Tektronix®
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S-3200 Series
Automated Test Systems

021-0299-00
WAVETEK 154
INTERFACE

Instruction Manual

070-2999-00
FIRST PRINTING – MARCH 1980
SEMICONDUCTOR TEST SYSTEMS

S-3200 Series
Automated Test Systems

021-0299-00
WAVETEK 154 INTERFACE

WARNING

THE FOLLOWING SERVICING INSTRUCTIONS ARE FOR USE BY QUALIFIED PERSONNEL ONLY. TO AVOID PERSONAL INJURY, DO NOT PERFORM ANY SERVICING OTHER THAN THAT CONTAINED IN OPERATING INSTRUCTIONS UNLESS YOU ARE QUALIFIED TO DO SO.

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Tektronix warrants that this product, excluding customer-supplied equipment, is free from defects in materials and workmanship. The warranty period is ninety (90) days from the date of installation or one-hundred twenty (120) days from the date of shipment, whichever is shorter. Tektronix will, at its option, repair or replace those components that Tektronix determines to be defective within the warranty period. CRTs are warranted for one (1) year. During the nine (9) months following expiration of the product warranty, Tektronix will replace defective CRTs at no charge for the material.

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c. if personnel other than Tektronix representatives modify the hardware or software.

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GENERAL INFORMATION

INTRODUCTION

This manual documents the Tektronix-manufactured interface package, Part Number 021-0299-00, designed to couple the Wavetek Model 154 Function Generator to the S-3200 Series System Controller via the 1340 Data Coupler. This manual is intended to provide the user with the information necessary to install and operate the Wavetek 154 Option, including a functional description, reference information, parts lists, wire lists, and schematics.

REFERENCE INFORMATION

If further information on the Wavetek 154 Interface, its software, or related assemblies is required, the following publications should be consulted:

32-Bit Output/Echo Check manual	070-3094
1340 Data Coupler manual	070-3107
SM-2 Signal Switcher manual	070-3176
Programming The Wavetek Model 154 Waveform Generator manual	070-3502
Model 154 Programmable Waveform Generator Instruction manual	062-4445
1340 to PDP-11 Multi-Interrupt manual	070-3192
PDP-11 Interface manual	070-3093

PHYSICAL AND FUNCTIONAL DESCRIPTION

The Wavetek Model 154 Programmable Waveform Generator Interface Package consists of two 32-Bit Output/Echo Check circuit boards and two interconnect cables to connect these cards to the Waveform Generator. The two interface cards plug into configuration-dependent card slots in the 1340 Data Coupler, and both the 1340 and the Waveform Generator are housed in the main equipment rack of the S-3200 Series Test System.

The Wavetek Model 154 is a fully programmable waveform generator capable of producing sine, square, and triangle waves at frequencies up to 10 MHz. Amplitude, frequency, DC offset, and signal waveform are software controlled. The instrument's output may also be used as a programmable low-voltage (±10 V) DC power supply, with a current capability of 100 mA and a source impedance of less than 1 Ω. Program instructions to the Model 154 are asserted through the two Output/Echo Check cards, which receive control data from the 1340 Data card and transmit that data to the inputs of the Model 154.

The Wavetek Model 154 exhibits a 50 Ω output impedance in its periodic signal modes. Using the appropriate SM-2 Matrix reed switch closures, the signals from the waveform generator can be coupled through a high-fidelity 50 Ω path (the Test Station SM-1 Matrix and the Pin Electronics Cards) to selected DUT pins, or through an alternate 50 Ω path to other instruments in the system rack. This latter capability is a useful calibration feature, allowing interconnected rack instruments to exercise and check each other.

INSTALLATION AND OPERATION

INSTALLATION OF THE 021-0299-00 INTERFACE

When furnished as original equipment with an S-3200 Series test system, the 021-0299-00 Interface Package is factory installed according to configuration-dictated guidelines. The 1340 card slots, into which the interface circuit cards are installed are defined by the UNIBUS Address Assignment Sheet included with the system manuals set, as are the device addresses that allow the Controller to access the interface.

Interface Address Assignment – Retrofit Installations

If the 021-0299-00 interface is to be added to an existing S-3200 Series system, the 1340 card slot and address assignments must be made by the user. The installation procedure is dependent upon the type of Controller Interface used in the 1340 Data Coupler designated to control the Wavetek 154. Following is a summary of the installation steps and references required to integrate an instrument interface into an operational system.

1340 Equipped with 021-0063 or 021-0097 Interface

The *PDP-11 Interface* manual (Tektronix Publication No. 070-3093) details the procedure explained below.

1. The 021-0063 and 021-0097 Control Interface-equipped 1340 Data Couplers are distinguishable by the presence of a Device Selector Card (Part No. 670-2160-00) in 1340 slot P1. The address assignment for the subordinate interfaces supported by the 1340 is accomplished with this card.

2. Any unused card slots can be allocated to the 021-0299-00 interface cards.

3. Choose an unused address group within the range activated by jumper strap "2" on the Device Selector card. The two ranges available are 164000_8 to 165774_8 or 166774_8 to 166774_8 specified by strap "2." Note that the most significant digit of these octal addresses may be expressed as either a "1" or a "7" since the two higher order bits composing this digit are not active on the UNIBUS. Thus, a number such as 166000_8 may appear as 766000_8 in some documentation.

4. Assign the chosen card addresses using the crossbar matrix strapping procedure explained in the 070-3093 (*PDP-11 Interface*) manual.

1340 Equipped with 021-0105 or 021-0237 Multi-Interrupt Interface

The *1340 to PDP-11 Multi-Interrupt Interface* manual (Tektronix Publication No. 070-3192) details the procedure explained below.

1. The 021-0105 and 021-0237 Control Interface-equipped 1340 instruments can be recognized by the presence of an Address card (Part No. 670-3261-01) in slot P1. The address assignment for the subordinate interfaces supported by the 1340 is dependent upon the base address selected on this card.

2. The octal base address of the 1340 can be determined by inspecting jumpers 7, 8, 9, and 10 on the Address card. These jumpers establish the base address portion of the UNIBUS word as shown in Figure 2-1.

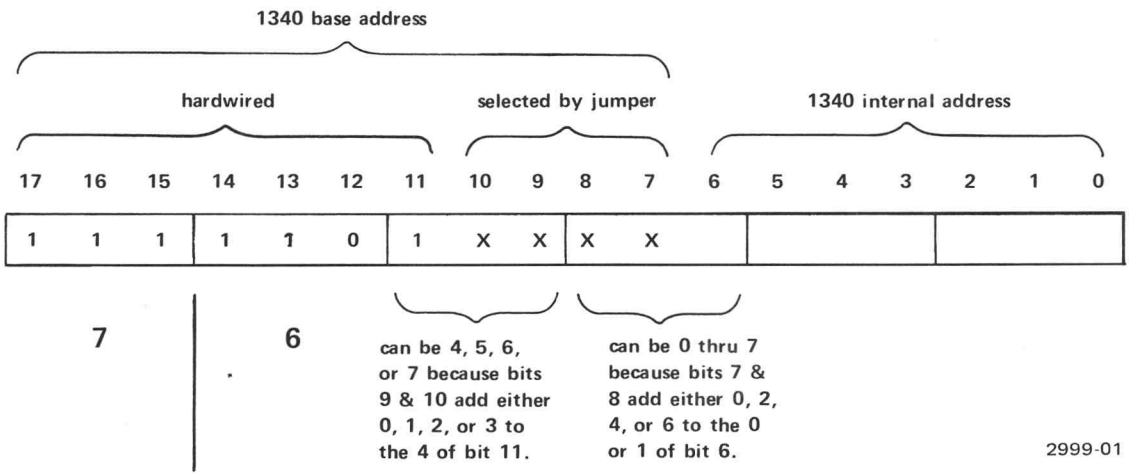


Figure 2-1. Relation of bits, selected by jumper, to characters in the 1340 base address.

3. Any unused card slots can be allocated to the 021-0299-00 interface. The address(es) of a card installed in any given slot is one of a fixed series of octal numbers, related to the 1340 base address determined in Step 2 above. This serial relationship is shown in Table 2-1.

Table 2-1

Function	Address
Select P4A	Base Address + 10_8
Select P4B	Base Address + 14_8
Select P5A	Base Address + 20_8
Select P5B	Base Address + 24_8
Select P6A	Base Address + 30_8
Select P6B	Base Address + 34_8
Select P7A	Base Address + 40_8
Select P7B	Base Address + 44_8
Select P8A	Base Address + 50_8
Select P8B	Base Address + 54_8
Select P9A	Base Address + 60_8
Select P9B	Base Address + 64_8
Select P10A	Base Address + 70_8
Select P10B	Base Address + 74_8
Select P11A	Base Address + 100_8
Select P11B	Base Address + 104_8
Select P12A	Base Address + 110_8
Select P12B	Base Address + 114_8

For example, if the 1340 base address asserted by jumpers 7, 8, 9, and 10 on the Address card is 766200_8, the "A" address of an interface card installed into slot P10 is $766200_8 + 70_8 = 766270_8$.

Preparing the 670-2117 Output/Echo Check Cards

The 021-0299-00 Interface Package is shipped complete and ready for installation. The information in this section is provided for reference and as an aid to visual inspection.

The circuit cards used with the 021-0299-00 Interface Package are general-purpose 32-Bit Output/Echo Check cards (Part No. 670-2117-00) specifically strapped for this application. Section 4 of this manual, "Schematics and Wire Lists," includes parts layout photographs of the interface cards, strapped per 021-0299-00 requirements.

Following is a strapping and modification procedure for the 021-0299-00 Interface cards.

670-2117-18 (Amplitude/Offset) Output Card

1. Starting with a 670-2117-00 General-Purpose card, install a short length of copper wire into hole "A" (strap location S3), and solder on both sides of the board. This connects solder pad "A" to the corresponding pad on the opposite side of the circuit board, causing the signal driven by transistor Q14 to appear at edge connector pin B19.

2. Similarly, install a length of wire into hold "D" at strap location S3, and solder on both sides. This causes the signal driven by transistor Q33 to appear at edge connector pin A18.

3. Remove R374 (a 4.7 kΩ, 1/4 watt resistor) and replace it with an insulated jumper (0 Ω resistor), Part No. 131-0566-00.

670-2117-19 (Frequency/Range) Output Card

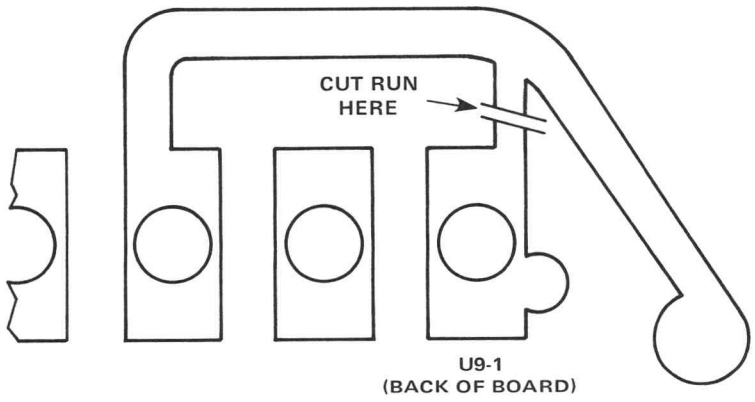
1. Install straps S3A and S3D as explained above.

2. Install a 0 Ω resistor at jumper location S2B.

3. Install a 0 Ω resistor at jumper location S20A.

4. On the reverse side of the board (etched circuit layer #5),
   a. cut the etched run immediately adjacent to U9-1 (see Figure 2-2), and
   b. reconnect U9-1 to U9-2.

5. Also on the reverse side of the board,
   a. cut the etched run connecting U20-4 to U20-1, and
   b. reconnect U20-4 to U20-5.



2999-02

Figure 2-2. Detail View of Step 4a

1340–Wavetek 154 Interconnection

Plug the two Output Interface cards into the slots designated by the UNIBUS Address Assignment Sheet. Refer to Table 2-2 to determine the 1340 back panel connector(s) corresponding to each applicable card slot. The 012-0901-00 Program Cable must be connected to the 1340 back panel connector associated with the 670-2117-18 Amplitude/Offset card slot; the 012-0902-00 Program Cable must be connected to the back panel connector associated with the 670-2117-19 Frequency/Range card slot.

Table 2-2

1340 Back Panel/Card Slot Hardwiring

1340 Card Slot	1340 Back Panel Connector(s)
J3	J323 A & B
J4	J324
J5	J114
J6	J302 A & B
J7	J302 A & B
J8	J325
J9	J326
J10	J301 A & B
J11	J327
J12	J328

The Amplitude/Offset Cable connects to J2 on the Wavetek 154 back panel, while the Frequency/Range Cable connects to J3 on the Wavetek.

Figure 2-3 is a comprehensive block diagram of a typical 021-0299-00 interface installation in an S-3200 Series test system, also depicting external connections not encompassed by the interface. Cables and assemblies shown within the dotted line are not included in the 021-0299-00 Interface Package. Note that signal routing from the Wavetek 154 instrument to other system elements is a user-configured option.

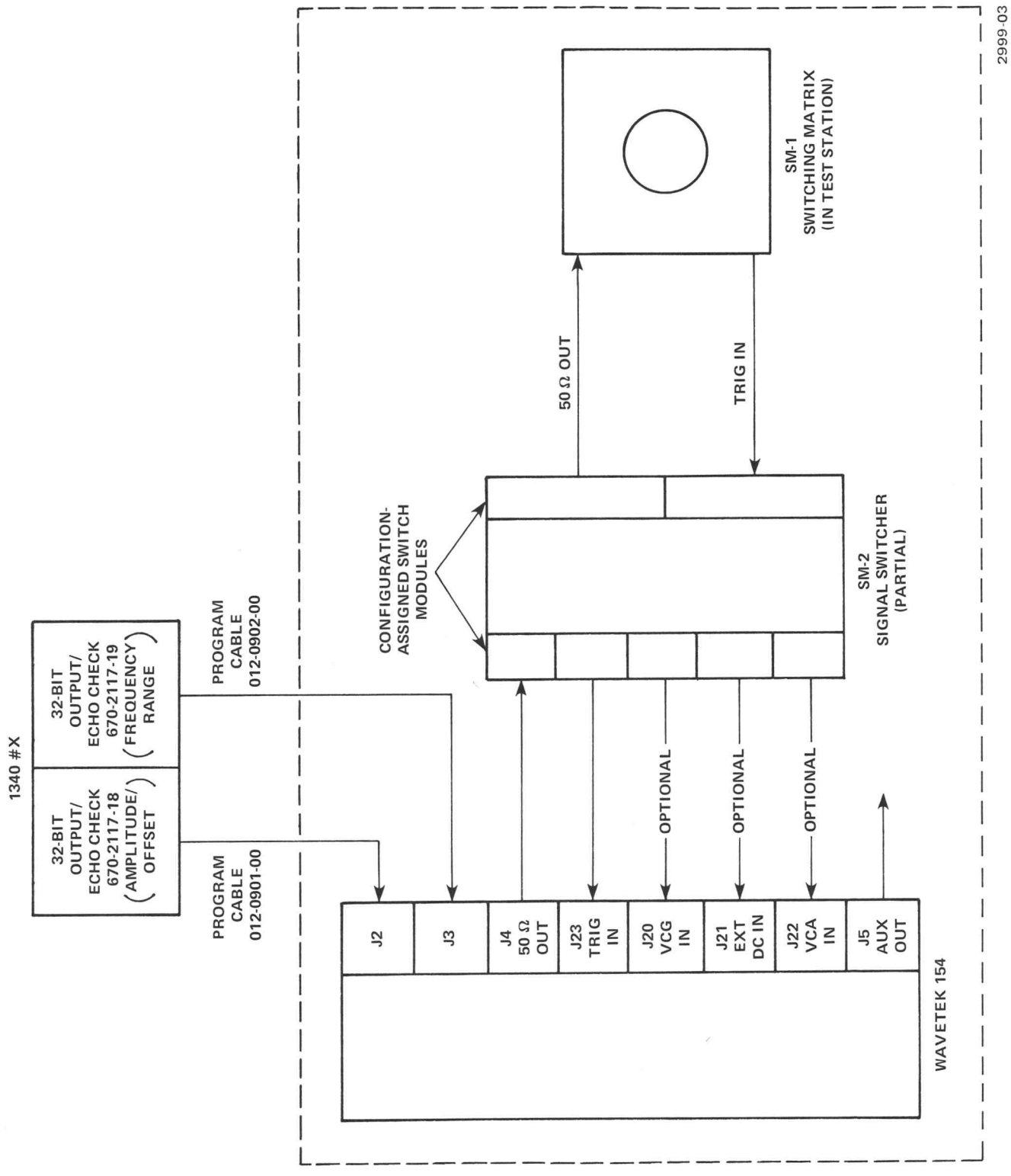


Figure 2-3. Wavetek 154: System Installation

Control and Diagnostic Software Preparation

A group of control and diagnostic routines is furnished on paper tape with the 021-0299-00 Interface Package.

WAV154.FNC — The control subroutine package that allows programming of all Wavetek 154 Waveform Generator functions from test programs running under the TEKTEST III Operating System. Part No. 062-4578.

CUSTOMIZE — A program that enables the user to configure the address assignments used by the WAV154.FNC subroutine in controlling the Wavetek 154 instruments interfaced through the 1340 Data Coupler. Part No. 062-4581.

W154IF.EDT/D360.TST — A diagnostic test that exercises the 670-2117 Output/Echo Check Cards and their associated output cables. This test does not involve the Wavetek 154 instrument itself. Part No. 062-4653.

The latter two programs mentioned above pertain to the installation procedure for the 021-0299-00 Interface Package, and therefore will be summarized in this Installation section. For detailed information on the WAV154.FNC subroutine, refer to the *Programming the Wavetek Model 154 Waveform Generator* manual, Part No. 070-3502.

Customizing the Wavetek 154 Interface Control Software

If the 021-0299-00 Interface is supplied as original equipment with an S-3200 Series system, the software for that interface is loaded onto the system disk and customized at the factory. For retrofit installations, the program must be loaded from the source tape to the system disk using the procedure explained in the *Command Language Reference Guide* manual, Part No. 062-3315.

The CUSTOMIZE program mates the interface hardware to the control software. The interface address is entered into the WAV154.FNC subroutine by responding to the CUSTOMIZE prompts as shown in the following example.

```
$CUSTOM

ENTER SYSTEM JOB NUMBER: (The user enters an arbitrarily selected alphanumeric designator
      used to associate the customized FNC file with a specific system.)

INPUT DEVICE: KB (Signifies keyboard entry.)

ENTER FILE NAME (FNC): WAV154 (The name of the FNC file to be customized.)

WVTKA: (This prompt must be ansered with the ocatl address assigned to the Frequency/Range card
      (670-2117-19).)

DONE, BUS ADDRESS= (The WVTKA address just entered is echoed to confirm entry.)

WVTKC: (The address of the Amplitude/Offset card (670-2117-18) must be entered here.)
```

DONE, BUS ADDRESS= (WVTKC address echoes.)

WVTKE: (The address of the Frequency/Range card of the **second** Wavetek 154 Interface, if applicable, is entered here.)

DONE, BUS ADDRESS= (WVTKE address echoes.)

WVTKG: (The address of the Amplitude/Offset card of the **second** Wavetek 154 Interface, if applicable, is entered here.)

DONE, BUS ADDRESS= (WVTKG address echoes.)

ALL SYMBOLS DEFINED IN WAV154.FNC:SYS (Indicates that the customizing procedure is completed. Type CTRL C to exit.)

Performance Verification

The W154IF/D360 Verification test should be run during first-time operation of the 021-0299-00 Interface. The purpose of this test is to ascertain that all interface registers are uniquely addressable and that the output cables are free of shorted or opened wires.

The W154IF.EDT file must be translated into the TST format before use. The translation procedure is outlined in the *TEKTEST II/III—Part One* manual, Part No. 062-3375-01. The translated TST file should be designated D360.TST for consistency with factory-configured systems.

A Program Data Indicator ("Light Box"), Part No. 067-0663-00, is required for the D360 test. This unit is available as an optional item.

The interface test is divided into two parts, the first of which exercises the interface circuit cards only, while the second checks the output cables using the interface cards as a signal source. When the D360 test is run, a detailed explanation of the test procedure appears on the terminal. The operator merely responds to the terminal prompts. The cable test requires installation of the Program Data Indicator and may be run in either the Manual or the Auto mode. Manual requires pressing the ADVANCE button on the Test Station Control Unit for every step of the cable test, while Auto mode runs through the entire test automatically. Both modes light the Program Data Indicator LED corresponding to the interface cable connector pin that is being driven, and simultaneously display on the TSCU the number of the pin under test.

OPERATION

The WAV154.FNC subroutine is designed to run in a standard CP 3200 (PDP-11/34) controller, with or without the floating-point hardware option. Using the WAV154 subroutine, the following Wavetek 154 signal parameters can be controlled:

- Function (Sine, Square, Triangle Waves or DC Voltage)
- Amplitude and Offset
- Range (Amplitude and Offset)
- Frequency

Refer to the *Programming the Wavetek Model 154 Waveform Generator* manual for detailed programming information.

Figures 2-4 and 2-5 depict the bit assignments of the control data words asserted by the WAV154.FNC program. The quantitative information (Amplitude, Frequency, and Offset) expressed by these words is organized in Binary Coded Decimal form. Each decimal numeral — Units, Tens, and Hundreds — is represented by a group of binary bits, which allows any numeral, 0 through 9, to be expressed as a combination of set bits. The remaining control information (Range, Polarity, Function, Mode, and Rear Panel Output) consists of simple binary codes, the decoding of which is shown in Tables 2-3 and 2-4. Note that, since the Wavetek Interface outputs "negative-true" logic signals, a set bit (indicated by a "1" in the decoding tables) is transmitted to the Wavetek 154 as a "low" voltage level (0 volts).

To enable program-controlled operation of the Wavetek 154, the six "Remote" pushbuttons on the instrument's front panel should be actuated. When the Wavetek 154 is in the Remote mode, the "All Remote" indicator lamp is lit, and the instrument is prepared for system-controlled operation.

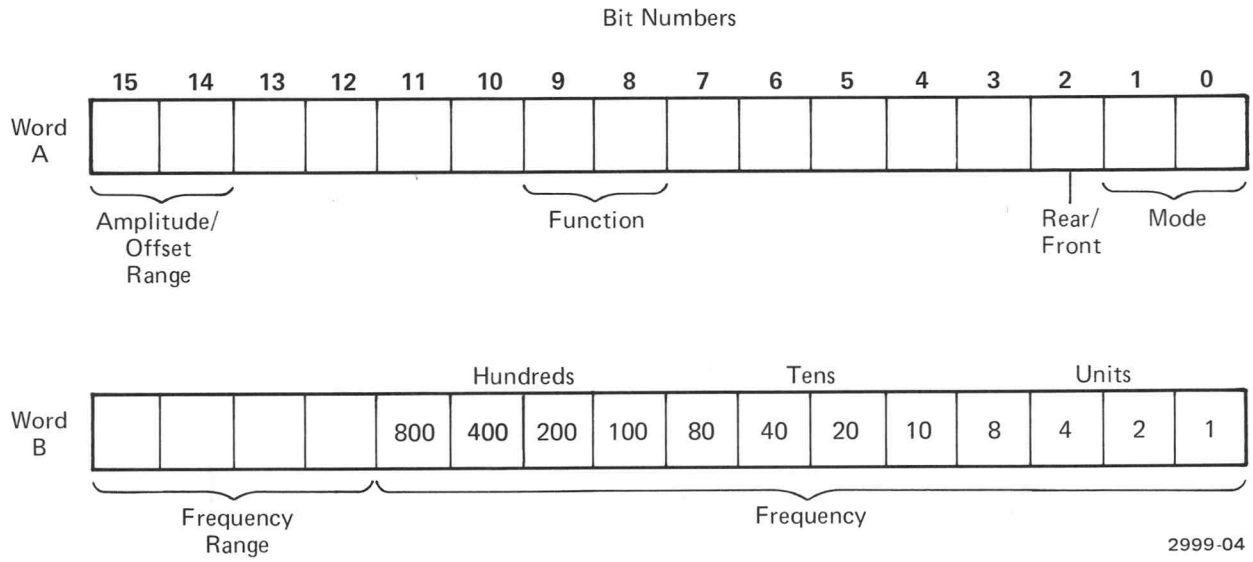


Figure 2-4. Frequency/Range Control Data Word

Table 2-3
Bit Assignments

Mode (Word A)	Bit 1	Bit 0	Function (Word A)	Bit 9	Bit 8	Amplitude Offset Range (Word A)	Bit 15	Bit 14
Continuous	0	0	Sine	0	0	0.001	0	0
Gated	0	1	DC	0	1	0.01	0	1
No Output	1	0	Triangle	1	0	0.1	1	0
Trigger	1	1	Square	1	1	1.0	1	1

Frequency Range (Word B)	Bit 15	Bit 14	Bit 13	Bit 12
0.001	0	0	0	0
0.01	0	0	0	1
0.1	0	0	1	0
1.0	0	0	1	1
10	0	1	0	0
100	0	1	0	1
1K	0	1	1	0
10K	0	1	1	1
100K	1	0	0	0
1M	1	0	0	1

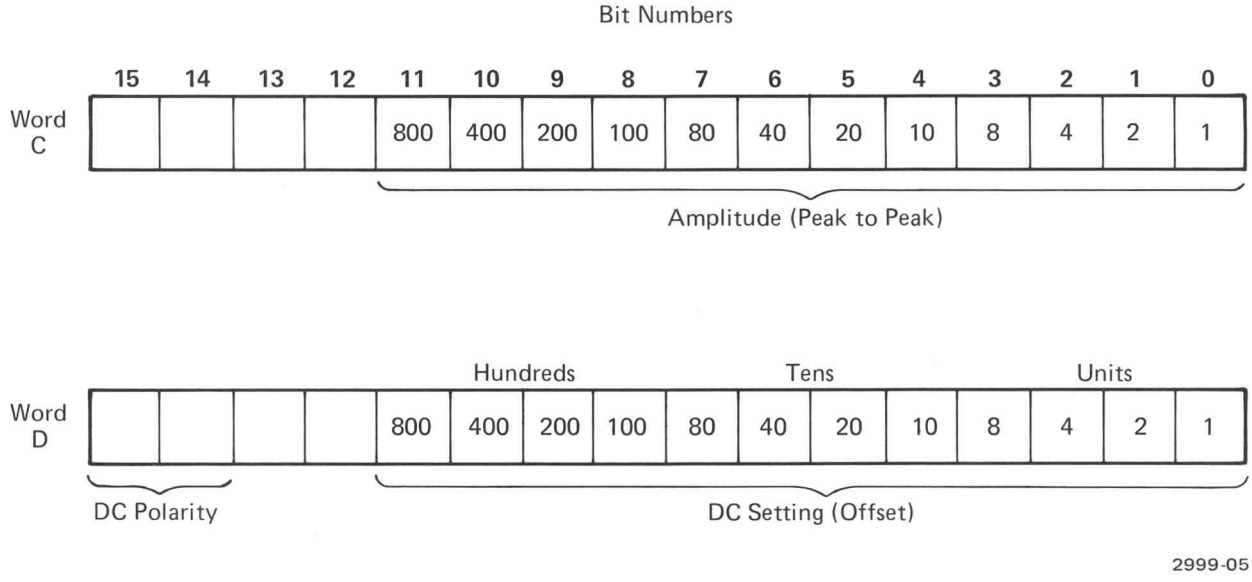


Figure 2-5. Amplitude Offset Control Data Word

Table 2-4
Bit Assignments

DC Polarity (Word D)	Bit 15	Bit 14
+	0	0
0	0	1
–	1	0

REPLACEABLE PARTS

PARTS ORDERING INFORMATION

Replacement parts are available from or through your local Tektronix, Inc. Field Office or representative.

Changes to Tektronix instruments are sometimes made to accommodate improved components as they become available, and to give you the benefit of the latest circuit improvements developed in our engineering department. It is therefore important, when ordering parts, to include the following information in your order: Part number, instrument type or number, serial number, and modification number if applicable.

If a part you have ordered has been replaced with a new or improved part, your local Tektronix, Inc. Field Office or representative will contact you concerning any change in part number.

Change information, if any, is located at the rear of this manual.

SPECIAL NOTES AND SYMBOLS

X000	Part first added at this serial number
00X	Part removed after this serial number

FIGURE AND INDEX NUMBERS

Items in this section are referenced by figure and index numbers to the illustrations.

INDENTATION SYSTEM

This mechanical parts list is indented to indicate item relationships. Following is an example of the indentation system used in the description column.

1 2 3 4 5 Name & Description

Assembly and/or Component
Attaching parts for Assembly and/or Component
\- - - * - - -
Detail Part of Assembly and/or Component
Attaching parts for Detail Part
\- - - * - - -
Parts of Detail Part
Attaching parts for Parts of Detail Part
\- - - * - - -

Attaching Parts always appear in the same indentation as the item it mounts, while the detail parts are indented to the right. Indented items are part of, and included with, the next higher indentation. The separation symbol - - - * - - - indicates the end of attaching parts.

Attaching parts must be purchased separately, unless otherwise specified.

ITEM NAME

In the Parts List, an Item Name is separated from the description by a colon (:). Because of space limitations, an Item Name may sometimes appear as incomplete. For further Item Name identification, the U.S. Federal Cataloging Handbook H6-1 can be utilized where possible.

ABBREVIATIONS

"	INCH
#	NUMBER SIZE
ACTR	ACTUATOR
ADPTR	ADAPTER
ALIGN	ALIGNMENT
AL	ALUMINUM
ASSEM	ASSEMBLED
ASSY	ASSEMBLY
ATTEN	ATTENUATOR
AWG	AMERICAN WIRE GAGE
BD	BOARD
BRKT	BRACKET
BRS	BRASS
BRZ	BRONZE
BSHG	BUSHING
CAB	CABINET
CAP	CAPACITOR
CER	CERAMIC
CHAS	CHASSIS
CKT	CIRCUIT
COMP	COMPOSITION
CONN	CONNECTOR
COV	COVER
CPLG	COUPLING
CRT	CATHODE RAY TUBE
DEG	DEGREE
DWR	DRAWER
ELCTRN	ELECTRON
ELEC	ELECTRICAL
ELCTLT	ELECTROLYTIC
ELEM	ELEMENT
EPL	ELECTRICAL PARTS LIST
EQPT	EQUIPMENT
EXT	EXTERNAL
FIL	FILLISTER HEAD
FLEX	FLEXIBLE
FLH	FLAT HEAD
FLTR	FILTER
FR	FRAME or FRONT
FSTNR	FASTENER
FT	FOOT
FXD	FIXED
GSKT	GASKET
HDL	HANDLE
HEX	HEXAGON
HEX HD	HEXAGONAL HEAD
HEX SOC	HEXAGONAL SOCKET
HLCPS	HELICAL COMPRESSION
HLEXT	HELICAL EXTENSION
HV	HIGH VOLTAGE
IC	INTEGRATED CIRCUIT
ID	INSIDE DIAMETER
IDENT	IDENTIFICATION
IMPLR	IMPELLER
IN	INCH
INCAND	INCANDESCENT
INSUL	INSULATOR
INTL	INTERNAL
LPHLDR	LAMPHOLDER
MACH	MACHINE
MECH	MECHANICAL
MTG	MOUNTING
NIP	NIPPLE
NON WIRE	NOT WIRE WOUND
OBD	ORDER BY DESCRIPTION
OD	OUTSIDE DIAMETER
OVH	OVAL HEAD
PH BRZ	PHOSPHOR BRONZE
PL	PLAIN or PLATE
PLSTC	PLASTIC
PN	PART NUMBER
PNH	PAN HEAD
PWR	POWER
RCPT	RECEPTACLE
RES	RESISTOR
RGD	RIGID
RLF	RELIEF
RTNR	RETAINER
SCH	SOCKET HEAD
SCOPE	OSCILLOSCOPE
SCR	SCREW
SE	SINGLE END
SECT	SECTION
SEMICOND	SEMICONDUCTOR
SHLD	SHIELD
SHLDR	SHOULDERED
SKT	SOCKET
SL	SLIDE
SLFLKG	SELF-LOCKING
SLVG	SLEEVING
SPR	SPRING
SQ	SQUARE
SST	STAINLESS STEEL
STL	STEEL
SW	SWITCH
T	TUBE
TERM	TERMINAL
THD	THREAD
THK	THICK
TNSN	TENSION
TPG	TAPPING
TRH	TRUSS HEAD
V	VOLTAGE
VAR	VARIABLE
W/	WITH
WSHR	WASHER
XFMR	TRANSFORMER
XSTR	TRANSISTOR

CROSS INDEX—MFR. CODE NUMBER TO MANUFACTURER

Mfr. Code	Manufacturer	Address	City, State, Zip
01121	ALLEN-BRADLEY COMPANY	1201 2ND STREET SOUTH	MILWAUKEE, WI 53204
55210	GETTIG ENG. AND MFG. COMPANY	PO BOX 85, OFF ROUTE 45	SPRING MILLS, PA 16875
56289	SPRAGUE ELECTRIC CO.		NORTH ADAMS, MA 01247
72982	ERIE TECHNOLOGICAL PRODUCTS, INC.	644 W. 12TH ST.	ERIE, PA 16512
73743	FISCHER SPECIAL MFG. CO.	446 MORGAN ST.	CINCINNATI, OH 45206
80009	TEKTRONIX, INC.	P O BOX 500	BEAVERTON, OR 97077
83385	CENTRAL SCREW CO.	2530 CRESCENT DR.	BROADVIEW, IL 60153
90201	MALLORY CAPACITOR CO., DIV. OF P. R. MALLORY AND CO., INC.	3029 E. WASHINGTON STREET P. O. BOX 372	INDIANAPOLIS, IN 46206

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
	021-0299-00			INTERFACE:WAVETEK 154	80009	021-0299-00
	670-2117-18			CKT BOARD ASSY:32 BIT OUTPUT/ECHO CHECK	80009	670-2117-18
	670-2117-19			CKT BOARD ASSY:UNDERSOCKET/MISC PROGRAM	80009	670-2117-19
	----- -----			EACH CKT BOARD USES THE FOLLOWING UNLESS OTHERWISE NOTED:		
C10	283-0108-00			CAP.,FXD,CER DI:220PF,10%,200V	56289	272C13
C11	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039 E 105Z
C12	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039 E 105Z
C13	283-0177-00			CAP.,FXD,CER DI:1UF,+80-20%,25V	72982	8131N039 E 105Z
C14	290-0524-00			CAP.,FXD,ELCTLT:4.7UF,20%,10V	90201	TDC475M010EL
C171	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C174	283-0060-00			CAP.,FXD,CER DI:100PF,5%,200V	72982	855-535U2J101J
C210	283-0108-00			CAP.,FXD,CER DI:220PF,10%,200V	56289	272C13
C274	283-0060-00			CAP.,FXD,CER DI:100PF,5%,200V	72982	855-535U2J101J
C371	283-0000-00			CAP.,FXD,CER DI:0.001UF,+100-0%,500V	72982	831-516E102P
C372	290-0530-00			CAP.,FXD,ELCTLT:68UF,20%,6V	90201	TDC686M006NLF
CR11	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR21	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR31	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR41	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR51	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR61	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR71	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR81	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR91	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR101	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR111	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR121	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR131	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR141	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR151	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR161	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR181	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR182	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR211	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR221	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR231	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR241	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR251	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR261	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR271	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR281	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR291	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR301	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR311	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR321	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR331	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR341	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR351	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR361	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR381	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
CR382	152-0141-02			SEMICOND DEVICE:SILICON,30V,50NA	80009	152-0141-02
Q1	151-0190-01			TRANSISTOR:SILICON,NPN	80009	151-0190-01
Q2	151-0190-01			TRANSISTOR:SILICON,NPN	80009	151-0190-01
Q3	151-0190-01			TRANSISTOR:SILICON,NPN	80009	151-0190-01
Q4	151-0190-01			TRANSISTOR:SILICON,NPN	80009	151-0190-01

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
Q5	151-0190-01			TRANSISTOR:SILICON,NPN	80009	151-0190-01
Q6	151-0190-01			TRANSISTOR:SILICON,NPN	80009	151-0190-01
Q7	151-0190-01			TRANSISTOR:SILICON,NPN	80009	151-0190-01
Q8	151-0190-01			TRANSISTOR:SILICON,NPN	80009	151-0190-01
Q9	151-0190-01			TRANSISTOR:SILICON,NPN	80009	151-0190-01
Q10	151-0190-01			TRANSISTOR:SILICON,NPN	80009	151-0190-01
Q11	151-0190-01			TRANSISTOR:SILICON,NPN	80009	151-0190-01
Q12	151-0190-01			TRANSISTOR:SILICON,NPN	80009	151-0190-01
Q13	151-0190-01			TRANSISTOR:SILICON,NPN	80009	151-0190-01
Q14	151-0190-01			TRANSISTOR:SILICON,NPN	80009	151-0190-01
Q15	151-0190-01			TRANSISTOR:SILICON,NPN	80009	151-0190-01
Q16	151-0190-01			TRANSISTOR:SILICON,NPN	80009	151-0190-01
Q17	151-0190-01			TRANSISTOR:SILICON,NPN	80009	151-0190-01
Q18	151-0127-00			TRANSISTOR:SILICON,NPN	80009	151-0127-00
Q21	151-0190-01			TRANSISTOR:SILICON,NPN	80009	151-0190-01
Q22	151-0190-01			TRANSISTOR:SILICON,NPN	80009	151-0190-01
Q23	151-0190-01			TRANSISTOR:SILICON,NPN	80009	151-0190-01
Q24	151-0190-01			TRANSISTOR:SILICON,NPN	80009	151-0190-01
Q25	151-0190-01			TRANSISTOR:SILICON,NPN	80009	151-0190-01
Q26	151-0190-01			TRANSISTOR:SILICON,NPN	80009	151-0190-01
Q27	151-0190-01			TRANSISTOR:SILICON,NPN	80009	151-0190-01
Q28	151-0190-01			TRANSISTOR:SILICON,NPN	80009	151-0190-01
Q29	151-0190-01			TRANSISTOR:SILICON,NPN	80009	151-0190-01
Q30	151-0190-01			TRANSISTOR:SILICON,NPN	80009	151-0190-01
Q31	151-0190-01			TRANSISTOR:SILICON,NPN	80009	151-0190-01
Q32	151-0190-01			TRANSISTOR:SILICON,NPN	80009	151-0190-01
Q33	151-0190-01			TRANSISTOR:SILICON,NPN	80009	151-0190-01
Q34	151-0190-01			TRANSISTOR:SILICON,NPN	80009	151-0190-01
Q35	151-0190-01			TRANSISTOR:SILICON,NPN	80009	151-0190-01
Q36	151-0190-01			TRANSISTOR:SILICON,NPN	80009	151-0190-01
Q37	151-0190-01			TRANSISTOR:SILICON,NPN	80009	151-0190-01
Q38	151-0127-00			TRANSISTOR:SILICON,NPN	80009	151-0127-00
R10	315-0221-00			RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215
R11	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R12	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R14	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R16	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R18	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R21	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R31	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R41	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R47	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R48	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R51	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R61	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R71	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R81	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R91	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R101	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R111	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R121	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R131	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R141	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R151	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R161	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R171	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
R172	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R173	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R174	315-0303-00			RES.,FXD,CMPSN:30K OHM,5%,0.25W	01121	CB3035
R175	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R181	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R182	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R183	315-0183-00			RES.,FXD,CMPSN:18K OHM,5%,0.25W	01121	CB1835
R184	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R210	315-0221-00			RES.,FXD,CMPSN:220 OHM,5%,0.25W	01121	CB2215
R211	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R221	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R231	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R241	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R251	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R261	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R271	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R274	315-0303-00			RES.,FXD,CMPSN:30K OHM,5%,0.25W	01121	CB3035
R275	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R281	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R291	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R301	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R311	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R321	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R331	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R341	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R351	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R361	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R371	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R372	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R373	315-0102-00			RES.,FXD,CMPSN:1K OHM,5%,0.25W	01121	CB1025
R374	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
	----- -----			(USED ON 670-2117-19 ONLY)		
R374	131-0566-00			LINK,TERM.CONNE:0.086 DIA X 2.375 INCH L	55210	L-2007-1
	----- -----			(INSTALL AT LOCATION R374. 670-2117-18 ONLY)		
R375	315-0472-00			RES.,FXD,CMPSN:4.7K OHM,5%,0.25W	01121	CB4725
R376	315-0103-00			RES.,FXD,CMPSN:10K OHM,5%,0.25W	01121	CB1035
R381	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R382	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
R383	315-0183-00			RES.,FXD,CMPSN:18K OHM,5%,0.25W	01121	CB1835
R384	315-0471-00			RES.,FXD,CMPSN:470 OHM,5%,0.25W	01121	CB4715
S2B	131-0566-00			LINK,TERM.CONNE:0.086 DIA X 2.375 INCH L	55210	L-2007-1
	----- -----			(USED ON 670-2117-19 ONLY)		
S20A	131-0566-00			LINK,TERM.CONNE:0.086 DIA X 2.375 INCH L	55210	L-2007-1
	----- -----			(USED ON 670-2117-19 ONLY)		
U1	156-0057-00			MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	80009	156-0057-00
U2	156-0392-00			MICROCIRCUIT,DI:QUAD LATCH	80009	156-0392-00
U3	156-0057-00			MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	80009	156-0057-00
U4	156-0392-00			MICROCIRCUIT,DI:QUAD LATCH	80009	156-0392-00
U5	156-0057-00			MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	80009	156-0057-00
U6	156-0392-00			MICROCIRCUIT,DI:QUAD LATCH	80009	156-0392-00
U7	156-0057-00			MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	80009	156-0057-00
U8	156-0392-00			MICROCIRCUIT,DI:QUAD LATCH	80009	156-0392-00
U9	156-0047-00			MICROCIRCUIT,DI:TPL 3-INPUT POS NAND GATE	80009	156-0047-00
U10	156-0382-00			MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	80009	156-0382-00
U11	156-0057-00			MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	80009	156-0057-00
U12	156-0392-00			MICROCIRCUIT,DI:QUAD LATCH	80009	156-0392-00

Ckt No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Name & Description	Mfr Code	Mfr Part Number
U13	156-0057-00			MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	80009	156-0057-00
U14	156-0392-00			MICROCIRCUIT,DI:QUAD LATCH	80009	156-0392-00
U15	156-0057-00			MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	80009	156-0057-00
U16	156-0392-00			MICROCIRCUIT,DI:QUAD LATCH	80009	156-0392-00
U17	156-0057-00			MICROCIRCUIT,DI:QUAD 2-INPUT NAND GATE	80009	156-0057-00
U18	156-0392-00			MICROCIRCUIT,DI:QUAD LATCH	80009	156-0392-00
U19	156-0172-00			MICROCIRCUIT,DI:DUAL RETRIG ONE-SHOT W/CLR	80009	156-0172-00
U20	156-0047-00			MICROCIRCUIT,DI:TPL 3-INPUT POS NAND GATE	80009	156-0047-00
U21	156-0093-00			MICROCIRCUIT,DI:HEX.INVERTER	80009	156-0093-00
U22	156-0043-00			MICROCIRCUIT,DI:QUAD 2-INPUT POS NOR GATE	80009	156-0043-00

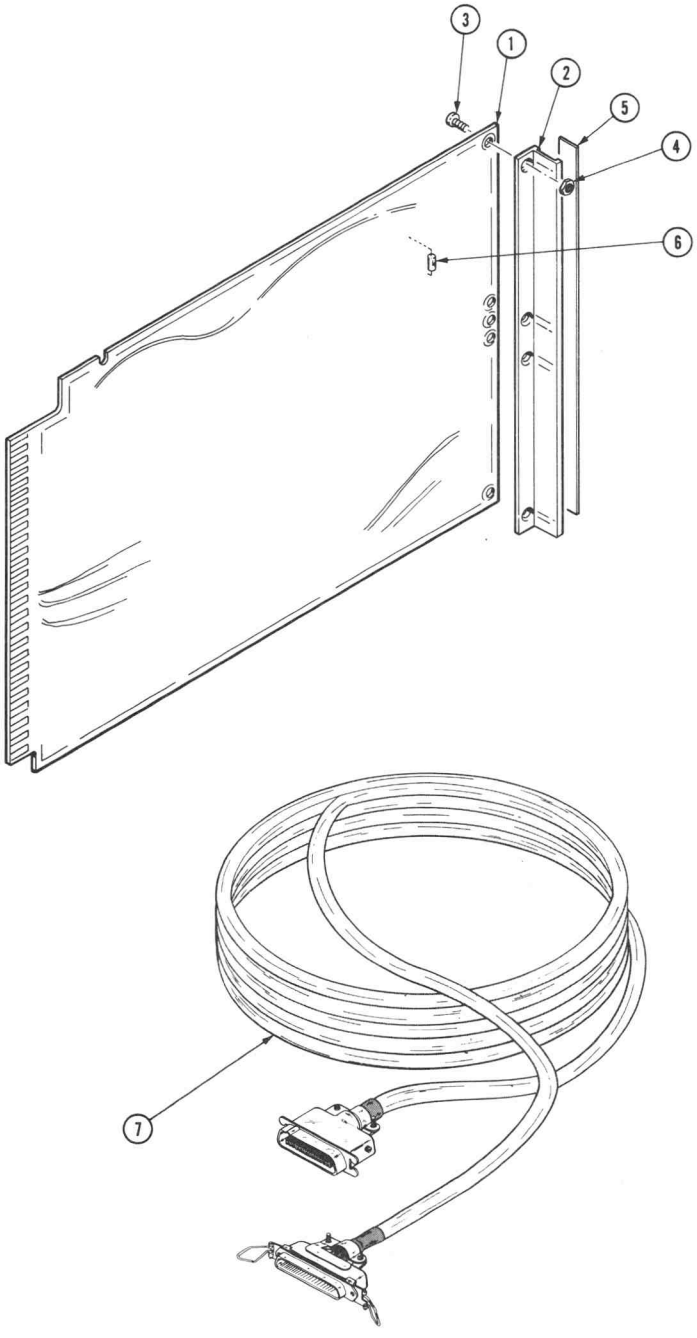

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Fig. & Index No.	Tektronix Part No.	Serial/Model No. Eff	Dscont	Qty	1 2 3 4 5	Name & Description	Mfr Code	Mfr Part Number
1-	021-0299-00			1		INTERFACE:WAVETEK 154	80009	021-0299-00
	670-2117-18			1		. CKT BOARD ASSY:32 BIT OUTPUT/ECHO CHECK	80009	670-2117-18
	670-2117-19			1		. CKT BOARD ASSY:UNDERSOCKET/MISC PROGRAM	80009	670-2117-19
						(EACH CKT BOARD CONTAINS)		
-1	670-2117-00			1		. . CKT BOARD ASSY:32 BIT OUTPUT/ECHO CHECK	80009	670-2117-00
	----- -----			-		. . (SEE EPL)		
-2	344-0149-00			1		. . STP,TIE,CKT BD:ACETAL	80009	344-0149-00
						(ATTACHING PARTS)		
-3	211-0008-00			4		. . SCREW,MACHINE:4-40 X 0.25 INCH,PNH STL	83385	OBD
-4	210-0406-00			4		. . NUT,PLAIN,HEX.:4-40 X 0.188 INCH,BRS	73743	2X12161-402
						- - - * - - -		
-5	334-3842-00			1		. MKR.SET,IDENT:	80009	334-3842-00
	----- -----			-		. (USED ON 670-2117-18 ONLY)		
	334-3843-00			1		. MKR.SET,IDENT:	80009	334-3843-00
	----- -----			-		. (USED ON 670-2117-19 ONLY)		
-6	131-0566-00			1		. LINK,TERM.CONNE:0.086 DIA X 2.375 INCH L	55210	L-2007-1
	----- -----			-		. (SEE R374 EPL, USED ON 670-2117-18 ONLY)		
	131-0566-00			2		. LINK,TERM CONNE:0.086 DIA X 2.375 INCH L	55210	L-2007-1
	----- -----			-		. (SEE S28,S20A EPL,USED ON 670-2117-19 ONLY)		
						STANDARD ACCESSORIES		
-7	012-0901-00			1		CABLE,INTCON:72.0 L,WAVETEK	80009	012-0901-00
	012-0902-00			1		CABLE,INTCON:72.0 L,WAVETEK INTFC TO R1340,J3	80009	012-0902-00
	070-2999-00			1		MANUAL,TECH:SERVICE	80009	070-2999-00

DIAGRAMS AND CIRCUIT BOARD ILLUSTRATIONS

Symbols

Graphic symbols and class designation letters are based on ANSI Standard Y32.2-1975.

Logic symbology is based on ANSI Y32.14-1973 in terms of positive logic. Logic symbols depict the logic function performed and may differ from the manufacturer's data.

The overline on a signal name indicates that the signal performs its intended function when it is in the low state.

Abbreviations are based on ANSI Y1.1-1972.

Other ANSI standards that are used in the preparation of diagrams by Tektronix, Inc. are:

Y14.15, 1966	Drafting Practices.
Y14.2, 1973	Line Conventions and Lettering.
Y10.5, 1968	Letter Symbols for Quantities Used in Electrical Science and Electrical Engineering.

American National Standard Institute
1430 Broadway
New York, New York 10018

Component Values

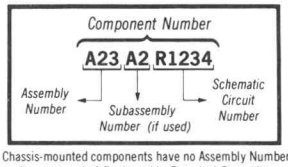
Electrical components shown on the diagrams are in the following units unless noted otherwise:

Capacitors = Values one or greater are in picofarads (pF). Values less than one are in microfarads (μF).
Resistors = Ohms (Ω).

Assembly Numbers and Grid Coordinates

Each assembly in the instrument is assigned an assembly number (e.g., A20). The assembly number appears on the circuit board outline on the diagram, in the title for the circuit board component location illustration, and in the lookup table for the schematic diagram and corresponding component locator illustration. The Replaceable Electrical Parts list is arranged by assemblies in numerical sequence; the components are listed by component number (see following illustration for constructing a component number).

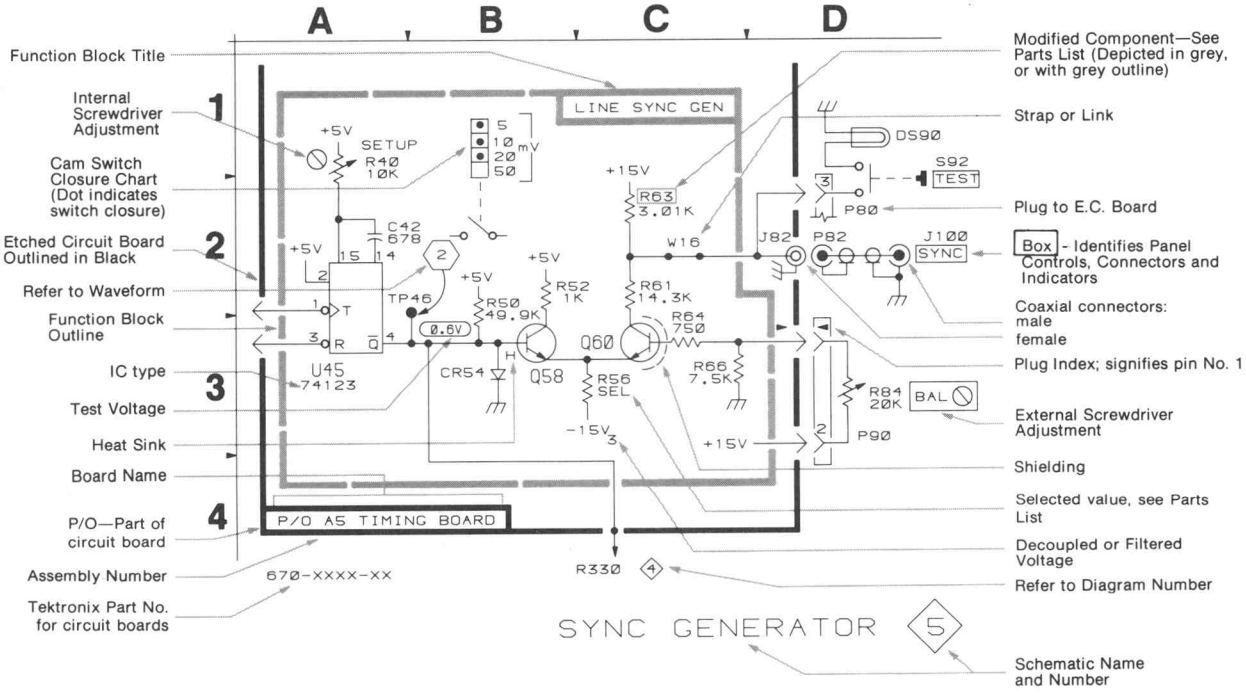
COMPONENT NUMBER EXAMPLE



Chassis-mounted components have no Assembly Number prefix—see end of Replaceable Electrical Parts List.

The schematic diagram and circuit board component location illustration have grids. A lookup table with the grid coordinates is provided for ease of locating the component. Only the components illustrated on the facing diagram are listed in the lookup table. When more than one schematic diagram is used to illustrate the circuitry on a circuit board, the circuit board illustration may only appear opposite the first diagram on which it was illustrated; the lookup table will list the diagram number of other diagrams that the circuitry of the circuit board appears on.

The following special symbols may appear on the diagrams:



CABLE INTERCONNECTIONS
(Part No. 012-0901-00)

	1340 JXXX	Wavetek J2								
1	$\overline{\text{DC POL 2}}$	19								
2	$\overline{\text{DC POL 1}}$	1								
3	SPARE	2								
4	SPARE	18								
5	$\overline{\text{DC 800}}$	28								
6	$\overline{\text{DC 400}}$	27								
7	$\overline{\text{DC 200}}$	9								
8	$\overline{\text{DC 100}}$	26								
9	$\overline{\text{DC 80}}$	25								
10	$\overline{\text{DC 40}}$	7								
11	$\overline{\text{DC 20}}$	24								
12	$\overline{\text{DC 10}}$	23								
13	$\overline{\text{DC 8}}$	5								
14	$\overline{\text{DC 4}}$	22								
15	$\overline{\text{DC 2}}$	21								
16	$\overline{\text{DC 1}}$	3								
17	SPARE	4								
18	NOT USED	–								
19	SPARE	8								
20	SPARE	12								
21	SPARE	14								
22	SPARE	16								
23	$\overline{\text{AMPL 800}}$	36								
24	$\overline{\text{AMPL 400}}$	35								
25	$\overline{\text{AMPL 200}}$	17								
26	$\overline{\text{AMPL 100}}$	34								
27	$\overline{\text{AMPL 80}}$	33								
28	$\overline{\text{AMPL 40}}$	15								
29	$\overline{\text{AMPL 20}}$	32								
30	$\overline{\text{AMPL 10}}$	31								
31	$\overline{\text{AMPL 8}}$	13								
32	$\overline{\text{AMPL 4}}$	30								
33	$\overline{\text{AMPL 2}}$	29								
34	$\overline{\text{AMPL 1}}$	11								
35	SPARE	10								
36	GND	20								

CABLE INTERCONNECTIONS

(Part No. 012-0902-00)

	1340 JXXX	Wavetek J3								
1	$\overline{\text{FREQ RNG 8}}$	7								
2	$\overline{\text{FREQ RNG 4}}$	5								
3	$\overline{\text{FREQ RNG 2}}$	3								
4	$\overline{\text{FREQ RNG 1}}$	1								
5	$\overline{\text{FREQ 800}}$	19								
6	$\overline{\text{FREQ 400}}$	20								
7	$\overline{\text{FREQ 200}}$	21								
8	$\overline{\text{FREQ 100}}$	22								
9	$\overline{\text{FREQ 80}}$	23								
10	$\overline{\text{FREQ 40}}$	24								
11	$\overline{\text{FREQ 20}}$	25								
12	$\overline{\text{FREQ 10}}$	26								
13	$\overline{\text{FREQ 8}}$	27								
14	$\overline{\text{FREQ 4}}$	28								
15	$\overline{\text{FREQ 2}}$	29								
16	$\overline{\text{FREQ 1}}$	30								
17	ALL REMOTE	15								
18	SPARE	31								
19	$\overline{\text{AMPL RNG 2}}$	11								
20	$\overline{\text{AMPL RNG 1}}$	9								
21	SPARE	2								
22	SPARE	4								
23	SPARE	6								
24	SPARE	8								
25	$\overline{\text{FUNCTION 2}}$	32								
26	$\overline{\text{FUNCTION 1}}$	33								
27	SPARE	10								
28	SPARE	12								
29	SPARE	14								
30	SPARE	16								
31	SPARE	17								
32	$\overline{\text{REAR/FRONT}}$	36								
33	$\overline{\text{MODE 2}}$	35								
34	$\overline{\text{MODE 1}}$	34								
35	SPARE	18								
36	GND	13								

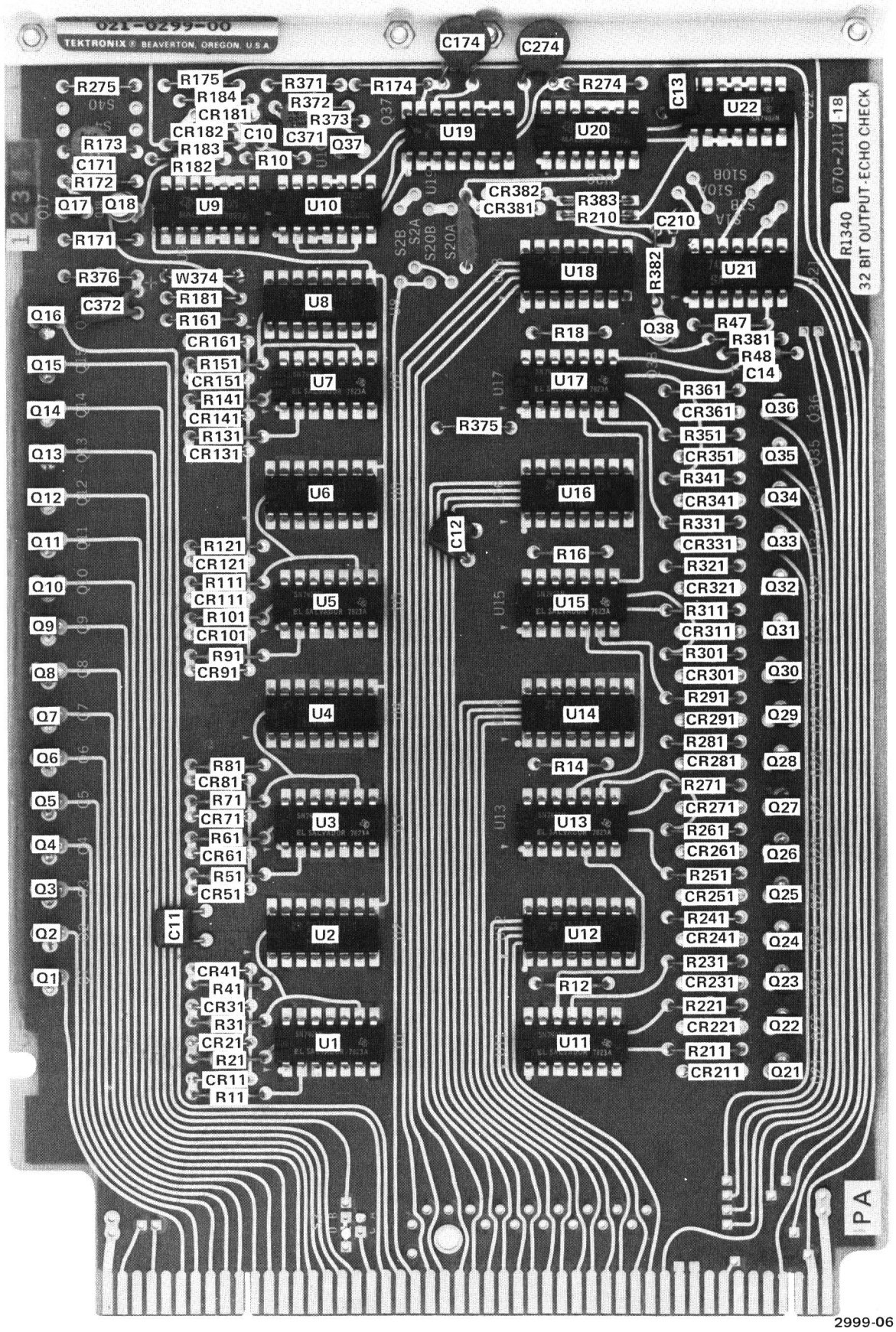
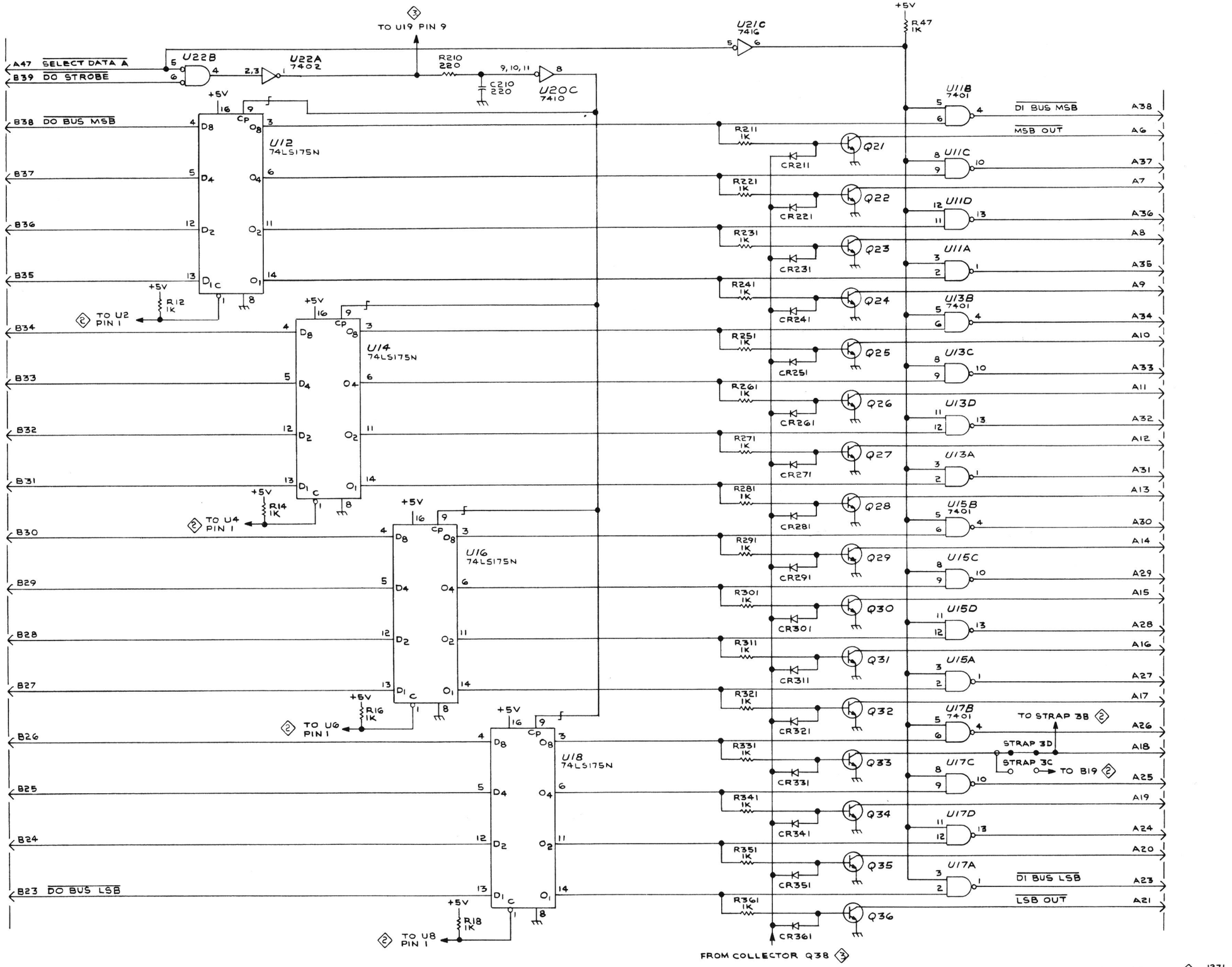


Figure 4-1. Parts Layout, 670-2117-18 Amplitude/Offset Card

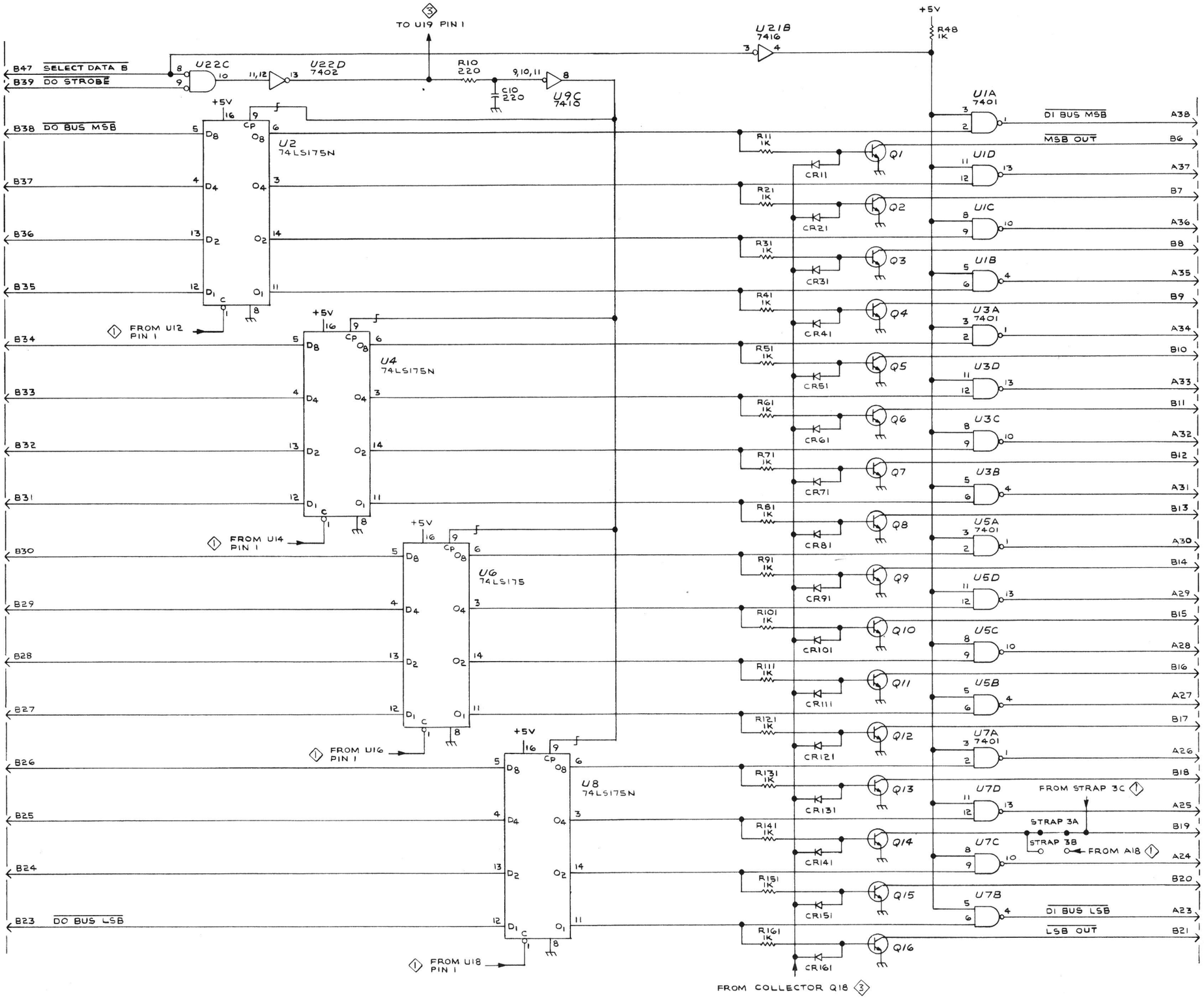


A DATA OUT & ECHO (1) 1271 EKP
PARTIAL 32-BIT OUTPUT/ECHO CHECK

2999-08
@

670-2117-18
WAVETEK 154 INTERFACE

AMPLITUDE/OFFSET CARD
1 OF 3
(1)

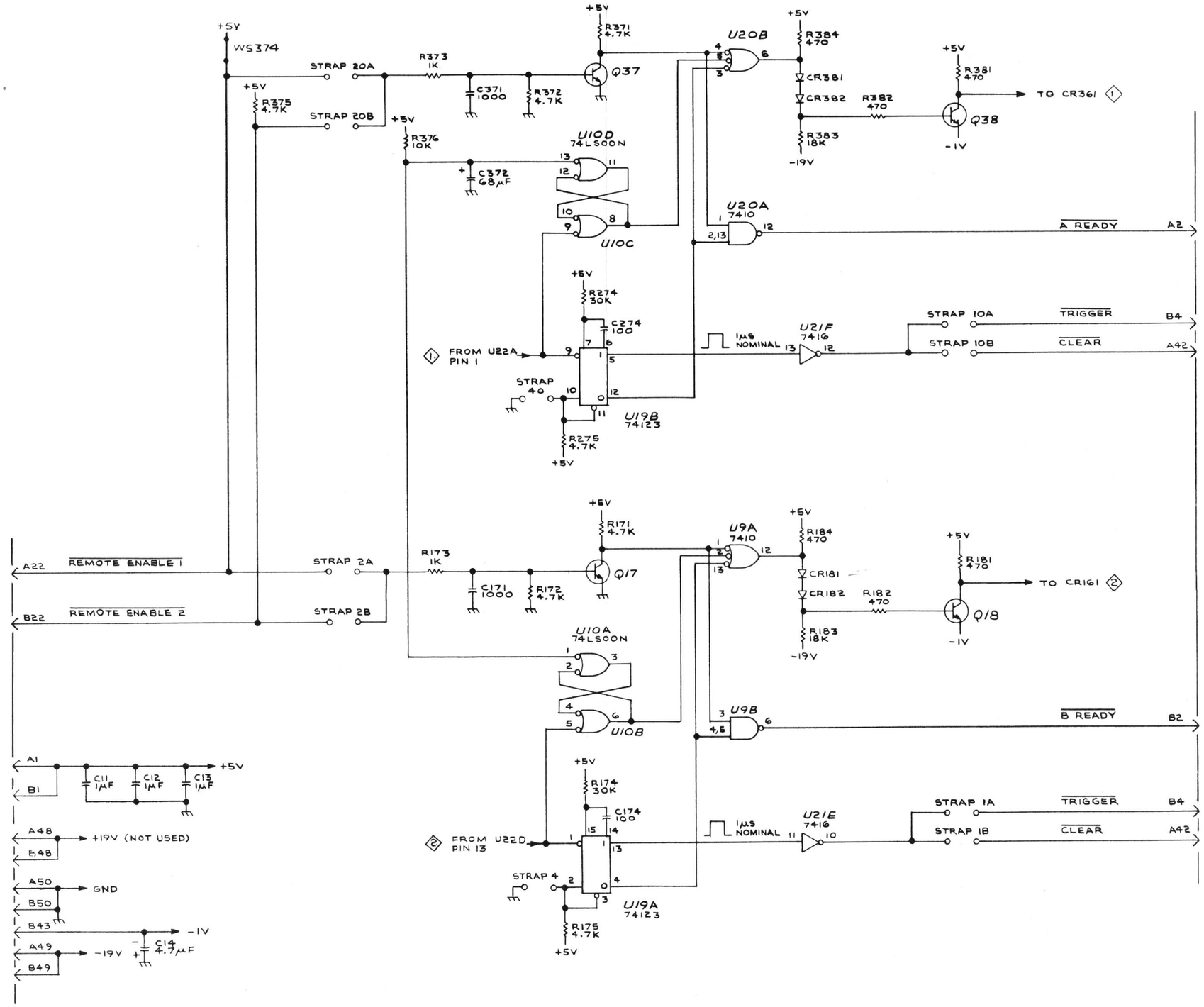


2999-09
(a)

670-2117-18
WAVETEK 154 INTERFACE

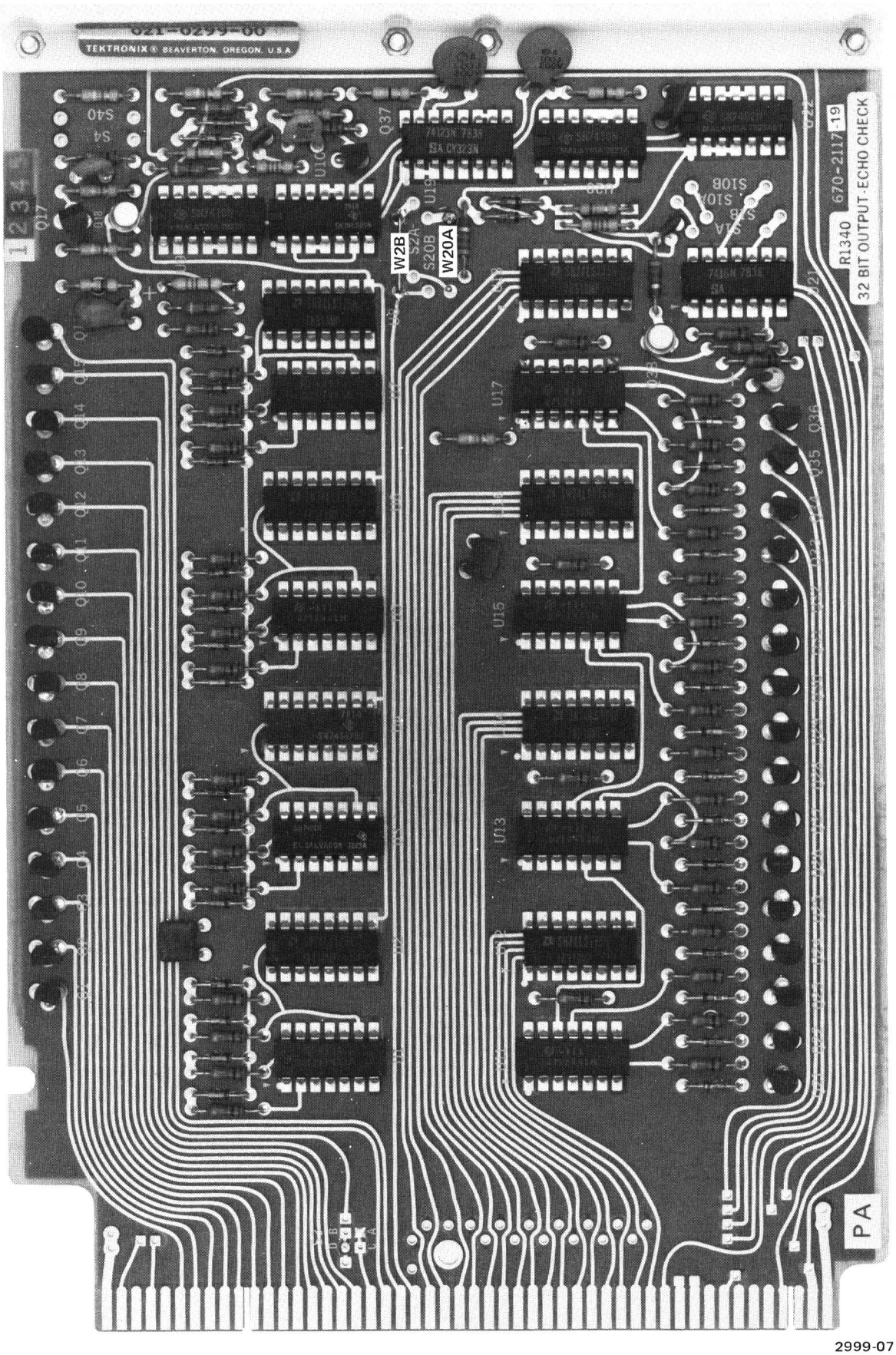
B DATA OUT & ECHO (2) 1271 EKP
PARTIAL 32 BIT OUTPUT / ECHO CHECK

AMPLITUDE/OFFSET CARD
2 OF 3
(2)



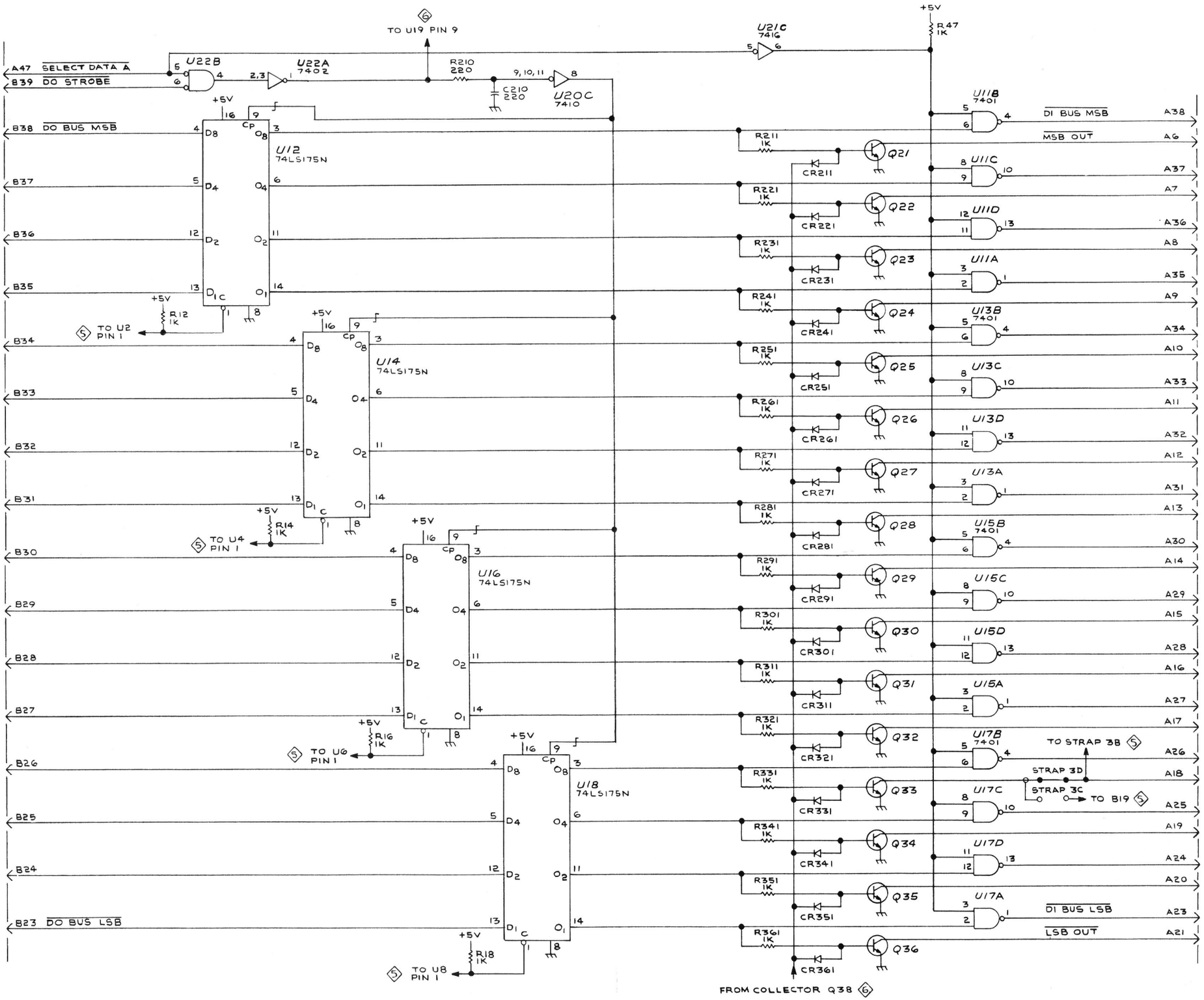
G70-2117-18
WAVETEK 154 INTERFACE

CONTROL LOGIC ③ 1271 EKP
PARTIAL 32-BIT OUTPUT/ECHO CHECK



2999-07

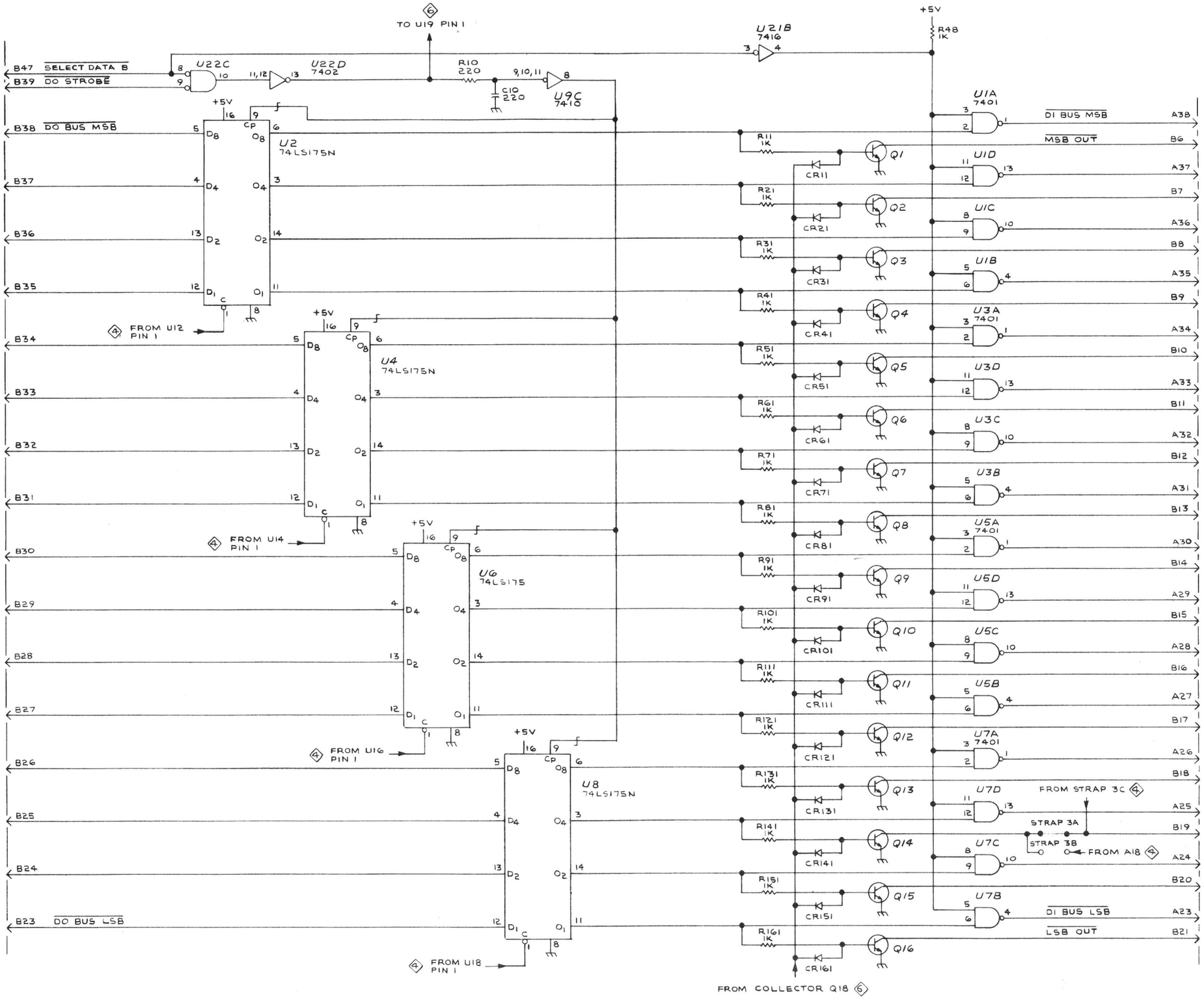
Figure 4-2. 670-2117-19 Frequency Range Card, Showing Circuit Numbers Unique to This Board



2999-11
@

A DATA OUT & ECHO 4 1271 EKP
PARTIAL 32-BIT OUTPUT/ECHO CHECK

670-2117-19
WAVETEK 154 INTERFACE



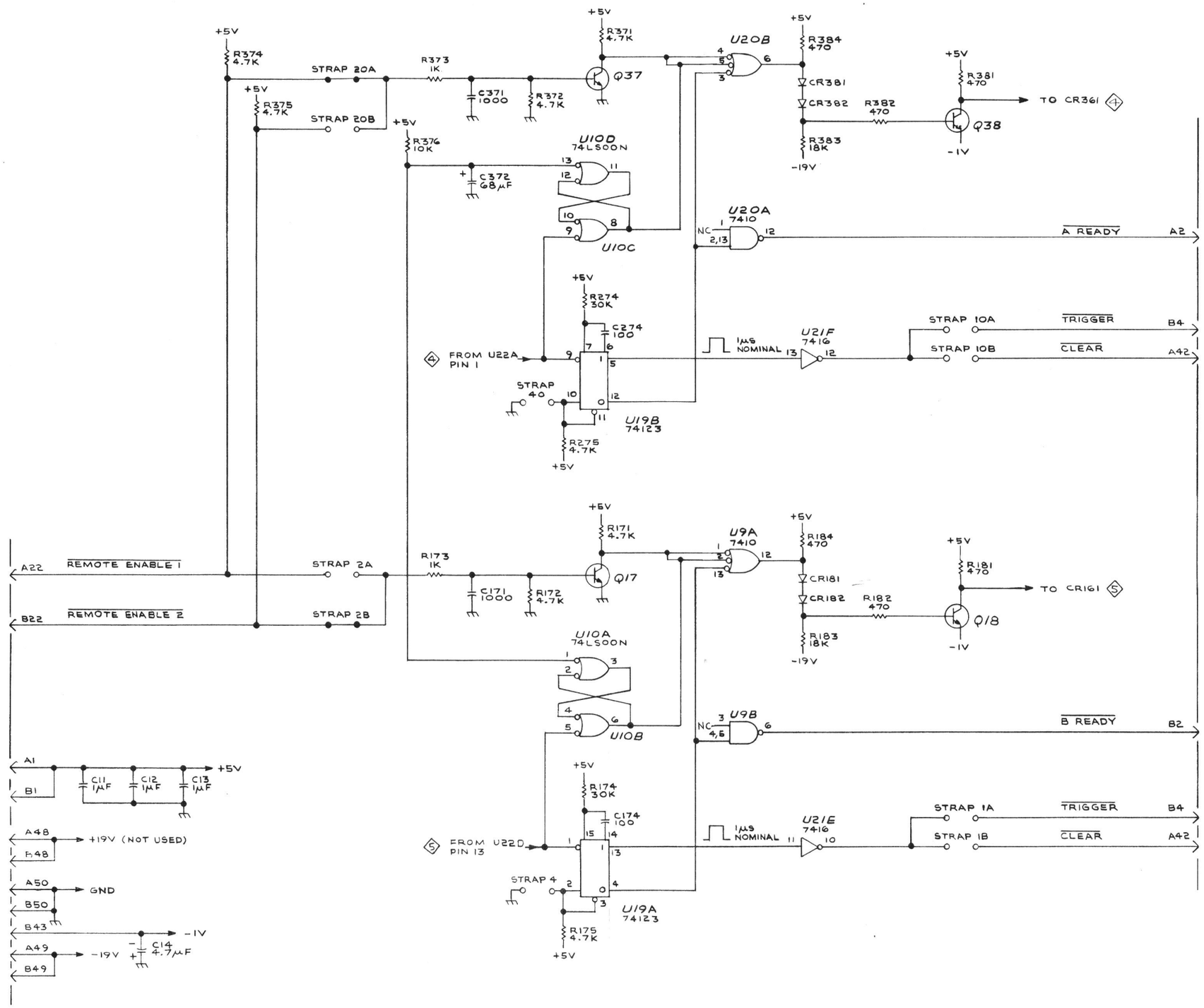
2999-12

@

670-2117-19
WAVETEK 154 INTERFACE

B DATA OUT & ECHO 5 1271 EKP
PARTIAL 32 BIT OUTPUT / ECHO CHECK

FREQUENCY/RANGE CARD
2 OF 3
5



670-2117-19
WAVETEK 154 INTERFACE

2999-13
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CONTROL LOGIC (5) 1271 EKP
PARTIAL 32-BIT OUTPUT/ECHO CHECK

FREQUENCY/RANGE CARD
3 OF 3
(6)