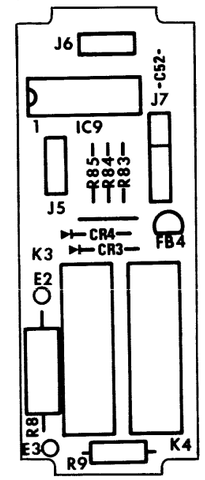
PAGE: 1

REV C

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE
	RELEASE APPROV		PARTS LIST PWR AMPL SUB ASSY #1
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		
	DO NOT SCALE DWG	MODEL NO. 172B	DWG NO. 1208-00-0591 REV C
	SCALE	CODE IDENT 23338	SHEET 1 OF 1

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-3994



1208-00-0592

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE ASSEMBLY POWER AMPLIFIER SUB. ASSY. NO. 2
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX .010 ANGLES 1 XX .030		
	DO NOT SCALE DWG		MODEL NO 172 / DWG NO 0101-00-0592 / REV
	SCALE		CODE IDENT 23338 / SHEET OF

REV	ECN	BY	DATE	APP

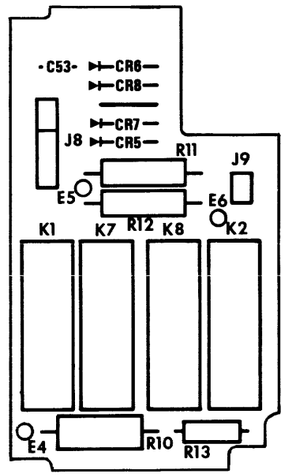
REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG PWR AMPL#2	0101-00-0592	WVTK	0101-00-0592	1
NONE	SCHEMATIC, PWR AMPL	0103-00-0710	WVTK	0103-00-0710	1
C52	CAP, CER, MN, .01MF, 50V	CAC02Z5U103Z100A	CORNG	1500-01-0310	1
NONE	PWR AMPL SUB BD #2	1700-00-0592	WVTK	1700-00-0592	1
J7A	CONN	22-17-2022	MOLEX	2100-02-0061	1
J5 J6 J7B	CONN	22-17-2042	MOLEX	2100-02-0065	3
NONE	SPRING SOCKET	50935-1	AMP	2100-03-0039	1
NONE	TRANSIPAD	10123N	METRS	2800-11-0003	1
FB4	BALUN CORE	2873000902	FARIT	3100-00-0002	1
K4	RELAY, REED, FORM-A	RA3019-1051	ETROL	4500-00-0007	1
K3	RELAY, FORM A MERCURY	4500-00-0012	WVTK	4500-00-0012	1
R9	RES, MF, 1/8W, .1%, 35.5	RN55E35R5B	MEPCO	4701-02-3559	1
R83 R84 R85	RES, MF, 1/8W, 1%, 10	RN55D-10ROF	TRW	4701-03-1009	3
R8	RES, MF, 3/4W, .1%, 450	ML212-450	CADDO	4799-00-0046	1
CR3 CR4	DIODE	1N4148	FAIR	4807-02-6666	2
NONE	WIRE, WIREWRAP 24GA. KYNAR INSULATION	UL1422 W/W WIRE WHT	BRDRX	6000-32-4009	1
IC9	IC	7416	SIG	8000-74-1600	1

WAVETEK PARTS LIST	TITLE PWR AMPL SUB ASSY #2	ASSEMBLY NO. 1208-00-0592 PAGE: 1	REV D

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST PWR AMPL SUB ASSY #2
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		MODEL NO. 172B / DWG NO. 1208-00-0592 / REV D
	DO NOT SCALE DWG		CODE IDENT 23338 / SHEET 1 OF 1
	SCALE		

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-3094



1208-00-0593

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE ASSEMBLY POWER AMPLIFIER SUB ASSY. NO. 3
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX .010 ANGLES 1 XX .030		
	DO NOT SCALE DWG		MODEL NO 172 / DWG NO 0101-00-0593 / REV
	SCALE		CODE IDENT 23338 / SHEET OF

REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG PWR AMPL#3	0101-00-0593	WVTK	0101-00-0593	1
NONE	SCHEMATIC, PWR AMPL	0103-00-0710	WVTK	0103-00-0710	1
C53	CAP, CER, MN, .01MF, 50V	CAC02Z5U103Z100A	CORNG	1500-01-0310	1
NONE	PWR AMPL BD #3	1700-00-0593	WVTK	1700-00-0593	1
J8A J9	CONN	22-17-2022	MOLEX	2100-02-0061	2
P8B	CONN	22-17-2042	MOLEX	2100-02-0065	1
NONE	SPRING SOCKET	50935-1	AMP	2100-03-0039	2
K2	RELAY, REED, FORM-A	RA3019-1051	ETROL	4500-00-0007	1
K1 K7 K8	RELAY, FORM A MERCURY	4500-00-0012	WVTK	4500-00-0012	3
R13	RES, MF, 1/8W, .1%, 55.5	RN55E55R5B	MEPCO	4701-02-5559	1
R11 R12	RES, MF, 3/4W, .1%, 100	ML212-100	CADDO	4799-00-0038	2
R10	RES, MF, 3/4W, .1%, 450	ML212-450	CADDO	4799-00-0046	1
CR5 CR6 CR7 CR8	DIODE	1N4148	FAIR	4807-02-6666	4
NONE	WIRE, WIREWRAP 24GA. KYNAR INSULATION	UL1422 W/W WIRE WHT	BRDRX	6000-52-4009	1

WAVETEK PARTS LIST	TITLE PWR AMPL SUB ASSY #3	ASSEMBLY NO. 1208-00-0593 PAGE: 1	REV D

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE
	RELEASE APPROV		PARTS LIST PWR AMPL SUB ASSY #3
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		
	DO NOT SCALE DWG	MODEL NO 172B	DWG NO 1208-00-0593 REV D
	SCALE	CODE IDENT 23338	SHEET 1 OF 1

REV	ECN	BY	DATE	APP
A	#2130	LTE	4-30-80	

PRE-AMP OUT (D8)

C1 .01 +5V

100/16V C2

J1 ATTEN OUT

+5V R1 4.99K

PRE-AMP OUT(48,49) ← PRE-AMP. OUT (D5)

IC1 74LS175 AMPLITUDE MSD

D4-Ø (10A)
D5-Ø (9A)
D7-Ø (7A)
D6-Ø (8A)

A4-0
A8-0
A2-0
A1-0

IC2 74LS175 MD

D1-Ø (13A)
D3-Ø (11A)
D2-Ø (12A)
D0-Ø (14A)

74LS00 IC5

A0.4-1
A0.2-0
A0.2-1
A0.1-0

IC3 74LS175 LSD

+5V (19,20)
COMMON (22,23,24)

FB FB
C8 .01
C6 .001
C7 .001

IC4 74LS139

A2-Ø (3A)
A3-Ø (2A)
STRB (1A)
A1-Ø (4A)
AØ-Ø (5A)

IC6 IC7 IC8 IC9

A0.04-1
A0.02-0
A0.02-1
A0.01-0

74LS05 (4)

CR1 CR2 K2 CR3 CR4 K4 CR5 CR6 K6 CR7 CR8 K8 CR9 K10 CR10 CR11 CR12 K12 CR13 K14 CR14 CR15 CR16 K16 CR17 K18 CR18 CR19 CR20 K20 CR21 K22 CR22 CR23 CR24 K24

C3 .01μF
C4 .01μF
C5 .01μF

R2 R3 K1 R11 R12 K2 IC6-6
R4 K3 R13 K4 IC6-4
R6 R5 K5 R14 K6 IC6-2
R7 R8 R9 R10 K7 R15 K8 IC7-6
R16 K9 R17 K10 IC7-10
R18 K11 R19 K12 IC7-2
R20 R21 R23 K13 R22 K14 IC8-8
R26 3K .1% K15 R27 3K .1% K16 IC8-4
R24 K17 R25 K18 IC8-12
R28 1.5K K19 R29 1.5K K20 IC9-6
R30 1.5K K21 R31 1.5K K22 IC9-10
R32 3.01K K23 R33 3.01K K24 IC9-2

R34 3K .1%
R35 30.1K
R36 3K .1%

(24,27,28) PWR COM
(43,44,45,46) SIG IN COM

RA3019-1051 FORM RELAY (24)

R11 THRU R25 Δ 750Ω .1% (15 ea)
R2 THRU R10 ✱ 750Ω .1% (9 ea) MATCHED SET (REF: 4789-00-0042)

TRUTH TABLE

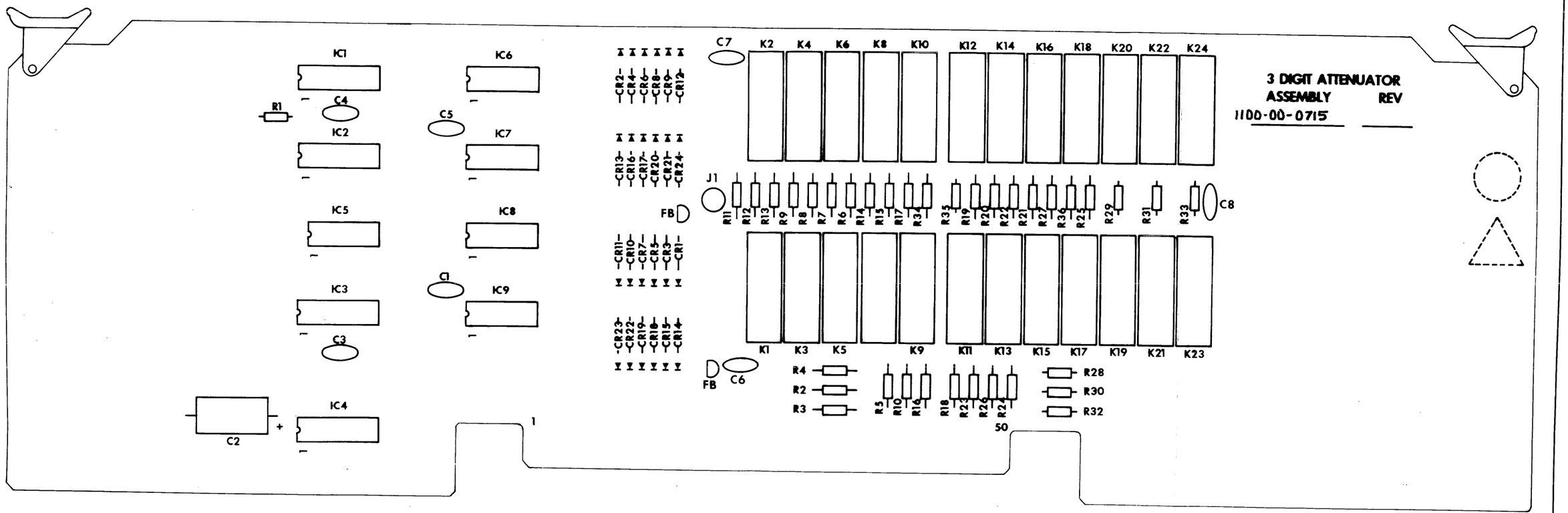
A3-1	A2-1	A1-1	A0-1	D7-D4	D3-D0
1	0	0	0	MSD	MMD
1	0	0	1	LSD	

LAST REF DES USED
C8
CR24
K24
IC9
R36
J1

1. ALL UNMARKED DIODES ARE FD6666 (24)

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN Bo Fifer	DATE 6-7-6	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR Tom Salga	DATE 8-17-77	TITLE 3 DIGIT ATTENUATOR SCHEMATIC
FINISH WAVETEK PROCESS	RELEASE APPROV		
	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1° .XX ±.030		
	DO NOT SCALE DWG	MODEL NO.	DWG NO. 0103-00-0215 REV A
	SCALE	CODE IDENT 23338	SHEET 1 OF 1



3 DIGIT ATTENUATOR ASSEMBLY REV
1100-00-0715

1100-00-0715

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: 3 DIGIT ATTENUATOR PCA
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 XX ± .030 ANGLES ± 1		
	DO NOT SCALE DWG		MODEL NO 172B / DWG NO 0101-00-0715 / REV
	SCALE		CODE IDENT 23338 / SHEET 1 OF 1

REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG, 3RD DIGIT	0101-00-0715	WVTK	0101-00-0715	1
NONE	SCHEMATIC, 3RD DIGIT	0103-00-0715	WVTK	0103-00-0715	1
C6 C7	CAP, CER, .001MF, 1KV	DD-102	CRL	1500-01-0211	2
C1 C3 C4 C5 C8	CAP, CER, MN, .01MF, 50V	CACD2Z5U103Z100A	CORNG	1500-01-0310	5
C2	CAP, ELECT, 100MF, 16V	500D107G016DC7	SPRAG	1500-31-0101	1
NONE	3RD DIGIT ATTEN BD	1700-00-0715	WVTK	1700-00-0715	1
J1	CONN	27-848	AMPH	2100-07-0011	1
NONE	PC BD EJECTOR	103 VIOLET	CALMK	2800-07-0015	2
NONE	TRANSIPAD	10123N	METRS	2800-11-0003	2
NONE	BALUN CORE	2873000902	FARIT	3100-00-0002	2
K10 K11 K12 K13 K14 K15 K16 K17 K18 K19 K2 K20 K21 K22 K23 K24 K4 K5 K6 K7 K8 K9	RELAY, REED, FORM-A	RA3019-1051	ETROL	4500-00-0007	22
K1 K3	RELAY, REED, FORM-C	RA3020-1051	ETROL	4500-00-0009	2
R26 R27 R34 R36	RES, MF, 1/8W, .1%, 3K	RN55E-3001B	MEPCO	4701-02-3001	4
R11 R12 R13 R14 R15 R16 R17 R18 R19 R20 R21 R22 R23 R24 R25	RES, MF, 1/8W, .1%, 750	RN55E-7500B	MEPCO	4701-02-7500	15
R28 R29 R30 R31	RES, MF, 1/8W, 1%, 1.5K	RN55D-1501F	TRW	4701-03-1501	4

WAVETEK PARTS LIST | TITLE PCA, 3 DIGIT ATTEN | ASSEMBLY NO. 1100-00-0715 | PAGE: 1 | REV A

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R32 R33	RES, MF, 1/8W, 1%, 3.01K	RN55D-3011F	TRW	4701-03-3011	2
R35	RES, MF, 1/8W, 1%, 30.1K	RN55D-3012F	TRW	4701-03-3012	1
R1	RES, MF, 1/8W, 1%, 4.99K	RN55D-4991F	TRW	4701-03-4991	1
R10 R2 R3 R4 R5 R6 R7 R8 R9	RES, SET, 9-750, 1/8W QTY: 9: 4701-02-7500	4789-00-0042	WVTK	4789-00-0042	1
CR5 CR1 CR10 CR11 CR12 CR13 CR14 CR15 CR16 CR17 CR18 CR19 CR2 CR20 CR21 CR22 CR23 CR24 CR3 CR4 CR6 CR7 CR8 CR9	DIODE	1N4148	FAIR	4807-02-6666	24
IC5	IC	74LS00	TI	8000-74-0010	1
IC6 IC7 IC8 IC9	IC	74LS05	TI	8000-74-0510	4
IC4	IC	74LS139	SIG	8007-41-3910	1
IC1 IC2 IC3	IC	74LS175	TI	8007-41-7510	3

WAVETEK PARTS LIST | TITLE PCA, 3 DIGIT ATTEN | ASSEMBLY NO. 1100-00-0715 | PAGE: 2 | REV A

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST PCA, 3 DIGIT ATTEN
FINISH WAVETEK PROCESS	RELEASE APPROV		
	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		MODEL NO 172B / DWG NO 1100-00-0715 / REV A
	DO NOT SCALE DWG		CODE IDENT 23338 / SHEET 1 OF 1
	SCALE		

NOTE UNLESS OTHERWISE SPECIFIED

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-3894

REV	ECN	BY	DATE	APP

SINE CONVERTOR

1 SET CR1-CR8 182-500-98

1 SET CR9-CR16 182-500-98

SQUARE WAVE SHAPER

INPUT CONTROL LOGIC

"A" SIDE

IC4 74LS139

A1 (4)
A0 (5)
STRB (1)
A3 (2)
A2 (3)

AMPL. SIGN

S(6)

IC3 7415 74

IC1 7416

IC2 74LS175 FUNCTION

D7 (7)
D6 (8)
D4 (10)
D5 (9)
F8(90)
SQ MODE (B6)

K2 RA3020-105(13)

K1

IC 1, 7416

K3

INVERTING AMPLIFIER

IC5 CA 3096AE

NON-INVERTING AMPLIFIER

IC6 CA 3096AE

(33,34) +15V
(26,27,28)
(30,31) -15V

(19)
(20) +5V
(22)
(23)
(24) COM

(48,49) PRE-AMP OUT
(43,44,45,46)

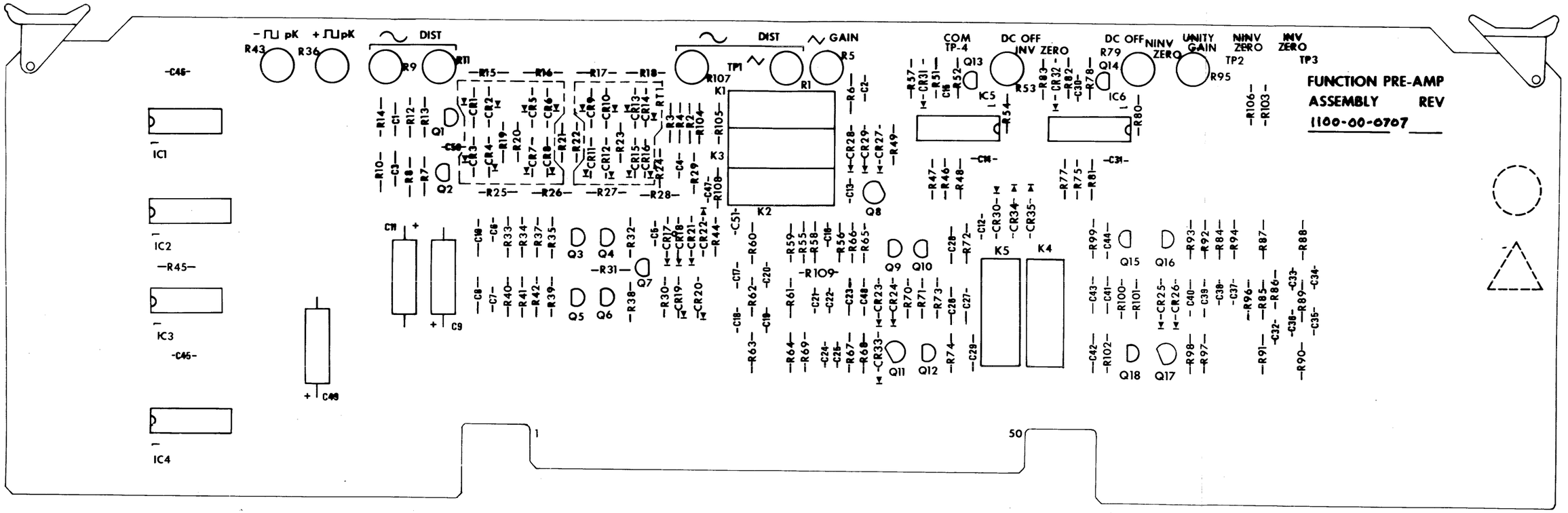
2) UNLESS OTHERWISE SPECIFIED: ALL CAPACITORS ARE MICROFARADS
ALL DIODES ARE FD6666

1) LAST REF. DESIGNATORS USED: K5, CS1, TP4, IC6, CR35, R108, Q18, RT1

NOTE: UNLESS OTHERWISE SPECIFIED

3 SQUARE WAVE ABERRATION TRIM CAP.

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN D. COOPER	DATE 6/28/78	WAVETEK SAN DIEGO • CALIFORNIA	
MATERIAL	PROJ ENGR Tom Seliga	SEPT 7'77	TITLE	SCHEMATIC FUNCTION/PRE-AMP.
	RELEASE APPROV			
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1° XX ±.030			
	DO NOT SCALE DWG		MODEL NO.	DWG NO. 0103-00-0101 REV F
	SCALE		CODE IDENT 23338	SHEET 1 OF 1



FUNCTION PRE-AMP ASSEMBLY REV
1100-00-0707

1100-00-0707

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: FUNCTION / PREAMP PCA
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		
	DO NOT SCALE DWG		MODEL NO 172B; DWG NO 0100-00-0707; REV
	SCALE		CODE IDENT 23338; SHEET 1 OF 1

REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG, FUNCTION	0101-00-0707	WVTK	0101-00-0707	1
NONE	SCHEMATIC, FUNCTION	0103-00-0707	WVTK	0103-00-0707	1
C21 C37 C38	CAP, CER, 5PF, 1KV	DD-050	CRL	1500-00-5011	3
C22	CAP, CER, 10PF, 1KV	DD-100	CRL	1500-01-0011	1
C16	CAP, CER, 100PF, 1KV	DD-101	CRL	1500-01-0111	1
C25	CAP, CER, .001MF, 1KV	DD-102	CRL	1500-01-0211	1
C14 C17 C18 C19 C20 C31 C33 C34 C35 C36 C45 C46 C47 C5 C6 C7	CAP, CER, MN, .01MF, 50V	CAC02Z5U103Z100A	CORNG	1500-01-0310	16
C1 C10 C12 C13 C23 C26 C27 C28 C29 C3 C39 C40 C41 C42 C43 C44 C48 C8	CAP, CER, MON, .1MF, 50V	CAC03Z5U104Z050A	CORNG	1500-01-0405	18
C15 C30	CAP, CER, 22PF, 1KV	DD-220	CRL	1500-02-2011	2
C50	CAP, CER, 33PF, 1KV	DD-330	CRL	1500-03-3011	1
C4	CAP, CER, 47PF, 1KV	DD-470	CRL	1500-04-7011	1
C32	CAP, CER, 470PF, 1KV	DD-471	CRL	1500-04-7111	1
C24	CAP, CER, 820PF, 1KV	DD-821 LONG LEAD	CRL	1500-08-2101	1
C51	CAP, MICA, 30PF, 500V	DM15-300J	ARCO	1500-13-0000	1
C11 C49 C9	CAP, ELECT, 100MF, 16V	500D107G016DC7	SPRAG	1500-31-0101	3

WAVETEK PARTS LIST | TITLE PCA, FUNCTION BD | ASSEMBLY NO. 1100-00-0707 PAGE: 1 | REV F

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R15 R17 R25 R27	RES, MF, 1/8W, 1%, 12.1K	RN55D-1212F	TRW	4701-03-1212	4
R22	RES, MF, 1/8W, 1%, 13K	RN55D-1302F	TRW	4701-03-1302	1
R67 R97	RES, MF, 1/8W, 1%, 1.5K	RN55D-1501F	TRW	4701-03-1501	2
R13 R31 R62 R7 R89	RES, MF, 1/8W, 1%, 15K	RN55D-1502F	TRW	4701-03-1502	5
R16 R20 R26	RES, MF, 1/8W, 1%, 16.5K	RN55D-1652F	TRW	4701-03-1652	3
R12 R47 R48 R77 R8 R81	RES, MF, 1/8W, 1%, 2K	RN55D-2001F	TRW	4701-03-2001	6
R2 R3	RES, MF, 1/8W, 1%, 21.5	RN55D-21R5F	TRW	4701-03-2159	2
R37 R42 R44	RES, MF, 1/8W, 1%, 2.21K	RN55D-2211F	TRW	4701-03-2211	3
R86	RES, MF, 1/8W, 1%, 237K	RN55D-2373F	TRW	4701-03-2373	1
R102 R51 R61 R72 R74 R82 R99	RES, MF, 1/8W, 1%, 249	RN55D-2490F	TRW	4701-03-2490	7
R34 R35 R38 R39 R41	RES, MF, 1/8W, 1%, 2.49K	RN55D-2491F	TRW	4701-03-2491	5
R18 R28	RES, MF, 1/8W, 1%, 24.9K	RN55D-2492F	TRW	4701-03-2492	2
R24	RES, MF, 1/8W, 1%, 274	RN55D-2740F	TRW	4701-03-2740	1
R10 R14	RES, MF, 1/8W, 1%, 301	RN55D-3010F	TRW	4701-03-3010	2
R109	RES, MF, 1/8W, 1%, 316	RN55D-3160F	TRW	4701-03-3160	1
R4	RES, MF, 1/8W, 1%, 33.2	RN55D-33R2F	TRW	4701-03-3329	1

WAVETEK PARTS LIST | TITLE PCA, FUNCTION BD | ASSEMBLY NO. 1100-00-0707 PAGE: 3 | REV F

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	FUNCTION BD	1700-00-0707	WVTK	1700-00-0707	1
TP1 TP2 TP3 TP4	TERM	4523B-5.04	USECO	2100-05-0029	4
NONE	PC BD EJECTOR	103 BLUE	CALMK	2800-07-0014	2
K1 K2 K3 K5	RELAY, REED, FORM-C	RA3020-1051	ETROL	4500-00-0009	4
K4	RELAY, FORM C MERCURY	4500-00-0013	WVTK	4500-00-0013	1
R5	POT, TRIM, 100	91AR100	BECK	4600-01-0103	1
R11 R9	POT, TRIM, 1K	91AR1K	BECK	4600-01-0209	2
R95	POT, TRIM, 10K	91AR10K	BECK	4600-01-0315	1
R1 R53 R79	POT, TRIM, 20	91AR20	BECK	4600-02-0000	3
R36 R43	POT, TRIM, 200	91AR200	BECK	4600-02-0101	2
R107	POT, TRIM, 20K	91AR20K	BECK	4600-02-0301	1
R29 R32 R33 R40 R55 R59 R64 R87 R91	RES, MF, 1/8W, 1%, 100	RN55D-1000F	TRW	4701-03-1000	9
R19 R21 R49 R52 R57 R65 R78 R83 R92	RES, MF, 1/8W, 1%, 1K	RN55D-1001F	TRW	4701-03-1001	9
R103 R104 R105 R106 R60 R63 R88 R90	RES, MF, 1/8W, 1%, 10K	RN55D-1002F	TRW	4701-03-1002	8
R100 R101 R66 R68 R71 R73 R93 R98	RES, MF, 1/8W, 1%, 10	RN55D-10R0F	TRW	4701-03-1009	8

WAVETEK PARTS LIST | TITLE PCA, FUNCTION BD | ASSEMBLY NO. 1100-00-0707 PAGE: 2 | REV F

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R23 R70	RES, MF, 1/8W, 1%, 392	RN55D-3920F	TRW	4701-03-3920	2
R108 R6 R85	RES, MF, 1/8, 1%, 499	RN55D-4990F	TRW	4701-03-4990	3
R45 R54 R80	RES, MF, 1/8W, 1%, 4.99K	RN55D-4991F	TRW	4701-03-4991	3
R69	RES, MF, 1/8W, 1%, 49.9K	RN55D-4992F	TRW	4701-03-4992	1
R96	RES, MF, 1/8W, 1%, 523	RN55D-5230F	TRW	4701-03-5230	1
R30	RES, MF, 1/8W, 1%, 61.9	RN55D-61R9F	TRW	4701-03-6199	1
R58	RES, MF, 1/8W, 1%, 68.1	RN55D-68R1F	TRW	4701-03-6819	1
R56 R84	RES, MF, 1/8W, 1%, 750	RN55D-7500F	TRW	4701-03-7500	2
R46 R75	RES, MF, 1/8W, 1%, 7.5K	RN55D-7501F	TRW	4701-03-7501	2
R94	RES, MF, 1/8W, 1%, 8.25K	RN55D-8251F	TRW	4701-03-8251	1
CR31 CR32	DIODE	1N4581	MICRO	4801-01-4581	2
CR17 CR18 CR19 CR20	DIODE	FD777	FAIR	4807-02-0777	4
CR21 CR22 CR23 CR24 CR25 CR26 CR27 CR28 CR29 CR30 CR34	DIODE	1N4148	FAIR	4807-02-6666	11
CR33 CR35	DIODE	5082-2811	HP	4809-02-2811	2
CR1 CR10 CR11 CR12 CR13 CR14 CR15 CR16 CR2 CR3 CR4 CR5 CR6	DIODE, SET, 8-FD-777 QTY: 8: 4807-02-0777	182-300-98	WVTK	4898-00-0010	2

WAVETEK PARTS LIST | TITLE PCA, FUNCTION BD | ASSEMBLY NO. 1100-00-0707 PAGE: 4 | REV F

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
CR7 CR8 CR9					
Q13 Q14	TRANS	2N3565	FAIR	4901-03-5650	2
Q16 Q9	TRANS	2N3640	FAIR	4901-03-6400	2
Q11 Q17 Q8	TRANS	2N3646	NSC	4901-03-6460	3
Q10 Q15 Q2 Q5 Q6 Q7	TRANS	2N3903	NSC	4901-03-9030	6
Q1 Q12 Q18 Q3 Q4	TRANS	2N3905	ITT	4901-03-9050	5
RT1	THERMISTER	LB12J2	FNWL	5300-00-0002	1
IC5 IC6	IC	CA-3096AE	RCA	7000-30-9600	2
IC1	IC	7416	SIG	8000-74-1600	1
IC3	IC	74LS74	TI	8000-74-7410	1
IC4	IC	74LS139	SIG	8007-41-3910	1
IC2	IC	74LS175	TI	8007-41-7510	1

WAVETEK PARTS LIST | TITLE PCA, FUNCTION BD | ASSEMBLY NO. 1100-00-0707 PAGE: 5 | REV F

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE
MATERIAL	PROJ ENGR	
	RELEASE APPROV	
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ± 1 XX ± .030	
	DO NOT SCALE DWG	
	SCALE	

WAVETEK SAN DIEGO • CALIFORNIA

TITLE: PARTS LIST PCA, FUNCTION BD

MODEL NO	DWG NO.	REV
172B	1100-00-0707	F

CODE IDENT 23338 | SHEET 1 OF 1

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-3994

REV	ECN	BY	DATE	APP
A	ENG IMPRV.	TLF	8-22-77	
B	ECN 1687, 1701	RO	3-27-78	
	2921, 3552 (CL III)	DC	2-1-83	
C	3555	DC	2-7-83	
D	3937	SC	7-23-85	

CONTROL LOGIC

TRIGGER CIRCUIT

TRIGGER, TRI. GEN ASSY. -0559

NOTE: UNLESS OTHERWISE SPECIFIED
LAST REF. DESIGNATORS USED: R181 C105 CR39 IC20 L2 K4 Q53

2) ALL CAPACITORS ARE IN MICROFARADS. ALL DIODES ARE FD6666.

3. UNUSED PINS: IC13 – 1,5,9,2,6,8 — IC12 – 3,4 — IC11 – 1,2,3

4. R2 AND R7 SIPS ARE 10K

5. * NOMINAL VALUE CALLED OUT ON P/L

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN D. COOPER	DATE 6-3-76	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL	PROJENGR CP Tom Doliga	1477 28pt	TITLE SCHEMATIC TRIANGLE GENERATOR
FINISH WAVETEK PROCESS	RELEASE APPROV		
	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX. ±.010 ANGLES ±1 XX ±.030		MODEL NO. 172B
	DO NOT SCALE DWG		DWG NO. 0103-00-0T147 REV D
	SCALE		CODE IDENT. 23338 SHEET 1 OF 2

GEN, HYS SW ASSY. 0558

REV	ECN	BY	DATE	APP

TRIANGLE BUFFER ASSY. 0560

CAPACITANCE MULTIPLIER ASSY. 0635

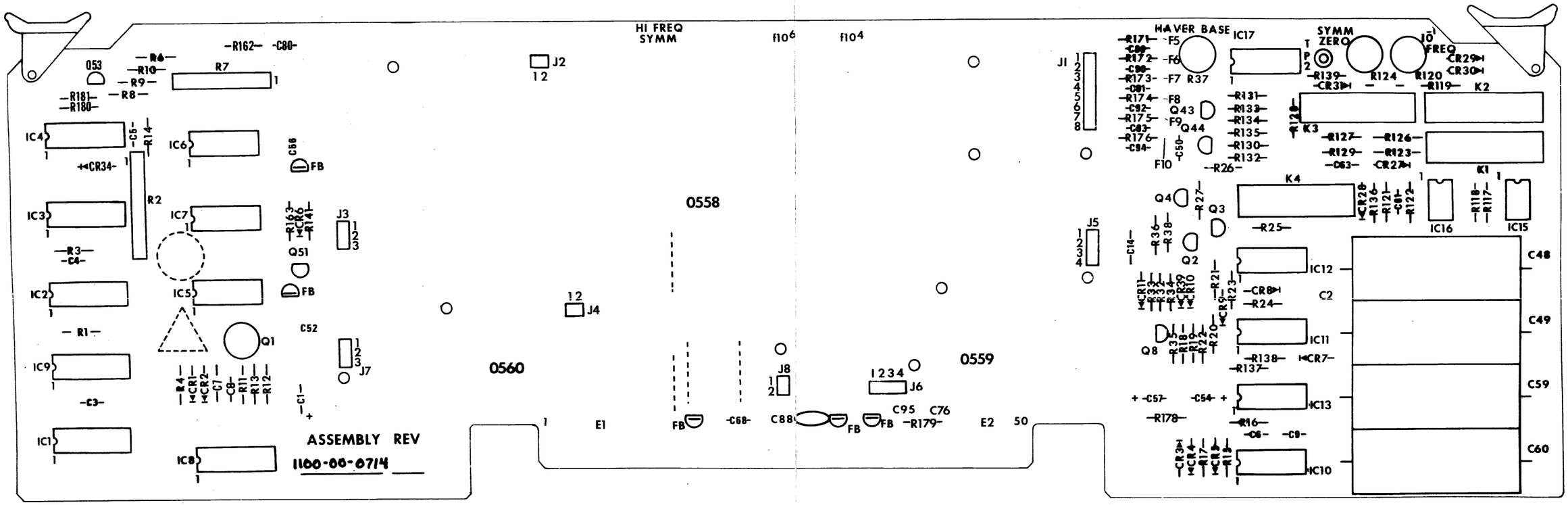
NOTE: △ = 130-501-6 MATCHED SETS (C45, C46, C47, C48, C49)

* SELECTED FOR <4V. VGS(OFF) C58, C62 ELIM.

NOTE: UNLESS OTHERWISE SPECIFIED

1. R2 AND R7 SIPS ARE 10K

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN D. COOPER	DATE 7-76	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL	PROJ ENGR Tom Selga	SEPT 6'77	TITLE SCHEMATIC TRIANGLE GENERATOR
FINISH WAVETEK PROCESS	RELEASE APPROV		
	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1° XX ±.030		
	DO NOT SCALE DWG.		
	SCALE	MODEL NO. 172B	DWG NO. 0003-00-0172 REV D
	CODE IDENT 23338	SHEET 2 OF	



1100-00-0714

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: TRIANGLE GENERATOR PCA
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ± XX ±.030		
	DO NOT SCALE DWG		MODEL NO 172B; DWG NO 0101-00-0714; REV
	SCALE		CODE IDENT 23338; SHEET 1 OF 1

REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG, TRI GEN	0101-00-0714	WVTK	0101-00-0714	1
NONE	SCHEMATIC, TRI GEN	0103-00-0714	WVTK	0103-00-0714	1
NONE	HYS. SWITCH TRI GEN	172-558	WVTK	1208-00-0558	1
NONE	TRIGGER TRI GEN	172-559	WVTK	1208-00-0559	1
NONE	BUFFER AMP TRI GEN	172-560	WVTK	1208-00-0560	1
NONE	SHIELD	1400-00-6651	WVTK	1400-00-6651	1
NONE	SHIELD	1400-00-6661	WVTK	1400-00-6661	1
NONE	SHIELD	1400-00-6671	WVTK	1400-00-6671	1
NONE	SHIELD	1400-00-6681	WVTK	1400-00-6681	1
C61 C9	CAP, CER, 100PF, 1KV	DD-101	CRL	1500-01-0111	2
C2 C3 C4 C5 C50 C52 C6 C76 C80 C89 C90 C91 C92 C93 C94	CAP, CER, MN, .01MF, 50V	CACD225U103Z100A	CORNG	1500-01-0310	15
C14 C63 C68 C7 C8	CAP, CER, MON, .1MF, 50V	CAC03Z5U104Z050A	CORNG	1500-01-0405	5
C59 C60	CAP, POLYC, 5MF, 100V	C1A505F	ELPAC	1500-45-0504	2
C1 C54 C57	CAP, TANT, 27MF, 35V	196D276X0035TE4	SPRAG	1500-72-7602	3
C56 C88 C95	CAP, CER, .1MF, 50V	DG45BX104MP	WSTCP	1509-90-0011	3
NONE	SHIELD, COVER TRI. GEN	1700-00-0625	WVTK	1700-00-0625	1
NONE	TRI GEN, CAP MULT BD	1700-00-0714	WVTK	1700-00-0714	1

WAVETEK PARTS LIST | TITLE: PCA, TRI GEN CAP MULT | ASSEMBLY NO. 1100-00-0714 | PAGE: 1 | REV C

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R171 R172 R173 R174 R175 R176 R183 R19 R27					
R121	RES, MF, 1/8W, 1%, 10	RN55D-10R0F	TRW	4701-03-1009	1
R138	RES, MF, 1/8W, 1%, 150	RN55D-1500F	TRW	4701-03-1500	1
R163	RES, MF, 1/8W, 1%, 1.5K	RN55D-1501F	TRW	4701-03-1501	1
R184 R26	RES, MF, 1/8W, 1%, 15K	RN55D-1502F	TRW	4701-03-1502	2
R22	RES, MF, 1/8W, 1%, 1.78K	RN55D-1781F	TRW	4701-03-1781	1
R129	RES, MF, 1/8W, 1%, 200	RN55D-2000F	TRW	4701-03-2000	1
R13 R130	RES, MF, 1/8W, 1%, 249	RN55D-2490F	TRW	4701-03-2490	2
R10 R11 R117 R35 R6 R8 R9	RES, MF, 1/8W, 1%, 2.49K	RN55D-2491F	TRW	4701-03-2491	7
R134	RES, MF, 1/8W, 1%, 24.9K	RN55D-2492F	TRW	4701-03-2492	1
R132	RES, MF, 1/8W, 1%, 332	RN55D-3320F	TRW	4701-03-3320	1
R136	RES, MF, 1/8W, 1%, 3.32K	RN55D-3321F	TRW	4701-03-3321	1
R141	RES, MF, 1/8W, 1%, 33.2	RN55D-33R2F	TRW	4701-03-3329	1
R133 R135	RES, MF, 1/8W, 1%, 3.65K	RN55D-3651F	TRW	4701-03-3651	2
R162	RES, MF, 1/8W, 1%, 392	RN55D-3920F	TRW	4701-03-3920	1
R178	RES, MF, 1/8W, 1%, 42.2	RN55D-42R2F	TRW	4701-03-4229	1

WAVETEK PARTS LIST | TITLE: PCA, TRI GEN CAP MULT | ASSEMBLY NO. 1100-00-0714 | PAGE: 3 | REV C

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	PIN, MALE	61182-2	AMP	2100-05-0020	11
NONE	CONN PIN, MALE (VOM-EA PIN)	CA-536SP-100-230-830	CA	2100-05-0034	28
NONE	STANDOFF, SWAGE .750 H, .187 DIA 2-56, .062 MAT'L	SS168-1D-5A	UNICP	2800-06-0003	6
NONE	PC BD EJECTOR	103 GREEN	CALMK	2800-07-0013	2
NONE	TRANSIPAD	10123N	METRS	2800-11-0003	6
NONE	SCREW, 2-56X1/4 NYLON	2-56X1/4 NYLON SCREW	WEKSR	2800-23-0009	6
NONE	BALUN CORE	2873000902	FARIT	3100-00-0002	5
K1 K2 K3	RELAY, REED, FORM-A	RA3019-1051	ETROL	4500-00-0007	3
K4	RELAY, REED, FORM-C	RA3020-1051	ETROL	4500-00-0009	1
R120 R37	POT, TRIM, 1K	91AR1K	BECK	4600-01-0209	2
R124	POT, TRIM, 20K	91AR20K	BECK	4600-02-0301	1
R128	RES, MF, 1/8W, .1%, 10K	RN55E-1002B	MEPCO	4701-02-1002	1
R127	RES, MF, 1/8W, .1%, 100K	RN55E-1003B	MEPCO	4701-02-1003	1
R179 R21	RES, MF, 1/8W, 1%, 100	RN55D-1000F	TRW	4701-03-1000	2
R118 R23 R32 R4	RES, MF, 1/8W, 1%, 1K	RN55D-1001F	TRW	4701-03-1001	4
R122 R139 R15 R16	RES, MF, 1/8W, 1%, 10K	RN55D-1002F	TRW	4701-03-1002	13

WAVETEK PARTS LIST | TITLE: PCA, TRI GEN CAP MULT | ASSEMBLY NO. 1100-00-0714 | PAGE: 2 | REV C

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R137 R17	RES, MF, 1/8, 1%, 499	RN55D-4990F	TRW	4701-03-4990	2
R1 R12 R14 R180 R181 R20 R24 R25 R3 R33 R36 R38	RES, MF, 1/8W, 1%, 4.99K	RN55D-4991F	TRW	4701-03-4991	12
R18	RES, MF, 1/8W, 1%, 61.9	RN55D-61R9F	TRW	4701-03-6199	1
R119	RES, MF, 1/8W, 1%, 6.98K	RN55D-6981F	TRW	4701-03-6981	1
R131	RES, MF, 1/8W, 1%, 750	RN55D-7500F	TRW	4701-03-7500	1
R34	RES, MF, 1/8W, 1%, 825	RN55D-8250F	TRW	4701-03-8250	1
R126	RES, MF, 1/4W, 1%, 1M	RN60D-1004F	TRW	4701-13-1004	1
R2 R7	RES MODULE	4310R-101-103	BOURN	4770-00-0008	2
R123	RES, MF, .6W, 1%, 10M	ML-181	CADDO	4799-00-0003	1
CR27	DIODE	1N4581	MICRO	4801-01-4581	1
CR4	DIODE	1N4732	MOT	4801-01-4732	1
CR10 CR11	DIODE	FD777	FAIR	4807-02-0777	2
CR1 CR2 CR28 CR29 CR3 CR30 CR31 CR34 CR39 CR5 CR6 CR7 CR8 CR9	DIODE	1N4148	FAIR	4807-02-6666	14
Q1	TRANS	2N2905A	NSC	4901-02-9051	1
Q53	TRANS	2N3640	FAIR	4901-03-6400	1

WAVETEK PARTS LIST | TITLE: PCA, TRI GEN CAP MULT | ASSEMBLY NO. 1100-00-0714 | PAGE: 4 | REV C

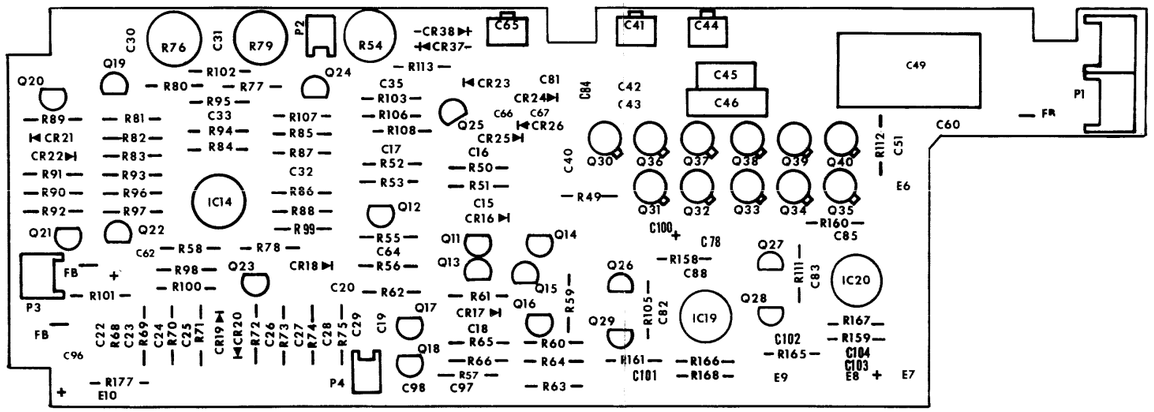
REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
Q2	TRANS	2N3646	NSC	4901-03-6460	1
Q44	TRANS	2N3903	NSC	4901-03-9030	1
Q3 Q4 Q43 Q51 Q8	TRANS	2N5139	FAIR	4901-05-1390	5
IC5 IC6 IC7	IC	MLM339P	MOT	7000-03-3900	3
IC15 IC16	IC, OP-AMP	LF356N	NSC	7000-03-5600	2
IC12 IC13 IC17	IC	7416	SIG	8000-74-1600	3
IC11	IC	7474	TI	8000-74-7400	1
IC10	IC	74LS132	TI	8007-41-3210	1
IC1 IC8	IC	74LS139	SIG	8007-41-3910	2
IC3 IC4	IC	74LS145	SIG	8007-41-4510	2
IC2 IC9	IC	74LS175	TI	8007-41-7510	2

WAVETEK PARTS LIST | TITLE: PCA, TRI GEN CAP MULT | ASSEMBLY NO. 1100-00-0714 | PAGE: 5 | REV C

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST PCA, TRI GEN CAP MULT
FINISH WAVETEK PROCESS	RELEASE APPROV		
	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		
	DO NOT SCALE DWG	MODEL NO 172B	DWG NO 1100-00-0714 REV C
	SCALE	CODE IDENT 23338	SHEET 1 OF 1

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-3894



I208-00-0558

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJENGR		TITLE: HYSTERESIS SW ASSY, TRI GEN
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ·010 ANGLES ·1 XX ·030		
	DO NOT SCALE DWG		MODEL NO
	SCALE		DWG NO 0101-00-0568 REV
			CODE IDENT 23338 SHEET 1 OF 1

REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
	CAP SET, POLYC MIXED MATCHED SET	130-501-6	WVTK	1509-80-0005	1
C45	CAP, POLYC, .01MF, 100V PART OF 1509-80-0005 QTY(1)				
C46	CAP, POLYC, .1MF, 100V PART OF 1509-80-0005 QTY(1)				
C47	CAP, POLYC, 1MF, 100V PART OF 1509-80-0005 QTY(1)				
C48 C49	CAP, POLYC, 5MF, 100V PART OF 1509-80-0005 QTY(2)				
C20	CAP, CER, .1MF, 50V	D045BX104MP	WSTCP	1509-90-0011	1
NONE	HYS SWITCH	1700-00-0558	WVTK	1700-00-0558	1
P2 P4	CONN	22-17-2022	MOLEX	2100-02-0061	2
P1A P1B	CONN	22-17-2042	MOLEX	2100-02-0065	2
P3	CONN	22-17-2032	MOLEX	2100-02-0066	1
NONE	SOCKET	5-330808-0	AMP	2100-03-0044	4
NONE	TRANSIPAD	10123N	METRS	2800-11-0003	3
NONE	BALUN CORE	2873000902	FARIT	3100-00-0002	3

WAVETEK PARTS LIST | TITLE HYS. SWITCH TRI GEN | ASSEMBLY NO. 1208-00-0558 | PAGE: 2 | REV G

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R94	RES, MF, 1/8W, 1%, 316	RN55D-3160F	TRW	4701-03-3160	1
R106 R80 R83 R91 R93	RES, MF, 1/8W, 1%, 33.2	RN55D-33R2F	TRW	4701-03-3329	5
R62	RES, MF, 1/8W, 1%, 3.65K	RN55D-3651F	TRW	4701-03-3651	1
R66	RES, MF, 1/8W, 1%, 392	RN55D-3920F	TRW	4701-03-3920	1
R77 R78	RES, MF, 1/8W, 1%, 4.32K	RN55D-4321F	TRW	4701-03-4321	2
R58 R84	RES, MF, 1/8W, 1%, 464	RN55D-4640F	TRW	4701-03-4640	2
R53 R60 R65	RES, MF, 1/8, 1%, 499	RN55D-4990F	TRW	4701-03-4990	3
R161 R165 R50 R52 R70 R73	RES, MF, 1/8W, 1%, 4.99K	RN55D-4991F	TRW	4701-03-4991	6
R71 R72 R86	RES, MF, 1/8W, 1%, 619	RN55D-6190F	TRW	4701-03-6190	3
R55 R56 R95	RES, MF, 1/8W, 1%, 61.9	RN55D-61R9F	TRW	4701-03-6199	3
R87	RES, MF, 1/8W, 1%, 6.81K	RN55D-6811F	TRW	4701-03-6811	1
R90	RES, MF, 1/8W, 1%, 825	RN55D-8250F	TRW	4701-03-8250	1
CR17	DIODE	1N751A	FAIR	4801-01-0751	1
CR18	DIODE	1N4581	MICRO	4801-01-4581	1
CR15 CR19 CR20 CR21 CR22 CR23 CR24 CR25 CR26 CR37 CR38	DIODE	FD777	FAIR	4807-02-0777	11
CR16	DIODE	1N4148	FAIR	4807-02-6666	1

WAVETEK PARTS LIST | TITLE HYS. SWITCH TRI GEN | ASSEMBLY NO. 1208-00-0558 | PAGE: 4 | REV G

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG, HYS SWITCH	0101-00-0558	WVTK	0101-00-0558	1
NONE	SCHEMATIC, TRI GEN	0103-00-0714	WVTK	0103-00-0714	1
C22T C23 C28 C29T C64 C97 C98	CAP, CER, 5PF, 1KV	DD-050 LONG LEAD	CRL	1500-00-5001	7
C30 C31	CAP, CER, 100PF, 1KV	DD-101 LONG LEAD	CRL	1500-01-0101	2
C33 C60 C85 C88	CAP, CER, .001MF, 1KV	DD-102 LONG LEAD	CRL	1500-01-0201	4
C101 C102 C104 C16 C17 C18 C19 C32 C35 C51 C78	CAP, CER, MN, .01MF, 50V	CAC02Z5U103Z100A	CORNG	1500-01-0310	11
C25 C26	CAP, CER, 22PF, 1KV	DD-220 LONG LEAD	CRL	1500-02-2001	2
C81	CAP, MICA, 150PF, 500V	DM15-151J	ARCO	1500-11-5100	1
C15 C40	CAP, MICA, 20PF, 500V	DM15-200J	ARCO	1500-12-0000	2
C24 C27	CAP, MICA, 30PF, 500V	DM15-300J	ARCO	1500-13-0000	2
C43T	CAP, MICA, 39PF, 500V	DM15-390J	ARCO	1500-13-9000	1
C84	CAP, MICA, 68PF, 500V	DM15-680J	ARCO	1500-16-8000	1
C42	CAP, MICA, 820PF, 300V	DM15-821F	ARCO	1500-18-2101	1
C41 C44	CAP, VARI, 7-35PF, 250V	7S TRIKO-22, 7/35PF	TRIKO	1500-53-5010	2
C100 C103 C62 C96	CAP, TANT, 22MF, 15V	196D226X9015KA1	SPRAG	1500-72-2601	4

WAVETEK PARTS LIST | TITLE HYS. SWITCH TRI GEN | ASSEMBLY NO. 1208-00-0558 | PAGE: 1 | REV G

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R54	POT, TRIM, 200	91AR200	BECK	4600-02-0101	1
R76 R79	POT, TRIM, 500	91AR500	BECK	4600-05-0104	2
R99	RES, MF, 1/8W, .1%, 1.5K	RN55E-1501B	CORN	4701-02-1501	1
R100 R101 R103 R107 R61 R98	RES, MF, 1/8W, 1%, 100	RN55D-1000F	TRW	4701-03-1000	6
R82 R96	RES, MF, 1/8W, 1%, 1K	RN55D-1001F	TRW	4701-03-1001	2
R112 R113 R159 R168	RES, MF, 1/8W, 1%, 10K	RN55D-1002F	TRW	4701-03-1002	4
R59 R85 R88	RES, MF, 1/8W, 1%, 1.21K	RN55D-1211F	TRW	4701-03-1211	3
R64	RES, MF, 1/8W, 1%, 124	RN55D-1240F	TRW	4701-03-1240	1
R89 R92	RES, MF, 1/8W, 1%, 1.5K	RN55D-1501F	TRW	4701-03-1501	2
R105 R111 R51	RES, MF, 1/8W, 1%, 15K	RN55D-1502F	TRW	4701-03-1502	3
R49 R81 R97	RES, MF, 1/8W, 1%, 15	RN55D-15R0F	TRW	4701-03-1509	3
R108	RES, MF, 1/8W, 1%, 1.78K	RN55D-1781F	TRW	4701-03-1781	1
R63 R69 R74	RES, MF, 1/8W, 1%, 200	RN55D-2000F	TRW	4701-03-2000	3
R177 R68 R75	RES, MF, 1/8W, 1%, 21.5	RN55D-21R5F	TRW	4701-03-2159	3
R166 R167	RES, MF, 1/8W, 1%, 249	RN55D-2490F	TRW	4701-03-2490	2
R102 R158 R160	RES, MF, 1/8W, 1%, 2.49K	RN55D-2491F	TRW	4701-03-2491	3
R57	RES, MF, 1/8W, 1%, 274	RN55D-2740F	TRW	4701-03-2740	1

WAVETEK PARTS LIST | TITLE HYS. SWITCH TRI GEN | ASSEMBLY NO. 1208-00-0558 | PAGE: 3 | REV G

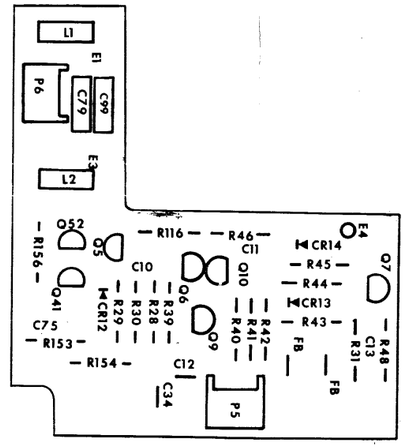
REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
G12 G15 G20 G21 G23	TRANS	2N3563	FAIR	4901-03-3630	5
G14 G16 G17 G18 G19 G22 G29	TRANS	2N3640	FAIR	4901-03-6400	7
G25 G28	TRANS	2N3646	NSC	4901-03-6460	2
G24	TRANS	2N5139	FAIR	4901-05-1390	1
G26	TRANS	2N5460	MOT	4901-05-4600	1
G27	TRANS	2N5485	MOT	4901-05-4850	1
G30 G31 G32 G33 G34 G35 G36 G37 G38 G39 G40	TRANS	SD215DE	SIG	4902-00-2140	11
G11 G13	TRANS, M/PR, 2N5485 QTY: 2: 4901-05-4850	142-501-53	WVTK	4998-00-0009	1
IC19 IC20	IC, OP-AMP	LF356N	NSC	7000-03-3600	2
IC14	IC	CA3049T	RCA	7000-30-4900	1

WAVETEK PARTS LIST | TITLE HYS. SWITCH TRI GEN | ASSEMBLY NO. 1208-00-0558 | PAGE: 5 | REV G

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST HYS. SWITCH TRI GEN
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		MODEL NO. 172B / DWG NO. 1208-00-0558 / REV G
	DO NOT SCALE DWG		CODE IDENT 23338 / SHEET 1 OF 1
	SCALE		

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-3094



1208-00-0559

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE ASSEMBLY TRIGGER, TRIANGLE GEN. ASSY.
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX .010 ANGLES 1 XX .030		
	DO NOT SCALE DWG		MODEL NO 172 / DWG NO 0101-00-0559 / REV
	SCALE		CODE IDENT 23338 / SHEET OF

REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG, TRIGGER	0101-00-0559	WVTK	0101-00-0559	1
NONE	SCHEMATIC, TRI GEN	0103-00-0714	WVTK	0103-00-0714	1
C13 C75	CAP, CER, MN, .01MF, 50V	CAC02Z5U103Z100A	CORNG	1500-01-0310	2
C10	CAP, CER, 22PF, 1KV	DD-220	CRL	1500-02-2011	1
C11	CAP, CER, 330PF, 1KV	DD-331	CRL	1500-03-3111	1
C79 C99	POLYC, .0022MF, 200V	192P22292	SPRAG	1500-42-2204	2
C12 C34	CAP, CER, .1MF, 50V	DG45BX104MP	WSTCP	1509-90-0011	2
NONE	TRIGGER	1700-00-0559	WVTK	1700-00-0559	1
L1 L2	CHOKE, 160MH	1537-86	DLVAN	1900-00-0016	2
P5 P6	CONN	22-17-2042	MOLEX	2100-02-0065	2
NONE	SOCKET	5-330808-0	AMP	2100-03-0044	3
NONE	TRANSIPAD	10123N	METRS	2800-11-0003	2
NONE	BALUN CORE	2873000902	FARIT	3100-00-0002	2
R156 R28 R31 R44	RES, MF, 1/8W, 1%, 100	RN55D-1000F	TRW	4701-03-1000	4
R29 R30	RES, MF, 1/8W, 1%, 1K	RN55D-1001F	TRW	4701-03-1001	2
R154	RES, MF, 1/8W, 1%, 10K	RN55D-1002F	TRW	4701-03-1002	1
R42	RES, MF, 1/8W, 1%, 1.5K	RN55D-1501F	TRW	4701-03-1501	1
R46	RES, MF, 1/8W, 1%, 249	RN55D-2490F	TRW	4701-03-2490	1

WAVETEK PARTS LIST	TITLE TRIGGER TRI GEN	ASSEMBLY NO. 1208-00-0559 PAGE: 1	REV C

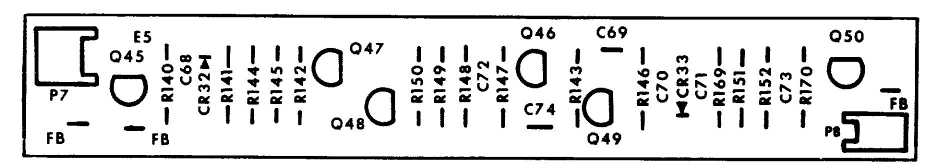
REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R116	RES, MF, 1/8W, 1%, 301	RN55D-3010F	TRW	4701-03-3010	1
R45	RES, MF, 1/8W, 1%, 301K	RN55D-3013F	TRW	4701-03-3013	1
R39	RES, MF, 1/8, 1%, 499	RN55D-4990F	TRW	4701-03-4990	1
R153	RES, MF, 1/8W, 1%, 4.99K	RN55D-4991F	TRW	4701-03-4991	1
R40 R41	RES, MF, 1/8W, 1%, 61.9	RN55D-61R9F	TRW	4701-03-6199	2
R43 R48	RES, MF, 1/8W, 1%, 7.5K	RN55D-7501F	TRW	4701-03-7501	2
CR13	DIODE	1N751A	FAIR	4801-01-0751	1
CR14	DIODE	FD777	FAIR	4807-02-0777	1
CR12	DIODE	1N4148	FAIR	4807-02-6666	1
G41 G52	TRANS	2N3565	FAIR	4901-03-3650	2
G5	TRANS	2N3640	FAIR	4901-03-6400	1
G6 G7	TRANS	2N3646	NSC	4901-03-6460	2
G10 G9	TRANS, M/PR, 2N5485 QTY: 2: 4901-05-4850	142-501-53	WVTK	4998-00-0009	1

WAVETEK PARTS LIST	TITLE TRIGGER TRI GEN	ASSEMBLY NO. 1208-00-0559 PAGE: 2	REV C

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE PARTS LIST TRIGGER TRI GEN
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		
	DO NOT SCALE DWG		MODEL NO 172B / DWG NO 1208-00-0559 / REV C
	SCALE		CODE IDENT 23338 / SHEET 1 OF 1

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-3854



1208-00-0560

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE ASSEMBLY BUFFER AMPLIFIER TRIANGLE GENERATOR ASSY.
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX 010 XX 030 ANGLES 1		
	DO NOT SCALE DWG		MODEL NO 172 — DWG NO 0101-00-0560 — REV
	SCALE		CODE IDENT 23338 — SHEET OF

REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG, BUFFER AMP	0101-00-0560	WVTK	0101-00-0560	1
NONE	SCHEMATIC, TRI GEN	0103-00-0714	WVTK	0103-00-0714	1
C71	CAP, CER, 100PF, 1KV	DD-101 LONG LEAD	CRL	1500-01-0101	1
C68 C70 C72 C73	CAP, CER, MN, .01MF, 50V	CAC02Z5U103Z100A	CORNG	1500-01-0310	4
C69 C74	CAP, CER, .1MF, 50V	D045BX104MP	WSTCP	1509-90-0011	2
NONE	BUFFER AMP	1700-00-0560	WVTK	1700-00-0560	1
P8	CONN	22-17-2022	MOLEX	2100-02-0061	1
P7	CONN	22-17-2032	MOLEX	2100-02-0066	1
NONE	SOCKET	5-330808-0	AMP	2100-03-0044	1
NONE	TRANSIPAD	10123N	METRS	2800-11-0003	3
NONE	BALUN CORE	2873000902	FARIT	3100-00-0002	3
R140 R148 R169	RES, MF, 1/8W, 1%, 100	RN55D-1000F	TRW	4701-03-1000	3
R143 R152 R170	RES, MF, 1/8W, 1%, 10	RN55D-10R0F	TRW	4701-03-1009	3
R144 R145	RES, MF, 1/8W, 1%, 124	RN55D-1240F	TRW	4701-03-1240	2
R151	RES, MF, 1/8W, 1%, 3.65K	RN55D-3651F	TRW	4701-03-3651	1
R147	RES, MF, 1/8, 1%, 499	RN55D-4990F	TRW	4701-03-4990	1
R149	RES, MF, 1/8W, 1%, 4.99K	RN55D-4991F	TRW	4701-03-4991	1
R141 R142 R146	RES, MF, 1/8W, 1%, 750	RN55D-7500F	TRW	4701-03-7500	3

WAVETEK PARTS LIST	TITLE BUFFER AMP TRI GEN	ASSEMBLY NO. 1208-00-0560 PAGE: 1	REV A

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R150	RES, MF, 1/8W, 1%, 7.5K	RN55D-7501F	TRW	4701-03-7501	1
CR33	DIODE	1N4581	MICRO	4801-01-4581	1
CR32	DIODE	1N4148	FAIR	4807-02-6666	1
Q45 Q48	TRANS	2N3563	FAIR	4901-03-5630	2
Q46 Q49	TRANS	2N3903	NSC	4901-03-9030	2
Q47 Q50	TRANS	2N5139	FAIR	4901-05-1390	2

WAVETEK PARTS LIST	TITLE BUFFER AMP TRI GEN	ASSEMBLY NO. 1208-00-0560 PAGE: 2	REV A

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE PARTS LIST BUFFER AMP TRI GEN
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ·010 ANGLES ·1 XX ·030		
	DO NOT SCALE DWG		MODEL NO 172B / DWG NO 1208-00-0560 / REV A
	SCALE		CODE IDENT 23338 / SHEET 1 OF

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-3894

REV	ECN	BY	DATE	APP
B		TLF	3/22/77	
C	ECN 1700	RO	3-23-77	

FREQUENCY

RANGE

SYMMETRY

MODE 1

LAST REF. DES. USED: T1, R133, C60, Q41, CR17, IC41, TP5, FB3

* = NOMINAL VALUE CALLED OUT ON PARTS LIST

NOTE: UNLESS OTHERWISE SPECIFIED

E	#3551	D. COOPER	2-1-83	
D	#2018	[illegible]	8-6-79	

REMOVE ALL BURRS AND BREAK SHARP EDGES | DRAWN D. COOPER | DATE 6-11-76

MATERIAL | PROJ ENGR Tom Sitiga | SEPT 8'77

RELEASE APPROV

FINISH WAVETEK PROCESS

TOLERANCE UNLESS OTHERWISE SPECIFIED XXX: .010 ANGLES: 1° XX: .030

DO NOT SCALE DWG

SCALE

WAVETEK SAN DIEGO • CALIFORNIA

TITLE: SCHEMATIC, VCG AND SYMMETRY

MODEL NO.

DWG NO. 0103-00-0711 REV. E

CODE IDENT 23338 SHEET 1 OF 3

REV	ECN	BY	DATE	APP

(10.5) DACFBK — R21 500Ω 10^2 TOP — R26 10K — R27 10K

10^0 10^1 10^3 10^5

R17 100K — R18 100K — R19 49.3K — R20 100K — R22 100K

(5) 2N5462 — Q3 Q4 Q5 Q6 Q7

DAC OUT (10.5) — VCG SUM (3C1) — E1 — E2 — R16 499

X1 — X10 — X100 X10K X10M — X1K — X100K

F11-0 (1C1) — F12-0 (1C1) — F13-0 (1C1) — F14-0 (1C1) — F15-0 (B3)(1C1)

CR5 FD6666 — C11 22Pf — R23 2.49K — R24 301K

IC16 LF356 — +15V — -15V

R25 49.9K — C10 .1/10V — R28 100K 10^2 BOTT FREQ. — C12 .1/10V — R29 49.9K

0.70.5V TYP

R30 10K — GCV OUT → (21B) GC1 OUT

R31 2.49K

R34 1.5K 0.1% — R35 1.5K 0.1% — R36 1.5K 0.1% — R37 750 0.1% — R38 750 0.1% — R39 7.5K 0.1% — R40 69.8K NOM — R41 1.5K 0.1%

Q8 2N5462 — Q9 2N5462 — Q10 2N5462 — Q11 2N5462 — Q12 2N5462 — Q13 SD215 — R42 15K — Q14 2N5462

10-50-1 (1B4)

C9 33Pf — IC15 LF356 — +15V — R32 2.49K

(1B4) 50-0 — (1B4) 40,90-0 — (1B4) 30,80-0 — F16-0 (1C1) (B3) — 20, 70-0 (1B4) — 10, 60-0 (1B4)

R33 20K — -15 — +15 — LO SYMM

-15V — R51 15K — C13, .1/10V — R52 15K

(1B4) 50-90-1 — Q16 SD215 — Q15 2N5462 — Q17 2N5462 — Q18 2N5462 — Q19 2N5462 — Q20 2N5462 — Q21 2N5462

R43 1.5K 0.1% — R44 7.5K 0.1% — R45 750 0.1% — R46 750 0.1% — R47 1.5K 0.1% — R48 1.5K 0.1% — R49 1.5K 0.1% — R50 2.49K — R56 69.8K NOM

R53 2.49K

C14 47Pf — C15 +15V 0.1/20V — IC17 LF356 — R54 2.49K — Q22 2N5485 — C16 0.1/20V — -15V

C17 33Pf — IC18 LF356N — R55 2.49K — Q23 2N5462 — C21 .1/20V — -15V

R57 2K — R74 2K

C18 .1/20V — +15V

IC19 LF356 — C19 .01 — C20 33Pf — +24V

R58 20K — 1000:1 SYM — R60 7.5K — R61 10K — R62 24.9K — R63 15K — R64 499 — R65 3.65K — R66 1.78K — R67 200 — R71 * — R72 100 X10S TOP SYM — R73 825 — X10² TOP SYM

Q25 — Q26 — Q27 — CR8 — Q28 2N3903 — R70 10K — +15V — → (36) POS CVR

CR6 — CR7 — F15-0(1C1) — F16-0(1C1) — Q29 2N4248 — R68 1.5K — R69 10K

IC20 LF356 — -24V — R77 24.9K — R78 10K — Q30 2N5485 — Q31 2N3903 — R75 20K — 1000:1 SYM — C22 33Pf — CR9 — Q32 2N5485 — Q33 2N5485 — R79 1.78K — R82 61.9 — R80 3.65K — R81 499 — R85 1K — R83 825 — R84 825 — C23 .1/20V — → (40) NEG CUR

IC21 LF356 — C24 .01 50V — -24V — C25 33Pf — R86 2.40K — Q34 2N5485 — Q35 2N5485 — → (38) CI

+15V (33,34) → +15V

(26,27,28) → TP1

-15V (30,31) → -15V

+24V (43) → +24V

-24V (41) → -24V

C3 .1/10V — C52 .1/10V — C53 .1/10V — C54 .1/10V — +5

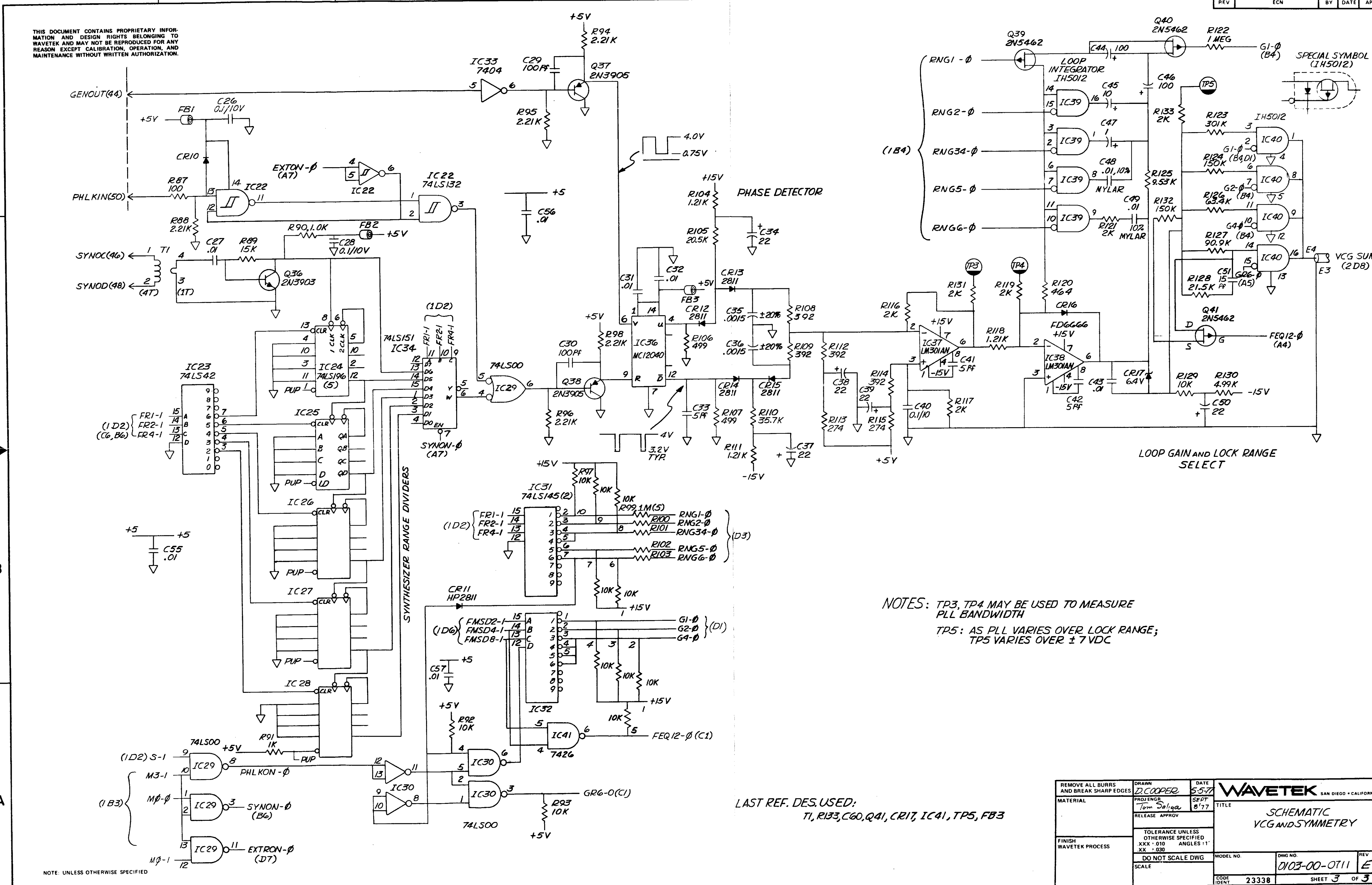
LAST REF. DES. USED:

T1, R133, C60, Q41, CR17, IC41, TP5, FB3

NOTE UNLESS OTHERWISE SPECIFIED △ 4998 00-0040

2. R34, R35, R36, R37, R38, R39, R41, R43, R44, R45, R47, R48, R46, AND R49 PRECISION .1% RESISTORS

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN D. COOPER	DATE 6-14-78	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR Tom Salva	SEPT 8177	TITLE SCHEMATIC - VCG & SYMMETRY
FINISH WAVETEK PROCESS	RELEASE APPROV		
	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ± 1 XX ± .030		
	DO NOT SCALE DWG	MODEL NO	DWG NO. 0103-00-0711 REV E
	SCALE	CODE IDENT 23338	SHEET 2 OF 3



NOTES: TP3, TP4 MAY BE USED TO MEASURE PLL BANDWIDTH

TP5: AS PLL VARIES OVER LOCK RANGE; TP5 VARIES OVER ± 7 VDC

LAST REF. DES. USED: T1, R133, C60, Q41, CR17, IC41, TP5, FB3

NOTE: UNLESS OTHERWISE SPECIFIED

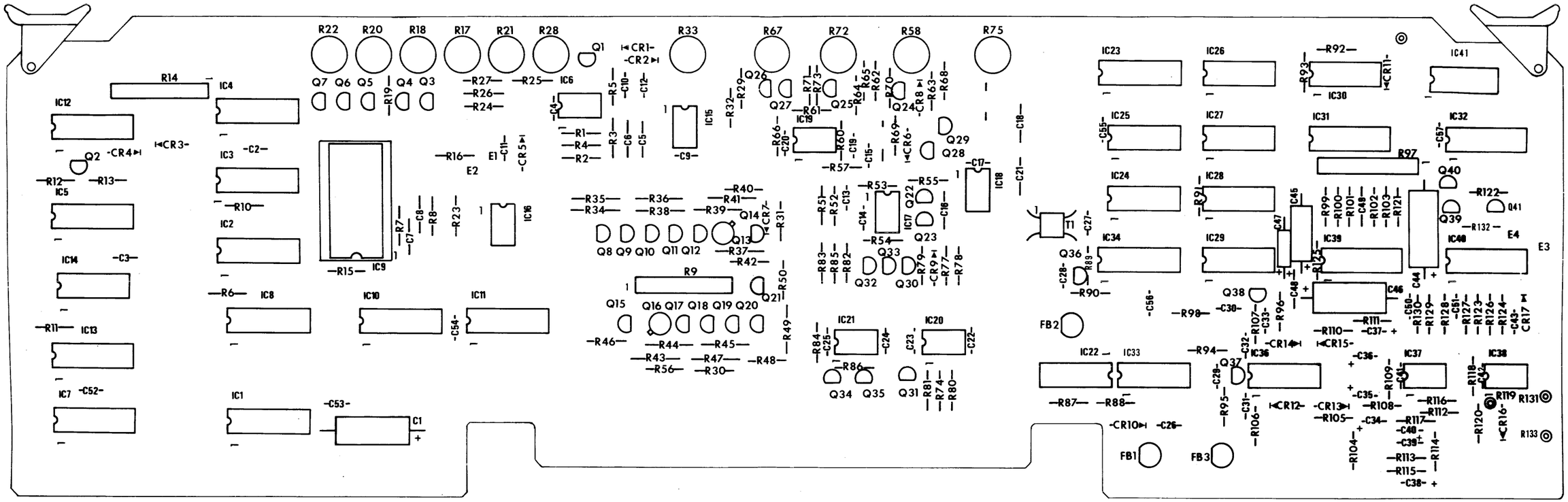
REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN D. COOPER, DATE 5-5-77
MATERIAL	PROJ ENGR Tom Saliga, SEPT 8'77
	RELEASE APPROV
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 XX ± .030 ANGLES ±1°
	DO NOT SCALE DWG
	SCALE

WAVETEK SAN DIEGO • CALIFORNIA

TITLE SCHEMATIC VCG AND SYMMETRY

DWG NO. 0103-00-0711 REV E

CODE IDENT 23338 SHEET 3 OF 3



1100-00-0711

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: VCG & SYMMETRY PCA
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ·010 ANGLES ·1 XX ·030		
	DO NOT SCALE DWG		MODEL NO 1726 · DWG NO 0101-00-0711 · REV
	SCALE		CODE IDENT 23338 · SHEET 1 OF 1

REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG, VCG	0101-00-0711	WVTK	0101-00-0711	1
NONE	SCHEMATIC, VCG	0103-00-0711	WVTK	0103-00-0711	1
T1	TRANSFORMER	172-562	WVTK	1204-00-0562	1
C33 C41 C42	CAP, CER, 5PF, 1KV	DD-050	CRL	1500-00-5011	3
C29 C30	CAP, CER, 100PF, 1KV	DD-101	CRL	1500-01-0111	2
C19 C24 C27 C31 C32 C43 C55 C56 C57	CAP, CER, MN, .01MF, 50V	CAC02Z5U103Z100A	CORNG	1500-01-0310	9
C10 C12 C13 C15 C16 C18 C2 C21 C23 C26 C28 C3 C40 C5 C52 C53 C54 C6 C7 C8	CAP, CER, MON, .1MF, 50V	CAC03Z5U104Z050A	CORNG	1500-01-0405	20
C51	CAP, CER, 15PF, 1KV	DD-150	CRL	1500-01-5011	1
C35 C36	CAP, CER, .0015MF, 1KV	DD-152 LONG LEAD	CRL	1500-01-5201	2
C11	CAP, CER, 22PF, 1KV	DD-220	CRL	1500-02-2011	1
C17 C20 C22 C25 C4 C9	CAP, CER, 33PF, 1KV	DD-330	CRL	1500-03-3011	6
C14	CAP, CER, 47PF, 1KV	DD-470	CRL	1500-04-7011	1
C1 C44 C46	CAP, ELECT, 100MF, 16V	300D107G016DC7	SPRAG	1500-31-0101	3
C48 C49	CAP, MYLAR, .01MF, 100V	225P10391WD3	SPRAG	1500-41-0314	2
C47	CAP, TANT, 1MF, 35V	150D105X9035A2	SPRAG	1500-71-0502	1
C45	CAP, TANT, 10MF, 20V	150D106X9020B2	SPRAG	1500-71-0601	1

WAVETEK PARTS LIST | TITLE PCA, VCG BD | ASSEMBLY NO. 1100-00-0711 | PAGE: 1 | REV F

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R129 R13 R15 R26 R27 R30 R61 R69 R70 R78 R92 R93	RES, MF, 1/8W, 1%, 10K	RN55D-1002F	TRW	4701-03-1002	12
R8	RES, MF, 1/8W, 1%, 10	RN55D-10R0F	TRW	4701-03-1009	1
R104 R111 R118	RES, MF, 1/8W, 1%, 1.21K	RN55D-1211F	TRW	4701-03-1211	3
R68	RES, MF, 1/8W, 1%, 1.5K	RN55D-1501F	TRW	4701-03-1501	1
R1 R42 R5 R51 R52 R63 R89	RES, MF, 1/8W, 1%, 15K	RN55D-1502F	TRW	4701-03-1502	7
R124 R132	RES, MF, 1/8W, 1%, 150K	RN55D-1503F	TRW	4701-03-1503	2
R66 R79	RES, MF, 1/8W, 1%, 1.78K	RN55D-1781F	TRW	4701-03-1781	2
R7	RES, MF, 1/8W, 1%, 200	RN55D-2000F	TRW	4701-03-2000	1
R116 R117 R119 R121 R131 R133 R57 R74	RES, MF, 1/8W, 1%, 2K	RN55D-2001F	TRW	4701-03-2001	8
R105	RES, MF, 1/8W, 1%, 20.5K	RN55D-2052F	TRW	4701-03-2052	1
R128	RES, MF, 1/8W, 1%, 21.5K	RN55D-2152F	TRW	4701-03-2152	1
R88 R94 R95 R96 R98	RES, MF, 1/8W, 1%, 2.21K	RN55D-2211F	TRW	4701-03-2211	5
R3	RES, MF, 1/8W, 1%, 249	RN55D-2490F	TRW	4701-03-2490	1
R23 R31 R32 R50 R53 R54 R55 R86	RES, MF, 1/8W, 1%, 2.49K	RN55D-2491F	TRW	4701-03-2491	8
R62 R77	RES, MF, 1/8W, 1%, 24.9K	RN55D-2492F	TRW	4701-03-2492	2

WAVETEK PARTS LIST | TITLE PCA, VCG BD | ASSEMBLY NO. 1100-00-0711 | PAGE: 3 | REV F

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R100 R101 R102 R103 R122 R99	RES, MF, 1/4W, 1%, 1M	RN60D-1004F	TRW	4701-13-1004	6
R14 R9 R97	RES MODULE	4310R-101-103	BOURN	4770-00-0008	3
CR17	DIODE	1N4581	MICRO	4801-01-4581	1
CR1 CR10 CR16 CR2 CR4 CR5 CR6 CR7 CR8 CR9	DIODE	1N4148	FAIR	4807-02-6666	10
CR11 CR12 CR13 CR14 CR15 CR3	DIODE	5082-2811	HP	4809-02-2811	6
Q2	TRANS	2N3646	NSC	4901-03-6460	1
Q28 Q31 Q36	TRANS	2N3903	NSC	4901-03-9030	3
Q37 Q38	TRANS	2N3905	ITT	4901-03-9050	2
Q29	TRANS	2N4248	FAIR	4901-04-2480	1
Q24	TRANS	2N5139	FAIR	4901-05-1390	1
Q1 Q10 Q11 Q12 Q14 Q15 Q17 Q18 Q19 Q20 Q21 Q23 Q3 Q39 Q4 Q40 Q41 Q5 Q6 Q7 Q8 Q9	TRANS	2N5462	MOT	4901-05-4620	22
Q22 Q30 Q32 Q33 Q34 Q35	TRANS	2N5485	MOT	4901-05-4850	6
Q13 Q16	TRANS	SD215DE	SIG	4902-00-2140	2
Q25 Q26 Q27	TRANS, SEL, 2N5461	4998-00-0040	WVTK	4998-00-0040	3

WAVETEK PARTS LIST | TITLE PCA, VCG BD | ASSEMBLY NO. 1100-00-0711 | PAGE: 5 | REV F

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
C34 C37 C38 C39 C30	CAP, TANT, 22MF, 15V	196D226X9015KA1	SPRAG	1500-72-2601	5
NONE	VCG BD	1700-00-0711	WVTK	1700-00-0711	1
NONE	SKT, IC, 24PIN	DILB-24P-108	BURND	2100-03-0029	1
NONE	PC BD EJECTOR	103 YELLOW	CALMK	2800-07-0012	2
NONE	TRANSIPAD	10123N	METRS	2800-11-0003	3
NONE	MOUSETAIL	2829-75-2	RUBTK	2800-12-0005	1
FB1 FB2 FB3	BALUN CORE	2873000902	FARIT	3100-00-0002	3
R72	POT, TRIM, 100	91AR100	BECK	4600-01-0103	1
R17 R18 R20 R22 R28	POT, TRIM, 100K	91AR100K	BECK	4600-01-0402	5
R677	POT, TRIM, 200	91AR200	BECK	4600-02-0101	1
R33 R58 R75	POT, TRIM, 20K	91AR20K	BECK	4600-02-0301	3
R21	POT, TRIM, 500	91AR500	BECK	4600-05-0104	1
R34 R35 R36 R41 R43 R47 R48 R49	RES, MF, 1/8W, .1%, 1.5K	RN55E-1501B	CORN	4701-02-1501	8
R37 R38 R45 R46	RES, MF, 1/8W, .1%, 750	RN55E-7500B	MEPCO	4701-02-7500	4
R39 R44	RES, MF, 1/8W, .1%, 7.5K	RN55E-7501B	MEPCO	4701-02-7501	2
R87	RES, MF, 1/8W, 1%, 100	RN55D-1000F	TRW	4701-03-1000	1
R85 R90 R91	RES, MF, 1/8W, 1%, 1K	RN55D-1001F	TRW	4701-03-1001	3

WAVETEK PARTS LIST | TITLE PCA, VCG BD | ASSEMBLY NO. 1100-00-0711 | PAGE: 2 | REV F

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R113 R115	RES, MF, 1/8W, 1%, 274	RN55D-2740F	TRW	4701-03-2740	2
R123 R24	RES, MF, 1/8W, 1%, 301K	RN55D-3013F	TRW	4701-03-3013	2
R110	RES, MF, 1/8W, 1%, 35.7K	RN55D-3572F	TRW	4701-03-3572	1
R65 R80	RES, MF, 1/8W, 1%, 3.65K	RN55D-3651F	TRW	4701-03-3651	2
R108 R109 R112 R114	RES, MF, 1/8W, 1%, 392	RN55D-3920F	TRW	4701-03-3920	4
R120	RES, MF, 1/8W, 1%, 464	RN55D-4640F	TRW	4701-03-4640	1
R106 R107 R16 R64 R81	RES, MF, 1/8, 1%, 499	RN55D-4990F	TRW	4701-03-4990	5
R10 R11 R12 R130 R4 R6	RES, MF, 1/8W, 1%, 4.99K	RN55D-4991F	TRW	4701-03-4991	6
R19 R25 R29	RES, MF, 1/8W, 1%, 49.9K	RN55D-4992F	TRW	4701-03-4992	3
R82	RES, MF, 1/8W, 1%, 61.9	RN55D-61R9F	TRW	4701-03-6199	1
R126	RES, MF, 1/8W, 1%, 63.4K	RN55D-6342F	TRW	4701-03-6342	1
R40 R56	RES, MF, 1/8W, 1%, 69.8K	RN55D-6982F	TRW	4701-03-6982	2
R2 R60	RES, MF, 1/8W, 1%, 7.5K	RN55D-7501F	TRW	4701-03-7501	2
R73 R83 R84	RES, MF, 1/8W, 1%, 825	RN55D-8250F	TRW	4701-03-8250	3
R71T	RES, MF, 1/8W, 1%, 8.25K	RN55D-8251F	TRW	4701-03-8251	1
R127	RES, MF, 1/8W, 1%, 90.9K	RN55D-9092F	TRW	4701-03-9092	1
R125	RES, MF, 1/8W, 1%, 9.53K	RN55D-9531F	TRW	4701-03-9531	1

WAVETEK PARTS LIST | TITLE PCA, VCG BD | ASSEMBLY NO. 1100-00-0711 | PAGE: 4 | REV F

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
	QTY: 1: 4901-05-4610				
IC37 IC38 IC6	IC	LM 301AN	NSC	7000-03-0100	3
IC15 IC16 IC17 IC18 IC19 IC20 IC21	IC, OP-AMP	LF356N	NSC	7000-03-5600	7
IC9	IC	AD563J	ANDEV	7000-05-6300	1
IC39 IC40	IC	IH5012	INTSL	8000-50-1200	2
IC29 IC30	IC	74LS00	TI	8000-74-0010	2
IC33	IC	7404	TI	8000-74-0400	1
IC14	IC	7416	SIG	8000-74-1600	1
IC41	IC	7426	TI	8000-74-2600	1
IC23	IC	74LS42B	SIG	8000-74-4210	1
IC36	IC	MC12040	MOT	8001-20-4000	1
IC22	IC	74LS132	TI	8007-41-3210	1
IC1 IC7	IC	74LS139	SIG	8007-41-3910	2
IC10 IC11 IC12 IC31 IC32	IC	74LS145	SIG	8007-41-4510	5
IC34	IC	74LS151	TI	8007-41-5110	1
IC13 IC2 IC3 IC4 IC5 IC8	IC	74LS175	TI	8007-41-7510	6

WAVETEK PARTS LIST | TITLE PCA, VCG BD | ASSEMBLY NO. 1100-00-0711 | PAGE: 6 | REV F

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST PCA, VCG BD
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		MODEL NO. 172B / DWG NO. 1100-00-0711 / REV F
	DO NOT SCALE DWG		CODE IDENT 23338 / SHEET 1 OF 2
	SCALE		

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-3894

REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
IC24 IC25 IC26 IC27 IC28	IC	74LS196	SIG	8007-41-9610	5

WAVETEK PARTS LIST	TITLE PCA. VCG BD	ASSEMBLY NO. 1100-00-0711 PAGE: 7	REV F

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST PCA, VCG BD
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ± 1 XX ± .030		
	DO NOT SCALE DWG	MODEL NO 172B	DWG NO 1100-00-0711 REV F
	SCALE	CODE IDENT 23338	SHEET 2 OF 2

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A 3894

REV	ECN	BY	DATE	APP
D	R3 WAS 2K, ICC2-8&15 WERE COMMON, "SBL-1" WAS "MDIC8"	TLF	6/30/77	

LOOP FILTERS

VCO LINEARIZER

35 MHz VCO MODULE

÷ 35 TO 47 LOGIC

DIG 1/MIXER PCB
DIGIT 1 SUBSYS.

1. ALL DIODES ARE FD6666
2. ALL CAPACITORS ARE MICROFARADS
3. ALL RESISTORS IN OHMS; 1/8W. 1%
4. FERRITE BEADS (REF. DES. "F.B.") NO. 56-590-65/3B
5. COIL FORMS; CAMBION 2173-X-3; X=2 FOR < 20Mc, X-3 FOR >20Mc
6. LAST REFFERENCE DESIGNATORS USED: L14, T1, CR6, R66, C54

7. R54 AND R55 (78.7Ω) ARE OPTIONAL, "DO NOT INSTALL"

8. R1 (499Ω) IS OPTIONAL, "DO NOT INSTALL".

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN J.D. COOPER	DATE 7-6-76	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR Tom Salga	SEPT 7'77	TITLE SCHEMATIC DIG 1/MIXER PCB.
FINISH WAVETEK PROCESS	RELEASE APPROV		
	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1 .XX ±.030		
	DO NOT SCALE DWG	MODEL NO.	DWG NO. 0103-00-0706 REV D
	SCALE	CODE IDENT 23338	SHEET 1 OF 2

REV	ECN	BY	DATE	APP

OUTPUT LPF

OUTPUT DRIVER

4.7V

F.B.

+5BUS

-15V

C25 .01

R37 4.99K

C26 .01

-8V

R38 40.2

Q2 (B8) 2N3903

+4.0V

R40 249Ω

C27 .01

L5 3.3uh,10%

C28 56PF SM

C29 56PF SM

C30 56PF SM

C31 56PF SM

L6 3.3uh,10%

C32 .01

C33 0.1

R50 249

C34 .01

(1D1) DIG1-0 P1

DIG1-1 P1

-1dBm ½V P-P

OUTPUT MIXER SBL-1

LO IF

ICB8 COM

RF

R32 15

R33 15

R28 68.1

TYP -11dBm 65mV RMS

VB

(16)

ICB9 MC10116(½)

VBB

R51-7 470Ω

R51-6 470Ω

(1)

ICB9 MC10116(½)

.8V P-P

R52 78.7

R53 78.7

R51-3 470Ω

R51-4 470Ω

R54 78.7 7

R55 78.7 7

R51-10 470Ω

R51-9 470Ω

SYNOA (47A,47B)

SYNOB (46A,46B)

SYNOC (43A,43B)

SYNOD (42A,42B)

(38A,38B) MC30-0

(39A,39B) MC30-1

R29 499

R30 124

R31 499

R35 499

R34 499

ICB6 MC10116(½)

R36 249

L7 (D6)

+3.6dBm 360 mV RMS

TP2

C37 30PF, SM

R39 499Ω

C39 100PF SM

C40 .01

ICB6 MC10116(½)

ECL OUT

R45 499

C45 .01

R46 150

R44 150

VBB

-11dBm 604V RMS@ 34.5MHz

TP3

C48 15PF, SM

C49 20PF, SM

C50 .001

R57 40.2Ω

Q1 (C7) 2N3903

C52 20PF, SM

C53 20PF, SM

R60 6.19K

R59 90.9

L13 (B8)

L14 (A8)

TP4

-3.5dBm @ 34.5MHz 150V RMS

C54 .01

(36A,36B) DIG 23-0

(35A,35B) DIG 23-1

ICB7 LM1496 MIXER

CAR OUT

-V GAIN B

SIG

C38 150PF SM

C42 150PF SM

C43 .001

L8 10uh

C41 .01

R41 249Ω

R43 249Ω

R42 2.21K

R47 2.21K

C44 .01

R48 499

R40 4.99K

C46 .001

R56 6.19K

C47 .01

L11 (A7)

L12 (B7)

R58 3.01K

C51 .01

10dB BUFFER

34.5 MHz BPF

FIRST MIXER

+5V TO MC 10116

L9 82uh

L10 82uh

C35 22/15V

C36 22/15V

C55 .1/10V

+5V

-15V

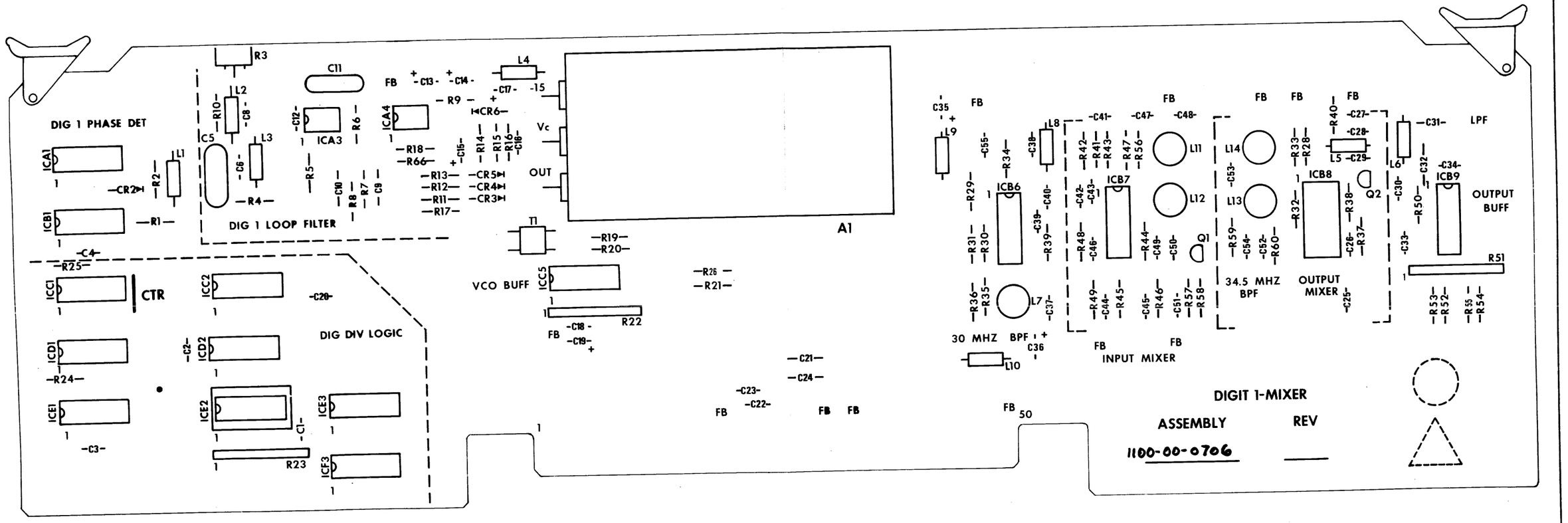
+5V BUS

-15V BUS

DIG 1/MIXER PCB.
MIXER AND LPF SUBSYS.

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN D. COOPER	DATE 7-6-76	WAVETEK SAN DIEGO, CALIFORNIA
MATERIAL	PROJ ENGR Tom Selga	SEPT 7'77	TITLE SCHEMATIC DIG 1/MIXER PCB.
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1° .XX ±.030		
	DO NOT SCALE DWG	MODEL NO.	DWG NO. 0103-00-0706 REV D
	SCALE	CODE IDENT 23338	SHEET 2 OF 2



1100-00-0706

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: DIGIT 1 / MIXER PCA
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ± 1 XX ± .030		MODEL NO 1725 · DWG NO 0101-00-0706 · REV
	DO NOT SCALE DWG		CODE IDENT 23338 · SHEET 1 OF 1
	SCALE		

REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG, DIGIT 1	0101-00-0706	WVTK	0101-00-0706	1
NONE	SCHEMATIC, DIGIT 1	0103-00-0706	WVTK	0103-00-0706	1
T1	TRANSFORMER	172-537	WVTK	1204-00-0537	1
L7	COIL, 30MC BPF	172-545	WVTK	1204-00-0545	1
L11	COIL, 35MC BPF	172-546	WVTK	1204-00-0546	1
L12	COIL, 35MC BPF	172-547	WVTK	1204-00-0547	1
L13	COIL, 35MC BPF	172-548	WVTK	1204-00-0548	1
L14	COIL, 35MC BPF	172-549	WVTK	1204-00-0549	1
A1	35/40 MHZ VCO MODULE	172-519	WVTK	1206-00-0519	1
NONE	SHIELD	1400-00-6171	WVTK	1400-00-6171	3
NONE	SHIELD	1400-00-6181	WVTK	1400-00-6181	1
NONE	SHIELD, SYNTH	1400-00-6193	WVTK	1400-00-6193	1
C43 C46 C50	CAP, CER, .001MF, 1KV	DD-102	CRL	1500-01-0211	3
C18 C20 C25 C26 C27 C32 C34 C40 C41 C44 C45 C47 C51 C54 C8	CAP, CER, MN, .01MF, 50V	CAC02Z5U103Z100A	CORNG	1500-01-0310	15
C1 C10 C2 C21 C22 C23 C24 C3 C33 C4 C55 C9	CAP, CER, MON, .1MF, 50V	CAC03Z5U104Z050A	CORNG	1500-01-0405	12
C16	CAP, CER, .0022, 1KV	DD-222SLL	CRL	1500-02-2201	1

WAVETEK PARTS LIST | TITLE PCA, DIGIT 1 | ASSEMBLY NO. 1100-00-0706 | PAGE: 1 | REV F

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	STANDOFF	SS5368-3C-5A	UNICP	2800-05-6114	5
NONE	PC BD EJECTOR	103 ORANGE	CALMK	2800-07-0011	2
NONE	TRANSIPAD	10123N	METRS	2800-11-0003	13
NONE	BALUN CORE	2873000902	FARIT	3100-00-0002	13
R3	POT, TRIM, 100K	91AR100K	BECK	4600-01-0402	1
R10 R24 R25 R9	RES, MF, 1/8W, 1%, 1K	RN55D-1001F	TRW	4701-03-1001	4
R66	RES, MF, 1/8W, 1%, 11K	RN55D-1102F	TRW	4701-03-1102	1
R30	RES, MF, 1/8W, 1%, 124	RN55D-1240F	TRW	4701-03-1240	1
R44 R46	RES, MF, 1/8W, 1%, 150	RN55D-1500F	TRW	4701-03-1500	2
R5	RES, MF, 1/8W, 1%, 1.5K	RN55D-1501F	TRW	4701-03-1501	1
R11	RES, MF, 1/8W, 1%, 15K	RN55D-1502F	TRW	4701-03-1502	1
R32 R33	RES, MF, 1/8W, 1%, 15	RN55D-15R0F	TRW	4701-03-1509	2
R16	RES, MF, 1/8W, 1%, 1.78K	RN55D-1781F	TRW	4701-03-1781	1
R21 R26	RES, MF, 1/8W, 1%, 21.5	RN55D-21R5F	TRW	4701-03-2159	2
R42 R47	RES, MF, 1/8W, 1%, 2.21K	RN55D-2211F	TRW	4701-03-2211	2
R12	RES, MF, 1/8W, 1%, 23.7K	RN55D-2372F	TRW	4701-03-2372	1
R18 R36 R40 R41 R43	RES, MF, 1/8W, 1%, 249	RN55D-2490F	TRW	4701-03-2490	6

WAVETEK PARTS LIST | TITLE PCA, DIGIT 1 | ASSEMBLY NO. 1100-00-0706 | PAGE: 3 | REV F

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
C39	CAP, MICA, 100PF, 500V	DM15-101J	ARCO	1500-11-0100	1
C12 C48	CAP, MICA, 15PF, 500V	DM15-150J	ARCO	1500-11-5000	2
C38 C42	CAP, MICA, 150PF, 500V	DM15-151J	ARCO	1500-11-5100	2
C49 C52 C53	CAP, MICA, 20PF, 500V	DM15-200J	ARCO	1500-12-0000	3
C37	CAP, MICA, 30PF, 500V	DM15-300J	ARCO	1500-13-0000	1
C6	CAP, MICA, 470PF, 500V	DM15-471J	ARCO	1500-14-7100	1
C28 C29 C30 C31	CAP, MICA, 56PF, 500V	DM15-560J	ARCO	1500-15-6000	4
C11	CAP, MYLAR, .01MF, 100V	225P10391WD3	SPRAG	1500-41-0314	1
C5	CAP, MLAR, .0047MF100V	225P47291WD3	SPRAG	1500-44-7204	1
C13 C14 C15 C17 C19 C35 C36	CAP, TANT, 22MF, 15V	196D226X9015KA1	SPRAG	1500-72-2601	7
NONE	1ST DIGIT MIXER BD	1700-00-0706	WVTK	1700-00-0706	1
L1 L2	CHOKE, 1000MIC H, 5%	2500-28	DLVAN	1800-00-0004	2
L10 L4 L9	CHOKE, 82MH, 5%	1537-72	DLVAN	1800-00-0005	3
L5 L6	CHOKE, 3.3MH, 10%	1537-24	DLVAN	1800-00-0006	2
L8	CHOKE, 10MH, 10%	1537-36	DLVAN	1800-00-0007	1
L3	CHOKE, 200MH, 5%	1537-90	DLVAN	1800-00-0008	1
NONE	SKT, IC, 16PIN	DILB-16P-108	BURND	2100-03-0028	1

WAVETEK PARTS LIST | TITLE PCA, DIGIT 1 | ASSEMBLY NO. 1100-00-0706 | PAGE: 2 | REV F

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R50					
R58	RES, MF, 1/8W, 1%, 3.01K	RN55D-3011F	TRW	4701-03-3011	1
R13	RES, MF, 1/8W, 1%, 30.1K	RN55D-3012F	TRW	4701-03-3012	1
R38 R57	RES, MF, 1/8W, 1%, 40.2	RN55D-40R2F	TRW	4701-03-4029	2
R29 R31 R34 R35 R39 R45 R48	RES, MF, 1/8, 1%, 499	RN55D-4990F	TRW	4701-03-4990	7
R17 R37 R49	RES, MF, 1/8W, 1%, 4.99K	RN55D-4991F	TRW	4701-03-4991	3
R19 R20 R7 R8	RES, MF, 1/8W, 1%, 51.1	RN55D-51R1F	TRW	4701-03-5119	4
R15 R2 R4	RES, MF, 1/8W, 1%, 576	RN55D-5760F	TRW	4701-03-5760	3
R56 R60	RES, MF, 1/8W, 1%, 6.19K	RN55D-6191F	TRW	4701-03-6191	2
R14	RES, MF, 1/8W, 1%, 681	RN55D-6810F	TRW	4701-03-6810	1
R28	RES, MF, 1/8W, 1%, 68.1	RN55D-68R1F	TRW	4701-03-6819	1
R6	RES, MF, 1/8W, 1%, 7.5K	RN55D-7501F	TRW	4701-03-7501	1
R52 R53	RES, MF, 1/8W, 1%, 78.7	RN55D-78R7F	TRW	4701-03-7879	2
R59	RES, MF, 1/8W, 1%, 90.9	RN55D-90R9F	TRW	4701-03-9099	1
R22 R51	RES MODULE	4310R-101-471	BOURN	4770-00-0009	2
R23	RES MODULE 2.2K	4310R-101-222	BOURN	4770-00-0011	1
CR2 CR3 CR4 CR5 CR6	DIODE	1N4148	FAIR	4807-02-6666	5

WAVETEK PARTS LIST | TITLE PCA, DIGIT 1 | ASSEMBLY NO. 1100-00-0706 | PAGE: 4 | REV F

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
Q1 Q2	TRANS	2N3903	NSC	4901-03-9030	2
ICB8	IC, MIXER	MD108	ANZAC	7000-01-0800	1
ICA3	IC	LM 301AN	NSC	7000-03-0100	1
ICA4	IC	MC1458P1	MOT	7000-14-5800	1
ICB7	IC	MC1496P	MOT	7000-14-9600	1
ICA1	IC	7404	TI	8000-74-0400	1
ICD1	IC	74S10	SIG	8000-74-1001	1
ICC1	IC	74S74	TI	8000-74-7401	1
ICC2	IC	MC10125P	MOT	8001-01-2500	1
ICF3	IC	74LS139	SIG	8007-41-3910	1
ICE3	IC	74LS175	TI	8007-41-7510	1
ICD2 ICE1	IC	74LS196	SIG	8007-41-9610	2
ICB1	IC	MC4044P	MOT	8100-40-4400	1
ICB6 ICB9 ICC5	IC, SEL, MC10116P QTY: 1: 8001-01-1600	8200-00-0012	WVTK	8200-00-0012	3
ICE2	IC, PROGRAMMED REF: 8007-41-8801	8600-00-0007	WVTK	8600-00-0007	1

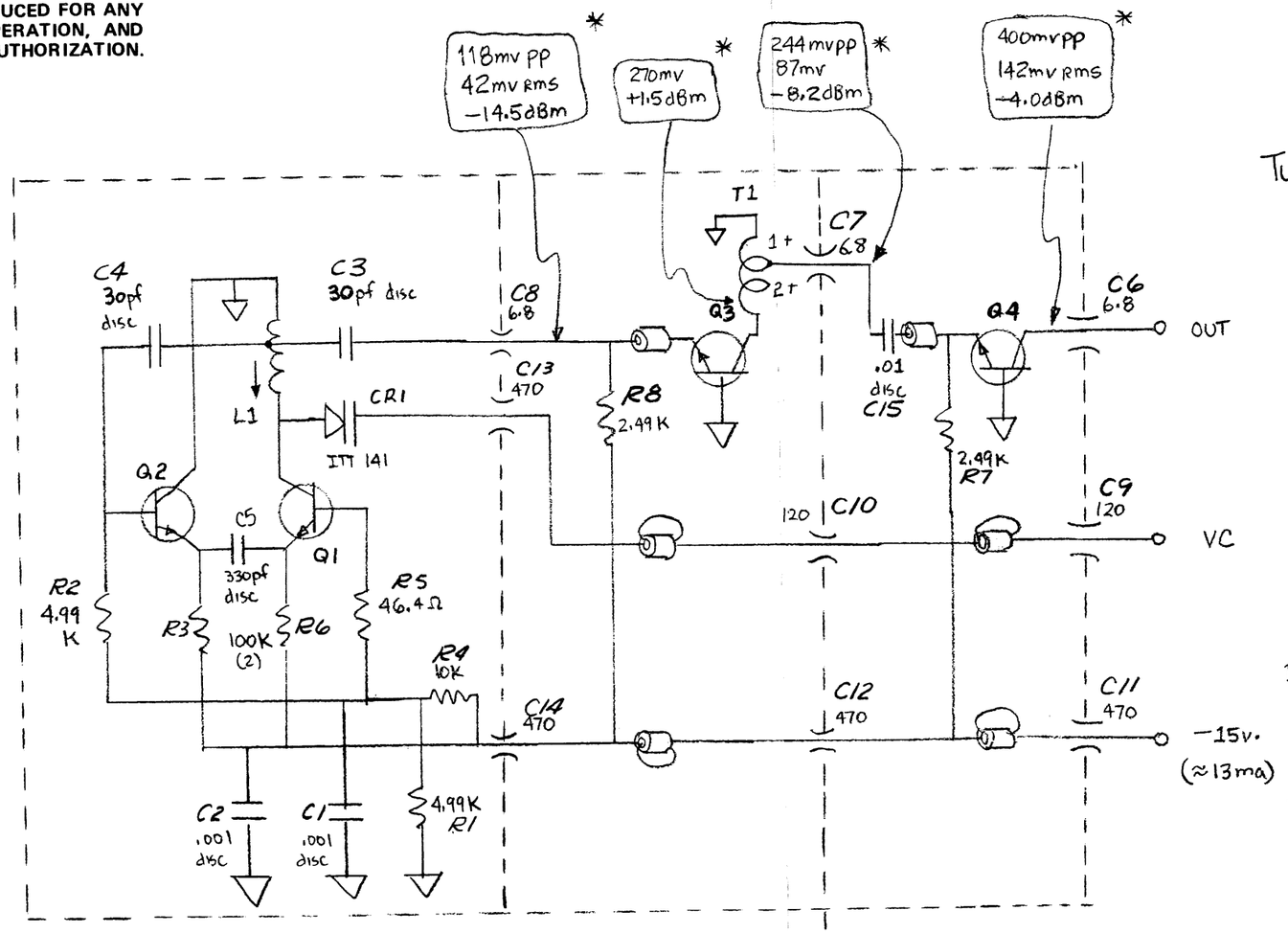
WAVETEK PARTS LIST | TITLE PCA, DIGIT 1 | ASSEMBLY NO. 1100-00-0706 | PAGE: 5 | REV F

NOTE. UNLESS OTHERWISE SPECIFIED

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-3894

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE
	RELEASE APPROV		PARTS LIST PCA, DIGIT 1
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		
	DO NOT SCALE DWG	MODEL NO 172B	DWG NO. 1100-00-0706 REV F
	SCALE	CODE IDENT 23338	SHEET 1 OF 1

REV	ECN	BY	DATE	APP
A	LOOP2 Added	TVS	18May	
B	ADD T1, DELETE +5V	✗	26May	
C	TUNE UP / TEST DATA	TVS	20JULY	



* FOR 40mHz VCO and V_C = 3.50v & 50Ω LOAD; TYPICAL VALUES ONLY

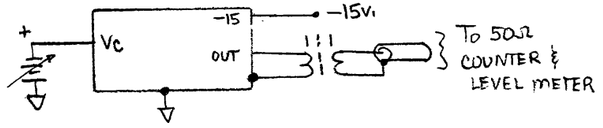
Q1 - Q4: 2N3563 (PRE-TESTED)

L1: 14t, TAP AT 1¼t; ON CAMBION FORM

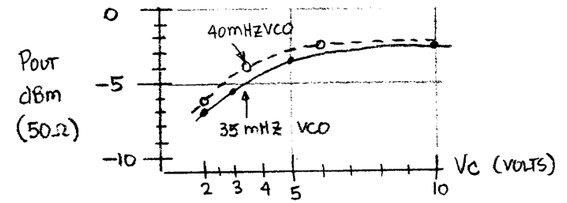
T1: 3t, TAP AT 1t on FAIR-RITE 2873002402

NOTE: UNLESS OTHERWISE SPECIFIED

TUNE UP & TEST DATA



(1) OUTPUT LEVEL VS Vc · (TYPICAL)



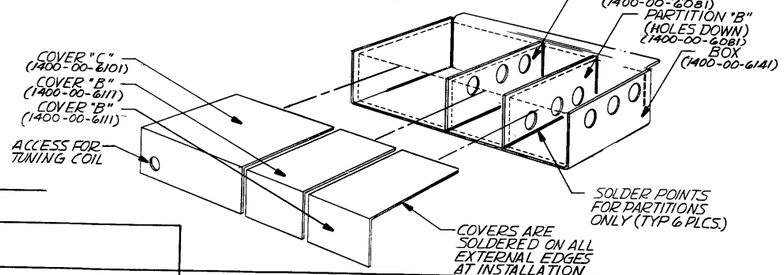
(2) TUNE UP & TEST DATA:

	Vc	FOUT	COMMENTS
DIGIT 1 VCO	3.0v.	35 ± 0.1 mHz	TUNE L1 FOR THIS
	5.0v	39.4 ± 0.3	CHECK POINT
	10.0v	47.5 ± 1.5	" "
DIGIT 2 VCO	3.5v.	40. ± 0.1 mHz	TUNE L1 FOR THIS
	6.0v.	45.9 ± 0.35	CHECK POINT
	10v.	53.1 ± 1.5	" "

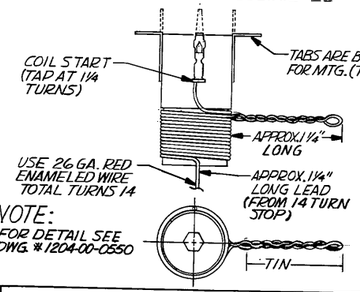
REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN TVS	DATE 16Apr	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR J. Kolb /TVS	SEPT 8 77	TITLE 35/40 mHz VCO MODULE (FOR DIG1 & DIG23 LOOPS)
	RELEASE APPROV 1976		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1° .XX ±.030		
	DO NOT SCALE DWG		MODEL NO. / DWG NO. 0104-00-0519 / REV C
	SCALE		CODE IDENT 23338 / SHEET 1 OF 1

REV	ECN	BY	DATE	APP

PARTITIONS AND COVERS INSTALLATION

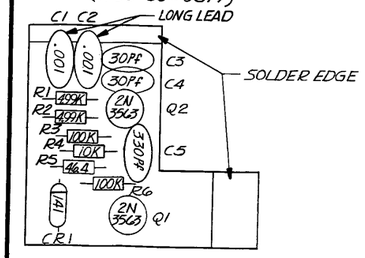


DETAIL "A" COIL DETAIL L1



NOTE: FOR DETAIL SEE DWG. # 1204-00-0550

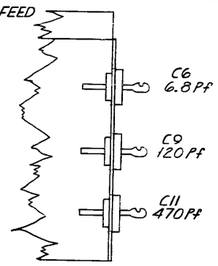
P.C. BOARD COMPONENT INSTALL. (1700-00-0519)



ASSEMBLY SEQUENCE

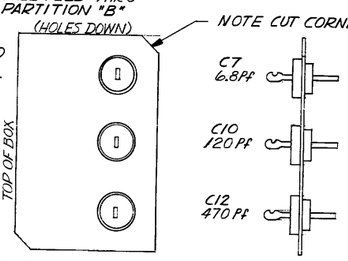
- STEP 1 SOLDER CORNERS OF BOX

- STEP 2 INSTALL FEED THRU CAPACITORS ON BOX

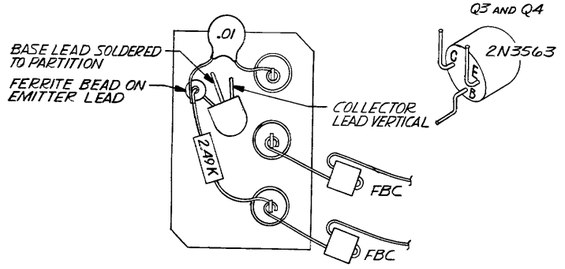


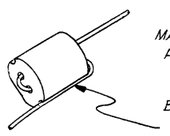
- STEP 3 INSTALL FEED THRU CAPACITORS ON PARTITION "B"

NOTE: SEE PARTITION AND COVER DETAIL FOR CAPACITOR ORIENTATION OF THIS PARTITION



- STEP 4 INSTALL COMPONENTS ON PARTITION "B"



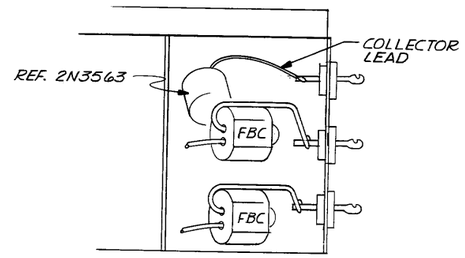


MAKE FERRITE CORE ASSEMBLIES:
A) CUT A LENGTH OF 22 GA. BUS WIRE 3" LONG, FOLD IN HALF
B) INSERT THRU THE TWO HOLES IN FERRITE BALUN CORE AND BEND ONE END OF WIRE BACK ALONG ONE SIDE OF CORE AS SHOWN

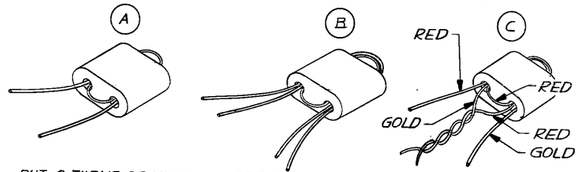
NOTE: UNLESS OTHERWISE SPECIFIED

- STEP 5 SOLDER COMPLETED PARTITION INTO PLACE IN BOX USING COVER B AS A SPACER. IT WILL BE NECESSARY TO BEND LEADS FROM PARTITION OUT OF THE WAY TO INSTALL COVER.

- STEP 6 CONNECT WIRES FROM PARTITION TO BOX



- STEP 7 "T1" ASSEMBLE TRANSFORMER ON FERRITE BALUN CORE NOTE: FOR DETAIL SEE DWG. # 1204-00-0551



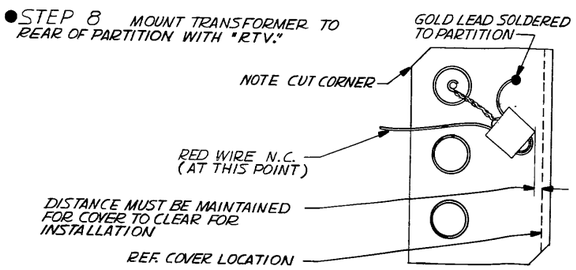
PUT 2 TURNS OF NO. 28 GA. RED ENAMELED WIRE THRU BOTH HOLES OF CORE WITH 1" OF LEAD LEFT AT EACH END

ADD 1 TURN OF NO. 28 GA. GOLD ENAMELED WIRE THRU BOTH HOLES LEAVING 1" LEADS

TWIST TOGETHER GOLD LEAD FROM ONE HOLE WITH RED LEAD FROM OTHER HOLE

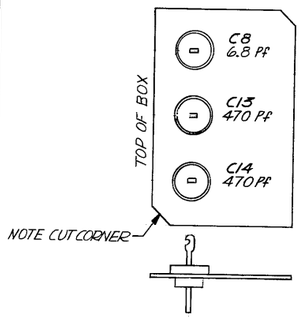
NOTE; AT COMPLETION OF STEP "C" TIN LEADS BY DIPPING IN SOLDER POT TO WITHIN 3/16" OF CORE. HOLD CORE WITH SUITABLE PLIERS TO AVOID BURNING FINGERS. DO NOT TIN TO CLOSE TO CORE, OR HOLD IN SOLDER POT TOO LONG, OR YOU WILL NOT BE ABLE TO DETERMINE COLOR OF WIRE PRIOR TO TINNING.

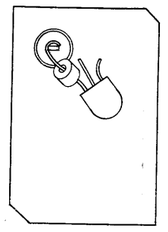
- STEP 8 MOUNT TRANSFORMER TO REAR OF PARTITION WITH "R.T.V."



- STEP 9 MOUNT TWO FERRITE CHOKES TO THE TWO REMAINING FEED THRU CAPACITORS MOUNTED IN THE BOX

- STEP 10 ASSEMBLE NEXT PARTITION.

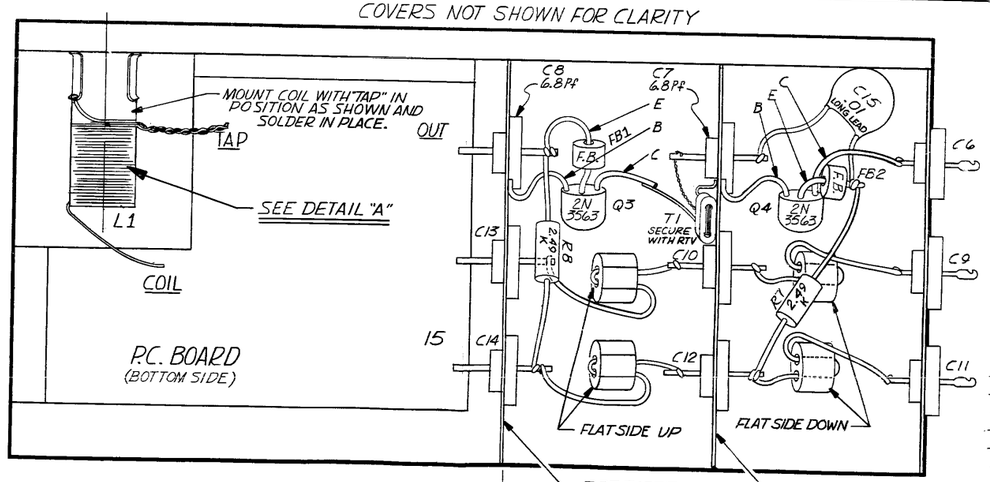


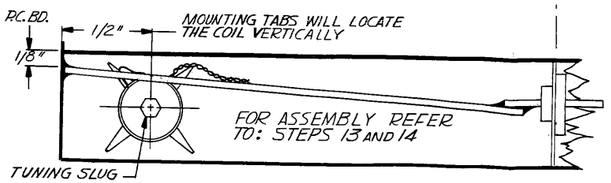


A) BASE LEAD SOLDERED TO PARTITION
B) COLLECTOR LEAD VERTICAL (SEE STEP 4 FOR REF.)

- STEP 11 INSTALL PARTITION IN BOX USING COVER AS SPACER, JOIN WIRES FROM FIRST PARTITION TO SECOND PARTITION.
- STEP 12 ASSEMBLE P.C. BOARD.
- STEP 13 MOUNT COIL IN BOX
- STEP 14 MOUNT P.C. BOARD IN BOX AND CONNECT TO COIL. NOTE THAT THE P.C. BOARD MUST BE INSTALLED AT ANGLE SHOWN FOR TUNING ACCESS OF COIL

COVERS NOT SHOWN FOR CLARITY





DRAWN	D. COOPER	DATE	7-27-76
PROJ ENGR	Tom Salsa		8-27
RELEASE APPROV			
TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1° XX ±.030			
DO NOT SCALE DWG			
SCALE			

WAVETEK SAN DIEGO • CALIFORNIA

TITLE: ASSEMBLY 35 40 MHz VCO MODULE

MODEL NO.	DWG NO.	REV
	0102-00-0519	
CODE IDENT 23338	SHEET 1 OF 1	

0102-00-0519

REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG, VCO MOD	0102-00-0519	WVTK	0102-00-0519	1
NONE	SCHEMATIC, VCO MOD	0104-00-0519	WVTK	0104-00-0519	1
L1	COIL, 35MHZ VCO	172-550	WVTK	1204-00-0550	1
T1	TRANSFORMER	172-551	WVTK	1204-00-0551	1
NONE	PARTITION (B)	1400-00-6081	WVTK	1400-00-6081	2
NONE	COVER (C)	1400-00-6101	WVTK	1400-00-6101	1
NONE	COVER (B)	1400-00-6111	WVTK	1400-00-6111	2
NONE	BOX, OSCILLATOR	1400-00-6141	WVTK	1400-00-6141	1
C1 C2	CAP, CER, .001MF, 1KV	DD-102 LONG LEAD	CRL	1500-01-0201	2
C15	CAP, CER, MN, .01MF, 50V	CAC02Z5U103Z100A	CORNG	1500-01-0310	1
C3 C4	CAP, CER, 30PF, 1KV	DD-300	CRL	1500-03-0001	2
C5	CAP, CER, 330PF, 1KV	DD-331	CRL	1500-03-3111	1
C10 C9	CAP, FTHRU, 120PF, 500V	54-794-005-X5R0-121K	SPECT	1500-61-2106	2
C11 C12 C13 C14	CAP, FTHRU, 470PF, 500V	54-794-010-X5R0-471M	SPECT	1500-64-7106	4
C6 C7 C8	CAP, FTHRU, 6.8PF, 500V	54-794-010-X5E0-689M	SPECT	1500-66-8906	3
NONE	VCO MOD	1700-00-0519	WVTK	1700-00-0519	1
FB1 FB2	FERRITE BEAD	56-590-65/3B	FERRX	3100-00-0001	2
NONE	BALUN CORE	2873000902	FARIT	3100-00-0002	4

WAVETEK PARTS LIST | TITLE 35/40 MHZ VCO MODULE | ASSEMBLY NO. 1206-00-0519 | PAGE: 1 | REV A

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R4	RES, MF, 1/8W, 1%, 10K	RN55D-1002F	TRW	4701-03-1002	1
R3 R6	RES, MF, 1/8W, 1%, 100K	RN55D-1003F	TRW	4701-03-1003	2
R7 R8	RES, MF, 1/8W, 1%, 2.49K	RN55D-2491F	TRW	4701-03-2491	2
R5	RES, MF, 1.8W, 1%, 46.4	RN55D-46R4F	TRW	4701-03-4649	1
R1 R2	RES, MF, 1/8W, 1%, 4.99K	RN55D-4991F	TRW	4701-03-4991	2
CR1	DIODE	141	ITT	4803-02-0141	1
Q1 Q2 Q3 Q4	TRANS	2N3563	FAIR	4901-03-3630	4

WAVETEK PARTS LIST | TITLE 35/40 MHZ VCO MODULE | ASSEMBLY NO. 1206-00-0519 | PAGE: 2 | REV A

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST 35/40 MHZ VCO MODULE
FINISH WAVETEK PROCESS	RELEASE APPROV	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030	MODEL NO 172B
	DO NOT SCALE DWG		DWG NO 1206-00-0519
	SCALE		REV A
			CODE IDENT 23338
			SHEET 1 OF 1

NOTE: UNLESS OTHERWISE SPECIFIED

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-3894

REV	ECN	BY	DATE	APP
E	"SBL-1" WAS "MD108"	TLF	6-30-77	
F	# 20646	BDS	12-1-78	

MC4044 · ICG4 74LS139 · ICG3 74LS192 · ICF4 74LS175 · ICE3 74LS192 · ICF3 74LS192 · ICF1 74S02 · ICE1 7474 · ICG1 74L140 · ICB1 LM361 · ICD1 MC10125P · ICD5 10116 · ICD6 SBL-1 · ICF10 MC4044 · ICF11 · ICF12 µA741 · ICC8 · ICB8 MC 10138 · A1 VCO MODULE · A2 60.4 MHz VCO MODULE · VR1 7805 · T1 · T2 · T3 · T4 · T5

- (33,34,A,B) +15V
- (19,20,A,B) +5V
- (26,27,28,A,B) COM
- (22,23,24,A,B) COM
- (50,A,B) -5V
- (30,31,A,B) -15V
- (36,A,B) DIG 23-1
- (35,A,B) DIG 23-0
- (46,A,B) MC60-0
- (47,A,B) MC60-COM

LAST REF DES USED
C68, R71, T5, L9, CR7, Q2, TP6

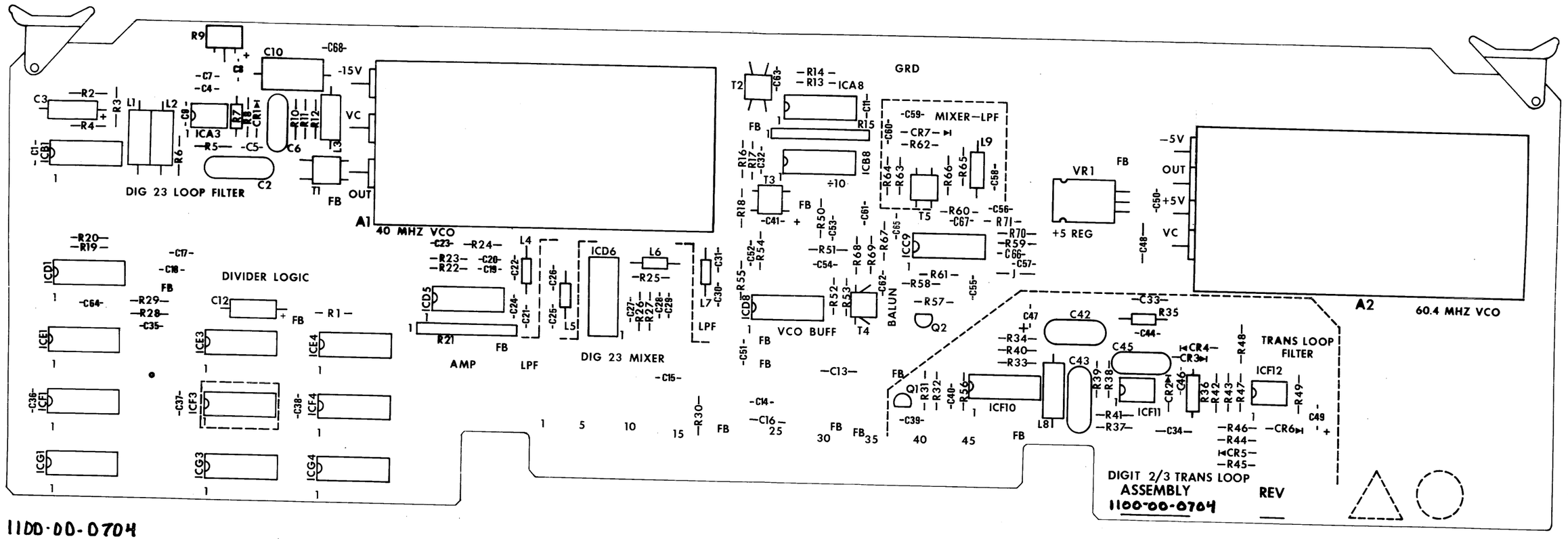
2. ALL CAPS ARE IN µF.
1. ALL RESISTORS ARE IN Ω.
NOTE UNLESS OTHERWISE SPECIFIED

4. TUNE VCO FOR 60.3 ± .01 MHz WITH TP6 GROUNDED; CONNECT 50Ω COUNTER DIRECTLY BETWEEN VCO OUTPUT AND GROUND.

3. INDICATES FERRITE BEAD.

5. ALL UNMARKED DIODES ARE FD6666

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN BA	DATE 7-6-76	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR Tom Saliga	SEPT 7 '77	TITLE SCHEMATIC DIGIT 2 & 3
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		
	DO NOT SCALE DWG		MODEL NO.
	SCALE		DWG NO. 0103-00-0704 REV F
			CODE IDENT 23338 SHEET 1 OF 1



1100-00-0704

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJENGR		TITLE: DIGITS 2 & 3 PCA
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ± 1 XX ± .030		
	DO NOT SCALE DWG		MODEL NO 172B; DWG NO 0101-00-0704; REV
	SCALE		CODE IDENT 23338; SHEET 1 OF 1

REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG, DIGIT 2&3	0101-00-0704	WVTK	0101-00-0704	1
NONE	SCHEMATIC, DIGIT 2-3	0103-00-0704	WVTK	0103-00-0704	1
T1 T2 T3 T5	TRANSFORMER	172-537	WVTK	1204-00-0537	4
T4	TRANSFORMER	172-539	WVTK	1204-00-0539	1
A1	35/40 MHZ VCO MODULE	172-519	WVTK	1206-00-0519	1
A2	60.4MHZ VCO MOD	172-520	WVTK	1206-00-0520	1
NONE	LOOP 2 SHIELD	1400-00-6161	WVTK	1400-00-6161	3
NONE	SHIELD, SYNTH	1400-00-6193	WVTK	1400-00-6193	1
C59 C61 C62	CAP, CER, .001MF, 1KV	DD-102	CRL	1500-01-0211	3
C11 C18 C19 C20 C21 C22 C23 C32 C35 C4 C46 C5 C51 C52 C53 C54 C55 C56 C63 C64 C66 C67 C7	CAP, CER, MN, .01MF, 50V	CAC02Z5U103Z100A	CORNG	1500-01-0310	23
C1 C13 C14 C15 C16 C17 C33 C34 C36 C37 C38 C39 C40 C44 C48 C50 C57 C60 C65	CAP, CER, MON, .1MF, 50V	CAC03Z5U104Z050A	CORNG	1500-01-0405	19
C58	CAP, CER, 470PF, 1KV	DD-471	CRL	1500-04-7111	1
C28 C29 C30 C31	CAP, CER, 82PF, 1KV	DD-820	CRL	1500-08-2011	4
C9	CAP, MICA, 15PF, 500V	DM15-150J	ARCO	1500-11-5000	1

WAVETEK PARTS LIST | TITLE PCA, 2ND DIGIT TRANS | ASSEMBLY NO. 1100-00-0704 | PAGE: 1 | REV J

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	PIN, MALE	61182-2	AMP	2100-05-0020	1
NONE	STANDOFF	SS5368-3C-5A	UNICP	2800-05-6114	5
NONE	PC BD EJECTOR	103 RED	CALMK	2800-07-0010	2
NONE	TRANSIPAD	10123N	METRS	2800-11-0003	14
NONE	BALUN CORE	2873000902	FARIT	3100-00-0002	14
R9	POT, TRIM, 2K	91AR2K	BECK	4600-02-0201	1
R7	RES, C, 1/2W, 10%, 1.5M	RC20GF-155	STKPL	4700-25-1504	1
R13 R22 R23 R30 R62 R63 R65 R66	RES, MF, 1/8W, 1%, 100	RN55D-1000F	TRW	4701-03-1000	8
R28 R29 R58	RES, MF, 1/8W, 1%, 1K	RN55D-1001F	TRW	4701-03-1001	3
R39 R41 R43 R47 R5 R6	RES, MF, 1/8W, 1%, 10K	RN55D-1002F	TRW	4701-03-1002	6
R51	RES, MF, 1/8W, 1%, 124	RN55D-1240F	TRW	4701-03-1240	1
R38	RES, MF, 1/8W, 1%, 13K	RN55D-1302F	TRW	4701-03-1302	1
R2 R26 R27	RES, MF, 1/8W, 1%, 150	RN55D-1500F	TRW	4701-03-1500	3
R32 R4	RES, MF, 1/8W, 1%, 1.5K	RN55D-1501F	TRW	4701-03-1501	2
R11	RES, MF, 1/8W, 1%, 2K	RN55D-2001F	TRW	4701-03-2001	1
R59 R60	RES, MF, 1/8W, 1%, 2.21K	RN55D-2211F	TRW	4701-03-2211	2
R12 R18 R54 R55 R68	RES, MF, 1/8W, 1%, 249	RN55D-2490F	TRW	4701-03-2490	6

WAVETEK PARTS LIST | TITLE PCA, 2ND DIGIT TRANS | ASSEMBLY NO. 1100-00-0704 | PAGE: 3 | REV J

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
CR1 CR2 CR3 CR4 CR5 CR6	DIODE	1N4148	FAIR	4807-02-6666	6
CR7	DIODE	5082-2811	HP	4809-02-2811	1
Q1 Q2	TRANS	2N3903	NSC	4901-03-9030	2
ICD6	IC, MIXER	MD108	ANZAC	7000-01-0800	1
ICA3	IC	LM 301AN	NSC	7000-03-0100	1
ICF11 ICF12	IC	LM741CN	NSC	7000-07-4100	2
ICF1	IC	74S02	SIG	8000-74-0201	1
ICE1	IC	7474	TI	8000-74-7400	1
VR1	VOLTAGE REGULATOR	MA7805UC	FAIR	8000-78-0500	1
ICD1	IC	MC10125P	MOT	8001-01-2500	1
ICB8	IC	MC10138P	MOT	8001-01-3800	1
ICG4	IC	74LS139	SIG	8007-41-3910	1
ICG1	IC	74S140	TI	8007-41-4001	1
ICE4 ICF4	IC	74LS175	TI	8007-41-7510	2
ICE3 ICF3 ICG3	IC	74LS192	TI	8007-41-9210	3
ICB1 ICF10	IC	MC4044P	MOT	8100-40-4400	2
ICA8 ICC9 ICD5 ICD8	IC, SEL, MC10116P	8200-00-0012	WVTK	8200-00-0012	4

WAVETEK PARTS LIST | TITLE PCA, 2ND DIGIT TRANS | ASSEMBLY NO. 1100-00-0704 | PAGE: 5 | REV J

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
C24 C25 C26 C27	CAP, MICA, 220PF, 500V	DM15-221J	ARCO	1500-12-2100	4
C68	CAP, MICA, 470PF, 500V	DM15-471J	ARCO	1500-14-7100	1
C43	CAP, MYLAR, .001MF100V	225P10291WD3	SPRAG	1500-41-0204	1
C45	CAP, MYLAR, .01MF, 100V	225P10391WD3	SPRAG	1500-41-0314	1
C6	CAP, MYLR, .0022MF100V	225P22291WD3	SPRAG	1500-42-2214	1
C10	CAP, POLY, .0025MF100V	SX225	MAL	1500-42-5204	1
C42	CAP, MLAR, .0047MF100V	225P47291WD3	SPRAG	1500-44-7204	1
C2	CAP, MYLAR, .047MF100V	225P47391WD3	SPRAG	1500-44-7314	1
C41 C47 C49 C8	CAP, TANT, 22MF, 15V	196D226X9015KA1	SPRAG	1500-72-2601	4
C12 C3	CAP, TANT, 5.6MF, 35V	150D565X9035B2	SPRAG	1500-75-6502	2
NONE	2ND DIGIT TRANS BD	1700-00-0704	WVTK	1700-00-0704	1
L3	CHOKE, 1000MIC H, 5%	2500-28	DLVAN	1800-00-0004	1
L9	CHOKE, 82MH, 5%	1537-72	DLVAN	1800-00-0005	1
L1 L2 L8	CHOKE, 2200MH	2500-44	DLVAN	1800-00-0010	3
L4 L5	CHOKE, .47MH, 10%	1025-12	DLVAN	1800-00-0011	2
L6 L7	CHOKE, .18MH, 10%	1025-02	DLVAN	1800-00-0012	2
NONE	SKT, IC, 16PIN	DILB-16P-108	BURND	2100-03-0028	1

WAVETEK PARTS LIST | TITLE PCA, 2ND DIGIT TRANS | ASSEMBLY NO. 1100-00-0704 | PAGE: 2 | REV J

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R69					
R3	RES, MF, 1/8W, 1%, 274	RN55D-2740F	TRW	4701-03-2740	1
R44	RES, MF, 1/8W, 1%, 3.32K	RN55D-3321F	TRW	4701-03-3321	1
R10 R57	RES, MF, 1/8W, 1%, 33.2K	RN55D-3322F	TRW	4701-03-3322	2
R25	RES, MF, 1/8W, 1%, 33.2	RN55D-33R2F	TRW	4701-03-3329	1
R64	RES, MF, 1/8W, 1%, 3.65K	RN55D-3651F	TRW	4701-03-3651	1
R8	RES, MF, 1/8W, 1%, 46.4K	RN55D-4642F	TRW	4701-03-4642	1
R1 R14 R16 R17 R19 R20 R48 R50 R52 R53 R61 R70 R71	RES, MF, 1/8, 1%, 499	RN55D-4990F	TRW	4701-03-4990	13
R31 R34	RES, MF, 1/8W, 1%, 4.99K	RN55D-4991F	TRW	4701-03-4991	2
R24	RES, MF, 1/8W, 1%, 51.1	RN55D-51R1F	TRW	4701-03-5119	1
R49	RES, MF, 1/8W, 1%, 5.76K	RN55D-5761F	TRW	4701-03-5761	1
R42 R45 R56	RES, MF, 1/8W, 1%, 681	RN55D-6810F	TRW	4701-03-6810	3
R67	RES, MF, 1/8W, 1%, 78.7	RN55D-78R7F	TRW	4701-03-7879	1
R33 R40	RES, MF, 1/8W, 1%, 825	RN55D-8250F	TRW	4701-03-8250	2
R37 R46	RES, MF, 1/8W, 1%, 8.25K	RN55D-8251F	TRW	4701-03-8251	2
R35 R36	RES, MF, 1/4W, 1%, 1M	RN60D-1004F	TRW	4701-13-1004	2
R15 R21	RES MODULE	4310R-101-471	BOURN	4770-00-0009	2

WAVETEK PARTS LIST | TITLE PCA, 2ND DIGIT TRANS | ASSEMBLY NO. 1100-00-0704 | PAGE: 4 | REV J

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
	QTY: 1. 8001-01-1600				

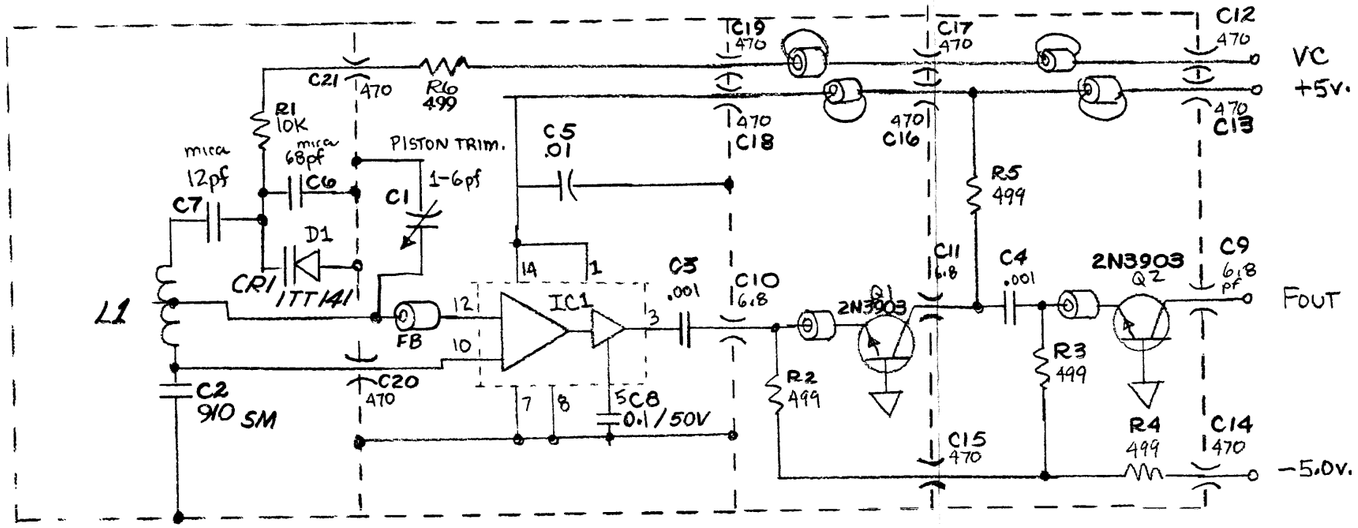
WAVETEK PARTS LIST | TITLE PCA, 2ND DIGIT TRANS | ASSEMBLY NO. 1100-00-0704 | PAGE: 6 | REV J

NOTE UNLESS OTHERWISE SPECIFIED

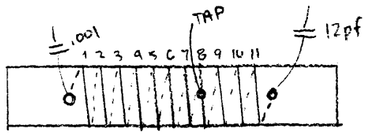
REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST PCA, 2ND DIGIT TRANS
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ± 1 XX ± .030		MODEL NO 172B · DWG NO 1100-00-0704 · REV J
	DO NOT SCALE DWG		CODE IDENT 23338 · SHEET 1 OF 1
	SCALE		

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-3894

REV	ECN	BY	DATE	APP
A	PISTON TRIMMER MOVED	TVS	JUNE 76	TVS
B	CHANGED: C2 FROM .001 TO 910	DC	22377	TVS



L1: COIL DETAIL



$(\frac{1}{2}+11+\frac{1}{2})t$ ON 3/8 PLEX ROD

AS PER DWG.# 1400-00-6150

IC1: PRETESTED MC1648

Q1, Q2: " 2N3903

D1: ITT 141 DIODE

470pf feThru: 10

6.8pf " 3

-Vcc correction: 24Feb

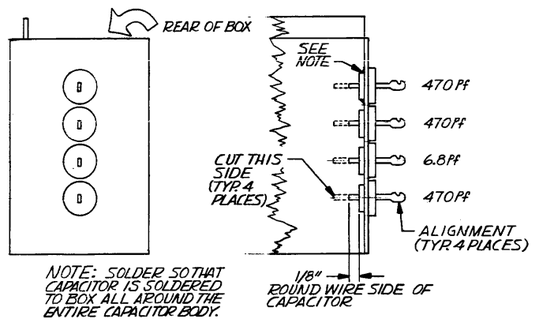
NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN T.V. Soliga	DATE 16 Feb	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR T. V. Soliga	SEPT 8 '77	TITLE: 60.4 MHz VCO MODULE FOR SUM LOOP
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1° .XX ±.030		
	DO NOT SCALE DWG		MODEL NO. / DWG NO. 0103-00-0520 / REV B
	SCALE		CODE IDENT 23338 / SHEET 1 OF 1

ASSEMBLY SEQUENCE

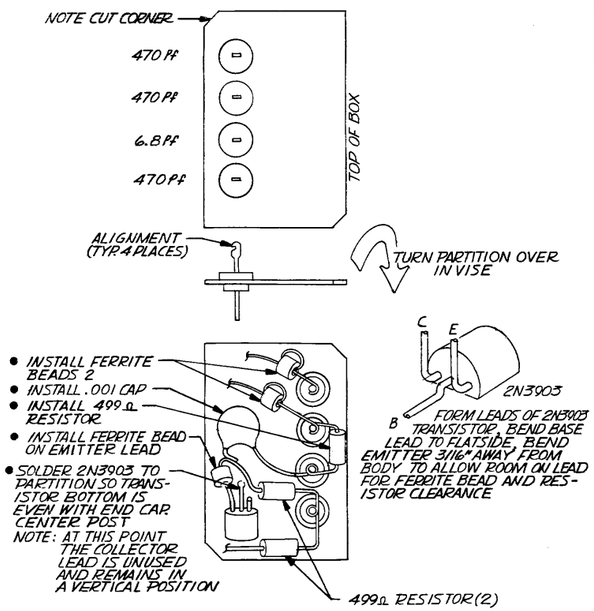
● STEP 1 SOLDER CORNERS OF BOX

STEP 2 STAND BOX ON END WITH WEIGHT. INSERT FEED THRU CAPACITORS AND ALIGN TERMINALS ON CAPACITORS IN SAME DIRECTION AS SHOWN.



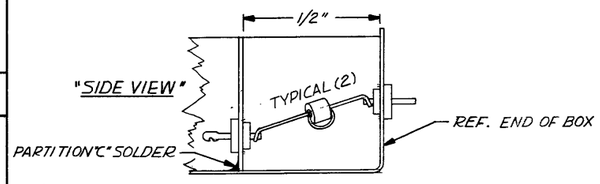
NOTE: SOLDER SO THAT CAPACITOR IS SOLDERED TO BOX ALL AROUND THE ENTIRE CAPACITOR BODY.

● STEP 3 HOLD CORNER OF PARTITION "C" IN BENCH VISE. INSTALL FEED THRU CAPACITORS AND ALIGN TERMINALS.

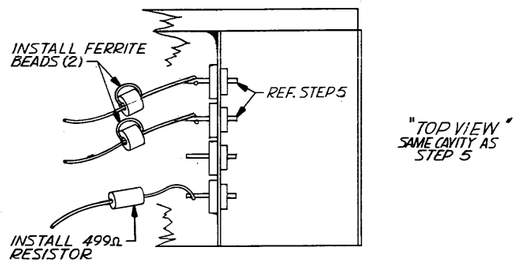


NOTE: UNLESS OTHERWISE SPECIFIED

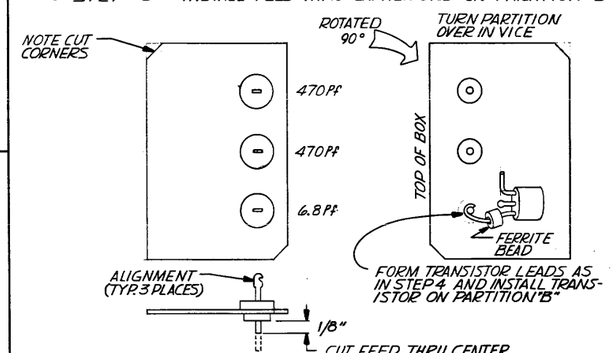
● STEP 4 SOLDER PARTITION "C" INTO BOX 1/2" FROM END OF BOX, MAKE COMPLETE SOLDER BEAD AROUND REAR AND BOTTOM OF BOX AND CONNECT LEADS FROM PARTITION TO FEED THRU CAPACITOR TERMINALS.



● STEP 5 INSTALL PARTS ON REAR OF PARTITION "C"

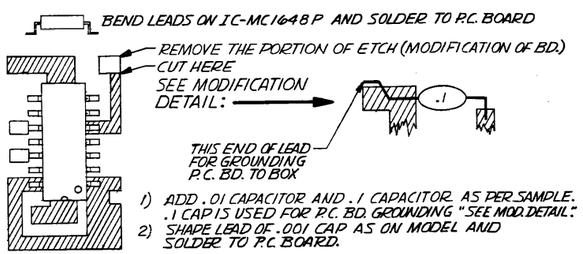


● STEP 6 INSTALL FEED THRU CAPACITORS ON PARTITION "B"



● STEP 7 INSTALL PARTITION "B" IN BOX, LAY COVER "A" OVER PARTITION "C" AREA FOR SPACER. AVOID GETTING EXCESS SOLDER ON BOTTOM OF BOX IN CENTER COMPARTMENT.

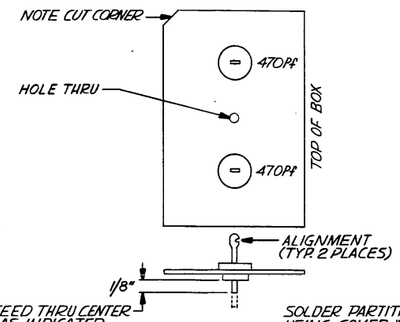
● STEP 8 BUILD P.C. BOARD FOR CENTER COMPARTMENT



1) ADD .01 CAPACITOR AND .1 CAPACITOR AS PER SAMPLE. .1 CAP IS USED FOR P.C. BD. GROUNDING "SEE MOD. DETAIL."
2) SHAPE LEAD OF .001 CAP AS ON MODEL AND SOLDER TO P.C. BOARD.

GLUE P.C. BD. TO BOX WITH RTV IN A POSITION WHERE THE .001 CAP LEAD REACHES THE FEED THRU CAP. TERMINAL AND THE .1 CAP WILL CLEAR THE TRIMMER CAP. WHEN INSTALLED.

● STEP 9 SOLDER FEED THRU CAPACITORS INTO PARTITION "A"

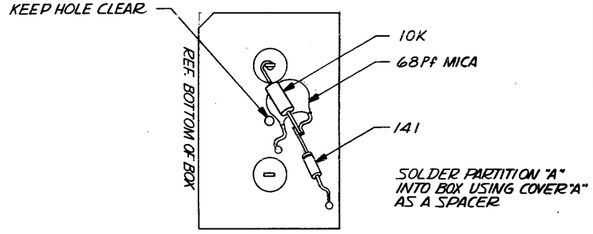


● STEP 10 INSTALL TRIMMER CAPACITOR IN MIDDLE COMPARTMENT AND COMPLETE WIRING OF MIDDLE COMPARTMENT AS PER SAMPLE.

CAUTION: GLASS PISTON TRIMMERS ARE VERY FRAGILE TIGHTEN MOUNTING NUT WITH 5/16" OPEN END WRENCH (THIN TYPE) HOLDING CAPACITOR WITH A 7/32" OPEN END WRENCH ON FLATTENED THREADS. ALLOW SLIGHT LOOP IN WIRE FROM CAPACITOR TO P.C. BOARD TO PREVENT STRAIN ON THE CAPACITOR.

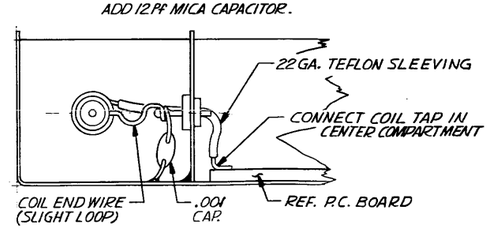
NOTE: SGE146 TRIMMER CAP IS INSTALLED BY SOLDER INSTEAD OF A MOUNTING NUT

● STEP 11 INSTALL: 10K RESISTOR
68 Pf MICA CAPACITOR
ITT 141 VARICAP
ON PARTITION "A" AS PER SAMPLE. DO NOT BLOCK CENTER HOLE IN PARTITION "A" WITH 68 Pf CAP.



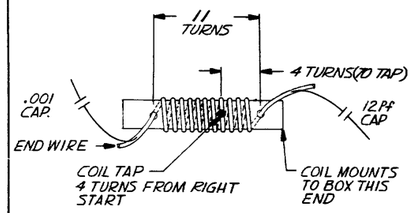
● STEP 12 INSTALL COIL IN END COMPARTMENT WITH 6/32 x 1/4 SCREW AND LOCKWASHER. COIL TAP IS INSULATED WITH 22 GA. TEFLON SLEEVING AND FED INTO CENTER COMPARTMENT. SOLDER END WIRE OF COIL TO FEED THRU CAPACITOR WITH SLIGHT LOOP IN WIRE, NOT DIRECT.

ADD 12 Pf MICA CAPACITOR.



FOR COIL WINDING SEE: "COIL DETAIL"

REV	ECN	BY	DATE	APP



COIL DETAIL

NOTE: USE 20 GA. WIRE AND COAT COIL WIRE WITH POLYSTYRINE Q-DOPE

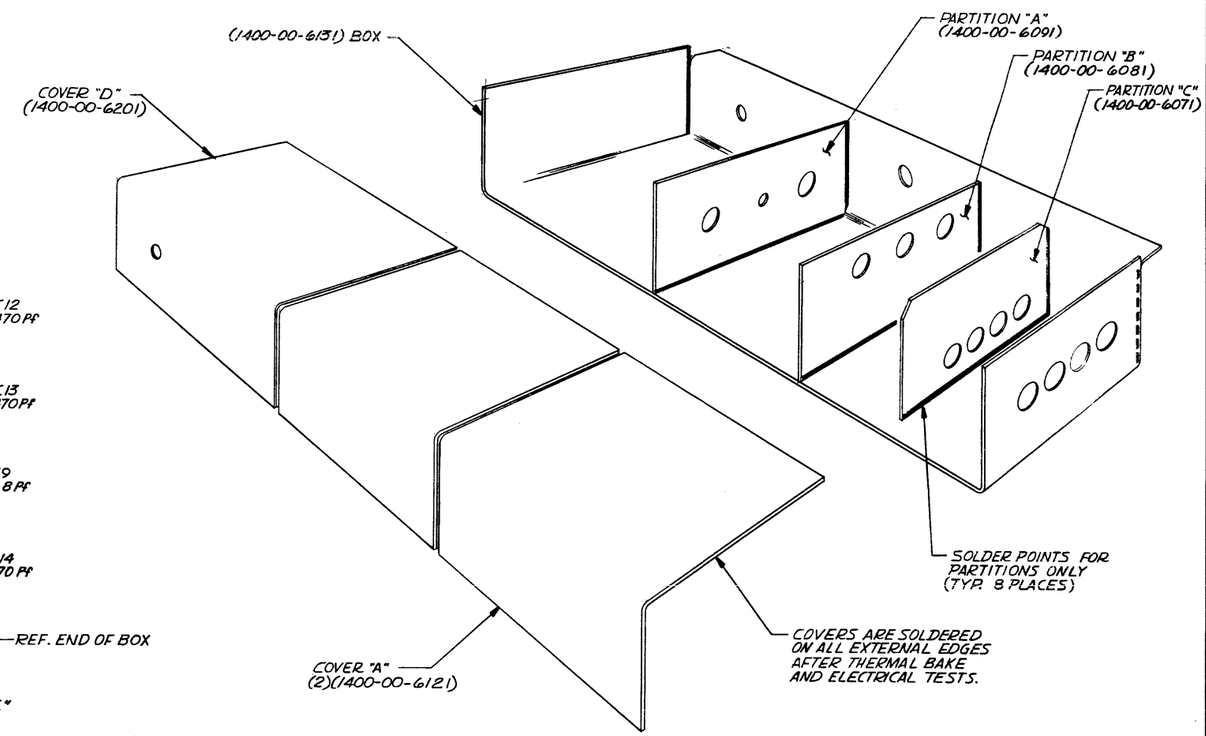
C	ECN 1693 & 1687	RO	3/1978

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN D. COOPER	DATE 7-29-76	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR T. Solga	SEPT 8'77	TITLE ASSEMBLY 60.4 MHz VCO MODULE, DIGITS 2 AND 3
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1° XX ±.030		
	DO NOT SCALE DWG	MODEL NO.	DWG NO. 0102-00-0520 REV C
	SCALE	CODE IDENT 23338	SHEET 1 OF 2

0102-00-0520

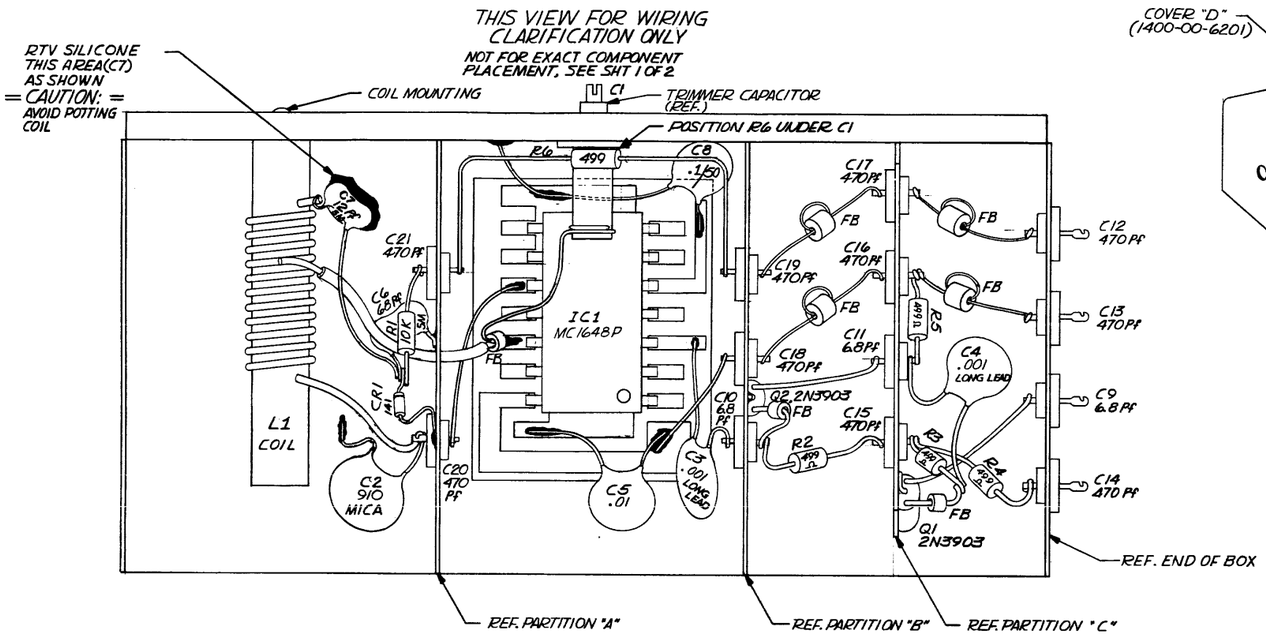
REV	ECN	BY	DATE	APP

PARTITIONS AND COVERS INSTALLATION

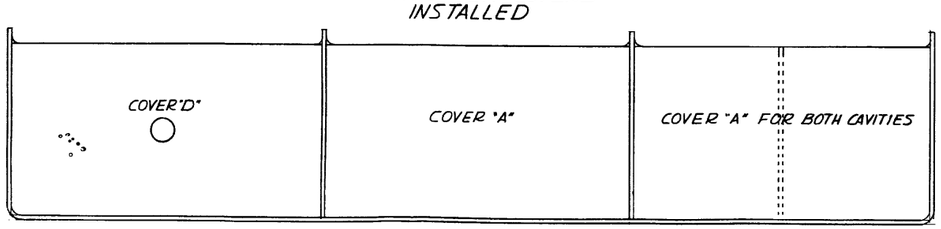


THIS VIEW FOR WIRING CLARIFICATION ONLY

NOT FOR EXACT COMPONENT PLACEMENT, SEE SHT 1 OF 2



THIS VIEW COVERS INSTALLED



NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN D. COOPER	DATE 7-30-76	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR Tom Saliga	DATE SEPT 8'77	TITLE ASSEMBLY 60.4 MHz VCO MODULE, DIGITS 2 AND 3
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1° .XX ±.030		
	DO NOT SCALE DWG	MODEL NO.	DWG NO. 0102-00-0520 REV C
	SCALE	CODE IDENT 23338	SHEET 2 OF 2

0102-00-0520

REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG, VCO MOD	0102-00-00520	WVTK	0102-00-0520	1
NONE	SCHEMATIC, VCO MOD	0103-00-0520	WVTK	0103-00-0520	1
NONE	INDUCTOR, 60.4MHZ	172-604	WVTK	1204-00-0604	4
NONE	PARTITION "C"	1400-00-6071	WVTK	1400-00-6071	1
NONE	PARTITION (B)	1400-00-6081	WVTK	1400-00-6081	1
NONE	PARTITION (A)	1400-00-6091	WVTK	1400-00-6091	1
NONE	COVER (A)	1400-00-6121	WVTK	1400-00-6121	2
NONE	BOX, OSCILLATOR	1400-00-6131	WVTK	1400-00-6131	1
L1	COIL FORM	1400-00-6150	WVTK	1400-00-6150	1
NONE	COVER (D)	1400-00-6201	WVTK	1400-00-6201	1
C3 C4	CAP, CER, .001MF, 1KV	DD-102 LONG LEAD	CRL	1500-01-0201	2
C5	CAP, CER, MN, .01MF, 50V	CAC02Z5U103Z100A	CORNG	1500-01-0310	1
C7	CAP, MICA, 12PF, 500V	DM15-120J	ARCO	1500-11-2000	1
C6	CAP, MICA, 68PF, 500V	DM15-680J	ARCO	1500-16-8000	1
C2	CAP, 910PF, 100V, 1%	DM15-911F	ARCO	1500-19-1101	1
C1	CAP, PISTON TRIMMER	GS0146	SPRGD	1500-50-9000	1
C12 C13 C14 C15 C16 C17 C18 C19 C20 C21	CAP, FTHRU, 470PF, 500V	54-794-010-X5R0-471M	SPECT	1500-64-7106	10

WAVETEK PARTS LIST | TITLE 60.4MHZ VCO MOD | ASSEMBLY NO. 1206-00-0520 | PAGE: 1 | REV C

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
C10 C11 C9	CAP, FTHRU, 6.8PF, 500V	54-794-010-X5E0-689M	SPECT	1500-66-8906	3
C8	CAP, CER, .1MF, 50V	D045BX104MP	WSTCP	1509-90-0011	1
NONE	60.4MHZ VCO MODULE	1700-00-0520	WVTK	1700-00-0520	1
NONE	FERRITE BEAD	56-590-65/3B	FERRX	3100-00-0001	3
R1	RES, MF, 1/8W, 1%, 10K	RN55D-1002F	TRW	4701-03-1002	1
R2 R3 R4 R5 R6	RES, MF, 1/8, 1%, 499	RN55D-4990F	TRW	4701-03-4990	5
CR1	DIODE	141	ITT	4803-02-0141	1
Q1 Q2	TRANS	2N3903	NSC	4901-03-9030	2
IC1	IC	MC1648P	MOT	8100-16-4810	1

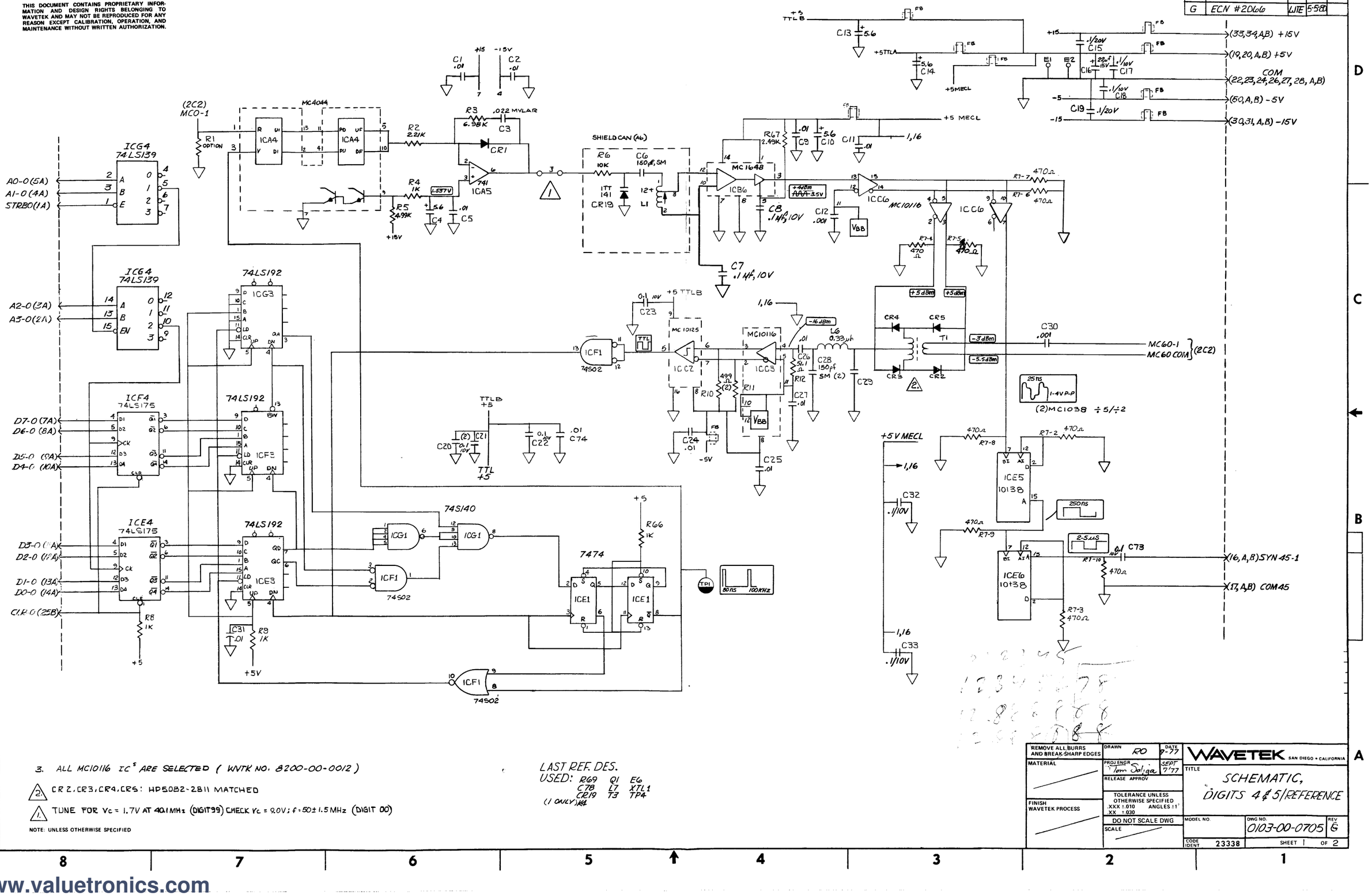
WAVETEK PARTS LIST | TITLE 60.4MHZ VCO MOD | ASSEMBLY NO. 1206-00-0520 | PAGE: 2 | REV C

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST 60.4 MHZ VCO MOD
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ± 1 XX ± .030		
	DO NOT SCALE DWG	MODEL NO 172B	DWG NO 1206-00-0520 REV C
	SCALE	CODE IDENT 23338	SHEET 1 OF 1

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A 3894

REV	ECN	BY	DATE	APP
F	ECN 1687	RO	4-18-78	
G	ECN #2066	LITE	5-5-80	



3. ALL MC10116 IC'S ARE SELECTED (WVTK NO. 8200-00-0012)

2. CR2, CR3, CR4, CR5: HP5082-2811 MATCHED

1. TUNE FOR Vc = 1.7V AT 40.1MHz (DIGIT 99) CHECK Vc = 9.0V; f = 50 ± 1.5 MHz (DIGIT 00)

NOTE: UNLESS OTHERWISE SPECIFIED

LAST REF. DES. USED:

R69	Q1	E6	
C78	L7	XTL1	
CR19	T3	TP4	

(1 ONLY) R4

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN RO	DATE 9-77	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR Tom Salga	SEPT 7'77	TITLE SCHEMATIC, DIGITS 4 & 5/REFERENCE
FINISH WAVETEK PROCESS	RELEASE APPROV		
	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1° .XX ±.030		
	DO NOT SCALE DWG	MODEL NO.	DWG NO. 0103-00-0705 REV G
	SCALE	CODE IDENT 23338	SHEET 1 OF 2

REV	ECN	BY	DATE	APP

+5V TTLA — P.I
+15V — P.I — +15
-15V — P.I — -15

REF/osc & VCXO

X3 MULT

X2 MULT

OPTION ONLY

REF DIVIDERS

LOOP FILTER

VCO LINEARIZER

LOCK DET.

EXT SIG LEVEL DET

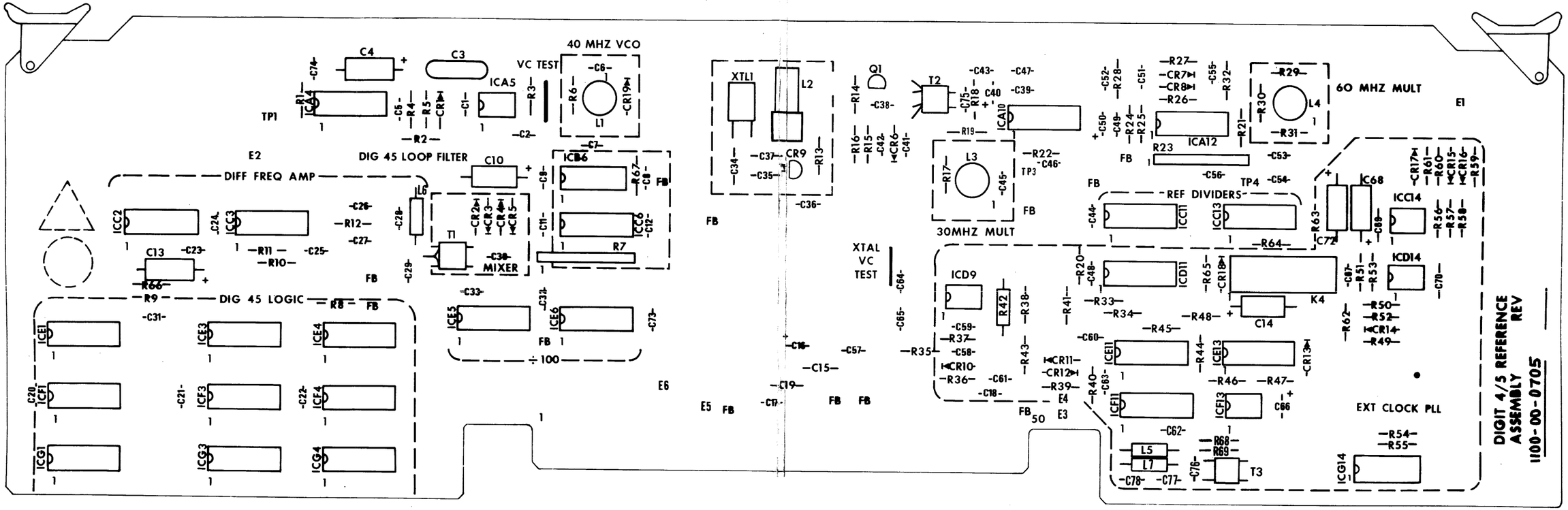
LOCK -Ø	CAUT -Ø	MEANING
0	0	(NEVER HAPPENS)
0	1	HAPPY - EXT STD
1	0	ALARM - PROBLEM
1	1	HAPPY - INT STD

LAST REF. DES. USED: R69 C1 E6 C78 L7 XTL1 CR19 T3 TP4
1 RELAY, REF K4

8. USE FERRITE BEAD NO. 3100-00-0002.
7. ALL .001, .01 & .1 CAPS ARE CERAMIC DISC.
6. DIODES UNMARKED ARE FD6666
5. XTL1: 10.00 MHz CRYSTAL PER SPEC.
4. VC10 JUMPERS TO ITSELF ON SAME PCB; @ T.P. : -0.4v To -5 vdc RANGE (±100∿)

NOTE: UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN RO	DATE 6-11-76	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR Tom Sallee	SEPT 7/77	TITLE SCHEMATIC, DIGITS 4&5/REFERENCE
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED .XXX ±.010 ANGLES ±1° .XX ±.030		
	DO NOT SCALE DWG	MODEL NO.	DWG NO. 0103-00-0705 REV 6
	SCALE	CODE IDENT 23338	SHEET 2 OF 2



1100-00-0705

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: DIGITS 4 & 5 / REF PCA
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ± .010 ANGLES ± 1 XX ± .030		
	DO NOT SCALE DWG		MODEL NO 1726 · DWG NO 0101-00-0705 · REV
	SCALE		CODE IDENT 23338 · SHEET 1 OF 1

REV	ECN	BY	DATE	APP

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	ASSY DRWG, DIGIT 4&5	0101-00-0705	WVTK	0101-00-0705	1
NONE	SCHEMATIC, DIGIT 4-5	0103-00-0705	WVTK	0103-00-0705	1
T1	TRANSFORMER MIXER	172-538	WVTK	1204-00-0538	1
T2	TRANSFORMER	172-540	WVTK	1204-00-0540	1
L1	COIL, 40MC VCO	172-541	WVTK	1204-00-0541	1
L3	COIL, 30MC MULT	172-543	WVTK	1204-00-0543	1
L4	COIL, 60MC MULT	172-544	WVTK	1204-00-0544	1
L2	COIL, XTAL TUNE	1204-00-0627	WVTK	1204-00-0627	1
NONE	SHIELD, SYNTH	1400-00-6193	WVTK	1400-00-6193	1
NONE	SHIELD, OSC	1400-00-6631	WVTK	1400-00-6631	1
C58	CAP, CER, 10PF, 1KV	DD-100LL	CRL	1500-01-0001	1
C12 C30 C36 C55	CAP, CER, .001MF, 1KV	DD-102 LONG LEAD	CRL	1500-01-0201	4
C1 C11 C2 C24 C25 C26 C27 C31 C41 C42 C43 C44 C47 C48 C49 C5 C52 C56 C57 C59 C60 C61 C63 C64 C65 C67 C74 C9	CAP, CER, MIN, .01MF, 50V	CAC02Z5U103Z100A	CORNG	1500-01-0310	28
C15 C17 C18 C19 C20 C21 C22 C23 C32 C33 C39 C62 C69 C7 C70	CAP, CER, MON, .1MF, 50V	CAC03Z5U104Z050A	CORNG	1500-01-0405	17

WAVETEK PARTS LIST | TITLE PCA, DIGIT 4-5 | ASSEMBLY NO. 1100-00-0705 | PAGE: 1 | REV E

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
NONE	PIN, MALE	61182-2	AMP	2100-05-0020	2
XTL1	CRYSTAL, 10MHZ	172-010	WVTK	2300-99-0007	1
NONE	STANDOFF	SS5368-3C-5A	UNICP	2800-05-6114	5
NONE	PC BD EJECTOR	103 BROWN	CALMK	2800-07-0009	2
NONE	TRANSIPAD	10123N	METRS	2800-11-0003	12
NONE	COIL SHIELD 3/4"	734-21	AURA	3000-00-0015	3
NONE	BALUN CORE	2873000902	FARIT	3100-00-0002	12
K4	RELAY, REED, FORM-A	RA3019-1051	ETROL	4500-00-0007	1
R16 R24 R25	RES, MF, 1/8W, 1%, 100	RN55D-1000F	TRW	4701-03-1000	3
R35 R4 R44 R66 R8 R9	RES, MF, 1/8W, 1%, 1K	RN55D-1001F	TRW	4701-03-1001	6
R15 R48 R49 R56 R58 R6	RES, MF, 1/8W, 1%, 10K	RN55D-1002F	TRW	4701-03-1002	6
R59	RES, MF, 1/8W, 1%, 12.1K	RN55D-1212F	TRW	4701-03-1212	1
R31	RES, MF, 1/8W, 1%, 150	RN55D-1500F	TRW	4701-03-1500	1
R60 R65	RES, MF, 1/8W, 1%, 1.5K	RN55D-1501F	TRW	4701-03-1501	2
R38 R46 R52 R53	RES, MF, 1/8W, 1%, 150K	RN55D-1503F	TRW	4701-03-1503	4
R27	RES, MF, 1/8W, 1%, 200	RN55D-2000F	TRW	4701-03-2000	1
R36 R54 R55	RES, MF, 1/8W, 1%, 2K	RN55D-2001F	TRW	4701-03-2001	3

WAVETEK PARTS LIST | TITLE PCA, DIGIT 4-5 | ASSEMBLY NO. 1100-00-0705 | PAGE: 3 | REV E

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R23 R7	RES MODULE	4310R-101-471	BOURN	4770-00-0009	2
CR19	DIODE	141	ITT	4803-02-0141	1
CR9	DIODE	MV2109	MOT	4803-02-2109	1
CR1 CR10 CR11 CR12 CR13 CR14 CR15 CR16 CR17 CR18 CR6	DIODE	1N4148	FAIR	4807-02-6666	11
CR7 CR8	DIODE	5082-2811	HP	4809-02-2811	2
CR2 CR3 CR4 CR5	DIODE, SET, 5082-2811 QTY: 4: 4809-02-2811	4898-00-0012	WVTK	4898-00-0012	1
Q1	TRANS	2N3903	NSC	4901-03-9030	1
ICF13	IC	NE555V	SIG	7000-05-5500	1
ICA5 ICC14 ICD14 ICD9	IC	LM741CN	NSC	7000-07-4100	4
ICF1	IC	74S02	SIG	8000-74-0201	1
ICD11	IC	7404	TI	8000-74-0400	1
ICG14	IC	7438	TI	8000-74-3800	1
ICE1	IC	7474	TI	8000-74-7400	1
ICE13	IC	74LS74	TI	8000-74-7410	1
ICE11	IC	7486	TI	8000-74-8600	1
ICC2	IC	MC10125P	MOT	8001-01-2500	1

WAVETEK PARTS LIST | TITLE PCA, DIGIT 4-5 | ASSEMBLY NO. 1100-00-0705 | PAGE: 5 | REV E

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
C73 C8					
C51	CAP, CER, 15PF, 1KV	DD-150	CRL	1500-01-5011	1
C46	CAP, MICA, 100PF, 500V	DM15-101J	ARCO	1500-11-0100	1
C53	CAP, MICA, 15PF, 500V	DM15-150J	ARCO	1500-11-5000	1
C28 C29 C6	CAP, MICA, 150PF, 500V	DM15-151J	ARCO	1500-11-5100	3
C45	CAP, MICA, 30PF, 500V	DM15-300J	ARCO	1500-13-0000	1
C34 C38	CAP, MICA, 39PF, 500V	DM15-390J	ARCO	1500-13-9000	2
C75T	CAP, MICA, 56PF, 500V	DM15-560J	ARCO	1500-15-6000	1
C37	CAP, MICA, 68PF, 500V	DM15-680J	ARCO	1500-16-8000	1
C35 C54	CAP, MICA, 82PF, 500V	DM15-820J	ARCO	1500-18-2000	2
C3	CAP, MYLAR, .022MF100V	225P22391WD3	SPRAG	1500-42-2314	1
C16 C40 C50 C66	CAP, TANT, 22MF, 15V	196D226X9015KA1	SPRAG	1500-72-2601	4
C10 C13 C14 C4 C68 C72	CAP, TANT, 5.6MF, 35V	150D565X9035B2	SPRAG	1500-75-6302	6
NONE	4TH/5TH FREG REF BD	1700-00-0705	WVTK	1700-00-0705	1
L5	CHOKE, 82MH, 5%	1537-72	DLVAN	1800-00-0005	1
L6	CHOKE, .33MH, 5%	1537-04	DLVAN	1800-00-0009	1
NONE	SKT, IC, 16PIN	DILB-16P-108	BURND	2100-03-0028	1

WAVETEK PARTS LIST | TITLE PCA, DIGIT 4-5 | ASSEMBLY NO. 1100-00-0705 | PAGE: 2 | REV E

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
R14 R2	RES, MF, 1/8W, 1%, 2.21K	RN55D-2211F	TRW	4701-03-2211	2
R19 R26 R33 R47	RES, MF, 1/8W, 1%, 249	RN55D-2490F	TRW	4701-03-2490	4
R67	RES, MF, 1/8W, 1%, 2.49K	RN55D-2491F	TRW	4701-03-2491	1
R17 R20	RES, MF, 1/8W, 1%, 301	RN55D-3010F	TRW	4701-03-3010	2
R41	RES, MF, 1/8W, 1%, 3.32K	RN55D-3321F	TRW	4701-03-3321	1
R37 R62 R64	RES, MF, 1/8W, 1%, 33.2K	RN55D-3322F	TRW	4701-03-3322	3
R51	RES, MF, 1/8W, 1%, 3.92K	RN55D-3921F	TRW	4701-03-3921	1
R10 R11 R22 R29 R30 R32 R39 R40	RES, MF, 1/8, 1%, 499	RN55D-4990F	TRW	4701-03-4990	8
R28 R43 R45 R5 R57	RES, MF, 1/8W, 1%, 4.99K	RN55D-4991F	TRW	4701-03-4991	5
R13	RES, MF, 1/8W, 1%, 49.9K	RN55D-4992F	TRW	4701-03-4992	1
R12 R18 R34	RES, MF, 1/8W, 1%, 51.1	RN55D-51R1F	TRW	4701-03-5119	3
R63	RES, MF, 1/8W, 1%, 6.19K	RN55D-6191F	TRW	4701-03-6191	1
R3	RES, MF, 1/8W, 1%, 6.98K	RN55D-6981F	TRW	4701-03-6981	1
R50	RES, MF, 1/8W, 1%, 69.8K	RN55D-6982F	TRW	4701-03-6982	1
R61	RES, MF, 1/8W, 1%, 750	RN55D-7500F	TRW	4701-03-7500	1
R21	RES, MF, 1/8W, 1%, 78.7	RN55D-78R7F	TRW	4701-03-7879	1
R42	RES, MF, 1/2W, 1%, 1.5M	RN65D-1504F	TRW	4701-23-1504	1

WAVETEK PARTS LIST | TITLE PCA, DIGIT 4-5 | ASSEMBLY NO. 1100-00-0705 | PAGE: 4 | REV E

REFERENCE DESIGNATORS	PART DESCRIPTION	ORIG-MFGR-PART-NO	MFGR	WAVETEK NO.	QTY/PT
ICE5 ICE6	IC	MC10138P	MOT	8001-01-3800	2
ICG4	IC	74LS139	SIG	8007-41-3910	1
ICG1	IC	74S140	TI	8007-41-4001	1
ICE4 ICF4	IC	74LS175	TI	8007-41-7510	2
ICE3 ICF3 ICG3	IC	74LS192	TI	8007-41-9210	3
ICC11 ICC13	IC	74LS290	TI	8007-42-9010	2
ICB6	IC	MC1648P	MOT	8100-16-4810	1
ICA4	IC	MC4044P	MOT	8100-40-4400	1
ICA10 ICA12 ICC3 ICC6 ICF11	IC, SEL, MC10116P QTY: 1: 8001-01-1600	8200-00-0012	WVTK	8200-00-0012	5

WAVETEK PARTS LIST | TITLE PCA, DIGIT 4-5 | ASSEMBLY NO. 1100-00-0705 | PAGE: 6 | REV E

NOTE UNLESS OTHERWISE SPECIFIED

REMOVE ALL BURRS AND BREAK SHARP EDGES	DRAWN	DATE	WAVETEK SAN DIEGO • CALIFORNIA
MATERIAL	PROJ ENGR		TITLE: PARTS LIST PCA, DIGIT 4-5
	RELEASE APPROV		
FINISH WAVETEK PROCESS	TOLERANCE UNLESS OTHERWISE SPECIFIED XXX ±.010 ANGLES ±1 XX ±.030		
	DO NOT SCALE DWG		MODEL NO 172B / DWG NO. 1100-00-0705 / REV E
	SCALE		CODE IDENT 23338 / SHEET 1 OF 1

BISHOP GRAPHICS/ACCUPRESS REORDER NO. A-3894

Table A-1. American Standard Code for Information Interchange (ASCII)

b7 b6 b5 / BITS					0_0	MSG[1]	0_1	MSG	$0_1{}_0$	MSG	$0_1{}_1$	MSG	$1_0{}_0$	MSG	$1_0{}_1$	MSG	$1_1{}_0$	MSG	$1_1{}_1$	MSG
b4	b3	b2	b1	column / row	0		1		2		3		4		5		6		7	
0	0	0	0	0	NUL		DLE		SP		0		@		P		\		p	
0	0	0	1	1	SOH	GTL	DC1	LLO	!		1		A		Q		a		q	
0	0	1	0	2	STX		DC2		"		2		B		R		b		r	
0	0	1	1	3	ETX		DC3		#		3		C		S		c		s	
0	1	0	0	4	EOT	SDC	DC4	DCL	$		4		D		T		d		t	
0	1	0	1	5	ENQ	PPC[3]	NAK	PPU	%		5		E		U		e		u	
0	1	1	0	6	ACK		SYN		&		6		F		V		f		v	
0	1	1	1	7	BEL		ETB		'		7		G		W		g		w	
1	0	0	0	8	BS	GET	CAN	SPE	(		8		H		X		h		x	
1	0	0	1	9	HT	TCT	EM	SPD	)		9		I		Y		i		y	
1	0	1	0	10	LF		SUB		*		:		J		Z		j		z	
1	0	1	1	11	VT		ESC		+		;		K		[		k		{	
1	1	0	0	12	FF		FS		,		<		L		\		l		|	
1	1	0	1	13	CR		GS		-		=		M		]		m		}	
1	1	1	0	14	SO		RS		.		>		N		^		n		~	
1	1	1	1	15	SI		US		/		?	UNL	O		_	UNT	o		DEL	

MLA ASSIGNED TO DEVICE

MTA ASSIGNED TO DEVICE

MEANING DEFINED BY PCG CODE

ADDRESSED COMMAND GROUP (ACG)

UNIVERSAL COMMAND GROUP (UCG)

LISTEN ADDRESS GROUP (LAG)

TALK ADDRESS GROUP (TAG)

PRIMARY COMMAND GROUP (PCG)

SECONDARY COMMAND GROUP (SCG)

[1]MSG = INTERFACE MESSAGE
[2]b1 = DIO1 . . . b7 = DIO7
[3]REQUIRES SECONDARY COMMAND
[4]DENSE SUBSET (COLUMN 2 THROUGH 5)

DC4	= DCL	Device clear	Universal Command Group
DC1	= LLO	Local lockout	
NAK	= PPU	Parallel poll unconfigure	
EM	= SPD	Serial poll disable	
CAN	= SPE	Serial poll enable	
SOH	= GTL	Go to local	Addressed Command Group
EOT	= SDC	Selected device clear	
ENQ	= PPC	Parallel poll configure	
BS	= GET	Group execute trigger	
HT	= TCT	Take control	

APPENDIX B

Table B-1. Programming Command Summary

Control and Data Names	Model 172B Key	ASCII Character
Clear Entry	CLR	None
Activate Keyboard	LOCAL	None
Invert and minus	+/−	—
Decimal point	.	.
0	0	0
1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9
Amplitude	AMPL	A
Operating mode	MODE	B
Function (waveform)	FUNC	C
Reference offset	OFST	D
×10 multiplier	EXP	E
Frequency	FREQ	F
Bus address status	ADR	G
Execute	EXEC	I
Trigger	TRIG	J
GET mode	GET	O
50Ω load condition	OUTP	P
Recall commands	CMD RCL	R
Symmetry	SYM	S
Amplitude definition	AMPL DEF	V
Display	(None)	'
Talk response	TLK	T
Previous setting	LAST	U
End of string	TRM	X
Service request	SRQ	Q
Store setting	STOR	M
Recall setting	RCL	Y
Next setting	NEXT	W
Recall fast	(None)	Z

Number of Significant Digits	
Frequency	5 floating (6 when overranging, 10 MHz)
Amplitude	3 floating (4 when overranging, 10V p-p)
Offset	3 floating
All other	1 floating

SRQ (Q) Code	
Off	0
Enabled	1

Function (C) Codes	
Sine	0
Triangle	1
Square	2
None	3
DC	4
+ Pulse	6
− Pulse	7

Mode (B) Codes	
Continuous	0
Triggered	1
Gated	2
Synthesized	3
Triggered haverwave	4
Gated haverwave	5
External phase lock	6

Output Load (P) Codes	
Load out, output on	0
Load in, output on	1
Load out, output off	2
Load in, output off	3

Symmetry (S) Codes	
50%	0 or 5
10% thru 90%	1 thru 9

GET (O) Codes	
Execute and trigger	0
Go to next program, execute and trigger	+1
Go to previous program, execute and trigger	−1

Ampl Def (V) Codes	
V p-p into 50Ω	0
Vrms	1
dBm into 50Ω	2

Talk (T) Codes	
Status	0
Error status	1
SRQ reason	2
Last setting	4

APPENDIX C

Table C-1. 172B Programming Examples

In the following examples, the 172B GPIB address switches are set to 00001. Therefore, the 172B's address on the HP 9825 calculator is 701 (the 7 selects the GPIB interface card, and the 01 selects the 172B). Also, the 172B's address on the HP 9830 calculator is then "!" (Listen address, ASCII exclamation point) or "A" (Talk address, ASCII letter A). Send CMD "?U!" to write; CMD "?A5" to read.

Example 1. Sweep amplitude from 1 to 11 volts in 10 millivolt steps.

Program for the HP 9825 (HPL Language).

Program	Remarks
0: wrt 701,"D0F1E4B0C1P1S3"	Set up other 172B waveform parameters: 0 volts offset, 10 kHz frequency, continuous mode, triangle waveshape, load and output connected, and 30% symmetry. Note that since the Execute action (designated by the letter "I") is not programmed, this information is not yet programmed into the waveform generator circuits. This will happen when the first amplitude is programmed.
1: 1→A	The variable A will be used to hold the current value of the amplitude being sent to the instrument.
2: wrt 701,"A",A,"I"	Send amplitude value to 172B. This is done by sending first the ASCII letter A, then the amplitude in variable A, followed by the letter I, which causes the Execute action, that transfers the information programmed since the last Execute was sent to the waveform generator circuits.
3: A+.01→A	Increment amplitude variable by 10 millivolts.
4: if A<=11;gto 2	Test if value of amplitude variable is less than or equal to 11 volts. If so, go back to statement 2 and send another amplitude. If not, proceed to statement 5.
5: stp	Stop program.

Program for the HP 9830 (BASIC Language).

1000 CMD"?U!","D0F1E4B0C1P1S3"	Set up other 172B waveform parameters: 0 volts offset, 10 kHz frequency, continuous mode, triangle waveshape, load and output connected and 30% symmetry. Note that since the Execute action (designated by the letter "I") is not programmed, this information is not yet programmed into the waveform generator circuits. This will happen when the first amplitude is programmed.
1010 FOR A = 1 TO 11 STEP .01	The variable A will be used to hold the current value of the amplitude being sent to the instrument.

Table C-1. 172B Programming Examples (Continued)

Example 1. Sweep Amplitude from 1 to 11 volts in 10 millivolt steps. (Continued)

Program for the HP 9830 (BASIC Language) (Continued).

Program	Remarks
1020 CMD "?U!"	
1030 OUTPUT (13,*)"A",A,"I"	Send amplitude value to 172B. This is done by sending first the ASCII letter A, then the amplitude in variable A, followed by the letter I which causes the Execute action, that transfers the information programmed since the last Execute was sent to the waveform generator circuits.
1040 NEXT I	Increment A by 10 millivolts and test if 11 volts have been reached.
1050 STOP	Stop program.

Example 2. Testing SRQ bit, polling and reading error message from the 172B.

Program for the HP 9825 (using the rds function)

0: dim E$ [50]	
1: wrt 701,"C30"	Cause an error in the 172B so that it will request service.
2: if bit (7,rds (7));gto 5	Wait at statement 2 until SRQ comes on.
3: dsp "SRQ NOT ON"	
4: gto 2	
5: dsp "SRQ ON"	
6: wrt 701, "T1"	Set 172B Talk message response setting to select the error message. It is necessary to do this before polling because the 9825 polling function sends the instrument talk address before the Serial Poll Enable (SPE) command. Thus, the 172B sees itself briefly addressed as a talker and fetches the selected talk message at that time.
7: rds (701) → A	Poll 172B and put its status byte in the variable A.
8: if A = 69 gto 10	Test if correct status byte (69 = decimal equivalent of ASCII letter E).
9: dsp "BAD STATUS BYTE";stp	If not, status byte is bad.
10: red 701, E$	Read error string into the string variable E$.
11: dsp E$	Display error string. Should look like E 1 C.
12: stp	

Table C-1. 172B Programming Examples (Continued)

Example 2. Testing SRQ bit, polling and reading error message from the 172B. (Continued)

Program for the HP 9830.

Program	Remarks
1000 DIM E$ [50]	
1010 CMD "?U!","C30C"	Cause an error in the 172B so that it will request service.
1020 IF STAT13< =0 THEN 1050	Wait at statement 1020 until SRQ comes on.
1030 DISP "SRQ NOT ON"	
1040 GO TO 1020	
1050 DISP "SRQ ON"	
1060 CMD "?U"	Set up calculator to talk for sending commands.
1070 FORMAT 5B	Binary format for sending commands.
1080 OUTPUT (13,1070)256,95,53,24, 65,512	Perform the following: turn on ATN line; send UNTALK command; send calculator listen address (so calculator can receive status byte); send Serial Poll Enable (SPE) command; send 172B's talk address, which commands it to send the status byte to the calculator; finally, turn off ATN. Note that the 172B's talk address is sent after the SPE command; this ensures that the instrument will not try to access a talk message during a poll.
1090 A=RBYTE13	Poll 172B and put its status byte in the variable A.
1100 IF A=69 THEN 1130	Test if correct status byte (69 = decimal equivalent of ASCII letter E).
1120 STOP	
1130 OUTPUT (13,1070)256,95,25,512	Finish poll by unaddressing 172B (with 95) and sending a Serial Poll Disable command (25).
1140 CMD "?5A"	Address 172B to talk and calculator to listen.
1150 ENTER (13,*) E$	Read error string into the string variable E$.
1160 DISP E$	Display error string. Should look like E 1 C.
1170 STOP	

Table C-1. 172B Programming Examples (Continued)

Example 3. Reading Contents of Stored Settings Into Calculator.

Program for the HP 9825.

Program	Remarks
0: dim S$ [80]	
1: wrt 701,"T0Q1Y",A	Initialize: Select talk response zero, which reports back a condensed reading of amplitude, offset, frequency, mode, function, load and symmetry. Also, enable GPIB Service Request (SRQ) for errors and recall the stored setting selected by the value in the variable A, which has previously been set to the lowest numbered setting to be read.
2: red 701, S$	Read program information just recalled into the variable S$.
3: wrt 701,"W"	Command 172B to advance to and recall next program.
4: (instructions to save S$ on tape or other storage)	
5: wait (100)	Insure that 100 ms have elapsed since the "W" was sent to allow time for the SRQ to be valid. This statement may be unnecessary if statement 4 lasts longer than 100 ms.
6: if not bit (7, rds (7));gto 2	Test if SRQ line is on. If not, go to statement 2 and read next program. If on, the last setting has been read.

Program for the HP 9830.

1000 DIM S$ (80)	
1010 CMD "?U!","T0Q1Y"	Initialize: Select talk response zero, which reports back a condensed reading of amplitude, offset, frequency, mode, function, load and symmetry. Also, enable GPIB Service Request (SRQ) for errors and recall the stored setting selected by the value in the variable A, which has previously been set to the lowest numbered setting to be read.
1020 OUTPUT (13,*) A	
1030 CMD "?A5"	Address 172B to talk and 9830 to listen.
1040 ENTER (13,*) S$	Read program information just recalled into the variable S$.
1050 CMD "?U!","W"	Command 172B to advance to and recall next program.
1060 (instructions to save S$ on tape or other storage)	

Table C-1. 172B Programming Examples (Continued)

Example 3. Reading Contents of Stored Settings Into Calculator (Continued)

Program for the HP 9830 (Continued).

Program	Remarks
1070 WAIT (100)	Insure that 100 ms have elapsed since the "W" was sent to allow time for the SRQ to be valid. This statement may be unnecessary if statement 1060 lasts longer than 100 ms.
1080 IF STAT13>1 THEN 1040	Test if SRQ line is on. If not, go to statement 1040 and read next program. If on, the last setting has been read.

Example 4. Logarithmic frequency sweep using high speed recall of stored settings.

Program for the HP 9825.

0: wrt 701,"A1D0B0C0P1S0"	Initialize settings to produce a 1 volt continuous sine wave.
1: for I = 1 to 240	Generate 240 settings with frequency logarithmically spaced between 1 kHz and 1 MHz.
2: (I−1)/80+3→E	Compute exponent of next frequency.
3: wrt 701,"F",10↑E,"M",I	Send new frequency to instrument and store into the program selected by I.
4: next I	
5: wrt 701,"Y1"	Recall first program to begin sweep.
6: "LOOP": wrt 701,"O1"	Program the 172B to fetch the next stored program when a Group Execute Trigger is sent to it.
7: for I = 1 to 239	Send 239 GETs to the 172B to fetch and execute the stored programs numbered 2 through 240, which will sweep the output frequency from 1 kHz to 1 MHz.
8: trg 701	
9: next I	
10: wrt 701,"O−1"	Program the 172B to fetch the previous stored program when a Group Execute Trigger is sent to it.
11: for I = 1 to 239	Send 239 GETs to the 172B to fetch and execute the stored programs numbered 239 through 1 in descending order, which will sweep the frequency from 1 MHz to 1 kHz.
12: trg 701	

Table C-1. 172B Programming Examples (Continued)

Example 4. Logarithmic frequency sweep using high speed recall of stored settings. (Continued)

Program for the HP 9825 (Continued).

Program	Remarks
13: next I 14: gto "LOOP"	

Program for the HP 9830

1000 CMD "?U!","A1D0B0C0P1S0"	Initialize settings to produce a 1 volt continuous sine wave.
1010 FOR I = 1 TO 240	Generate 240 settings with frequencies logarithmically spaced between 1 kHz and 1 MHz.
1020 E = (I−1)/80+3	Compute exponent of next frequency.
1030 CMD "?U!"	
1040 OUTPUT (13,*)"F",10↑E,"M",I	Send new frequency to instrument and store it into the program selected by I.
1050 NEXT I	
1060 CMD "?U!","Y1"	Recall first program to begin sweep.
1070 CMD "?U!","O1"	Program the 172B to fetch the next stored program when Group Execute Trigger is sent to it.
1080 FOR I = 1 TO 239	Send 239 GETs to the 172B to fetch and execute the stored programs numbered 2 through 240, which will sweep the output frequency from 1 kHz to 1 MHz.
1090 OUTPUT (13,1100)256,8,512;	
1100 FORMAT 3B	
1110 NEXT I	
1120 CMD "?U!","O−1"	Program the 172B to fetch the previous stored program when a Group Execute Trigger is sent to it.
1130 FOR I = 1 TO 239	Send 239 GETs to the 172B to fetch and execute the stored programs numbered 239 to 1 in descending order, which will sweep the frequency from 1 MHz to 1 kHz.
1140 OUTPUT (13,1100)256,8,512;	
1150 NEXT I	
1160 GO TO 1070	