

VS 211 UPGRADE

FOR THE FOLLOWING INSTRUMENTS:

VS 211 ALL

RC 211 ALL

This product modification kit provides parts and instructions to upgrade a VS 211 to VS 211A performance. A new ADC circuit board and firmware version 2.1 for the VS 211 and firmware version 2.0 for the companion RC 211 are included in the kit.

Note that the companion RC 211 must be upgraded to version 2.0.

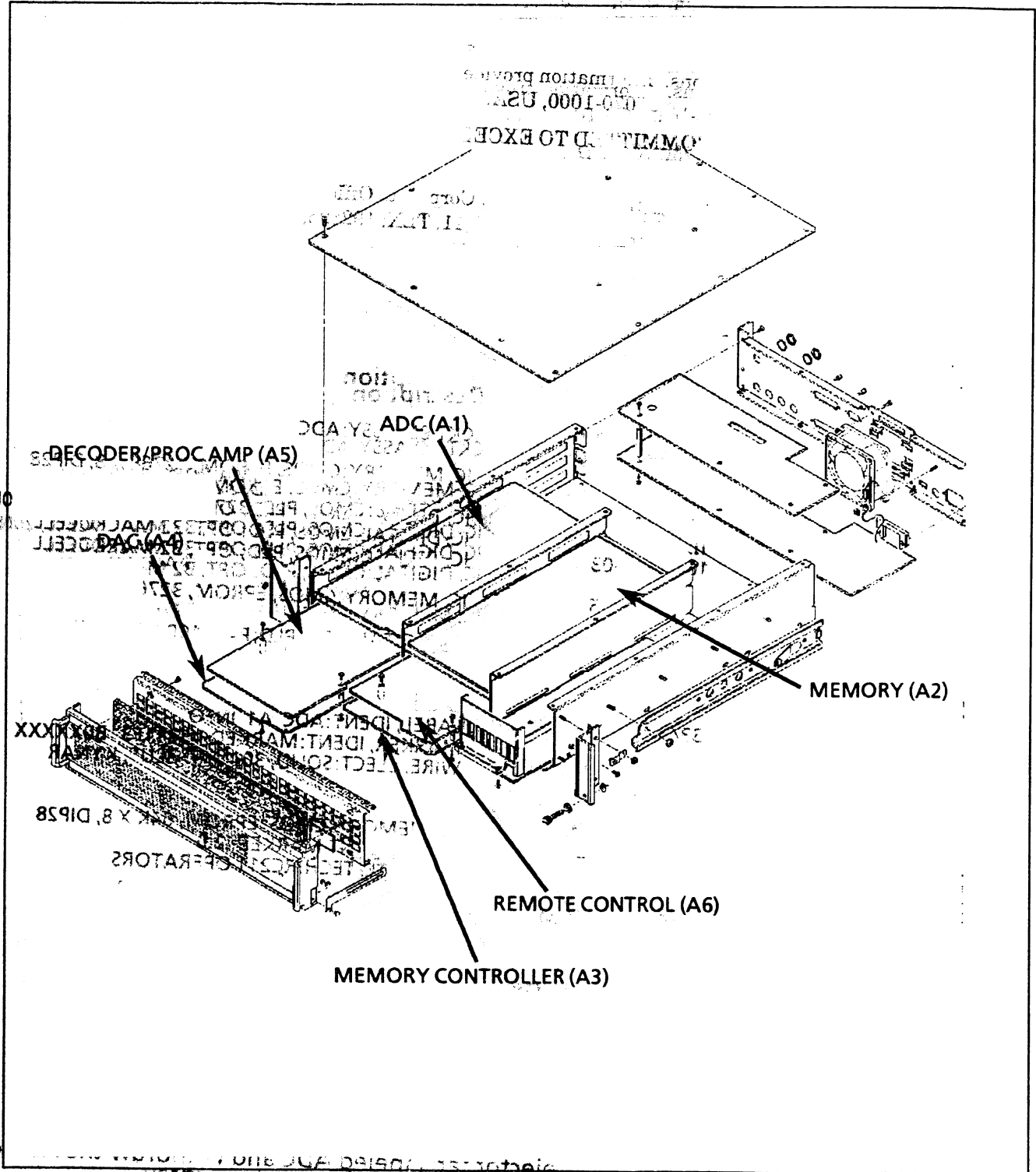


Fig. 1. VS 211 exploded view.

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KIT PARTS LIST:

Kct no.	Quant.	Part no.	Description
VS 211 A1	1 EA	671-2857-02	CKT BD ASSY: ADC
A3U63	1 EA	160-8363-06	IC, MEMORY: CMOS, EPROM, 32768 X 8, DIP28
A3U5	1 EA	160-8371-01	IC, DIGITAL: CMOS, PLD, 32768 X 8, DIP28
A3U21	1 EA	160-8372-04	IC, DIGITAL: CMOS, PLD; OPT, 32 MACROCELL, 20NS
A3U4	1 EA	160-8373-01	IC, DIGITAL: CMOS, PLD; OPT, 32 MACROCELL
A3U20	1 EA	160-8374-03	IC, DIGITAL: CMOS, PLD; OPT, 32 MACROCELL
A4U24	1 EA	160-7510-05	IC, MEMORY: CMOS, EPROM, 32768 X 8, DIP28
A5U7	1 EA	160-8419-01	IC, DIGITAL: STTL, PLD: PAL, 16R8, 37MHZ
A6U7	1 EA	160-8354-05	IC, MEMORY: CMOS, EPROM, 64K X 8, DIP28
	1 EA	-----	LABEL, IDENT: MARKED 2.1
	1 EA	334-8660-01	LABEL, IDENT: ADC A1 INFO
	1 EA	-----	MARKER, IDENT: MARKED VS211A3 BOXXXX
	1.5FT	175-2054-06	WIRE, ELECT: SOLID, 30AWG, BLUE, KYNAR
RC 211 A1U7	1 EA	160-8356-05	IC, MEMORY: CMOS, EPROM, 64K X 8, DIP28
	1 EA	-----	LABEL, IDENT MARKED 2.0
	1 EA	070-8075-01	MANUAL, TECH: RC211 OPERATORS

INSTRUCTIONS:

WARNING

Before proceeding, ensure the power switch is in the off position, then disconnect the instrument from the power source.

- 1. Pull the front panel out and pivot it down to expose the circuit boards.
- 2. Pull out on the circuit board ejector tab labeled ADC and withdraw the ADC circuit board assembly from the instrument.
- 3. Install the new ADC circuit board provided in the kit.

- 4. Pull out on the circuit board ejector tab labeled DAC and withdraw the DAC and Decoder/Proc Amp circuit board assemblies from the instrument.
- 5. Replace U7 on the Decoder/Proc Amp circuit board (A5) with the 160-8419-01 IC provided in the kit. See fig. 2 for location.

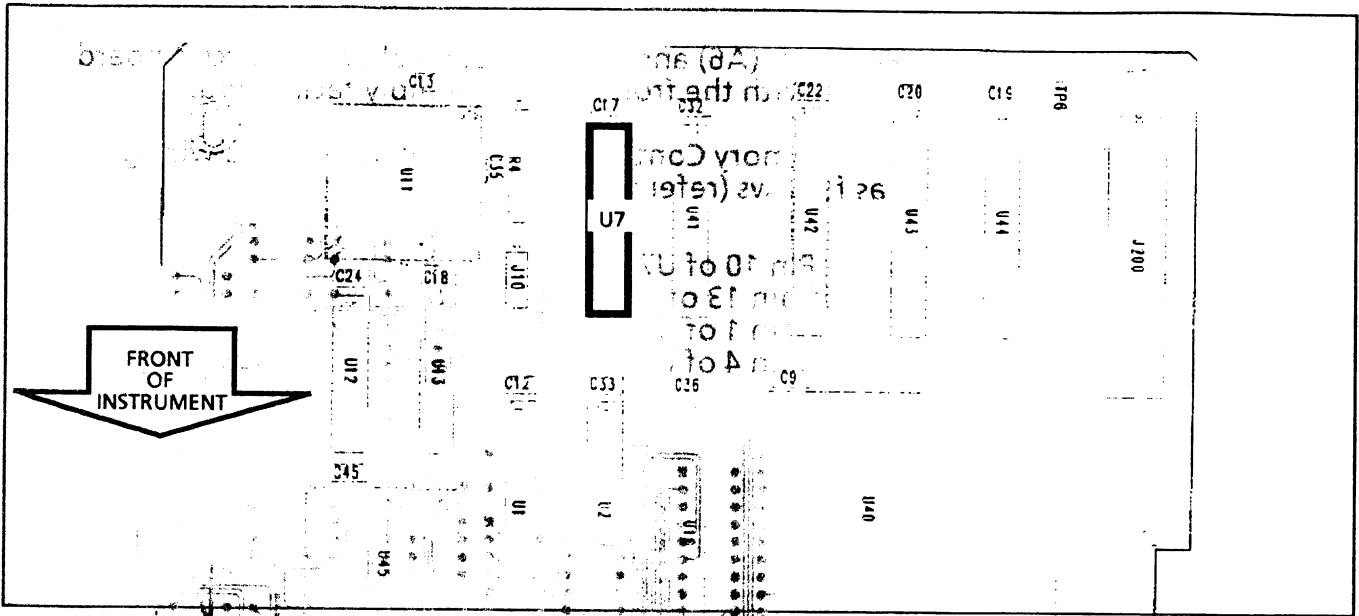


Fig. 2. Partial Decoder/Proc Amp circuit board (A5) showing location of U7.

- 6. Remove the two leftmost Decoder/Proc Amp circuit board securing screws then pivot the circuit board up and to the right to expose the DAC circuit board.
- 7. On the DAC circuit board (A4) make the following changes:
 - a. Replace U24 with the 160-7510-05 IC provided in the kit. Refer to fig. 3 for component locations.
 - b. Change switch setting of S1 to position 6 to select NVROM Test.

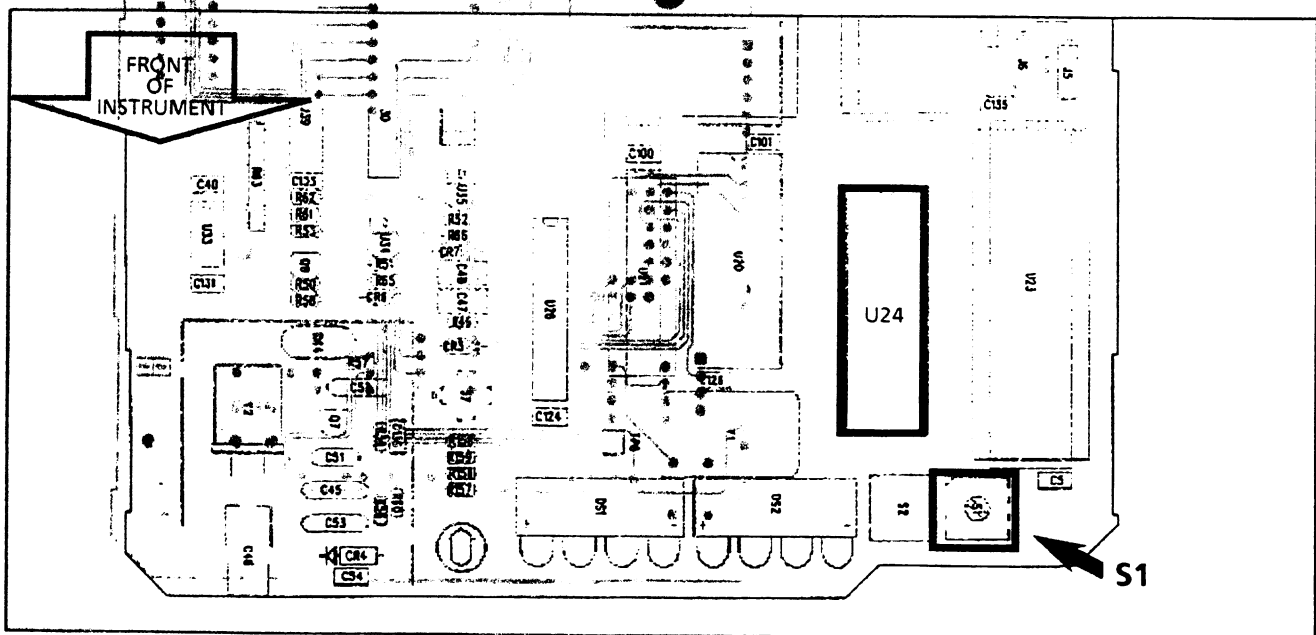


Fig. 3. Partial DAC circuit board (A4) showing location of U24 and S1.

- 8. Pivot the Decoder/Proc Amp circuit board back into position and install the securing screws. Install the assembly in the instrument. □
- 9. Pull out on the circuit board ejector tab labeled CONTROLLER and withdraw the Remote Control (A6) and Memory Controller (A3) circuit board assemblies from the instrument.
- 10. Position the Remote Control (A6) and Memory Controller (A3) circuit board assemblies up-side-down with the front of the assembly facing you.
- 11. On the back side of the Memory Controller circuit board (A3) add wiring (provided in the kit) as follows (refer to fig. 4):

Connect

- pin 1 of U74 and Pin 10 of U74.
- Pin 10 of U74 and pin 13 of U74
- Pin 11 of U74 and pin 1 of U28
- Pin 12 of U74 and pin 4 of U28

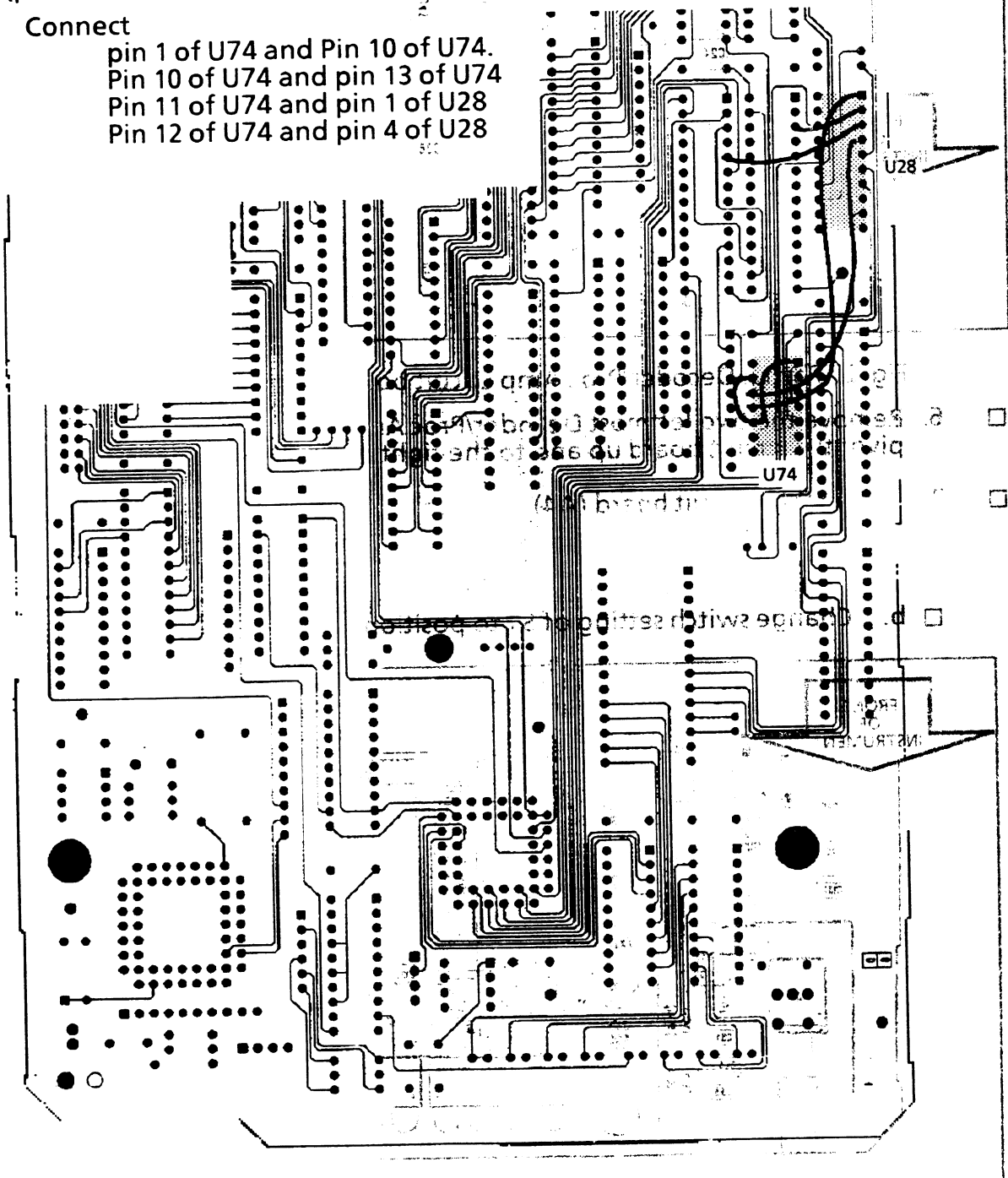


Fig. 4. Partial Memory Controller circuit board (back side) showing added wires.

- 12. Position the Remote Control (A6) and Memory Controller (A3) circuit board assemblies so that the Remote Control circuit board is up and the front of the assembly is toward you. Remove the two leftmost securing screws.
- 13. Pivot the Remote Control circuit board (A6) up and to the right to expose the component side of the Memory Controller circuit board (A3) then make the following changes (refer to fig. 5):
 - a. Replace U4, U5, U20, U21 and U63 with the appropriate IC provided.
 - b. Remove U28 from the socket and bend out pins 1 and 4. Reinstall U28.
 - c. Connect together (using a length of the wire provided) pin 1 of U28 (bent out in step b) and pin 2 of U20.
 - d. Connect together pin 4 of U28 (bent out in step b) and pin 9 of U74.
 - e. Pivot the Remote Control circuit board (A6) back into position and install the securing screws.

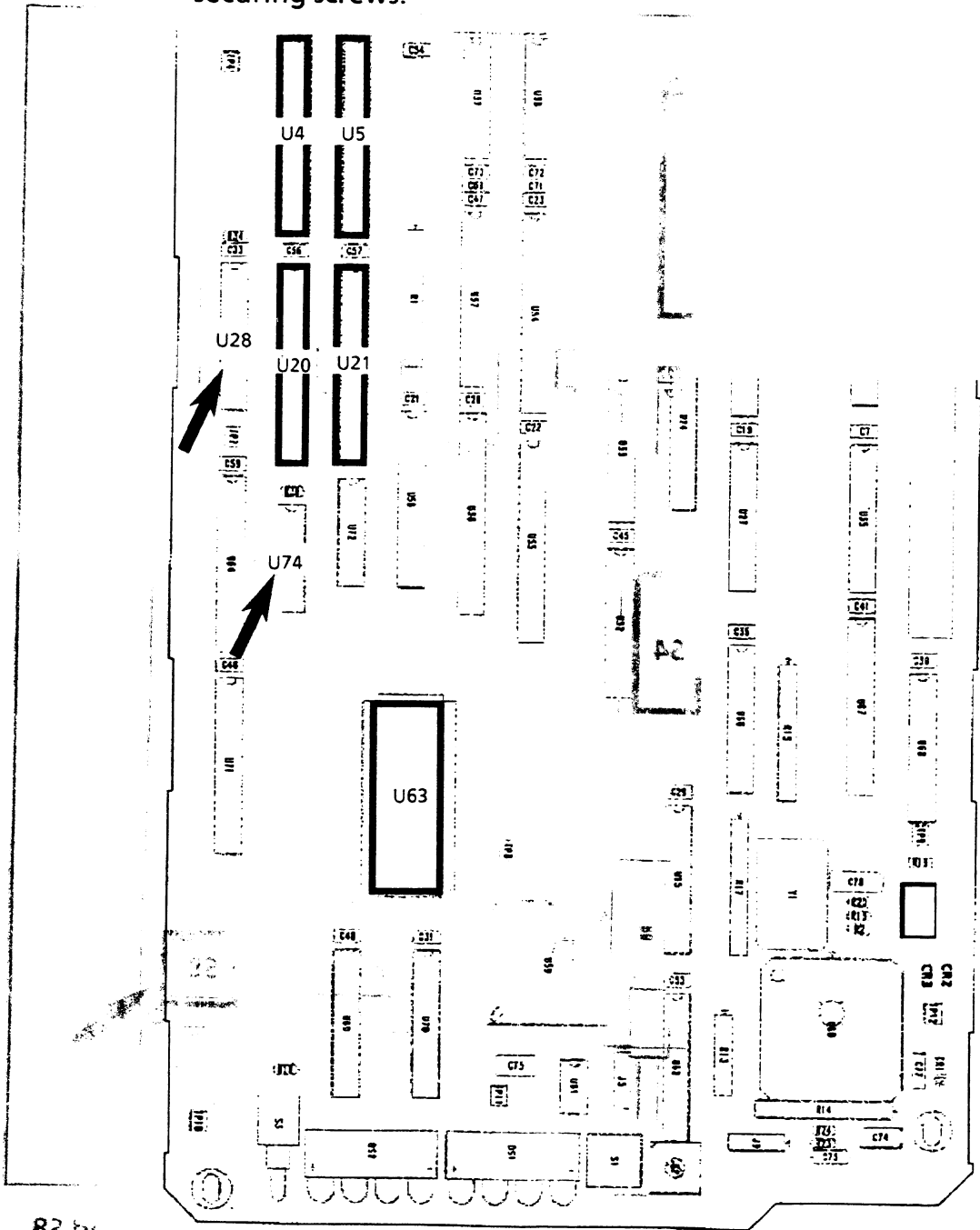


Fig. 5. Partial Memory Controller circuit board (A3) showing location of U4, U5, U20, U21 and U63.

- 14. On the Remote Control circuit board (A6) make the following changes:
 - a. Replace U7. Refer to fig. 6 for component locations.
 - b. Set S4 DIP switch, segment 8, as follows:
 - i. Set to position 0 (closed) for instruments with serial number B020000 and up or instruments with serial number below B020000 with field upgrade VS211F1 or VS211F2 installed. Refer to Appendix A, Table A-1.
 - ii. Set to position 1 (open) for instruments with serial number below B020000 without field upgrade VS211F1 or VS211F2.
 - c. Change switch setting of S8 to position E to select RAM and NVRAM Test.

11500

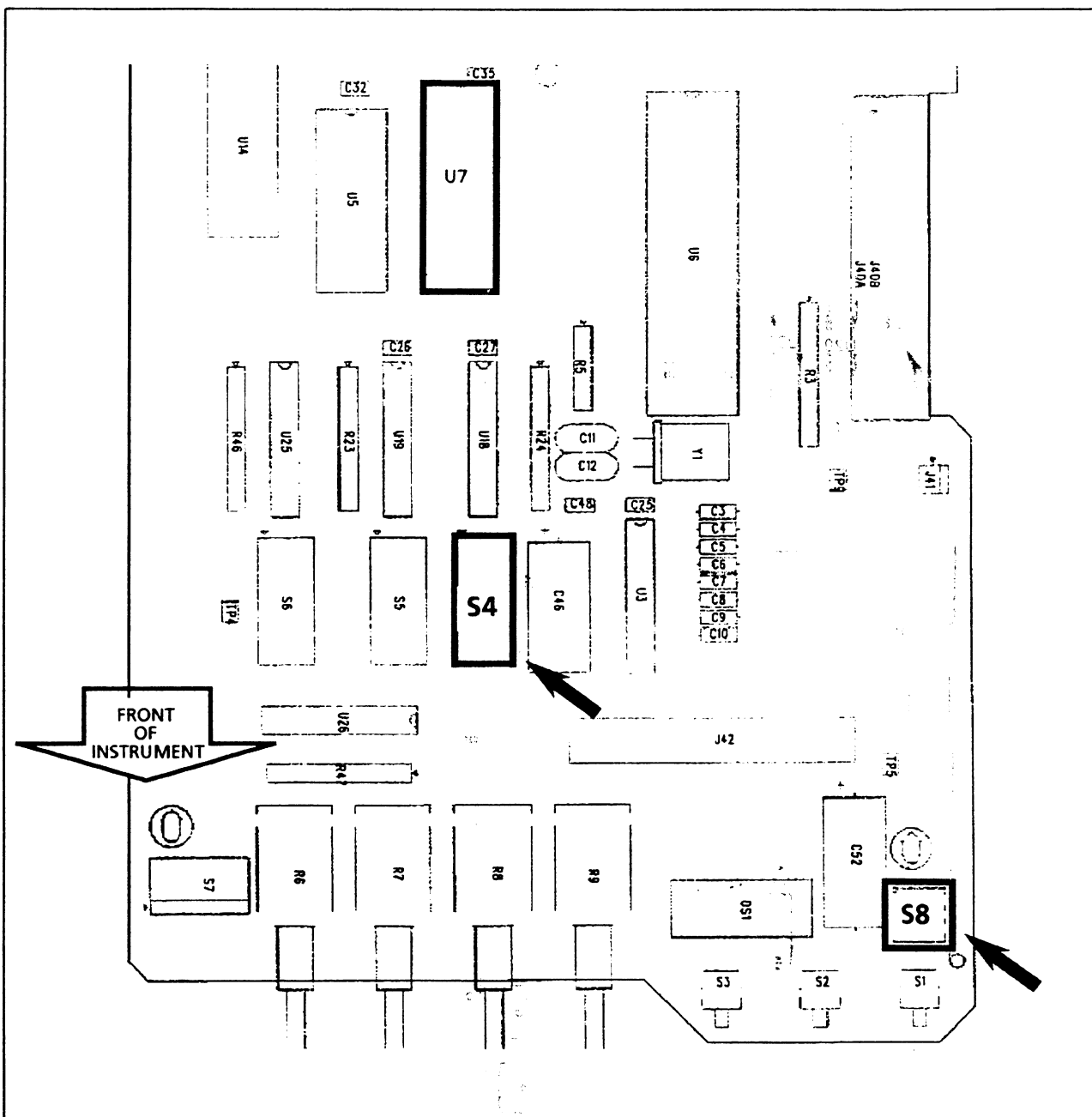


Fig. 6. Partial Remote Control circuit board (A6) showing location of U7, S4 and S8.

- 15. Install the Memory Controller and Remote Control circuit board assemblies in the instrument.
- 16. Apply the label (334-8660-01) to the inside surface of the front panel to cover the existing ADC A1 information. The new label conforms to the new ADC circuit board.

□ 17. **VERIFICATION PROCEDURE**

- a. Connect the VS 211 to an appropriate power source.
- b. Set the VS 211 POWER switch to ON.
- c. CHECK - that the LEDs DS1-1 thru DS1-8 are lit on the Remote Control ckt bd.
- d. CHECK - that the rightmost LED (LED 0) on the DAC ckt bd is lit.
- e. Switch off the power to the VS 211.
- f. Remove the DAC ckt bd and set S1 to setting 0. Reinstall the ckt bd.
- g. Remove the Remote Control ckt bd and set S8 to setting 0. Reinstall the ckt bd.

- 18. Pivot the front panel back and press into position.
- 19. Affix the labels, one marked 2.1 and the other marked **VS211F3 B0XXXXX** (provided in the kit), to the right side rail of the VS 211. Replace the earlier version label if one is present.
- 20. For future reference, attach the following Manual Modification Insert in the Instruction Manual.

THIS COMPLETES THE UPGRADE FOR THE VS 211. The RC 211 that may be used in conjunction with the VS 211 must be upgraded to version 2.0. Check the version label located on the right side panel of the RC 211. If a version 2.0 label is **not** present -- proceed to the next step of these instructions to upgrade the RC 211 to version 2.0.

RC 211 INSTRUMENTS

- 1. Disconnect the power adapter from the RC 211.
- 2. Remove the top cover from the instrument to expose the Remote Control circuit board (A1).
- 3. Make the following changes on the Remote Control circuit board (Refer to fig. 7 for component locations):
 - a. Replace U7 with the 160-8356-05 IC provided in the kit.
 - b. Change switch setting of S8 to position E to select RAM and NVRAM Test.

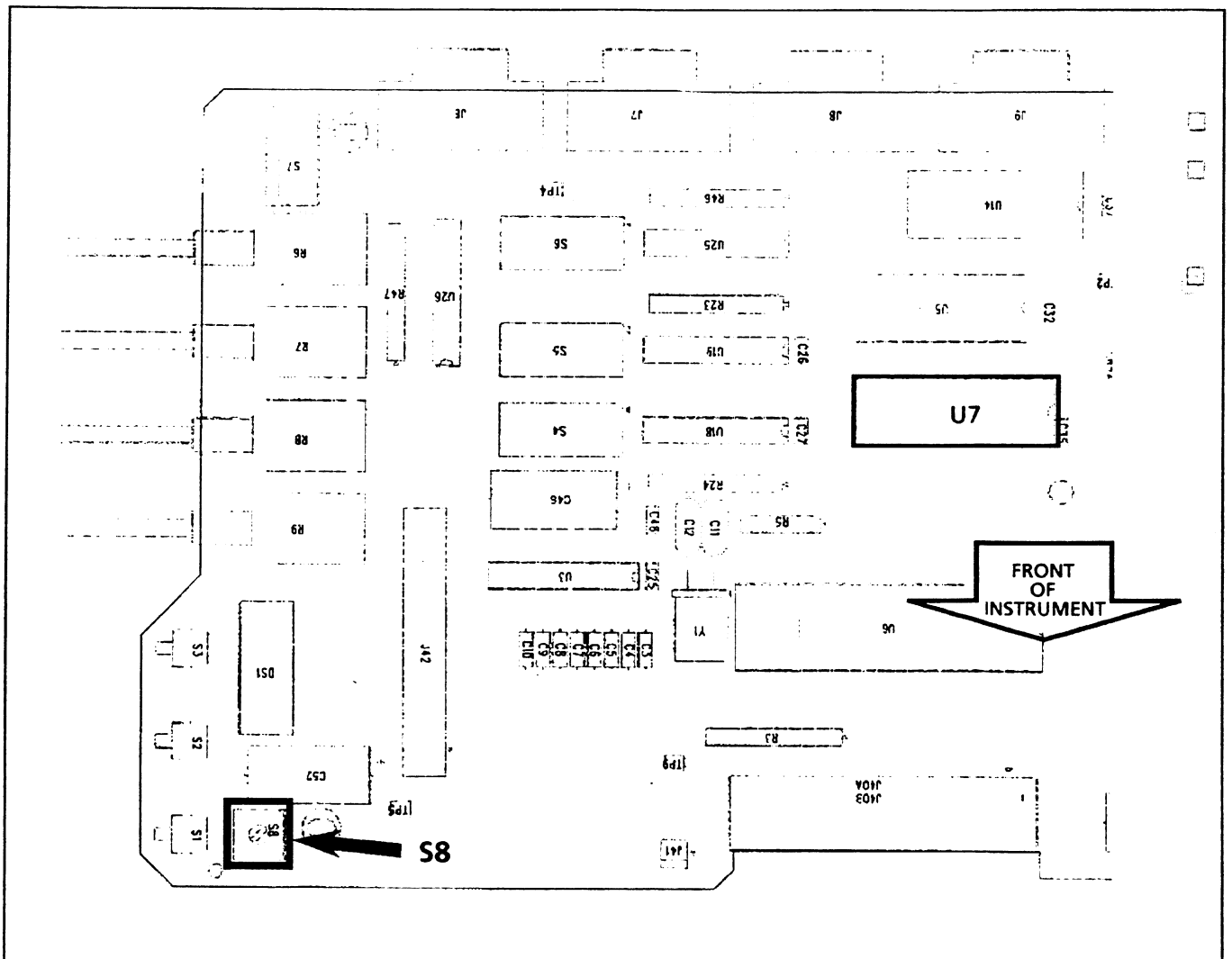


Fig. 7. Partial Remote Control (A1) circuit board assembly (RC 211) showing location of U7 and S8.

- 4. Affix the label marked 2.0 to the right side frame of the RC 211.

□ **5. VERIFICATION PROCEDURE**

- a. Connect the power adapter to the RC 211 (a long beep should be heard).
- b. Wait approximately 15 seconds then check that the RC 211 display is showing a typical readout (>FRAME SYNC STATUS▶)
- c. Disconnect the power adapter from the RC 211.
- d. Change the switch setting of S8 to position 0 to select normal operation.
- e. Install the cover on the RC 211.



MANUAL MODIFICATION INSERT

VS 211 UPGRADE

FOR THE FOLLOWING INSTRUMENTS:

VS211	ALL
RC211	ALL

installed in sn _____ Date _____

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GENERAL INFORMATION

This product modification kit upgrades a VS 211 to VS 211A performance. A new ADC circuit board and firmware version 2.1 for the VS 211 and firmware version 2.0 for the companion RC 211 are included in the kit. Information contained in this insert is valid for software versions 2.0 and up.

Note that the companion RC 211 must be upgraded to version 2.0.

TEXT and ELECTRICAL PARTS LIST CHANGES

SECTION 3 SPECIFICATIONS

Page 3-8, Table 3-7

CHANGE Chrominance Phase Error with Burst Amplitude Change entry **TO READ:**

Chrominance Phase Error with Burst Amplitude Change	< 1.5° change with a ± 3 dB amplitude change (S/N B010561 and above)	Switches to sync lock when burst amplitude is attenuated by 9 dB.	4.
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CHANGE step 4 of Performance Check and Calibration procedures in Section 4, to reflect this spec change.

SECTION 5 TROUBLESHOOTING

Page 5-8;

Controller Board Diagnostics

Table 5-6 Controller Board Diagnostics

CHANGE Diag setting 02 entry **TO READ**

02	Digital Pass Through
----	----------------------

CHANGE Diag setting 0A **TO READ:**

0A	Spare
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Page 5-9;

CHANGE first paragraph of Controller Board Diagnostics discussion **TO READ:**

The Controller board has three types of tests and one adjustment aid available through the diagnostics switch. The available tests are:

- Controller Test
- Memory Tests
- Cycle Test

And the adjustment aid is:

- Digital Pass Through

Page 5-10;

Remote Test

DELETE Remote Test heading, Remote Communications Test discussion, and Figure 5-24.

DECREMENT remaining figure numbers by 1.

ADD THE FOLLOWING:

Adjustment Aid

Digital Pass Through - This aid disables sync and burst insertion when applying a non-composite signal to the DIGITAL IN connector. The input signal is still routed through the operating signal path; this is not a bypass function. This allows a continuous digital signal to be used when adjusting the DAC output filter.

Replaceable Electrical Parts List

Changes:

Component Number	Tektronix Part Number	Name & Description
A1	671-2857-02	CKT BD ASSY:ADC
A3	671-1272-08	CKT BD ASSY:MEMORY CONTROLLER
A3U5	160-8371-01	IC, DIGITAL:CMOS, PLD; 32768 X 8, DIP28
A3U4	160-8373-01	IC, DIGITAL:CMOS, PLD; 32 MACROCELL
A3U20	160-8374-03	IC, DIGITAL:CMOS, PLD; OPT, 32 MACROCELL
A3U21	160-8372-04	IC, DIGITAL:CMOS, PLD; OPT, 32 MACROCELL
A3U63	160-8363-06	IC, MEMORY:CMOS, EPROM, 32768 X 8, DIP28
A4	671-1276-05	CKT BD ASSY:DAC
A4U24	160-7510-05	IC, MEMORY:CMOS, EPROM, 32768 X 8, DIP28
A5	671-1273-01	CKT BD ASSY:PROC/AMP DECODER
A5U7	160-8419-01	IC, MEMORY:CMOS, EPROM, 32768 X 8, DIP28
A6	671-1649-06	CKT BD ASSY:REMOTE CONTROL
A6U7	160-8354-05	IC, MEMORY:CMOS, EPROM, 64K X 8, DIP28
RC 211		
A1	671-1648-06	CKT BD ASSY:REMOTE CONTROL
A1U7	160-8356-05	IC, MEMORY:CMOS, EPROM, 64K X 8, DIP28

Date: 9/23/93

Change Reference: M80314

Product(s): VS 211A

Manual Part No: 070-8827-00

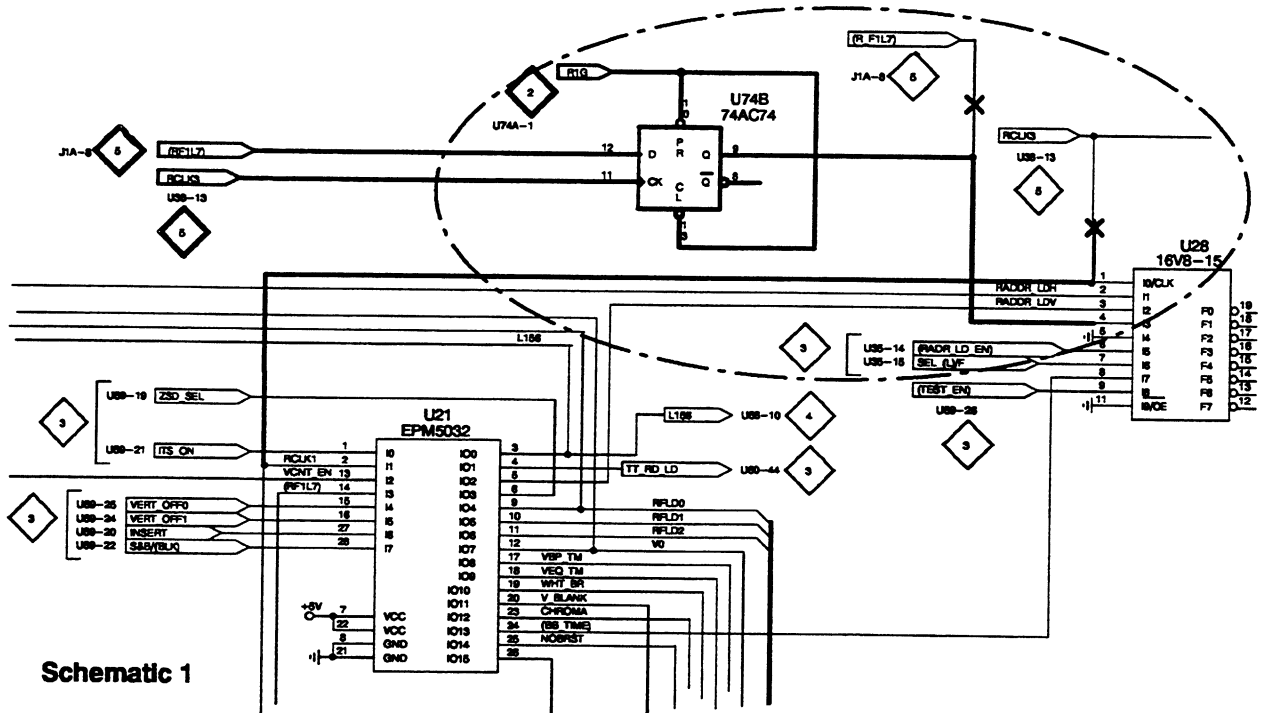
DESCRIPTION

EFF S/N B020119

ELECTRICAL PARTS LIST AND SCHEMATIC CHANGES

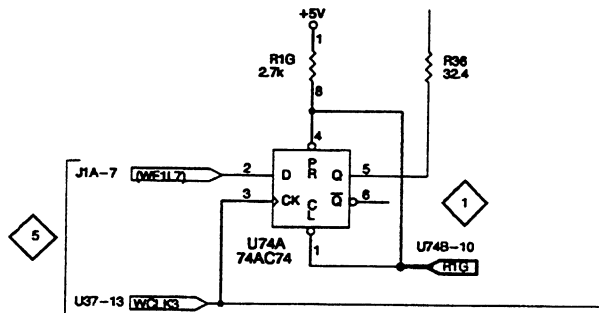
CHANGE TO READ:

- A3 671-1272-08 CIRCUIT BD ASSY: CONTROLLER
- A5 671-1273-01 CIRCUIT BD ASSY: DECODER
- A3U20 160-8374-03 IC,DGTL:CMOS,PLD;OTP,5032,32MACRO-CELL,20NS,83.3MHZ;5032-2,DIP28.3
- A5U7 160-8419-01 IC,DGTL:STTL,PLD;PAL,16R8,37MHZ,180MA;16R8B, DIP20.3



Schematic 1

Schematic 2



Schematic 2

Part of A3 schematics 1 and 2 showing added wire straps.

SECTION 2

THEORY OF OPERATION

This section has three main parts: instrument level, board level, and schematic level.

Where the user should turn for information depends upon their needs. Find general information at the instrument level. Find board functions at the board level. The schematic level gives specific components and signal names.

NOTE

*This manual uses the following signal name conventions:
(SIGNAL) is equivalent to SIGNAL,
[SIGNAL] is an aside of SIGNAL,
[(SIGNAL)] is an aside of (SIGNAL).*

Theory of Operation

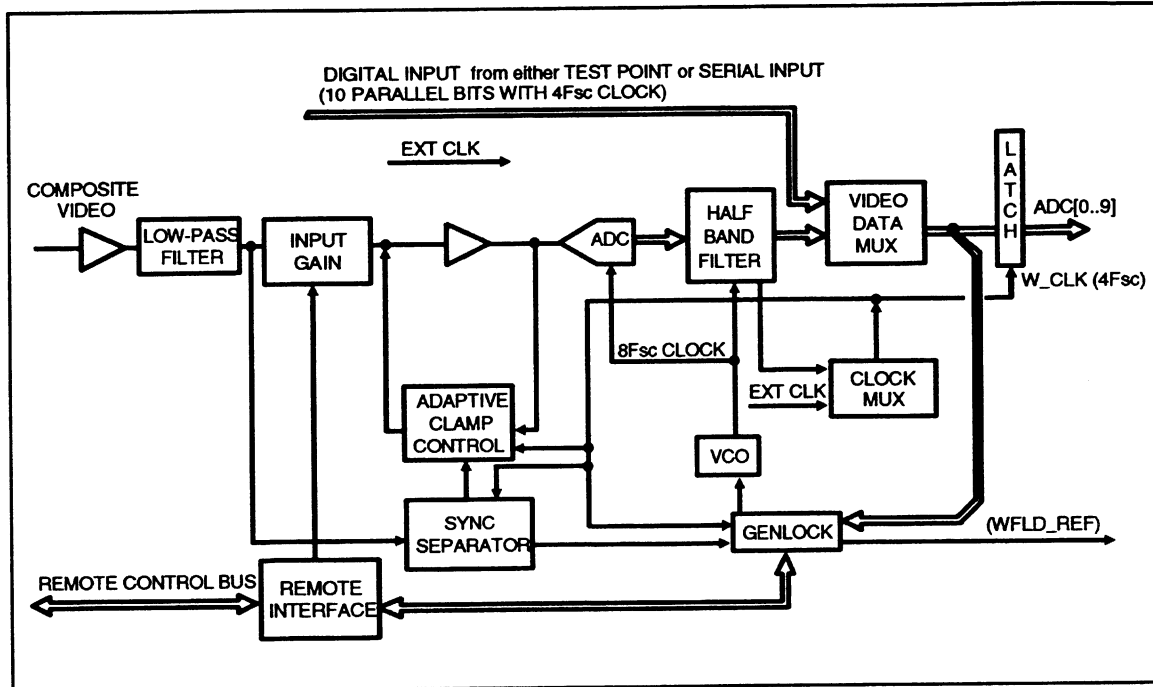


Fig. 2-1. Block diagram of the ADC board.

ADC BOARD

BLOCK LEVEL DESCRIPTION (See Fig. 2-1)

The task of the VS 211 (software version 2.0) ADC board is to genlock to incoming video, digitize it, and provide $4F_{sc}$ clocks (W_CLK) and a field reference pulse (WFLD_REF).

The composite video signal, from the PROGRAM INPUT, is immediately buffered and low-pass filtered. (This is for anti-aliasing.) The output of the filter is directed to the sync separator and to a gain control stage (input gain).

The sync separator extracts sync timing from the video signal for use by the genlock circuitry.

The input gain is an amplifier (controlled either by a local potentiometer or through the remote control bus) in the signal processing path. Its purpose is to compensate for any non-standard program input signal level.

After the input gain, the video is clamped at backporch level. The adaptive clamp circuit samples video just prior to the input of the ADC during backporch time. Timing for the clamp is derived from the sync separator circuit. The adaptive clamp has circuitry that looks at the

composite video signal and measures the RMS noise. As noise increases, the speed of the clamp loop slows to prevent streaking. The output of the clamp drives the Analog to Digital Converter (ADC).

The ADC converts the video signal at an $8F_{sc}$ rate. The signal is then digitally filtered by the half band filter to a $4F_{sc}$ rate.

The half band filter outputs a 10-bit digital representation of the composite video signal with sync tip represented by a hex value of 004_h and a peak white value of $34C_h$ for nominal input levels. See Fig. 2-2.

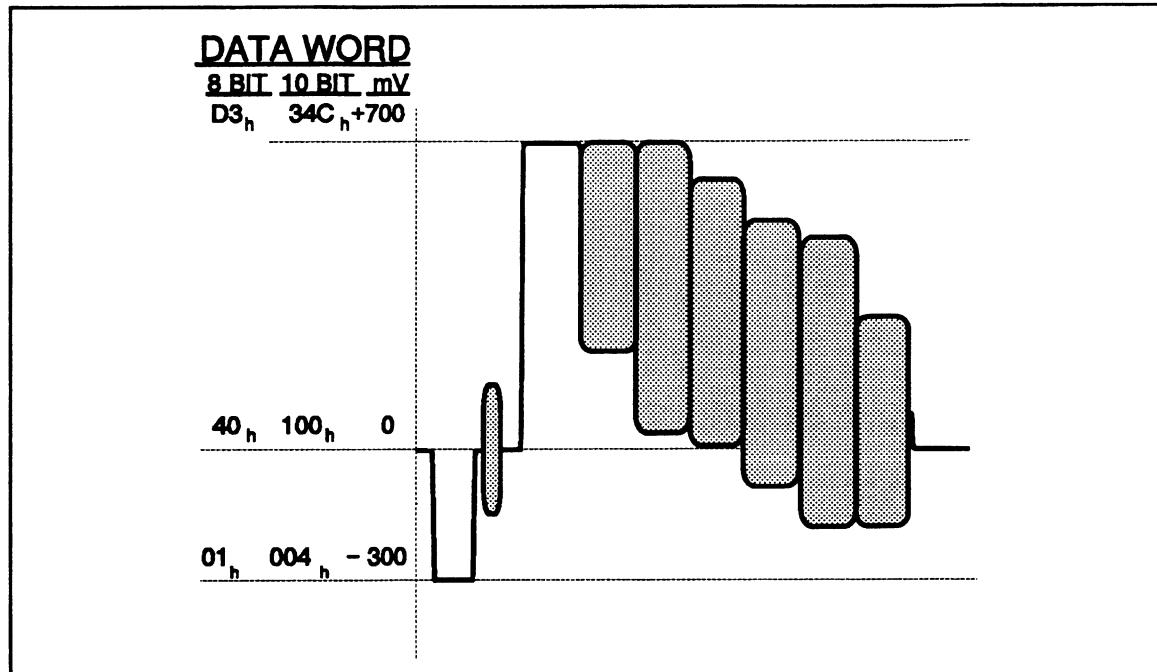


Fig. 2-2. The digital levels of the converted signals.

The output of the half band filter goes to a multiplexer (MUX) that selects between the ADC's output and the SERIAL IN signal. (The genlock's processor controls the MUX via the remote bus.) The output of the MUX goes to the genlock and latches.

The genlock circuitry is a microprocessor and data acquisition system that gets input from the video data MUX, the remote control bus, and the sync separator. The genlock samples sync and burst from the video data MUX and calculates the phase of burst, the position of sync, and the relationship between the sync and burst (SC/H phase). It outputs a correction voltage to the VCO to lock it to the burst of the incoming video signal. The genlock also outputs a color frame reference pulse (WFLD_REF) that occurs for one $4F_{sc}$ clock cycle at the middle of field 1 line 7 of the PAL eight-field sequence. If the video data MUX had selected the SERIAL IN signal, $D2_{[0..9]}$, instead of output from the ADC, then the $4F_{sc}$ clock (W_CLK) is derived from the serial digital signal clock, $PCLKA$. (The genlock will not affect the external clock, but will provide the color frame reference pulse based on the external data.)

Theory of Operation

The output of the latches passes through the Upper Interconnect board and is stored on the Memory board.

LIST OF SCHEMATICS for ADC BOARD

- ① Analog Input
- ② ADC, Half Band Filter, & References
- ③ Data MUX, Interconnect, & Power Distribution
- ④ Genlock Ic & Sync Separators
- ⑤ Genlock Processor Kernel
- ⑥ D2 Clock, VCO, & $8F_{sc}$ Distribution

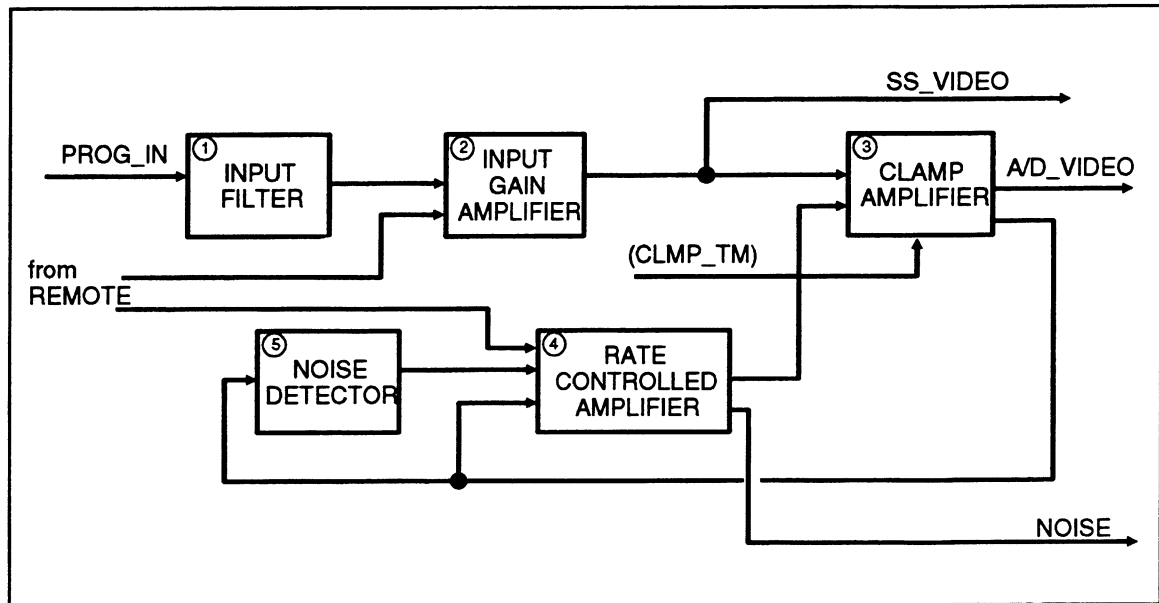


Fig. 2-3.
Block diagram of the Analog Input circuit on the ADC board.

SCHEMATIC LEVEL DESCRIPTIONS ADC BOARD

ANALOG INPUT 1 (See Fig. 2-3)

① Input Filter

The purpose of the Input Filter is to remove any out-of-band components of the input signal and provide source and load termination of 75Ω .

The filter consists of L1 through L3 and associated components that form a 7-pole elliptical low-pass filter. (A simple filter is possible due to the $8F_{sc}$ sampling rate of the ADC 2.) J1 and J2 can take the filter out of service for diagnostic testing.

② Input Gain Amplifier

The Input Gain Amplifier gets its gain value from either the on-board input gain pot or from the RC 211 via the remote port. The placement of J3 chooses what controls the input gain. This amplifier is user adjustable and compensates for input attenuation or low input levels.

③ Clamp Amplifier

The program video signal from the Input Gain Amplifier is applied to the input of the Clamp Amplifier. The Clamp Amplifier (U2) is a non-inverting amplifier that drives the ADC. Clamping is controlled by the DC offset from the Rate Controlled Amplifier, applied to pin 2. U2 also clips the input to protect the ADC from the overrange inputs.

Theory of Operation

④ Rate Controlled Amplifier

The video signal from the Clamp Amplifier is applied to the input of the Rate Controlled Amplifier through a chrominance band-stop filter (burst trap) (C8, C7, and L4) in the Clamp Amplifier that removes the burst information from the backporch of the video signal. The sample and hold device, U11, samples the dc voltage level from the backporch, clocked by CLMP_TM. The CLMP_TM signal is derived from on-board clocks and signals from the Sync Separator \diamond . U11 samples the input signal at pin 2 during the time that pin 14 is low and holds the sample when pin 14 is high.

The output of U11 pin 7 drives an integrator, U14. The integrator circuit consists of the amplifier (U1A), the feedback capacitor (C24), and the input resistance (R50 plus up to three other parallel resistors from the Noise Detector). The integrator circuit compares the backporch level from the Clamp Amplifier output with the clamp dc level set by R3 (the Clamp DC Level Adjustment to -0.875 V) applied to the positive input of U1A. If there is a difference between these two levels, the integrator feeds a signal back to the negative input of the Clamp Amplifier (U2), via J5, to cause the output to slew towards the desired offset level. The integrator capacitor C24 then holds the integrator output level until another offset difference is detected.

The amount of noise on the program signal determines the rate at which the integrator responds to correct the dc offset at the output of the Clamp Amplifier. With no noise, the integrator reacts the fastest, but as the noise level increases the rate of correction slows down. This is done by changing the input resistance of the integrator. When no noise is present, the input resistances (R51, R52, R53, and R54) are all in parallel. U15A, U15B, and U15C and the switches in U4 control the paralleling of the resistors across R50. U15 is a quad comparator with reference voltages on each of the - inputs and the Noise Detector output driving the + inputs. As the noise level on the program video signal increases, the dc voltage level out of the Noise Detector rises above the threshold level of each comparator. That comparator then opens its switch and removes the corresponding parallel resistor from across R50. This will cause the reaction speed of the integrator to slow down. U15D generates the NOISE2 signal flagging a noisy input signal (≈ 28 dB signal to noise ratio or worse).

⑤ Noise Detector

The Noise Detector analyzes the amount of noise present on the backporch of the video signal at the output of the sample and hold device (U11) and controls the reaction time of the integrator in the Rate Controlled Amplifier accordingly. As the noise level increases, the integrator slows down.

The output of U11 also drives the + input of op amp U1B (configured as a high-pass filter). U1B drives the RMS converter, U10, through U9.

To avoid detecting large dc transients as noise, the large transient detector (U8A and U8B) monitors the high-pass filter output for voltage changes that exceed the ± 1.88 V threshold. If the output of U1B exceeds either of these thresholds, the output of the large transient detector switches from a high to a low state, triggering the time out circuit (U69A, a one-shot multivibrator). U69A output, after being triggered, goes high opening switch U9 and disconnecting the outputs of U1B from the RMS converter (U10). If the threshold level was exceeded due to a short term transient, U69A output will revert to a low level after a short time out (≈ 1 ms) allowing switch U9 to close.

To determine if high noise levels are being detected as large transients, U62B, a low-pass filter, detects and averages the time the U69A's output is high. When the output of U69A is high for an excessive time (which would occur if high noise levels are present) the output of U62B approaches 2.5 V. When the output exceeds 2.5 V, U62A's output is forced low. This closes switch U9 and connects the output of U15 to the input of the RMS converter. The time that U9 is closed depends upon the amount of noise on the signal. Large DC level transients, such as those caused by hot switches, etc., do not occur on a frequent basis, therefore frequent tripping of the large transient detector occurs only when there is high amplitude noise.

U10 is an RMS noise converter that provides a dc output directly proportional to the RMS value of its input. U10 has a long time constant determined by C34 and C33 that averages the noise pulses. Averaging is used because noise levels on television signals do not change rapidly and using a time constant equal to a number of fields ensures that the clamp amplifier will not be upset by a random occurrence. The voltage level output of U10 drives the noise comparator in the Rate Controlled Amplifier.

Theory of Operation

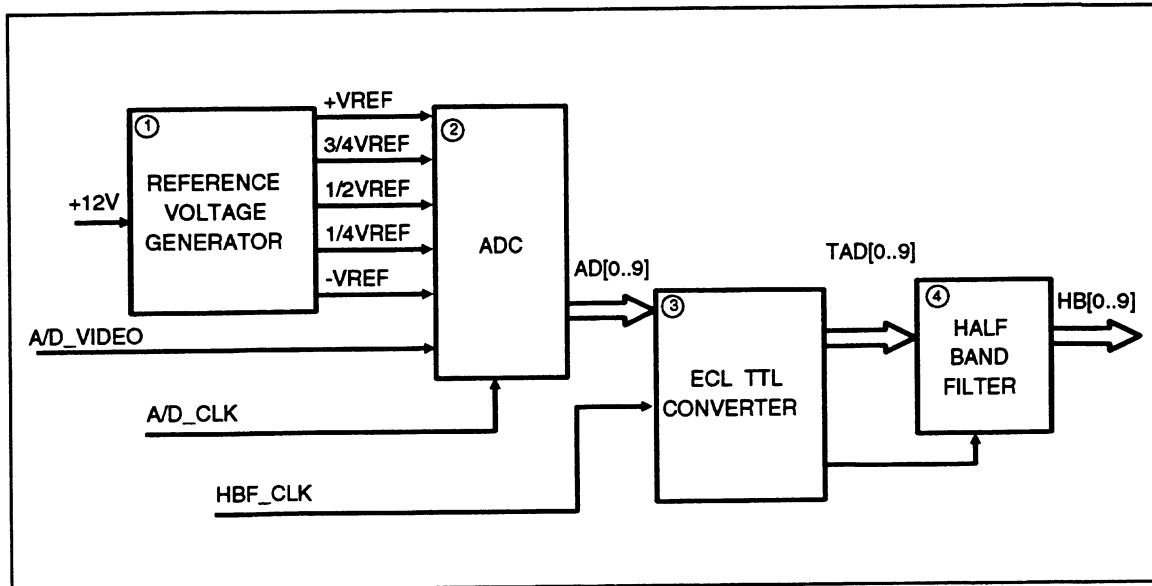


Fig. 2-4.

Block diagram of the ADC board's ADC, Data MUX, and Latches circuitry.

ADC, HALF BAND FILTER, & REFERENCES 2

(See Fig. 2-4)

① Reference Voltage Generator

The purpose of the reference voltage generator is to generate precise, accurate voltages as reference for the ADC. The main reference voltages are ± 1.75 V and all the other voltages are derived from these references. Adjustments are provided on the $\frac{1}{4}$, $\frac{1}{2}$, and $\frac{3}{4}$ taps on the reference ladder allowing for minor corrections in linearity.

② ADC

The ADC takes the filtered and clamped video input and converts it to a digital signal in the ADC (U23). The ADC converts the signal at an $8F_{sc}$ rate. The high conversion rate allows a simpler input filter and better frequency response. The digital signal then goes to the ECL-TTL Converter.

③ ECL-TTL CONVERTER


The ECL-TTL Converter takes the signal from the ADC [AD[0..9]] and the $8F_{sc}$ clock signal from the $8F_{sc}$ PLL and converts them for the Half Band Filter.

④ HALF BAND FILTER

The Half Band Filter, U21, takes the digitized video signal from the ADC and converts it from an $8F_{sc}$ signal to a $4F_{sc}$ signal. At the same time, it digitally limits the bandwidth of the signal without introducing group delay distortion. The output of the filter, HB[0..9] goes to the Multiplexer ◆.

DATA MUX, INTERCONNECT, AND POWER DISTRIBUTION


Multiplexer—ADC or Digital Input

The Multiplexer consists of one register (U28) and two registered ECL-TTL converters (U29 and U30). These ICs are enabled by the D2_EN/(ADC_EN) and (D2_EN) signals respectively. This allows only one of the two sets of input signals (either the signal from the Half Band Filter or the Serial Digital input signal) to drive the ECL Converter and the Genlock IC . This signal is MD[0..9].

ECL Converters

MD[0..9] is converted back to ECL levels by U36 and U37. The signal is clocked through by the SYSCKL1 signal (derived from the $4F_{sc}$ clock). These converters drive the signal, ADC[0..9], off the board through J19C.


Remote Control Interface

PLD, U39, controls the Remote Buffer. The Remote Buffer takes signals from the remote control bus (RMC) and, using information generated internally on the ADC board, derives control signals for use in the Microprocessor Kernel . These control signals go out on the external data bus (ED).

Interconnect

See Table 2-1 for the interconnection for the ADC board.

Clamp Timing & Video Detect

U39 detects video absent. It also extracts the SERIAL INPUT's comp sync timing. It sends the middle 8 bits to the Genlock IC (where the comp sync should be located). Using only these bits will provide greater resolution. U39 detects video absent by looking for a sync pulse within 1.5 lines. A sync pulse is determined from the digital data stream value. The middle eight bits of the memory data [MD[0..9]] are clipped, latched, registered, and sent to the genlock IC . Clipping occurs if the MD9 bit is set. Latching occurs whenever the SIS line is high.

Theory of Operation

Table 2-1. Pin-out for J19

PIN	J19A	J19B	J19C
1	GROUND	GROUND	GROUND
2	GROUND	PROG_IN	GROUND
3	GROUND	GROUND	GROUND
4	not connected	not connected	not connected
5	not connected	not connected	not connected
6	not connected	ED2_EN)	not connected
7	not connected	not connected	not connected
8	PCLKA	NOISE	(PCLKA)
9	not connected	(AUTOFRZ)	not connected
10	(BST_ABS)	WFLD_REF	not connected
11	GROUND	GROUND	GROUND
12	WCLKB	GROUND	(WCLKB)
13	-5 V	-5 V	-5 V
14	-5 V	-5 V	-5 V
15	-12 V	-12 V	-12 V
16	GROUND	GROUND	GROUND
17	GROUND	GROUND	GROUND
18	+12 V	+12 V	+12 V
19	+5 V	+5 V	+5 V
20	+5 V	+5 V	+5 V
21	WCLKA	GROUND	(WCLKA)
22	GROUND	GROUND	GROUND
23	D2_9	(R/O_0)	ADC9
24	D2_8	RRD/(WR)	ADC8
25	D2_7	RMC_7	ADC7
26	D2_6	RMC_6	ADC6
27	D2_5	RMC_5	ADC5
28	D2_4	RMC_4	ADC4
29	D2_3	RMC_3	ADC3
30	D2_2	RMC_2	ADC2
31	D2_1	RMC_1	ADC1
32	D2_0	RMC_0	ADC0

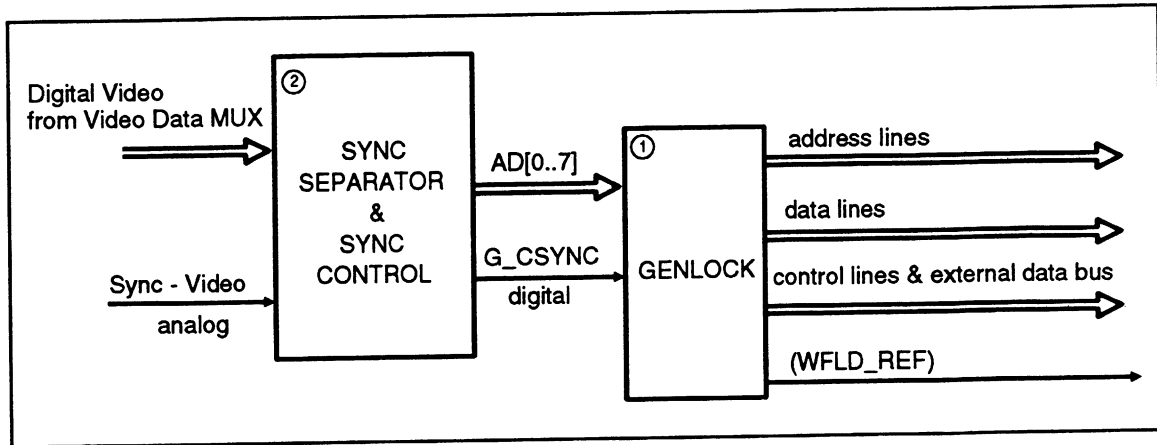


Fig. 2-5. Block diagram of the genlock schematic.

GENLOCK IC & SYNC SEPARATORS 4

(See Fig. 2-5)

① Genlock IC (GLIC)

The GLIC, U40, performs a number of tasks. In terms of genlock function, its main task is to acquire a sample of sync and burst as digitized by the ADC (and processed by U41) in its internal sample RAM. This RAM interfaces with the Genlock Processor Kernel via address and data lines to the GLIC.

The GLIC also contains all the address decoding and RAM for the microprocessor. In conjunction with the microprocessor and other associated genlock hardware, the GLIC generates the (WFLD_REF) pulse which is the basic timing reference for the entire input side of the instrument.

② Sync Separator and Sync Control

The Sync Separator and the Sync Control are two ICs that work together to produce the composite sync output. The Sync Separator (U42) takes the video signal directly out of the input filter [SS_VIDEO] and outputs a TTL sync pulse [A_CSINC]. U42 also generates the timing for Sound in Sync, ASIS_TM. These signals go to the Sync Control (U44). The Sync Control uses sync pulses to generate the CSYNC_IN signal until the VCO is locked. Once the VCO locks, then the sync source is simply based on the (WFLD_REF) pulse and the phase locked system clock, SYSCLK2. This allows the signal to stay locked in the presence of greater amounts of noise.

SIS mode is entered by the remote control via the μP [(SIS_SEL)=0]. When this line is low, the analog sound in sync lines are effectively wire-or'd to gate out the sound data from the internal sync detector (U44). Also, the DSLS_TM signal is delayed and sent to U39 4 to latch the MD[0..9] data before storing it in GLIC, U40.

Theory of Operation

U44 contains circuitry to detect hotswitching of the input. Disable the burst hotswitching detection by moving J32 to pins 2-3. The hotswitching detection is shut off in the presence of noise.

Finally, U44 selects the input to U44-23 to be either an H sync pulse or a “clocked” comp sync that clocks U46 whenever the incoming comp sync is low. This is used to detect the vertical interval in the presence of noise. Note that the sync source for the clamp timing, A_CS SYNC, is either the internal comp sync in U44 or the analog comp sync, but it is never referenced to the digital input. When digital input is selected, the analog comp sync is used.

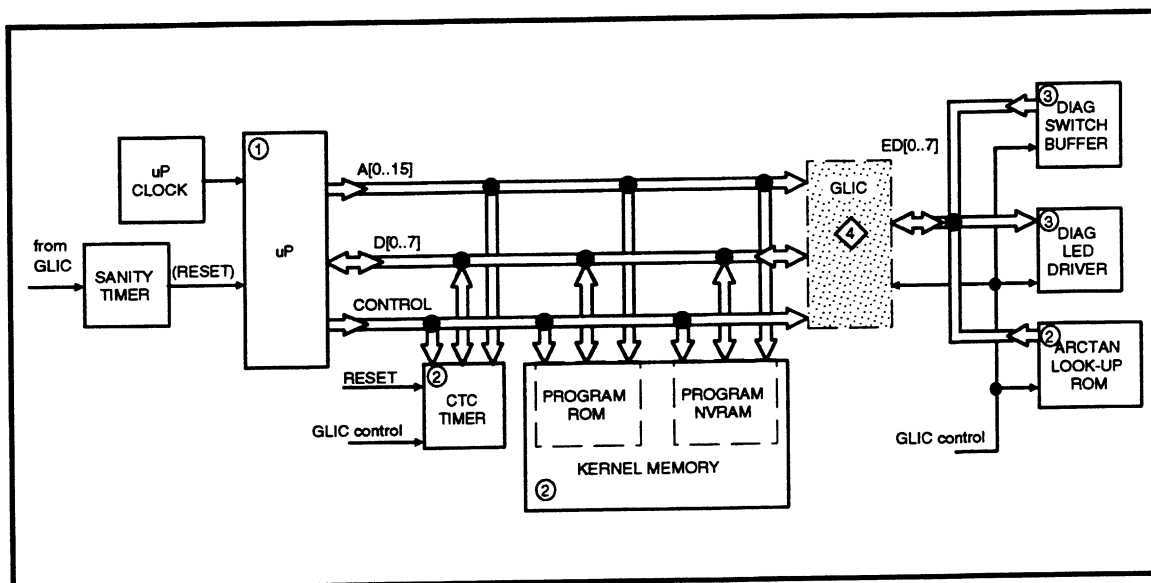


Fig. 2-6.
Block diagram of the Genlock Processor Kernel on the ADC board.

GENLOCK PROCESSOR KERNEL 5

(See Fig. 2-6)

This section briefly describes the functions of the Microprocessor (μP) Kernel and its components. For a description of the diagnostics executed by the μP , refer to the Troubleshooting section of this manual.

The μP Kernel has three main functions: (1) to acquire and maintain genlock with the incoming reference signal, (2) to service remote commands, and (3) to execute diagnostics. The components of the μP Kernel are as follows:

① Microprocessor

The Microprocessor (μP) (U48) is the heart of the Kernel. Receiving its program instructions from the EPROM (U53), the μP controls the Kernel through address lines A[0..15], data lines D[0..7], and various other control lines. When the instrument is being powered up the (RESET) pulse goes low, resetting the μP Kernel. The μP can be manually reset by pressing the manual reset button, S2.

During normal operation, the Genlock IC (U40) 4 monitors the μP . If the μP is not sending the proper I/O decoded address, U40 will pulse the NMI (non-maskable interrupt) of the Z80 causing the processor to reinitialize without running the power-up diagnostics.

U45 contains a timer circuit. During normal operation, the μP keeps this timer reset by asserting the I/O_14 line repeatedly. If the μP fails to reset the timer, U45 resets the μP . Moving jumper J30 to the 2-3 position disables the μP resets for troubleshooting purposes. U45 also monitors the +5 V supply and will generate a reset if it falls below 4.75 V.

Theory of Operation

② Kernel Memory, Arctangent Look-up, & CTC Timer

EPROM (U53) contains the instructions that control the μ P. The EPROM occupies the μ P's address spaces between 0000 and 7FFF hex.

The arctangent PROM (U47) is a look-up table of the trigonometric function of the ratio of two numbers. While doing genlock calculations, the μ P looks up the solution to the arctangent calculation in the PROM instead of calculating it.

The μ P first outputs the divisor of the calculation and U52 latches it. This provides the lower half of the PROM address. Then the μ P reads from the arctangent I/O location. By virtue of the μ P architecture, the upper 8 address lines contain the I/O port address. These 8 bits form the upper 8 bits of the PROM address. The PROM outputs are then available on the external data bus ED[0..7].

The E²PROM (U54) is an electrically writeable and erasable PROM. It stores the genlock sampling angle and remote video gain values. It occupies addresses E000 - E7FF. Selection for reading and writing is controlled via U55.

The E²PROM is read at power-up and after a reset. These values are transferred to the processor RAM for use by the appropriate circuitry.

③ Diagnostic Selectors and LEDs

The diagnostic select switch, S3, controls the diagnostic routines that are run on the ADC board through the μ P. U49 buffers the signals from the switches and sends them off on the ED bus to drive the μ P.

Latches U50 and U51 drive the diagnostic LEDs as well as a number of other control lines.

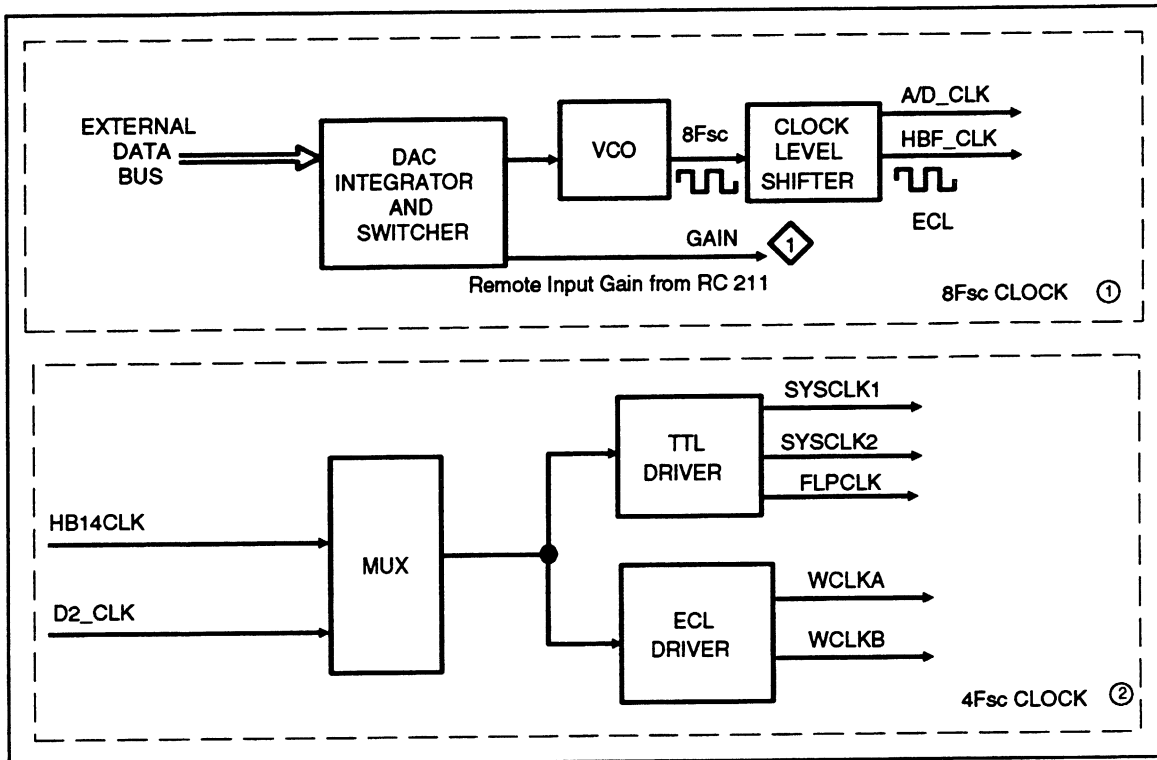


Fig. 2-7.
Block diagram of the VCO and Clock Distribution circuit on the ADC board.

D2 CLOCK, VCO, & $8F_{sc}$ DISTRIBUTION ⑥

(See Fig. 2-7)

① $8 F_{sc}$ Clock

DAC Integrator and Switcher

DAC, U56, has two functions: convert the input gain from the RC 211 to an analog voltage and convert the PLL correction word to a voltage for the PLL loop filter.

The input gain from the RC 211 comes over the ED bus. GAIN/(VCO) controls whether ED is the PLL correction word or the remote input gain. If it is the gain, it is output at U56-20 where it is amplified by U57B and sent to the Input Gain Amplifier ④.

The Genlock Kernel Processor ④ controls the PLL through the VCO DAC (U56). The VCO DAC in conjunction with U57A, converts the correction word (ranging from 00_h to FF_h) from the processor to a voltage. The voltage is applied to the PLL Loop Filter composed of U60, R122, R125, R124, R126, C78, and some control switches (U58). These switches are under the control of the Kernel Processor via the control signals from U50 and determine which one of 4 modes the PLL Loop Filter will operate in. The two major modes are INTERNAL and GENLOCK. GENLOCK has several submodes. A description of each one follows.

Theory of Operation

INTERNAL MODE: When a valid genlock is not possible, this mode is forced by pulling the (INT)/GLK line low. This will configure U60 as a voltage follower and the voltage at the wiper of R134 will be applied to the VCXO control input. The VCXO will then free run at the frequency set by R134. The PGM UNLCK (Program Unlocked) LED on the front of the ADC board is on when the PLL Loop Filter is in this state.

GENLOCK MODE: During normal synchronizer operation, most of the time is spent in this mode and its submodes. The (INT)/GLK line will be high and the loop filter will operate in one of three submodes: ACQUIRE, HOLD, or CORRECT. The PGM UNLCK (Program Unlocked) LED on the front of the ADC board is off when the PLL Loop Filter is in this state.

ACQUIRE MODE: The ACQUIRE mode is used for acquiring the initial lock. It results in an effective bandwidth of ≈ 20 Hz. It can indicate a very noisy signal. The GNLK ACQ (Genlock Acquire) LED on the front of the ADC board is on when the PLL Loop Filter is in this state.

HOLD MODE: HOLD mode results in an effective bandwidth of ≈ 6 Hz, and is used after initial acquisition. The GNLK ACQ (Genlock Acquire) LED on the front of the ADC board is off when the PLL Loop Filter is in this state.

CORRECT Active low: is used during some portions of the active video field when the Processor Kernel is busy doing other things and doesn't have time to generate correction words. It results in the output of the Loop Filter IC (U60) being held at whatever level it is currently at. In this manner, disturbances that would otherwise have resulted from not generating correction words at some times can be minimized. (This state is never indicated by the LEDs on the ADC board.)

VCO


Y2 takes the output control voltage and generates a frequency that is 8 times the input burst frequency, nominally 35.468950 MHz ($8F_{sc}$).

Clock Level Shifter

U61 converts the $8F_{sc}$ clock to ECL levels by U61, for distribution on the ADC board.

② 4 F_{sc} Clock

MUX

The $4F_{sc}$ clock is derived from either the SERIAL DIGITAL input or the clock signal output by the Half Band Filter . U31 selects which one from the (EADC_EN) signal.

TTL & ECL Drivers

The selected signal is converted to TTL levels by U32 for ADC board use and to ECL levels by U34B and U34C for off-board use.

SECTION 4 PERFORMANCE VERIFICATION & ADJUSTMENT PROCEDURE

Performance Verification

No changes should be required when changing to software version 2.0

Adjustment Procedure (Short Form)

NOTE

Perform the Adjustment Procedures for the Power Supply and the DAC board first for optimum results.

ADC Board

1. ADC Reference Voltages
(REF,REF, REF) — R154, R155, and R156
2. ADC VCO Adjustment — R134
3. Clamp DC Level and Input Gain — R3 and R23
4. Input Frequency Response — C189 & C191 (also L1, L2, & L3 if necessary)
5. Burst Trap — C7
6. Clamp Loop Response — R56

Adjustment Procedure (Long Form)

NOTE

Perform the Adjustment Procedures for the Power Supply and the DAC board first for optimum results.

ADC Board

NOTE

Remove the top cover instead of using the Extender board for more accurate ADC board adjustments.

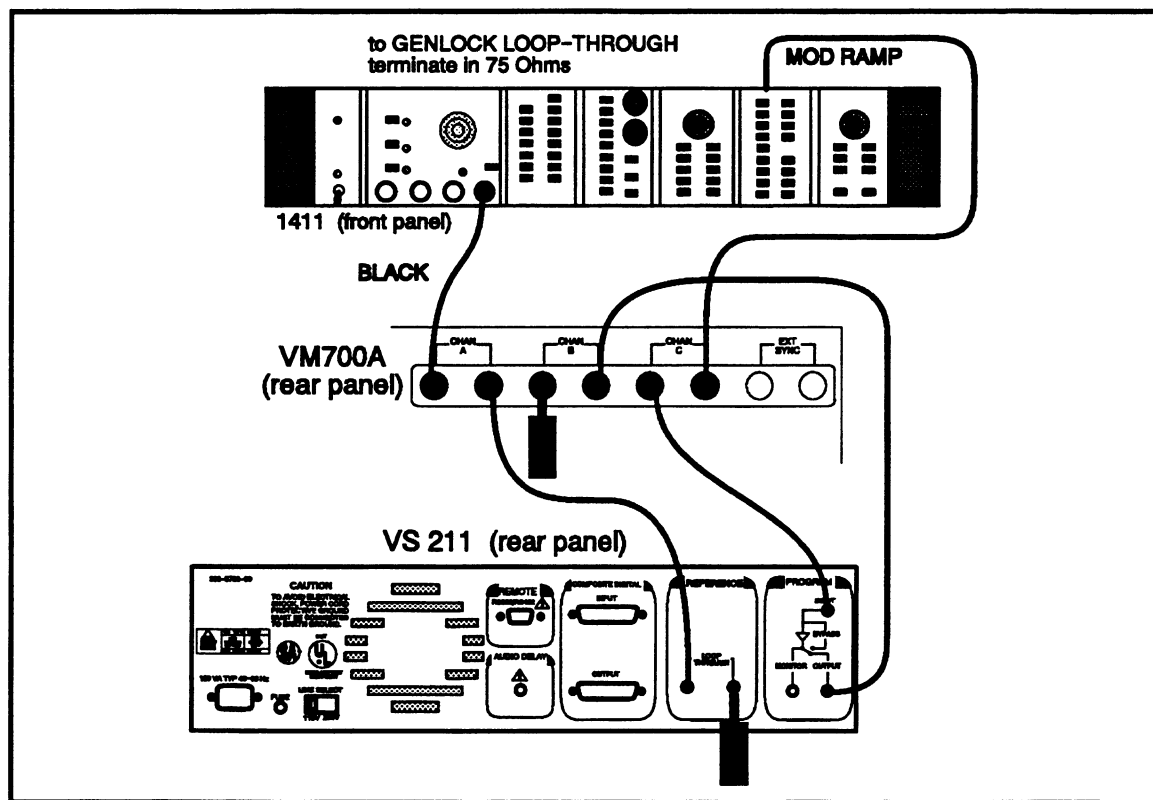


Fig. 4-1.
Setup to adjust the ADC Reference Voltages.

1. **ADC Reference Voltages**
($\frac{3}{4}$ REF, $\frac{1}{2}$ REF, $\frac{1}{4}$ REF) — R154, R155, and R156
 - a. Connect the test equipment as shown in Fig. 4-1.
 - b. Set the VS 211 (software version 2.0) to use the PROGRAM INPUT as the input signal (S4-5 on the Remote I/O board closed).

Performance Verification & Adjustment Procedure

- c. Set the 1411 to output a Mod Ramp.
- d. Use the VM 700A's **DGDP** measurement mode to measure the differential gain of the signal on CHAN C (input).
- e. Store this value as reference 1.
- f. Display the differential gain of CHAN B (output) relative to reference 1.
- g. Adjust R154, R155, and R156 so that the differential gain of the output signal relative to the input signal is as close to zero as possible. (Each resistor adjusts a different amplitude of the signal.)

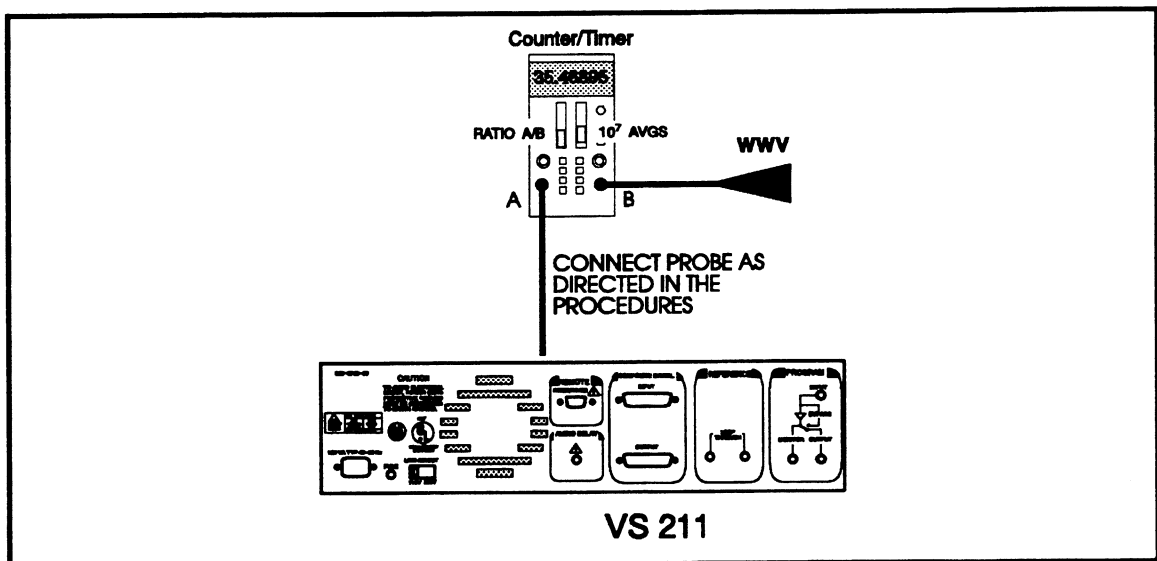


Fig. 4-2. Setup to adjust the ADC frequency.

2. ADC VCO Adjustment — R134

- a. Connect the equipment as shown in Fig. 4-2.
- b. Move jumper J31, on the ADC board, to the 2-3 position.
- c. Attach the probe to TP24 on the ADC board.
- d. Adjust R134 (front edge of the ADC board) for 35.468950 MHz.
- e. Return jumper J31 to the 1-2 position.

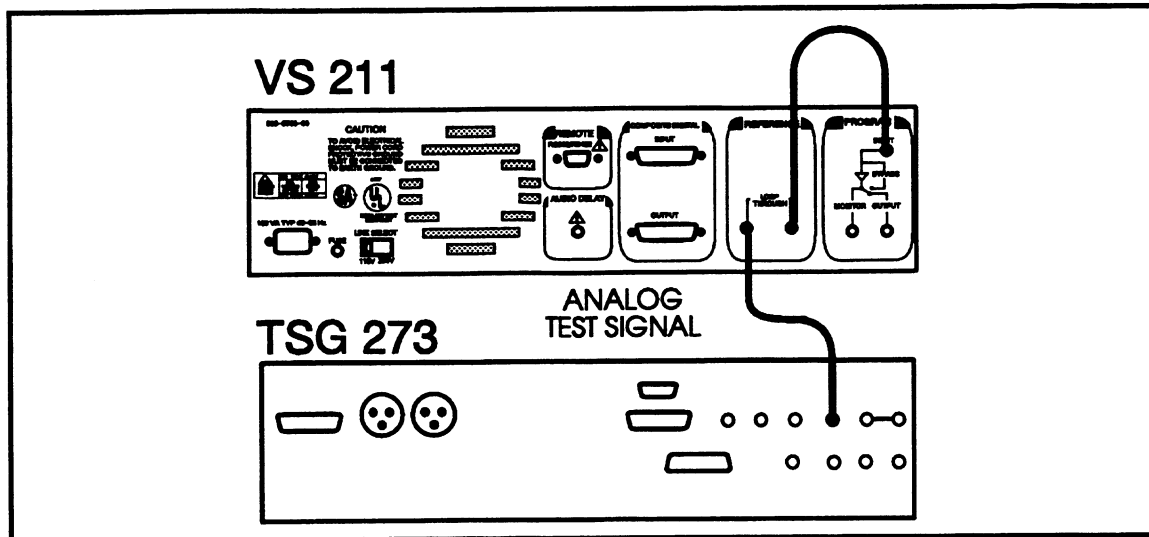


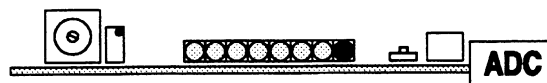
Fig. 4-3.
Setup to adjust the ADC Clamp Level and the Input Gain.

3. Clamp DC Level and Input Gain — R3 and R23

NOTE

If using an RC 211, simply repeat the following procedures with J1 in 1-2 and replace adjustments for R23 with the remote Input Gain control.

- a. Connect the equipment as shown in Fig. 4-3.
- b. Set the ADC board Diagnostic Switch (S1) to "5".
- c. Press the RESET button (S2). This puts the VS 211 (software version 2.0) in Diagnostic mode.
- d. Adjust R3 until the far right LED on the edge of the circuit board comes on. Continue to adjust until the LED is as bright as possible.



- e. Check that jumper J1, on the ADC board, is in the 2-3 position. (Give local control to the Input Gain.)



- f. Adjust R23 (Input Gain) to light the second from the right LED. Continue adjusting until it is as bright as possible.
- g. Go back and adjust R3 to turn both LEDs on and off together. Leave it adjusted so that both LEDs are as bright as possible.

- h. Return the ADC board Diagnostic Switch (S2) to the "0" position.
- i. Press the RESET button (S1), on the ADC board, to return the VS 211 (software version 2.0) to normal operation.

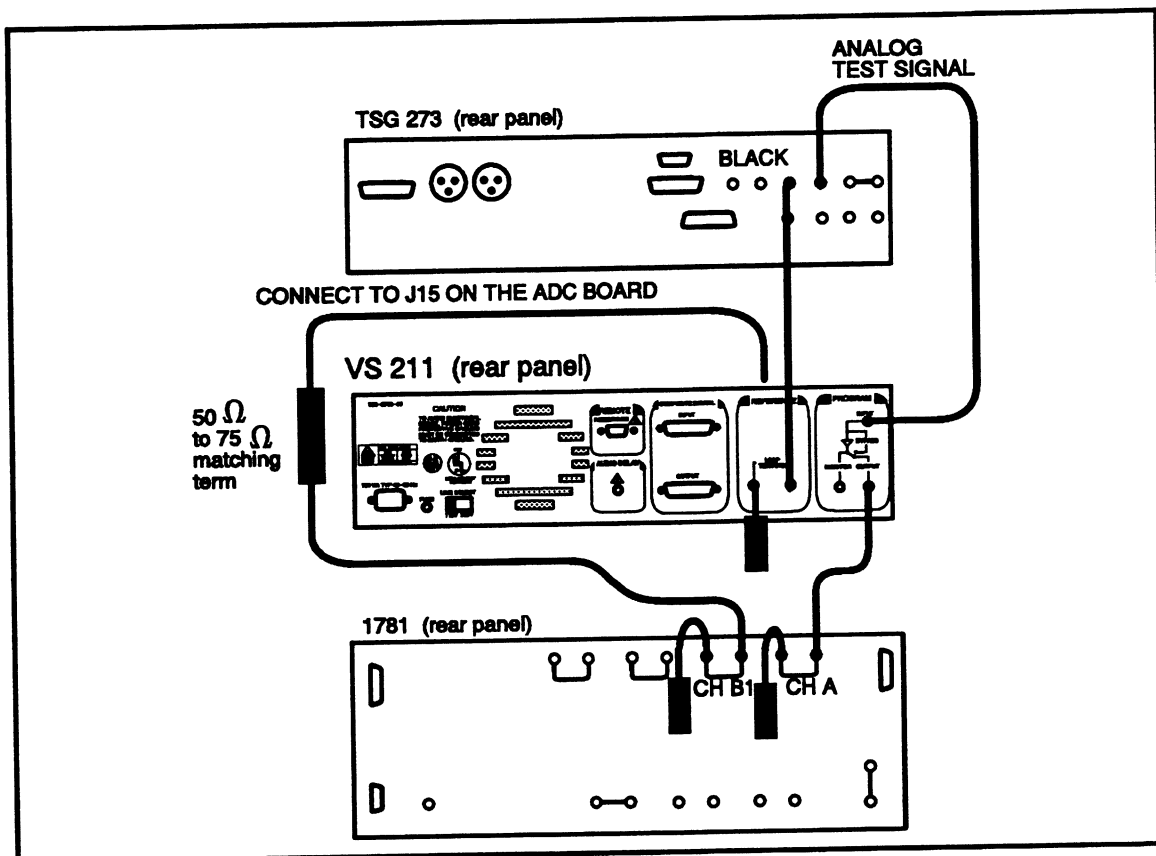


Fig. 4-4. Setup to adjust the ADC frequency response.

NOTE

The following inductors are factory set. Only make these adjustments if the instrument is out of spec.

4. Input Frequency Response — C189 & C191 (Also L1, L2, & L3 if necessary)

- a. Connect the test equipment as shown in Fig. 4-4.
- b. Select Line Sweep from the TSG 273.
- c. Connect the waveform monitor to J6 on the VS 211 (software version 2.0) as shown in Fig. 4-4, using an SMB to BNC cable. (See the regular Service manual for the construction of this cable.)
- d. **CHECK** — that the signal is flat within 1% to 5.5 MHz.

Performance Verification & Adjustment Procedure

- e. Adjust C189 and C191 for a flat frequency response (within 1%).
- f. If it cannot be brought into spec using C189 and C191, adjust L1, L2, and L3 to bring the input frequency response to within 1%.

5. Burst Trap — C7

- a. Connect the test equipment as shown in Fig. 4-4.
- b. Connect the waveform monitor probe to TP23 on the ADC board.
- c. Set the TSG 273 for 5-Step Staircase.
- d. Adjust C7 to minimize the PROGRAM Input's burst amplitude, while keeping as much luminance information as possible.

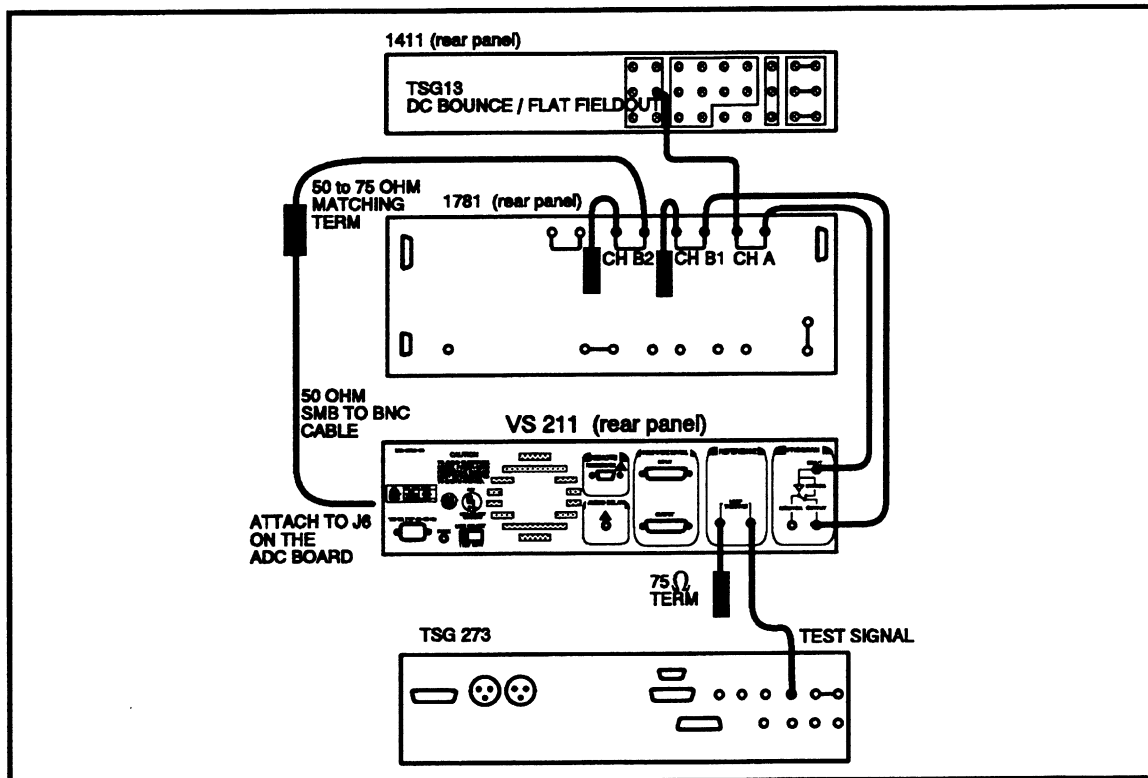


Fig. 4-5. Setup to adjust the Clamp Loop Response.

6. Clamp Loop Response — R56

- a. Set up the equipment as shown in Fig. 4-5.
- b. Attach the waveform monitor to J6, using a smb to bnc cable. (See the regular Service manual for cable construction.)
- c. Set the TSG3 for 0 mV Flat Field with a fast dc bouncing rate.
- d. Set the TSG3 test signal generator controls for a dc bouncing, Flat Field output. [Set the bouncing rate to fast by placing the jumper for P148 in the 1-2 and 4-5 position on the TSG3 Linearity Logic board (A40)].
- e. Display CH B2.
- f. Adjust the waveform monitor for a 2-field display, with the horizontal magnification set to display a 100% to 0% transition.
- g. Adjust R56 for the least amount of ringing on the transition. (A small amount of overshoot is preferable to undershoot.)

SECTION 5 TROUBLESHOOTING

DIAGNOSTIC ROUTINES

ADC BOARD

Overview

The VS 211 (software version 2.0) ADC diagnostics have two levels; the power-up diagnostics and the user diagnostics. The power-up diagnostics execute each time the instrument power cycles or the microprocessor resets. If the tests pass successfully, then the operation of the software continues on to normal instrument operation (i.e., remote control service routines and genlocking). If the tests fail, then the software turns on the LEDs and continues running the diagnostic routines.

Power-up Diagnostics

The power-up diagnostics are a set of routines that the processor runs to verify that the processor kernel is functional. It verifies that the microprocessor RAM, the genlock sample RAM, the arctangent EPROM, and the CTC are functional. Find a description of each of the tests in the power-up diagnostic, in the description of the user diagnostics. Select power-up diagnostics by setting S2 to position 0 (default) and resetting the microprocessor (pressing S1, RESET) or cycling the power.

User Diagnostics

NOTE

When using the user diagnostics always power the VS 211 (software version 2.0) down for a few seconds when returning to normal operating mode. This guarantees that the entire instrument resets and is ready for normal operation.

When in the user diagnostic mode (S2 in a position other than 0), select the diagnostics one at a time (see Table 5-2). If you select an invalid switch setting, a scanning pattern appears on the LEDs.

Troubleshooting

Table 5-2. ADC board Diagnostics.

DIAG SETTING	DIAGNOSTIC TEST SELECTED
0	No Diags Selected — Normal Operation
1	EPROM Checksum — continuous pass/fail
2	RAM Tests — continuous pass/fail
3	ARCTAN PROM Test — continuous pass/fail
4	CTC Test — continuous pass/fail
5	ADC Setup — continuous interactive
6	E ² PROM Test/Initialize — one time pass fail
7	Port Test — continuous interactive
8	VCO DAC Test — continuous interactive
9	Sampler Test 1 — continuous interactive
A	Sampler Test 2 — continuous interactive
B	No Diagnostics Selected
C	Reset Test — continuous interactive
D	No Diagnostics Selected
E	D-2 Test — continuous interactive
F	Cycle Test — continuous pass/fail

The user diagnostics can be classified as two types: pass/fail and interactive. The pass/fail tests require the user to simply set the diagnostic switch and watch the LEDs for an indication of pass or fail. The pass/fail tests are the EPROM checksum test, RAM and sample RAM tests, the arctangent EPROM test, and the CTC test. Below is a complete explanation of these tests. The interactive tests exercise the VS 211 (software version 2.0) hardware to allow the user to verify and troubleshoot specific features of the instrument. Each of the interactive tests is explained in detail below.

User Diagnostics Test Definitions

EPROM Test — Computes the checksum of the system EPROM (U25) and compares the value with one written in the EPROM. This test runs continuously. Lights LED 5 on error. See Fig. 5-6.

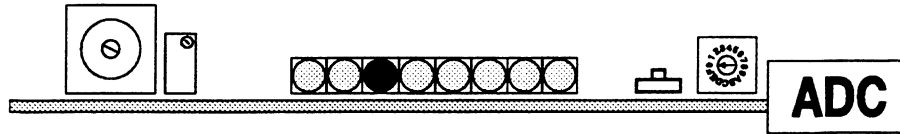


Fig. 5-6. ADC EPROM Test failing.

RAM Tests — Writes to and then reads from all microprocessor RAM locations in the Genlock IC (GLIC) (U37) and checks to see if the two compare. Writes to and then reads from all sample RAM locations in the GLIC and checks to see if the two compare. These tests run continuously. During power-up diagnostics these same tests run once. Lights LED 4 (BURST ABS) on error. See Fig. 5-7.

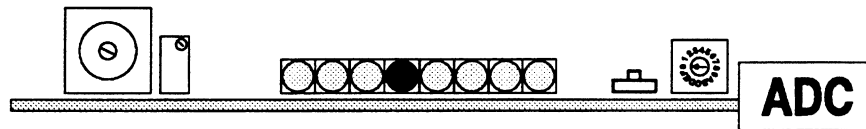


Fig. 5-7. RAM Tests error.

ARCTAN EPROM Test — Computes the checksum of the arctangent EPROM (U26) and compares the value with one written in the processor EPROM. This test runs continuously. During power-up diagnostics this same test runs once. Lights LED 3 (PGM NOISY) on error. See Fig. 5-8.

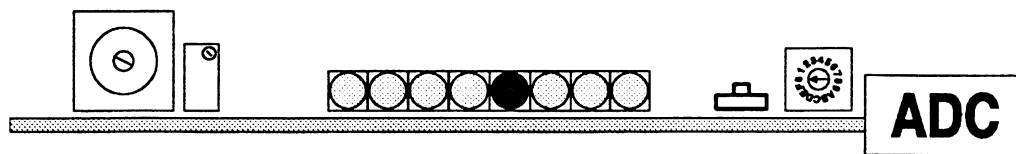


Fig. 5-8. ATAN EPROM Test error.

Troubleshooting

CTC Test — This test sets up the counter timer chip (CTC) (U23) as timers and checks to see that it can generate interrupts. Each of the CTC's four sections interrupt after 4096 processor clock cycles. An error logs, if any of the CTC's sections has not interrupted within the allocated time. This test runs continuously. During power-up diagnostics, this same test runs once. Lights LED 2 (ADC OVRNG) on error. See Fig. 5-9.

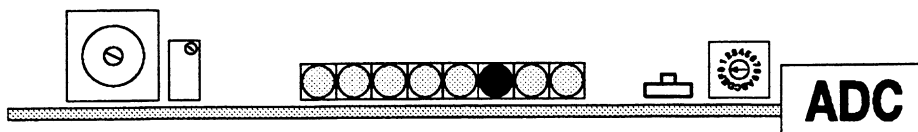


Fig. 5-9. CTC Test error.

ADC Setup — Use this diagnostic to adjust the ADC clamp's DC level (R68) and input gain (R166 or R177). With J1 in the appropriate position (for either R166 or R177 calibration), adjust these potentiometers until the two far right LEDs on the ADC board are both lit equally and as brightly as possible. This test runs continuously. See Fig. 5-10.

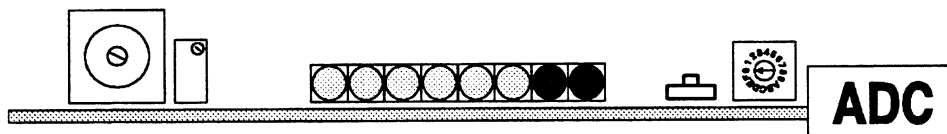


Fig. 5-10.

ADC Clamp DC Level and Input Gain set to proper levels using the ADC setup diagnostic.

E²PROM TEST / INIT — This test initializes the E²PROM to move the half-line delay originally on the ADC board to the Memory board. Only run this test once during the original set-up. The second from the right LED lights when the test completes / passes. See Fig. 5-11.

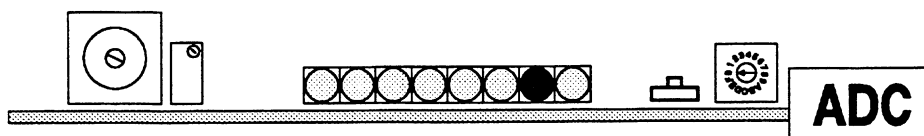


Fig. 5-11.

E²PROM setup completed and passed.

D-2 Test — (This test is similar to Sampler Test 2 except the video source is the Composite Digital input instead of the analog genlock input.) This test sets up the genlock acquisition system to sample incoming video continuously for checking acquisition timing. Trigger on input video and check genlock timing pulses (on CTC U23 pins 20-23).

Port Test — Counts from 0-255 on the I/O ports of the microprocessor system. This is the ED[0..7] bus.

VCO DAC Test — Generates a field rate ramp at the genlock DAC for checking the genlock DAC and integrator. Move J12 to the 2-3 position. Look for the signal on U53 pin 7.

Sampler Test 1 — Acquires a sample of sync and burst via the genlock input and then reconstructs the sampled sync and burst at equivalent time through the genlock DAC (U53 pin 7). Move J12 to the 2-3 position. The pulse occurring at U18 pin 7 provides a trigger and zero address reference for the signal.

Sampler Test 2 — Sets up the genlock acquisition system to sample incoming video continuously for checking acquisition timing. Trigger on input video and check genlock timing pulses (on CTC U23 pins 20-23).

Reset Test — This test checks both the software and hardware resets.

It tests the software reset by setting up the GLIC, allowing it to pull the NMI line on the microprocessor low. The test requires setting J5 to the 1-2 position and setting J6 to the 2-4 test position and monitoring J5 or U24 pin 17 with a scope. When the software reset test is running, a 5-30 μ sec low true pulse occurs at a 30 msec rate.

The reset test also checks the hardware processor reset circuitry. The hardware part of the Reset test requires setting J5 to the 2-3 position and J6 to the 1-2 position. Select the hardware Reset test and check J6 or U24 pin 26 with a scope and verify that there's a 600 msec low true pulse occurring at a 1200 msec rate.

Cycle Test — Continuously cycles through the EPROM, RAM, ARCTAN EPROM, and CTC tests and then turns on all the LEDs. On failure, the error is logged by turning on the appropriate LED and stopping execution of the test. The genlock DAC sets to maximum and then minimum at the same rate the LEDs turn on and off.

APPENDIX A

LIST OF JUMPERS & SWITCHES

This section supercedes any information contained in any other section.

Table A-1. Remote Board DIP Switch Functions.
 (Switches initially set to 0. 0 is rocker switch with high side towards "OPEN" or switch "down" for S7.)

DIP #	SWITCH NUMBER	DEFINITION OF SWITCH SETTINGS	
S4	1	Synchronizer Mode	21 00 = 8 Field Synchronizer Mode 01 = Zero Studio Delay 10 = 2 Field Decode 11 = 2 Field Pixel Shift
	2		
	3	Force Reference Sync Lock	0 = no 1 = yes
	4	Force Program Sync Lock	0 = no 1 = yes
	5	Program Input	0 = analog 1 = digital
	6	unused	
	7	unused	
	8	Interconnect Boards	0 = serial (VS 211A) 1 = pre-serial (VS 211 without serial installed)

Jumpers and Switches

Table A-1. cont.

DIP #	SWITCH NUMBER	DEFINITION OF SWITCH SETTINGS	
S5	1	Proc Amp Clip Mode	21 00 = off 01 = Soft (only clip luma) 10 = Hard (clip both luma and chroma) 11 = Auto (Soft Clip unless PROGRAM INPUT is noisy, then Hard Clip.)
	2		
	3	Proc Amp White Clip	0 = disable 1 = enable
	4	Proc Amp Black Clip	0 = 0 mV 1 = 10 mV
	5	Sync & Burst Insertion	0 = no 1 = yes
	6	ITS Handling	0 = pass 1 = delete
	7	SIS (Sound-in-Sync) on Program	0 = no 1 = yes It is recommended that this flag only be set if necessary. If SIS is set and the instrument goes into sync lock the quality of the output signal will be greatly reduced.
	8	Digital Output	0 = 10-bit 1 = 8-bit
S6	1	Program Error Handling	321 000 = No Action (always pass the signal through the VS 211 with sync & burst inserted and auto clipping.) 001 = Bypass (Freeze for ≈ 1 sec then Bypass.) 010 = Black 011 = Freeze for 5 sec → Black 100 = Freeze (1 Field Freeze) 101-111 = unused
	2		
	3		
	4	Reference Error Handling	0 = Bypass 1 = use internal reference
	5	unused	
	6	Parser Selection	0 = RC 211 1 = Terminal
	7	Baud Rate	87 00 = 19.2k 01 = 9600 10 = 4800 11 = 2400
	8		

Table A-1. cont.

DIP #	SWITCH NUMBER	DEFINITION OF SWITCH SETTINGS	
S7	1	Zero Proc Amps (reset)	0 = Proc Amp Operate 1 = Proc Amp Reset
	2	Proc Amp Knobs	0 = disable (freeze value) 1 = enable
	3	Timing Keys	0 = disable (freeze value) 1 = enable
	4	Vertical Timing	54 00 = 0 line 10 = +1 line 01 = -1 line 11 = -2 lines
	5		
	6	Control	0 = local 1 = remote

Table A-2. Remote Board Jumpers.
(These jumpers are for Service use ONLY.)

FUNCTION	JUMPER #	DESCRIPTION	
Reset	J2	1-2	Normal
		2-3	Reset
Watch Dog Enable	J3	1-2	Enable
		2-3	Disable
Beep Enable	J43	1-2	Beep Enabled
		2-3	Beep Disabled

Jumpers and Switches

Table A-3. Remote Board Diagnostics (S8).

NOTE

When using the user diagnostics always power the VS 211 down for a few seconds when returning to normal operating mode. This guarantees that the entire instrument is reset and ready for normal operation.

SWITCH SETTING	DIAGNOSTIC TEST SELECTED
0	Diagnostics Off (no diags selected)
1	Switches Test
2	Pots Test
3	RS-232 Test
4	S4 Test
5	S5 Test
6	S6 Test
7	S7 Test
8	Board Communication Test
9	ADC Timing Test
A	spare
B	spare
C	Digital Delay
D	spare
E	RAM & NVRAM Test
F	spare

Table A-4. ADC Board Jumpers.

FUNCTION	JUMPER #	DESCRIPTION	
Input Gain Select (GREEN)	J3	1-2	Gain controlled by the RC 211
		2-3	Gain controlled by R23 on ADC board
Burst Hotswitch Detection (GREEN)	J32	1-2	Enable
		2-3	Disable
Input Filter isolate input (RED — Service use only)	J1	1-2	Operate
		3-4	Disable
Input Filter isolate output (RED — Service use only)	J2	1-2	Operate
		3-4	Disable
Clamp Disable (RED — Service use only)	J5	1-2	Normal
		2-3	Clamp Disabled
Set Frequency (RED — Service use only)	J11	1-2	Normal
		2-3	Adjust
Soft Reset (RED — Service use only)	J28	1-2	Normal Operation
		2-3	Test used to test soft reset function, used with diagnostics.
Hard Reset Enable (RED — Service use only)	J30	1-2	Enable
		2-3	Disable
Set VCXO Freq. (RED — Service use only)	J31	1-2	Operate
		2-3	Set VCXO Center Frequency using R134.

Jumpers and Switches

Table A-5. ADC Board Diagnostic Switch (S2).

NOTE

When using the user diagnostics always power the VS 211 down for a few seconds when returning to normal operating mode. This guarantees that the entire instrument is reset and ready for normal operation.

DIAG SETTING	DIAGNOSTIC TEST SELECTED
0	No diags selected — normal operation
1	EPROM Checksum — continuous pass/fail
2	RAM Tests — continuous pass/fail
3	ARCTAN PROM Test — continuous pass/fail
4	CTC Test — continuous pass/fail
5	ADC Setup — continuous interactive
6	E ² PROM Test/Initialize — one time pass fail
7	Port Test — continuous interactive
8	VCO DAC Test — continuous interactive
9	Sampler Test 1 — continuous interactive
A	Sampler Test 2 — continuous interactive
B	No diagnostics selected
C	Reset Test — continuous interactive
D	No diagnostics selected
E	D-2 Test — continuous interactive
F	Cycle Test — continuous pass/fail

Table A-6. Proc Amp/Decoder Board Jumpers.
 (These jumpers are for Service use only.
 They mimic the DIP switches on the Remote board.)

FUNCTION	JUMPER #	DESCRIPTION		
		J3	J4	
Decoder Mode	J3 & J4	1-2	1-2	Controller Controls Mode
		2-3	2-3	Force 0° Phase Shift
		2-3	2-4	Force 0° Phase Shift with V-Axis Compensation
		2-4	2-3	Force 180° Phase Shift
		2-4	2-4	Force 180° Phase Shift with V-Axis Compensation
Remote Proc Amp Control Enable	J8	1-2	Force Remote Coefficients	
		2-3	Force Default Coefficients	
Decoder Enable	J10	1-2	Disable Decoder	
		2-3	Enable Decoder	
Freeze Decoder Mode	J13 & J14	J13	J14	
		1-2	1-2	Enable Remote Board Control
		2-3	2-3	Decoder Mode 0 (no decoding)
		2-3	2-4	Decoder Mode 1 (2 field)
		2-4	2-3	Decoder Mode 2 (1 field)
		2-4	2-4	Decoder Mode 3 (not used)
Vertical Timing Offset	J15	1-2	Remote Vertical Offset	
		2-3	Force 0 Vertical Offset	
		2-4	Force Vertical Offset Handling	
Program Input Noise	J16	1-2	Remote Noise Level Select	
		2-3	Force 0 Noise	
		2-4	Force Noise Handling	
Black Clip Select	J17	1-2	Remote Black Clip Enable	
		2-3	Force 0 mV Black Clip Enable	
		2-4	Force -10 mV Black Clip Enable	
White Clip Enable	J18	1-2	Remote White Clip Enable	
		2-3	Force White Clip Disable	
		2-4	Force 110% White Clip Enable	

Jumpers and Switches

Table A-6. cont.

FUNCTION	JUMPER #	DESCRIPTION		
		J20	J19	
Clip Mode Select	J20 & J19	1-2	1-2	Remote Clip Mode Select
		2-3	2-3	Force Clip Disable
		2-3	2-4	Force Soft Clip (only clip luma)
		2-4	2-3	Force Hard Clip (clip both chroma and luma)
		2-4	2-4	Force Auto Clip (Soft Clip unless the PROGRAM INPUT is noisy then Hard Clip.)

**Table A-7. DAC Board Jumpers.
(These jumpers are for Service use ONLY.)**

FUNCTION	JUMPER #	DESCRIPTION	
Soft Reset Enable	J5	1-2	Enable
		2-3	Disable
Hard Reset Enable	J6	1-2	Enable
		2-3	Forced Reset
		2-4	Disable
VCO Test	J7	2-3	Operate
		4-3	Low Frequency
		1-3	Mid Frequency
		5-3	High Frequency
Analog Video Enable	J10	1-2	Enable
		2-3	Disable
VCO DAC Test	J11	1-2	Operate
		2-3	Test
Reference Input Clamp Enable	J12	1-2	Enable
		2-3	Disable
Analog Video Enable	J13	1-2	Enable
		1-4	Disable

Table A-8. DAC Board Diagnostic Switch (S1).**NOTE**

When using the user diagnostics always power the VS 211 down for a few seconds when returning to normal operating mode. This guarantees that the entire instrument is reset and ready for normal operation.

DIAG SETTING	DIAGNOSTIC TEST SELECTED
0	No Diags Selected — Normal Operation
1	EPROM Checksum — continuous pass/fail
2	RAM Tests — continuous pass/fail
3	ARCTAN PROM Test — continuous pass/fail
4	CTC Test — continuous pass/fail
5	NVRAM Test — continuous pass/fail
6	NVROM Test & Initialization — one time pass/fail
7	Port Test — continuous interactive
8	VCO DAC Test — continuous interactive
9	Sampler Test 1 — continuous interactive
A	Sampler Test 2 — continuous interactive
B	Sampler Test 3 — continuous interactive
C	Reset Test — continuous interactive
D	No diagnostics selected
E	Proc Amp/Decoder disable
F	Cycle Test — continuous pass/fail

Jumpers and Switches

Table A-9. Controller Board Jumpers.
(This jumper is for Service use ONLY.)

FUNCTION	JUMPER #	DESCRIPTION	
μ C Reset	J5	1-2	Normal Operation
		2-3	Forced Reset
		3-4	Disable Watchdog and Power-on reset

Table A-10. Controller Board Diagnostics (S2).**NOTE**

When using the user diagnostics always power the VS 211 down for a few seconds when returning to normal operating mode. This guarantees that the entire instrument is reset and ready for normal operation.

DIAG SETTING	DIAGNOSTIC TEST SELECTED
0	No Diagnostics Selected — Normal Operation
1	R&W Vertical Test
2	spare
3	Port Test & Audio Delay Output Test
4	Memory Address Test
5	Automatic Memory Test
6	Manual Memory Test (00h)
7	Manual Memory Test (FFh)
8	Manual Memory Test (55h)
9	Manual Memory Test (AAh)
A	spare
B	Cycle Test
C	Digital Delay
D	spare
E	spare
F	spare

Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
A1	671-2857-00	B020000	B020131	CIRCUIT BD ASSY:ADC	80009	671-2857-00
A1	671-2857-01	B020132		CIRCUIT BD ASSY:ADC	80009	671-2857-01
				ATTACHED PARTS		
	105-0792-00			EJECTOR,CKT BD:PLSTC	80009	105-0792-00
	131-0157-00			TERM,PIN:0.25 L X 0.04 OD,BRS,SLDR PL (QUANTITY 2)	80009	131-0157-00
	155-0144-01			MICROCKT,LIN:16 LEAD DUAL IN INLINE TV	80009	155-0144-01
				END ATTACHED PARTS		
A1C1	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C2	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C3	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C4	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C5	281-0773-00			CAP,FXD,CER:MLC;0.01UF,10%,100V,SAF,0.100 X 0.170;AXIAL,MI	80009	281-0773-00
A1C6	281-0814-00			CAP,FXD,CER:MLC;100 PF,10%,100V,0.100 X 0.170;AXIAL,MI	80009	281-0814-00
A1C7	281-0221-00			CAP,VAR,CER DI:2-10PF,100V	80009	281-0221-00
A1C8	283-0663-01			CAP,FXD,MICA DI:16.8PF,500V	80009	283-0663-01
A1C9	283-0706-00			CAP,FXD,MICA DI:91PF,1%,500V	80009	283-0706-00
A1C10	283-0648-01			CAP,FXD,MICA DI:10PF,5%,500V	80009	283-0648-01
A1C11	283-0779-01			CAP,FXD,MICA:27PF,2%,500V,T&A	80009	283-0779-01
A1C12	283-0641-00			CAP,FXD,MICA DI:180PF,1%,100V	80009	283-0641-00
A1C13	283-0766-01			CAP,FXD,MICA DI:47PF,1%,500V,T&A	80009	283-0766-01
A1C14	283-0791-00			CAP,FXD,MICA DI:156PF,1%,500V	80009	283-0791-00
A1C15	283-0648-01			CAP,FXD,MICA DI:10PF,5%,500V	80009	283-0648-01
A1C16	283-0636-01			CAP,FXD,MICA DI:36PF,1%,500V,T&A	80009	283-0636-01
A1C17	283-0647-01			CAP,FXD,MICA DI:70PF,1%,500V,T&A	09023	CDA15ED700F03
A1C18	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C19	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C20	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C21	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C22	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C23	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C24	285-1062-00			CAP,FXD,PLSTC;0.005UF,1%,200V	80009	285-1062-00
A1C25	281-0759-00			CAP,FXD,CER:MLC;22PF,10%,100V,0.100 X 0.170;AXIAL,MI	80009	281-0759-00
A1C26	283-0212-02			CAP,FXD,CER DI:2UF,20%,50V	80009	283-0212-02
A1C27	283-0177-05			CAP,FXD,CER DI:1UF,+80-20%,25V	04222	SR303E105ZAAAP1
A1C28	283-0177-05			CAP,FXD,CER DI:1UF,+80-20%,25V	04222	SR303E105ZAAAP1
A1C29	285-1062-00			CAP,FXD,PLSTC;0.005UF,1%,200V	80009	285-1062-00
A1C30	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C31	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C32	283-0051-02			CAP,FXD,CER DI:0.0033UF,5%,100V	04222	SR591A332JAAAP1
A1C33	283-0339-01			CAP,FXD,CER:MLC;0.22UF,10%,50V,X7R,0.300 X 0.300;RDL,T&A,	80009	283-0339-01
A1C34	283-0194-00			CAP,FXD,CER DI:4.7UF,20%,50V	05397	C350C475M5UICA
A1C35	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA

Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
A1C36	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C43	290-0782-02	671-2857-00	671-2857-00	CAP,FXD,ELCTLT:4.7UF,+75-10%,35VDC	55680	UVX1V4R7MAA1TD
A1C43	290-1319-00	671-2857-01		CAP,FXD,ALUM:4.7UF,20%,50V,5 X 11MM,105 DEG,LOW IMP,RDL,T&R	55680	UPL1H4F7MDH1TD
A1C46	290-0782-02	671-2857-00	671-2857-00	CAP,FXD,ELCTLT:4.7UF,+75-10%,35VDC	55680	UVX1V4R7MAA1TD
A1C46	290-1319-00	671-2857-01		CAP,FXD,ALUM:4.7UF,20%,50V,5 X 11MM,105 DEG,LOW IMP,RDL,T&R	55680	UPL1H4F7MDH1TD
A1C47	283-0058-00			CAP,FXD,CER DI:0.027UF,10%,100V	80009	283-0058-00
A1C48	283-0058-00			CAP,FXD,CER DI:0.027UF,10%,100V	80009	283-0058-00
A1C49	290-0782-02	671-2857-00	671-2857-00	CAP,FXD,ELCTLT:4.7UF,+75-10%,35VDC	55680	UVX1V4R7MAA1TD
A1C49	290-1319-00	671-2857-01		CAP,FXD,ALUM:4.7UF,20%,50V,5 X 11MM,105 DEG,LOW IMP,RDL,T&R	55680	UPL1H4F7MDH1TD
A1C50	290-0782-02	671-2857-00	671-2857-00	CAP,FXD,ELCTLT:4.7UF,+75-10%,35VDC	55680	UVX1V4R7MAA1TD
A1C50	290-1319-00	671-2857-01		CAP,FXD,ALUM:4.7UF,20%,50V,5 X 11MM,105 DEG,LOW IMP,RDL,T&R	55680	UPL1H4F7MDH1TD
A1C51	283-0058-00			CAP,FXD,CER DI:0.027UF,10%,100V	80009	283-0058-00
A1C52	283-0058-00			CAP,FXD,CER DI:0.027UF,10%,100V	80009	283-0058-00
A1C53	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C54	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C55	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C56	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C57	290-0973-01	671-2857-00	671-2857-00	CAP,FXD,ALUM:100UF,20%,25VDC;8 X 11MM,0.2 LS;RDL,T&A	55680	UVX1E101MPA1TA
A1C57	290-1296-00	671-2857-01		CAP,FXD,ALUM:100UF,20%,25V,8 X 9MM;RDL,105 DEG,BULK	80009	290-1296-00
A1C58	290-0973-01	671-2857-00	671-2857-00	CAP,FXD,ALUM:100UF,20%,25VDC;8 X 11MM,0.2 LS;RDL,T&A	55680	UVX1E101MPA1TA
A1C58	290-1296-00	671-2857-01		CAP,FXD,ALUM:100UF,20%,25V,8 X 9MM;RDL,105 DEG,BULK	80009	290-1296-00
A1C59	290-0973-01	671-2857-00	671-2857-00	CAP,FXD,ALUM:100UF,20%,25VDC;8 X 11MM,0.2 LS;RDL,T&A	55680	UVX1E101MPA1TA
A1C59	290-1296-00	671-2857-01		CAP,FXD,ALUM:100UF,20%,25V,8 X 9MM;RDL,105 DEG,BULK	80009	290-1296-00
A1C60	290-0973-01	671-2857-00	671-2857-00	CAP,FXD,ALUM:100UF,20%,25VDC;8 X 11MM,0.2 LS;RDL,T&A	55680	UVX1E101MPA1TA
A1C60	290-1296-00	671-2857-01		CAP,FXD,ALUM:100UF,20%,25V,8 X 9MM;RDL,105 DEG,BULK	80009	290-1296-00
A1C61	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C62	290-0536-04			CAP,FXD,ELCTLT:10UF,20%,25V	2N936	
A1C63	283-0256-00			CAP,FXD,CER DI:130PF,5%,100V	TK1134	8111A100P3K0131J
A1C64	283-0027-00			CAP,FXD,CER DI:0.02UF,20%,50V	05397	C330C203M5X5CA
A1C65	283-0785-01			CAP,FXD,MICA DI:250PF,1%,500V,T&A	09023	CDA15FD251F03
A1C66	283-0177-05			CAP,FXD,CER DI:1UF,+80-20%,25V	04222	SR303E105ZAAAP1
A1C67	283-0190-00			CAP,FXD,CER DI:0.47UF,5%,50V	04222	SR305C47AJAA
A1C68	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C69	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C70	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C71	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C72	283-0177-05			CAP,FXD,CER DI:1UF,+80-20%,25V	04222	SR303E105ZAAAP1

Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
A1C73	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C74	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C75	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C76	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C77	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C78	283-0894-00			CAP,FXD,EL:CLT;100UF,20%,4V,TANTULUM	80031	49SC107H004M0AR
A1C79	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C81	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C82	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C83	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C84	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C85	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C86	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C87	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C88	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C89	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C90	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C91	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C92	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C93	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C94	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C95	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C96	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C97	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C98	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C99	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C100	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C101	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C102	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C103	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C105	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA

Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
A1C106	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C109	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C110	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C111	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C112	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C113	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C114	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C115	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C116	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C117	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C118	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C119	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C120	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C121	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C122	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C124	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C125	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C126	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C127	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C128	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C129	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C131	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C132	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C134	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C135	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C136	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C137	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C138	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C139	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C140	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA

Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
A1C141	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C143	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C144	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C145	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C146	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C147	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C148	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C149	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C150	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C151	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C152	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C153	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C155	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C156	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C157	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C158	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C159	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C160	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C161	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C162	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C163	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C164	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C166	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C167	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C168	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C170	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C171	290-0990-01			CAP,FXD,ELCTLT:10UF,20%,50V	24165	502D437A
A1C171	290-0990-01	671-2857-00	671-2857-00	CAP,FXD,ELCTLT:10UF,20%,50V	24165	502D437A
A1C172	281-0756-00	671-2857-00	671-2857-00	CAP,FXD,CER:MLC;2.2PF,+/-0.5PF,200V,0.100 X 0.170;AXIAL_MI	04222	SA102A2R2DAA
A1C173	281-0218-00	671-2857-00	671-2857-00	CAP,VAR,CER DI:1-5PF,+2 -2.5%,100V	80009	281-0218-00
A1C174	281-0815-00			CAP,FXD,CER:MLC;0.027UF,20%,50V,0.100 X 0.260;AXIAL_MI	04222	SA205C273MAA
A1C175	290-0973-01	671-2857-00	671-2857-00	CAP,FXD,ALUM:100UF,20%,25VDC;8 X 11MM,0.2 LS;RDL,T&A	55680	UVX1E101MPA1TA

Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number Effective	Serial / Assembly Number Discontinued	Name & Description	Mfr. Code	Mfr. Part Number
A1C175	290-1296-00	671-2857-01		CAP,FXD,ALUM:100UF,20%,25V,8 X 9MM;RDL,105 DEG,BULK	80009	290-1296-00
A1C176	281-0815-00			CAP,FXD,CER:MLC;0.027UF,20%,50V,0.100 X 0.260;AXIAL,MI	04222	SA205C273MAA
A1C177	290-0973-01	671-2857-00	671-2857-00	CAP,FXD,ALUM:100UF,20%,25VDC;8 X 11MM,0.2 LS;RDL,T&A	55680	UVX1E101MPA1TA
A1C177	290-1296-00	671-2857-01		CAP,FXD,ALUM:100UF,20%,25V,8 X 9MM;RDL,105 DEG,BULK	80009	290-1296-00
A1C178	281-0773-00			CAP,FXD,CER:MLC;0.01UF,10%,100V,SAF,0.100 X 0.170;AXIAL,MI	80009	281-0773-00
A1C179	281-0773-00			CAP,FXD,CER:MLC;0.01UF,10%,100V,SAF,0.100 X 0.170;AXIAL,MI	80009	281-0773-00
A1C180	281-0773-00			CAP,FXD,CER:MLC;0.01UF,10%,100V,SAF,0.100 X 0.170;AXIAL,MI	80009	281-0773-00
A1C181	281-0776-00			CAP,FXD,CER:MLC;120PF,5%,100V,0.100 X 0.170;AXIAL,MI	04222	SA102A121JAA
A1C182	281-0776-00			CAP,FXD,CER:MLC;120PF,5%,100V,0.100 X 0.170;AXIAL,MI	04222	SA102A121JAA
A1C183	281-0776-00			CAP,FXD,CER:MLC;120PF,5%,100V,0.100 X 0.170;AXIAL,MI	04222	SA102A121JAA
A1C184	281-0776-00			CAP,FXD,CER:MLC;120PF,5%,100V,0.100 X 0.170;AXIAL,MI	04222	SA102A121JAA
A1C185	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C186	281-0770-00			CAP,FXD,CER DI:1000PF,20%,100V	04222	SA101C102MAA
A1C187	281-0934-00			CAP,FXD,CER DI:24PF,5%,100V	80009	281-0934-00
A1C188	281-0811-00	671-2857-01		CAP,FXD,CER:MLC;10PF,10%,100V,0.100 X 0.170;AXIAL,MI	04222	SA102A100KAA
A1C189	281-0221-00			CAP,VAR,CER DI:2-10PF,100V	80009	281-0221-00
A1C190	281-0773-00			CAP,FXD,CER:MLC;0.01UF,10%,100V,SAF,0.100 X 0.170;AXIAL,MI	80009	281-0773-00
A1C191	281-0218-00			CAP,VAR,CER DI:1-5PF,+2 -2.5%,100V	80009	281-0218-00
A1C192	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C193	290-0804-01	671-2857-00	671-2857-00	CAP,FXD,ELCTLT:10UF,20%,25V	55680	UVX1E100MAA1TD
A1C193	290-1311-00	671-2857-01		CAP,FXD,ALUM:10UF,20%,50V,5 X 11MM;5000 HOURS,RDL,T&A	80009	290-1311-00
A1C194	290-0804-01	671-2857-00	671-2857-00	CAP,FXD,ELCTLT:10UF,20%,25V	55680	UVX1E100MAA1TD
A1C194	290-1311-00	671-2857-01		CAP,FXD,ALUM:10UF,20%,50V,5 X 11MM;5000 HOURS,RDL,T&A	80009	290-1311-00
A1C195	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1C196	281-0775-01			CAP,FXD,CER:MCL;0.1UF,20%,50V,Z5U,0.170 X 0.100;AXIAL	04222	SA105E104MAA
A1CR2	152-0141-02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A1CR3	152-0141-02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A1CR4	152-0141-02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A1CR5	152-0141-02			DIO,SIG:ULTRA FAST;40V,150MA,4NS,2PF;1N4152,DO-35,T&R	80009	152-0141-02
A1DS1	150-1255-00			DIO,OPTO:LED:ARRAY,RED,635,10MA,4 LED,90 DEG;PCL2004-BR5V	80009	150-1255-00
A1DS2	150-1255-00			DIO,OPTO:LED:ARRAY,RED,635,10MA,4 LED,90 DEG;PCL2004-BR5V	80009	150-1255-00
A1E1	337-1417-00			SHIELD,ELEC:0.55 SQ X 0.685 INCH HIGH	32436	A-1020002-1
A1E2	276-0752-00			CORE,EM:FERRITE TELEQ,	34899	2743001111
A1J1	131-0608-00			TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 4)	80009	131-0608-00

Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
A1J2	131-0608-00			TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 4)	80009	131-0608-00
A1J3	131-0608-00			TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 3)	80009	131-0608-00
A1J5	131-0608-00			TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 3)	80009	131-0608-00
A1J6	131-2766-02	671-2857-00	671-2857-00	CONNECTOR,PROBE:	80009	131-2766-02
A1J19	131-3692-00			CONN DIN:PCB;MALE,RTANG,3 X 32,0.1 CTR,0.104 TAIL,BD RETENTION	80009	131-3692-00
A1J21	131-0608-00			TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 10)	80009	131-0608-00
A1J28	131-0608-00			TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 3)	80009	131-0608-00
A1J30	131-0608-00			TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 3)	80009	131-0608-00
A1J31	131-0608-00			TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 3)	80009	131-0608-00
A1J32	131-0608-00			TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 3)	80009	131-0608-00
A1J35	131-0608-00	671-2857-00	671-2857-00	TERM,PIN:0.365 L X 0.025 BRZ GLD PL (QUANTITY 2)	80009	131-0608-00
A1L1	114-0411-00			COIL,RF:VAR,0.9UH-1.0UH	80009	114-0411-00
A1L2	114-0451-00			COIL,RF:VAR,0.780UH-0.862UH,POT CORE	54937	500-4730
A1L3	114-0415-01			COIL,RF:VAR 725-825NH, PRESET/SECURED TO 745 NH +/-1%,POT CORE	54937	500-4726
A1L4	108-1268-00			COIL,RF:FIXED,56UH,10%,ON POWDER	24226	10M562K
A1L5	108-0184-00			COIL,RF:FIXED,3.35UH	TK1345	108-0184-00
A1L6	108-0184-00			COIL,RF:FIXED,3.35UH	TK1345	108-0184-00
A1L7	108-0184-00			COIL,RF:FIXED,3.35UH	TK1345	108-0184-00
A1L8	108-0184-00			COIL,RF:FIXED,3.35UH	TK1345	108-0184-00
A1L9	108-0368-00			COIL,RF:FIXED,9.7UH	TK1345	108-0368-00
A1P1	131-0993-02			BUS,CNDCT:SHUNT ASSY,RED	00779	1-850100-O
A1P2	131-0993-02			BUS,CNDCT:SHUNT ASSY,RED	00779	1-850100-O
A1P3	131-0993-05			BUS,CNDCT:SHUNT ASSY,GRN	00779	850100-5
A1P5	131-0993-02			BUS,CNDCT:SHUNT ASSY,RED	00779	1-850100-O
A1P28	131-0993-02			BUS,CNDCT:SHUNT ASSY,RED	00779	1-850100-O
A1P30	131-0993-02			BUS,CNDCT:SHUNT ASSY,RED	00779	1-850100-O
A1P31	131-0993-02			BUS,CNDCT:SHUNT ASSY,RED	00779	1-850100-O
A1P32	131-0993-05			BUS,CNDCT:SHUNT ASSY,GRN	00779	850100-5
A1P35	131-0993-02	671-2857-00	671-2857-00	BUS,CNDCT:SHUNT ASSY,RED	00779	1-850100-O
A1Q5	151-0192-05			XSTR,SIG:BIPO- LAR,NPN;25V,100MA,200MHZ,AMPL;MPS6521,TO- 92 EBC,T&A	80009	151-0192-05
A1Q6	151-1063-00			XSTR,PWR:MOS,N-CH;60V,0.8A,0.8 OHM;IRFD113,DIP04.3	80009	151-1063-00
A1Q7	151-1183-00			XSTR,PWR:MOS,P-CH;60V,0.6A,1.6 OHM;IRFD9113,DIP04.3	04713	IRFD9113
A1R2	322-3281-00			RES,FXD:MET FILM;8.25K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	80009	322-3281-00
A1R3	311-2238-00			RES,VAR,TRMR:CERMET;50K OHM,20%,0.5W,0.197 SQ,SIDE ADJUST;T&R	TK1450	GF06UT 50 K
A1R4	322-3215-00			RES,FXD,FILM:1.69K OHM,1%,0.2W,TC=T0	91637	CCF50-2F16900F
A1R5	322-3105-00			RES,FXD:MET FILM;121 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	80009	322-3105-00
A1R6	322-3231-00			RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	80009	322-3231-00
A1R7	322-3231-00			RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	80009	322-3231-00
A1R8	322-3231-00			RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	80009	322-3231-00
A1R9	322-3231-00			RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	80009	322-3231-00

Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
A1R10	322-3193-00			RES,FXD,MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	57668	CRB20 FXE 1K00
A1R11	322-3193-00			RES,FXD,MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	57668	CRB20 FXE 1K00
A1R15	322-3193-00			RES,FXD,MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	57668	CRB20 FXE 1K00
A1R16	322-3205-00			RES,FXD,FILM:1.33K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 1K33
A1R17	322-3135-00			RES,FXD,FILM:249 OHM,1%,0.2W,TC=T0	80009	322-3135-00
A1R18	322-3119-00			RES,FXD,FILM:169 OHM,1%,0.2W,TC=T0	80009	322-3119-00
A1R19	322-3193-00			RES,FXD,MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	57668	CRB20 FXE 1K00
A1R23	311-2205-00			RES,VAR,NONWW:CKT BD,50K OHM,10%,0.5W	80009	311-2205-00
A1R24	322-3414-00			RES,FXD,MET FILM;200K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	91637	CCF501G20002F
A1R26	322-3303-00			RES,FXD,FILM:14K OHM,1%,0.2W,TC=T0	80009	322-3303-00
A1R27	322-3233-00			RES,FXD,FILM:2.61K OHM,1%,0.2W,TC=T0	80009	322-3233-00
A1R28	322-3233-00			RES,FXD,FILM:2.61K OHM,1%,0.2W,TC=T0	80009	322-3233-00
A1R29	322-3303-00			RES,FXD,FILM:14K OHM,1%,0.2W,TC=T0	80009	322-3303-00
A1R30	322-3235-00			RES,FXD,MET FILM;2.74K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	57668	CRB20 FXE 2K74
A1R31	322-3260-00			RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 4K99
A1R32	322-3260-00			RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 4K99
A1R33	322-3193-00			RES,FXD,MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	57668	CRB20 FXE 1K00
A1R34	322-3322-00			RES,FXD,MET FILM;22.1K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	80009	322-3322-00
A1R35	322-3322-00			RES,FXD,MET FILM;22.1K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	80009	322-3322-00
A1R36	322-3437-00			RES,FXD,FILM:348K OHM,1%,0.2W,TC=T0	80009	322-3437-00
A1R37	322-3235-00			RES,FXD,MET FILM;2.74K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	57668	CRB20 FXE 2K74
A1R38	322-3190-00			RES,FXD,FILM:331 OHM,1%,0.2W,TC=T0	80009	322-3190-00
A1R39	322-3333-00			RES,FXD,FILM:28.7K OHM,1%,0.2W,TC=T0	80009	322-3333-00
A1R40	322-3259-00			RES,FXD,FILM:4.87K OHM,1%,0.2W,TC=T0	80009	322-3259-00
A1R41	322-3181-00			RES,FXD,FILM:750 OHM,1%,0.2W,TC=T0	80009	322-3181-00
A1R42	322-3085-00			RES,FXD,MET FILM;75 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	57668	CRB20 FXE 75E0
A1R43	322-3181-00			RES,FXD,FILM:750 OHM,1%,0.2W,TC=T0	80009	322-3181-00
A1R44	322-3085-00			RES,FXD,MET FILM;75 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	57668	CRB20 FXE 75E0
A1R45	322-3085-00			RES,FXD,MET FILM;75 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	57668	CRB20 FXE 75E0
A1R46	322-3484-00			RES,FXD,FILM:600 OHM,1%,0.2W,TC=T0	80009	322-3484-00
A1R47	322-3318-00			RES,FXD,MET FILM;20K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	57668	CRB20 FXE 20K0
A1R48	322-3318-00			RES,FXD,MET FILM;20K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	57668	CRB20 FXE 20K0
A1R49	322-3289-00			RES,FXD,MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	80009	322-3289-00
A1R50	322-3389-00			RES,FXD,FILM:110K OHM,1%,0.2W,TC=T0	56845	CCF-50-2-1103F
A1R51	322-3400-00			RES,FXD,FILM:143K OHM,1%,0.2W,TC=T0	80009	322-3400-00
A1R52	322-3378-00			RES,FXD,FILM:84.5K OHM,1%,0.2W,TC=T0	91637	CCF50-2F84501F
A1R53	322-3181-00			RES,FXD,FILM:750 OHM,1%,0.2W,TC=T0	80009	322-3181-00
A1R54	322-3189-00			RES,FXD,FILM:909 OHM,1%,0.2W,TC=T0	57668	CRB 20 FXE 909E
A1R55	322-3066-00			RES,FXD,MET FILM;47.5 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	09969	CCF502G47R50F
A1R56	311-2231-00			RES,VAR,TRMR:CERMET;1K OHM,20%,0.5W,0.197 SQ,TOP ADJUST,T&R	TK1450	GF06UT 1K
A1R57	322-3481-00			RES,FXD,FILM:1M OHM,1%,0.2W,TC=T0	80009	322-3481-00
A1R58	322-3481-00			RES,FXD,FILM:1M OHM,1%,0.2W,TC=T0	80009	322-3481-00

Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
A1R59	322-3481-00			RES,FXD,FILM:1M OHM,1%,0.2W,TC=T0	80009	322-3481-00
A1R60	307-0651-00			RES NTWK,FXD,FI:5.3.3K OHM,5%,0.150W	80009	307-0651-00
A1R61	322-3114-00			RES,FXD:MET FILM;150 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	91637	CCF50-2-G1500F
A1R62	322-3163-00			RES,FXD,FILM:487 OHM,1%,0.2W,TC=T0	91637	CCF50-2G487R0F
A1R63	322-3289-00			RES,FXD:MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	80009	322-3289-00
A1R64	322-3294-00			RES,FXD,FILM:11.3K OHM,1%,0.2W,TC=T0	80009	322-3294-00
A1R65	322-3141-00			RES,FXD,FILM:287 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 287E
A1R66	322-3294-00			RES,FXD,FILM:11.3K OHM,1%,0.2W,TC=T0	80009	322-3294-00
A1R67	322-3339-00			RES,FXD:MET FILM;33.2K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	80009	322-3339-00
A1R68	322-3300-02			RES,FXD,FILM:13K OHM,0.5%,0.2W,TC=T2	57668	CRB20 DYE 13K0
A1R69	322-3306-00			RES,FXD:MET FILM;15K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	57668	CRB20 FXE 15K0
A1R70	322-3318-00			RES,FXD:MET FILM;20K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	57668	CRB20 FXE 20K0
A1R71	322-3481-00			RES,FXD,FILM:1M OHM,1%,0.2W,TC=T0	80009	322-3481-00
A1R72	322-3117-00			RES,FXD,FILM:162 OHM,1%,0.2W,TC=T0	80009	322-3117-00
A1R73	321-0924-07			RES,FXD,FILM:40K OHM,0.1%,0.125W,TC=T9	80009	321-0924-07
A1R74	321-0924-07			RES,FXD,FILM:40K OHM,0.1%,0.125W,TC=T9	80009	321-0924-07
A1R75	322-3318-00			RES,FXD:MET FILM;20K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	57668	CRB20 FXE 20K0
A1R78	321-0267-07			RES,FXD,FILM:5.9K OHM,0.1%,0.125W,TC=T9	57027	RC55-D-5K9-B-R
A1R79	321-1612-07			RES,FXD,FILM:4.455K OHM,0.1%,0.125W,TC=T9	80009	321-1612-07
A1R80	322-3097-00			RES,FXD:MET FILM;100 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	57668	CRB20 FXE 100E
A1R81	322-3097-00			RES,FXD:MET FILM;100 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	57668	CRB20 FXE 100E
A1R82	321-1643-07			RES,FXD,FILM:11.03K OHM,0.1%,0.125W,TC=T9	80009	321-1643-07
A1R83	321-1643-07			RES,FXD,FILM:11.03K OHM,0.1%,0.125W,TC=T9	80009	321-1643-07
A1R84	307-1601-00			RES NTWK,FXD,FI:	80009	307-1601-00
A1R85	307-1318-00			RES NTWK,FXD,FI:(2) 162 OHM,(2) 260 OHM,2%,0.125W	80009	307-1318-00
A1R86	307-0539-00			RES NTWK,FXD,FI:(7)510 OHM,10%,1W	80009	307-0539-00
A1R87	307-1318-00			RES NTWK,FXD,FI:(2) 162 OHM,(2) 260 OHM,2%,0.125W	80009	307-1318-00
A1R88	307-0741-00			RES NTWK,FXD,FI:7.3.3K OHM,2%,0.19W EACH	80009	307-0741-00
A1R89	307-0741-00			RES NTWK,FXD,FI:7.3.3K OHM,2%,0.19W EACH	80009	307-0741-00
A1R97	307-0526-00			RES,NTWK:THICK FILM;(5)510 OHM,10%,0.125W EACH,TC=100 PPM;SIP6,PIN 1 COM	57924	4306X-101-511
A1R99	322-3260-00			RES,FXD,FILM:4.99K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 4K99
A1R100	307-0526-00			RES,NTWK:THICK FILM;(5)510 OHM,10%,0.125W EACH,TC=100 PPM;SIP6,PIN 1 COM	57924	4306X-101-511
A1R101	307-0526-00			RES,NTWK:THICK FILM;(5)510 OHM,10%,0.125W EACH,TC=100 PPM;SIP6,PIN 1 COM	57924	4306X-101-511
A1R102	307-0526-00			RES,NTWK:THICK FILM;(5)510 OHM,10%,0.125W EACH,TC=100 PPM;SIP6,PIN 1 COM	57924	4306X-101-511
A1R103	307-0526-00			RES,NTWK:THICK FILM;(5)510 OHM,10%,0.125W EACH,TC=100 PPM;SIP6,PIN 1 COM	57924	4306X-101-511
A1R104	307-0847-00			RES NTWK,FXD,FI:12 X 220 OHM,12 X 330 OHM, 5%,0.125W	01121	314E221331
A1R105	307-0526-00			RES,NTWK:THICK FILM;(5)510 OHM,10%,0.125W EACH,TC=100 PPM;SIP6,PIN 1 COM	57924	4306X-101-511
A1R107	322-3231-00			RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	80009	322-3231-00
A1R108	322-3354-00			RES,FXD:MET FILM;47.5K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	80009	322-3354-00
A1R111	322-3469-00			RES,FXD,FILM:750K OHM,1%,0.2W,TC=T0	80009	322-3469-00
A1R112	322-3329-00			RES,FXD,FILM:26.1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 26K1
A1R113	322-3231-00			RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=T0	80009	322-3231-00

Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
A1R114	322-3197-00			RES,FXD,FILM:1.1K OHM,1%,0.2W,TC=T0	80009	322-3197-00
A1R116	322-3339-00			RES,FXD:MET FILM;33.2K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	80009	322-3339-00
A1R117	322-3354-00			RES,FXD:MET FILM;47.5K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	80009	322-3354-00
A1R118	322-3097-00			RES,FXD:MET FILM;100 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	57668	CRB20 FXE 100E
A1R119	322-3311-00			RES,FXD,FILM:16.9K OHM,1%,0.2W,TC=T0	56845	CCF-50-2-1692F
A1R120	307-0650-00			RES NTWK,FXD,FI:9.2.7K OHM,5%,0.150W	11236	750-101-R2.7K
A1R121	307-0651-00			RES NTWK,FXD,FI:5.3.3K OHM,5%,0.150W	80009	307-0651-00
A1R122	322-3481-00			RES,FXD,FILM:1M OHM,1%,0.2W,TC=T0	80009	322-3481-00
A1R124	322-3308-00			RES,FXD,FILM:15.8K OHM,1%,0.2W,TC=T0	80009	322-3308-00
A1R125	322-3316-00			RES,FXD,FILM:19.1K OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 19K1
A1R126	322-3244-00			RES,FXD,FILM:3.4K OHM,1%,0.2W,TC=T0	80009	322-3244-00
A1R127	322-3222-00			RES,FXD:MET FILM;2K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	57668	CRB20 FXE 2K00
A1R131	321-0641-07			RES,FXD,FILM:1.8K OHM,0.1,0.125W,TC=T9	07716	CEAE 18000B
A1R132	321-0164-03			RES,FXD,FILM:499 OHM,0.25%,0.125W,TC=T2	19701	5033RC499R0C
A1R133	321-0641-07			RES,FXD,FILM:1.8K OHM,0.1,0.125W,TC=T9	07716	CEAE 18000B
A1R134	311-1935-00			RES,VAR,NONWW:TRMR,50K OHM,10%,0.5W	80009	311-1935-00
A1R135	307-0651-00			RES NTWK,FXD,FI:5.3.3K OHM,5%,0.150W	80009	307-0651-00
A1R136	307-0651-00			RES NTWK,FXD,FI:5.3.3K OHM,5%,0.150W	80009	307-0651-00
A1R138	307-0651-00			RES NTWK,FXD,FI:5.3.3K OHM,5%,0.150W	80009	307-0651-00
A1R139	307-0651-00			RES NTWK,FXD,FI:5.3.3K OHM,5%,0.150W	80009	307-0651-00
A1R145	322-3077-00			RES,FXD,FILM:61.9 OHM,1%,0.2W,TC=T0	57668	CRB20 FXE 61E9
A1R146	307-1318-00			RES NTWK,FXD,FI:(2) 162 OHM,(2) 260 OHM,2%,0.125W	80009	307-1318-00
A1R147	322-3365-00			RES,FXD,FILM:61.9K OHM,1%,0.2W,TC=T0	80009	322-3365-00
A1R148	322-3344-00			RES,FXD,FILM:37.4K OHM,1%,0.2W,TC=T0	80009	322-3344-00
A1R149	322-3001-00			RES,FXD:MET FILM;10 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	80009	322-3001-00
A1R150	322-3288-00	671-2857-00	671-2857-00	RES,FXD,FILM:9.76K OHM,1%,0.2W,TC=T0	80009	322-3288-00
A1R151	322-3193-00			RES,FXD:MET FILM;1K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	57668	CRB20 FXE 1K00
A1R152	322-3001-00			RES,FXD:MET FILM;10 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	80009	322-3001-00
A1R153	322-3001-00			RES,FXD:MET FILM;10 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	80009	322-3001-00
A1R154	311-2230-00			RES,VAR,TRMR:CERMET;500 OHM,20%,0.5W,0.197 SQ,TOP ADJUST;T&R	TK1450	GF06UT 500
A1R155	311-2230-00			RES,VAR,TRMR:CERMET;500 OHM,20%,0.5W,0.197 SQ,TOP ADJUST;T&R	TK1450	GF06UT 500
A1R156	311-2230-00			RES,VAR,TRMR:CERMET;500 OHM,20%,0.5W,0.197 SQ,TOP ADJUST;T&R	TK1450	GF06UT 500
A1R157	322-3097-00			RES,FXD:MET FILM;100 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	57668	CRB20 FXE 100E
A1R158	322-3097-00			RES,FXD:MET FILM;100 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	57668	CRB20 FXE 100E
A1R159	322-3097-00			RES,FXD:MET FILM;100 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	57668	CRB20 FXE 100E
A1R162	322-3069-00			RES,FXD,FILM:51.1 OHM,1%,0.2W,TC=T0	80009	322-3069-00
A1R163	322-3097-00			RES,FXD:MET FILM;100 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	57668	CRB20 FXE 100E
A1R164	322-3001-00			RES,FXD:MET FILM;10 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	80009	322-3001-00
A1R165	322-3001-00			RES,FXD:MET FILM;10 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	80009	322-3001-00
A1R166	322-3346-00			RES,FXD:MET FILM;39.2K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	80009	322-3346-00

Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
A1R167	322-3289-00			RES,FXD;MET FILM;10K OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	80009	322-3289-00
A1R168	322-3484-00			RES,FXD,FILM:800 OHM,1%,0.2W,TC=TO	80009	322-3484-00
A1R169	322-3155-00			RES,FXD,FILM:402 OHM,1%,0.2W,TC=TO	80009	322-3155-00
A1R170	322-3134-00			RES,FXD,FILM:243 OHM,1%,0.2W,TC=TO	80009	322-3134-00
A1R171	322-3251-00			RES,FXD,FILM:4.02K OHM,1%,0.2W,TC=TO	57668	CRB20 FXE 4K02
A1R172	322-3308-00			RES,FXD,FILM:15.8K OHM,1%,0.2W,TC=TO	80009	322-3308-00
A1R173	322-3277-00			RES,FXD,FILM:7.5K OHM,1%,0.2W,TC=TO	57668	CRB20 FXE 7K50
A1R174	322-3231-00			RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=TO	80009	322-3231-00
A1R175	322-3073-00			RES,FXD;MET FILM;56.2 OHM,1%,0.2W,TC=100 PPM;AXIAL,T&R,SM BODY	80009	322-3073-00
A1R176	322-3231-00			RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=TO	80009	322-3231-00
A1R177	322-3277-00			RES,FXD,FILM:7.5K OHM,1%,0.2W,TC=TO	57668	CRB20 FXE 7K50
A1R178	322-3077-00			RES,FXD,FILM:61.9 OHM,1%,0.2W,TC=TO	57668	CRB20 FXE 61E9
A1R179	322-3197-00			RES,FXD,FILM:1.1K OHM,1%,0.2W,TC=TO	80009	322-3197-00
A1R180	322-3231-00			RES,FXD,FILM:2.49K OHM,1%,0.2W,TC=TO	80009	322-3231-00
A1S2	260-2280-01			SW,PUSH BTN:SPRT,NORMALLY OPEN,LOW PRO-FILE,SHORT TRAVEL	31918	KSA1M411
A1S3	260-2571-00			SW,ROTARY:BINARY CODE,16 POS,SIDE ADJ,SEALED,PC MOUNT	80009	260-2571-00
A1TP1	214-4085-00	671-2857-00	671-2857-00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104-01-02
A1TP2	214-4085-00	671-2857-00	671-2857-00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104-01-02
A1TP4	214-4085-00			TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104-01-02
A1TP7	214-4085-00	671-2857-00	671-2857-00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104-01-02
A1TP8	214-4085-00	671-2857-00	671-2857-00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104-01-02
A1TP9	214-4085-00			TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104-01-02
A1TP10	214-4085-00	671-2857-00	671-2857-00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104-01-02
A1TP11	214-4085-00	671-2857-00	671-2857-00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104-01-02
A1TP12	214-4085-00			TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104-01-02
A1TP13	214-4085-00			TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104-01-02
A1TP14	214-4085-00			TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104-01-02
A1TP15	214-4085-00			TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104-01-02
A1TP16	214-4085-00	671-2857-00	671-2857-00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104-01-02
A1TP17	214-4085-00			TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104-01-02
A1TP18	214-4085-00	671-2857-00	671-2857-00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104-01-02
A1TP19	214-4085-00	671-2857-00	671-2857-00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104-01-02
A1TP20	214-4085-00			TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104-01-02
A1TP21	214-4085-00	671-2857-00	671-2857-00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104-01-02
A1TP22	214-4085-00			TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104-01-02
A1TP23	214-4085-00			TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104-01-02

Replaceable Electrical Parts

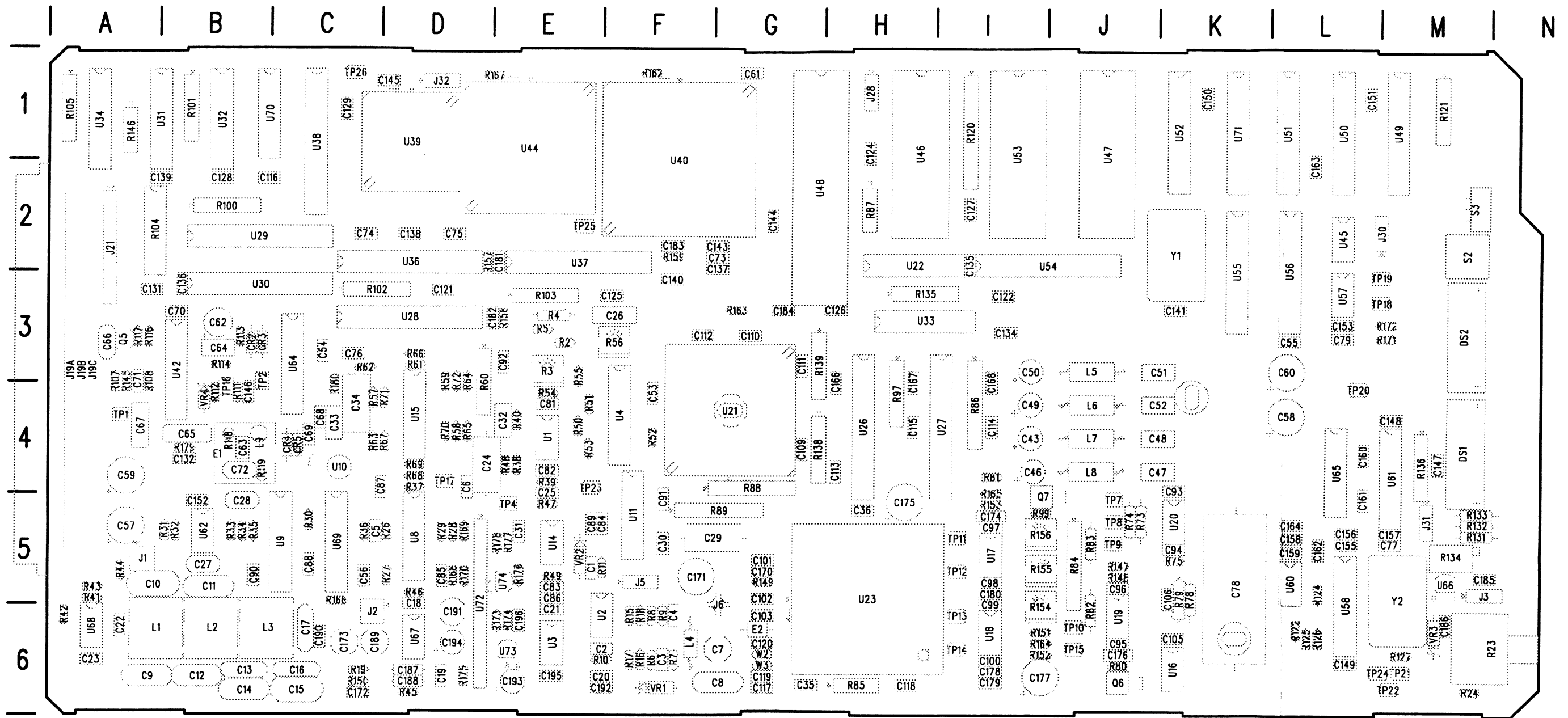
Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
A1TP24	214-4085-00	671-2857-00	671-2857-00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104-01-02
A1TP25	214-4085-00	671-2857-00	671-2857-00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104-01-02
A1TP26	214-4085-00	671-2857-00	671-2857-00	TERM,TEST PT:0.070 ID,0.220 H,0.063 DIA PCB,0.015 X 0.032 BRS,W/ RED NYL CLR	26364	104-01-02
A1U1	156-4174-00			IC,LIN:BIPOLAR,OP-AMP;DUAL,LOW OFF-SET,LOW IN BIAS CUR;OP297FP,DIP08.3	80009	156-4174-00
A1U2	156-4137-00			IC,LIN:	80009	156-4137-00
A1U3	156-4174-00			IC,LIN:BIPOLAR,OP-AMP;DUAL,LOW OFF-SET,LOW IN BIAS CUR;OP297FP,DIP08.3	80009	156-4174-00
A1U4	156-3972-00			IC,MISC:CMOS,ANALOG SWITCH;QUAD SPST,100 OHM,400NS;DG444,DIP16.3	80009	156-3972-00
A1U8	156-1226-00			IC,LIN:BIPOLAR,COMPARATOR;DUAL,OPEN COLLECTOR,80NS;LM319N,DIP14.3	80009	156-1226-00
A1U9	156-3972-00			IC,MISC:CMOS,ANALOG SWITCH;QUAD SPST,100 OHM,400NS;DG444,DIP16.3	80009	156-3972-00
A1U10	156-1457-00			IC,MISC:BIPOLAR,MISC;TRUE RMS TO DC CONVERTER;AD536AJH,TO-100	24355	AD41127
A1U11	156-1312-00			IC,MISC:BIPOLAR,SAMPLE/HOLD;LOW DROOP RATE;SMP-11,DIP14.3	06665	SMP11-004Y
A1U14	156-0742-00			IC,LIN:BIPOLAR,OP-AMP;HIGH SLEW RATE;LM318N,DIP08.3	01295	LM318P
A1U15	156-0411-00			IC,LIN:BIPOLAR,COMPARATOR;QUAD,SINGLE SUPPLY,300NS;LM339N,DIP14.3	80009	156-0411-00
A1U16	156-3608-00			IC,LIN:BIPOLAR,V REF;POS,5.0V,0.05%,20PPM,SE-RIES;LT1021CCN8-5,DIP08.3	64155	LT1021CCN8-5
A1U17	156-4174-00			IC,LIN:BIPOLAR,OP-AMP;DUAL,LOW OFF-SET,LOW IN BIAS CUR;OP297FP,DIP08.3	80009	156-4174-00
A1U18	156-4174-00			IC,LIN:BIPOLAR,OP-AMP;DUAL,LOW OFF-SET,LOW IN BIAS CUR;OP297FP,DIP08.3	80009	156-4174-00
A1U19	156-4174-00			IC,LIN:BIPOLAR,OP-AMP;DUAL,LOW OFF-SET,LOW IN BIAS CUR;OP297FP,DIP08.3	80009	156-4174-00
A1U20	156-4174-00			IC,LIN:BIPOLAR,OP-AMP;DUAL,LOW OFF-SET,LOW IN BIAS CUR;OP297FP,DIP08.3	80009	156-4174-00
A1U21	156-6233-00			IC,ASIC:CMOS,CUSTOM;HALF BAND FILTER;ADG243;MM9217,PLCC68	80009	156-6233-00
	136-0871-00			*MOUNTING PARTS* SKT,PLCC:	80009	136-0871-00
				END MOUNTING PARTS		
A1U22	156-2290-00			IC,DGTL:ECL,XLTR;QUAD ECL-TO-TTL;10H125,DIP16.3,TUBE	80009	156-2290-00
A1U23	156-6015-00			IC,CONVERTER:ECL,A/D;10 BIT,FLASH,75MHZ;9060,LCC68	80009	156-6015-00
	136-0848-00			*MOUNTING PARTS* SKT,LCCC:PCB,JEDEC A,B,D;68 POS,0.275 H X 0.110 TAIL,W/O COVER	80009	136-0848-00
	214-3789-00			HEAT SINK,ELEC:CKT,BD,68 PIN	00779	55358-3
				END MOUNTING PARTS		
A1U26	156-4173-00			IC,DGTL:ECL,XLTR;OCTAL ECL-TO-TTL,D-TYPE FLIP FLOP;3-	80009	156-4173-00
A1U27	156-4173-00			IC,DGTL:ECL,XLTR;OCTAL ECL-TO-TTL,D-TYPE FLIP FLOP;3-	80009	156-4173-00
A1U28	156-4163-00			IC,DGTL:BCTCMOS,FLIP FLOP;10-BIT BUS INTERFACE;74BCT29821,DIP24.3	80009	156-4163-00
A1U29	156-4173-00			IC,DGTL:ECL,XLTR;OCTAL ECL-TO-TTL,D-TYPE FLIP FLOP;3-	80009	156-4173-00
A1U30	156-4173-00			IC,DGTL:ECL,XLTR;OCTAL ECL-TO-TTL,D-TYPE FLIP FLOP;3-	80009	156-4173-00
A1U31	156-0746-01			IC,DGTL:ECL,MUX;QUAD 2-IN MUX;10158,DIP16.3,TUBE	80009	156-0746-01

Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
A1U32	156-2290-00			IC,DGTL:ECL,XLTR;QUAD ECL-TO-TTL;10H125,DIP16.3,TUBE	80009	156-2290-00
A1U33	156-2289-00			IC,DGTL:ECL,XLTR;QUAD TTL-TO-ECL;10H124,DIP16.3,TUBE	04713	MC10H124P
A1U34	156-1640-00			IC,DGTL:ECL,RECEIVER;TRIPLE LINE;10H116,DIP16.3,TUBE	80009	156-1640-00
A1U36	156-4172-00			IC,DGTL:ECL,XLTR;OCTAL TTL-TO-ECL,D-TYPE FLIP-FLOP,ECL OE;10KHT5578,DIP24.3,TUBE	80009	156-4172-00
A1U37	156-4172-00			IC,DGTL:ECL,XLTR;OCTAL TTL-TO-ECL,D-TYPE FLIP-FLOP,ECL OE;10KHT5578,DIP24.3,TUBE	80009	156-4172-00
A1U38	156-1661-00			IC,DGTL:LSTTL,TRANSCEIVER;OCTAL W/MUX REGISTER, NONINV, 3-STATE;74LS646,DIP24.3,TUBE	80009	156-1661-00
A1U39	160-9733-00			IC,DGTL:CMOS,PLD;OTP;5064,64 MACRO-CELL,30NS;5064-30,PLCC44	80009	160-9733-00
	136-1047-00			*MOUNTING PARTS* SKT,PLCC:PCB;44 POS,0.05 CTR,0.360 H X 0.125 TAIL,TIN	80009	136-1047-00
A1U40	156-6117-00			*END MOUNTING PARTS* IC,ASIC:CMOS,CUSTOM;Z80 GENLOCK IC,ADG236;VF4697,PLCC84	80009	156-6117-00
	136-0965-00			*MOUNTING PARTS* SKT,PLCC:PCB;84,0.05 CTR,0.360 H X 0.125 TAIL,TIN,0.055-0.075 SHOULDER HEIGHT	80009	136-0965-00
A1U42	155-0144-01			*END MOUNTING PARTS* MICROCKT,LIN:16 LEAD DUAL IN INLINE TV	80009	155-0144-01
A1U44	160-9732-00			IC,DGTL:CMOS,PLD;OTP;5128,30NS;EPM5128LC,P LCC68	80009	160-9732-00
	136-0871-00			*MOUNTING PARTS* SKT,PLCC:	80009	136-0871-00
A1U45	156-3050-00			*END MOUNTING PARTS* IC,MISC:	80009	156-3050-00
A1U46	156-3715-00			IC,PROCESSOR:CMOS,PERIPHERAL;COUNTER/TIMER CIRCUIT,8MHZ;84C30,DIP2 8.6	80009	156-3715-00
	136-0755-00			*MOUNTING PARTS* SKT,DIP:	09922	DILB28P-108
A1U47	160-8933-00			*END MOUNTING PARTS* IC,MEMORY:CMOS,EPPROM;64K 8,250NS;7C263-30,DIP28.6	80009	160-8933-00
	136-0755-00			*MOUNTING PARTS* SKT,DIP:	09922	DILB28P-108
A1U48	156-3728-00			*END MOUNTING PARTS* IC,PROCESSOR:CMOS,MICROPROCESSOR;8-BIT,8MHZ;Z84C0008,DIP40.6	80009	156-3728-00
	136-0757-00			*MOUNTING PARTS* SKT,DIP:	09922	DILB40P-108
A1U49	156-2391-00			*END MOUNTING PARTS* IC,DGTL:ALSTTL,BUFFER/DRIVER;OCTAL NON-INV, 3-STATE;74ALS541,DIP20.3,TUBE	80009	156-2391-00
A1U50	156-1998-00			IC,DGTL:ALSTTL,FLIP FLOP;OCTAL D-TYPE, W/CLEAR;74ALS273,DIP20.3	01295	SN74ALS273
A1U51	156-1664-00			IC,DGTL:ALSTTL,FLIP FLOP;OCTAL NONINV D-TYPE, 3-STATE;74ALS574,DIP20.3,TUBE	80009	156-1664-00
A1U52	156-1664-00			IC,DGTL:ALSTTL,FLIP FLOP;OCTAL NONINV D-TYPE, 3-STATE;74ALS574,DIP20.3,TUBE	80009	156-1664-00
A1U53	160-9731-00			IC,DGTL:CMOS,EPPROM;32K X 8,120NS;27C256,DIP28.6	80009	160-9731-00
	136-0755-00			*MOUNTING PARTS* SKT,DIP:	09922	DILB28P-108
				END MOUNTING PARTS		

Replaceable Electrical Parts

Component Number	Tektronix Part Number	Serial / Assembly Number		Name & Description	Mfr. Code	Mfr. Part Number
		Effective	Discontinued			
A1U54	156-4140-00			IC, MEMORY: CMOS, EEPROM; 2K X 8, 70NS; 28HC16, DIP24.3	80009	156-4140-00
	136-0925-00			*MOUNTING PARTS* SKT, DIP:	91506	224-AG30D
				END MOUNTING PARTS		
A1U55	160-9729-00			IC, DGTL: CMOS, PLD; EEPD, 16V8, 15NS, 90MA; 16V8-15, DIP20.3, TUBE	80009	160-9729-00
	136-0752-00			*MOUNTING PARTS* SKT, PL-IN ELEK/MICROCIRCUIT, 20 DIP	09922	DILB20P-108
				END MOUNTING PARTS		
A1U56	156-2493-00			IC, CONVERTER:	80009	156-2493-00
A1U57	156-4174-00			IC, LIN: BIPOLAR, OP-AMP; DUAL, LOW OFF-SET, LOW IN BIAS CUR; OP297FP, DIP08.3	80009	156-4174-00
A1U58	156-3972-00			IC, MISC: CMOS, ANALOG SWITCH; QUAD SPST, 100 OHM, 400NS; DG444, DIP16.3	80009	156-3972-00
A1U60	156-1156-00			IC, LIN: BIFET, OP-AMP; LF356N, DIP08.3	80009	156-1156-00
A1U61	156-2289-00			IC, DGTL: ECL, XLTR; QUAD TTL-TO-ECL; 10H124, DIP16.3, TUBE	04713	MC10H124P
A1U62	156-0853-00			IC, LIN: BIPOLAR, OP-AMP; DUAL, SINGLE SUPPLY; LM358N, DIP08.3	80009	156-0853-00
A1U64	156-4430-00			IC, LIN: BIPOLAR, COMPARTOR; DUAL, TTL, 9NS, LATCH; AD9698KN, DIP08.3	80009	156-4430-00
A1U65	156-0382-00			IC, DGTL: LSTTL, GATE; QUAD 2-IN NAND; 74LS00, DIP14.3, TUBE	80009	156-0382-00
A1U66	156-0991-02			IC, LIN: BIPO-LAR, VR; POS, 5.0V, 100MA, 5%; MC78L05ACP, TO-92 T&A	80009	156-0991-02
A1U67	156-4229-00			IC, LIN: BIPOLAR, OP-AMP; 120MHZ, UNCOMPEN-SATED, HIGH OUTPUT CUR; AD829JN, DIP08.3	80009	156-4229-00
A1U68	156-4228-00			IC, LIN:	80009	156-4228-00
A1U69	156-1600-00			IC, DGTL: LSTTL, MISC; DUAL RETRIG MONOST-ABLE MULTIVIBRATOR; 74LS123, DIP16.3, TUBE	62786	HD74LS123
A1U70	156-1611-00			IC, DGTL: FTTL, FLIP FLOP; DUAL D-TYPE; 74F74, DIP14.3, TUBE	80009	156-1611-00
A1U71	156-2391-00			IC, DGTL: ALSTTL, BUFFER/DRIVER; OCTAL NON-INV, 3-STATE; 74ALS541, DIP20.3, TUBE	80009	156-2391-00
A1U72	165-0018-00			MICROCKY, HYBRID; FOR VS211A	80009	165-0018-00
A1U73	156-1631-01			IC, LIN: BIPOLAR, VR; AD-JUST, SHUNT, 100MA, 2.2%; TL431CLP, TO-92 T&A	80009	156-1631-01
A1U74	156-1631-01			IC, LIN: BIPOLAR, VR; AD-JUST, SHUNT, 100MA, 2.2%; TL431CLP, TO-92 T&A	80009	156-1631-01
A1VR1	152-0227-00			DIO, ZENER: 6.2V, 5%, 0.4W; 1N753A FMLY, DO-35 OR 7, TR	80009	152-0227-00
A1VR2	152-0227-00			DIO, ZENER: 6.2V, 5%, 0.4W; 1N753A FMLY, DO-35 OR 7, TR	80009	152-0227-00
A1VR3	152-0279-00			DIO, ZENER: 5.1V, 5%, 0.4W; 1N751A, DO-7 OR 35, TR	80009	152-0279-00
A1VR4	152-0405-00			DIO, ZENER: 15V, 5%, 1W; 1N4744A, DO-41	12954	DZ841205A
A1W2	131-4566-00			BUS, CONDCT: 0 OHM, 300 SPACING, SM BODY	80009	131-4566-00
A1W3	131-4566-00			BUS, CONDCT: 0 OHM, 300 SPACING, SM BODY	80009	131-4566-00
A1Y1	158-0391-00			OSC, XTAL CLOCK: 8.0 MHZ, +/-0.01% HCMOS, CL 15PF, 4 PIN 14 PIN COMPATIBLE PKG	80009	158-0391-00
A1Y2	158-0440-00			OSCILLATOR: VCXO; 35.468950 MHZ, TTL, 0.0025%, 14 PIN DIP COMPATIBLE, 4 PINS USED	80009	158-0440-00

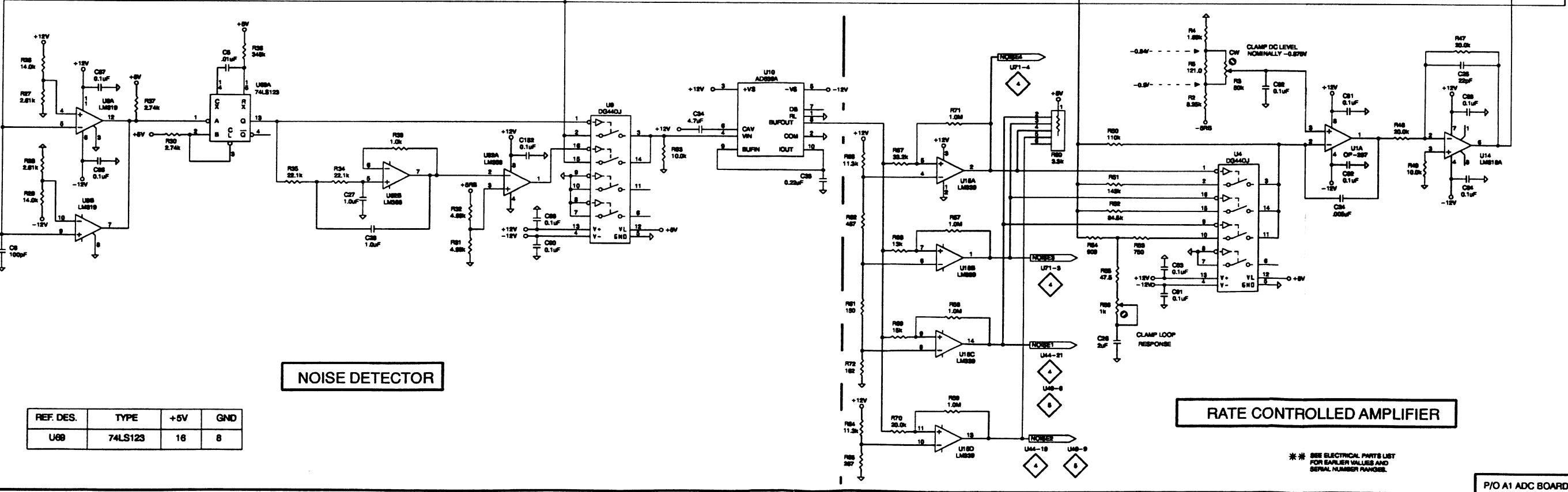
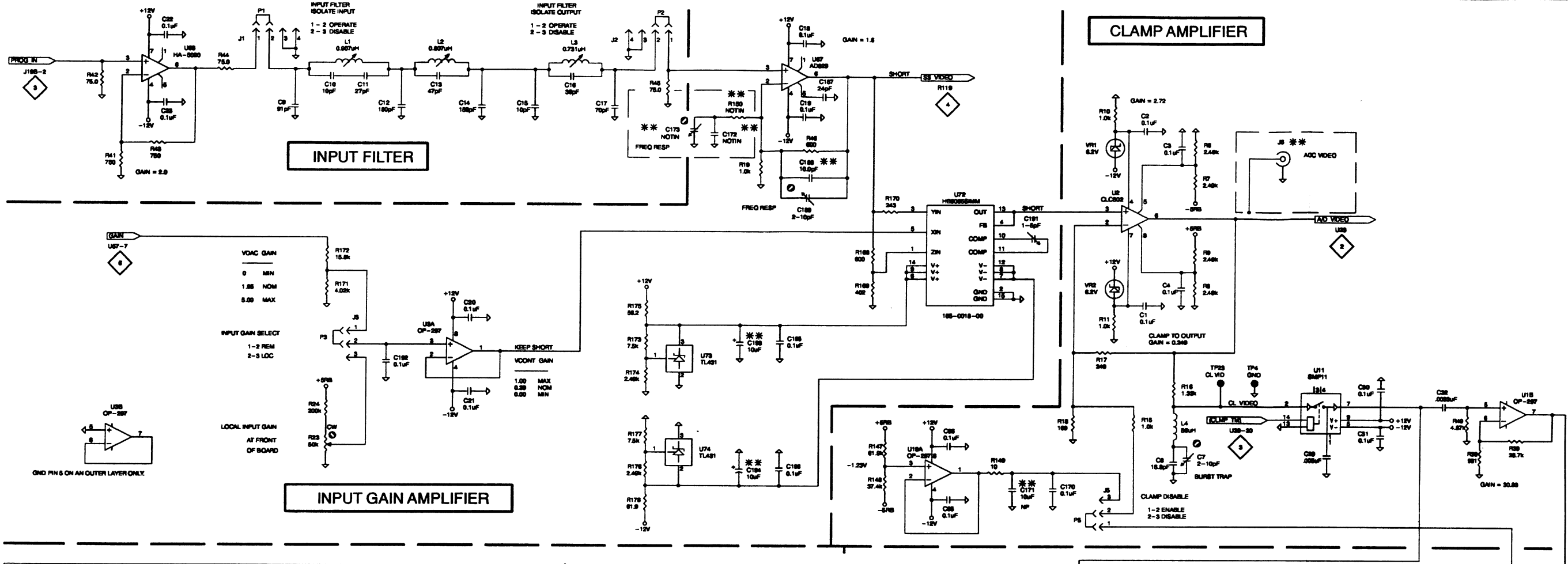


A1 ADC Circuit Board Assembly

A1 ADC Board Component Locator (with cross-references to schematic diagrams 1, 2, 3, 4, 5, and 6)

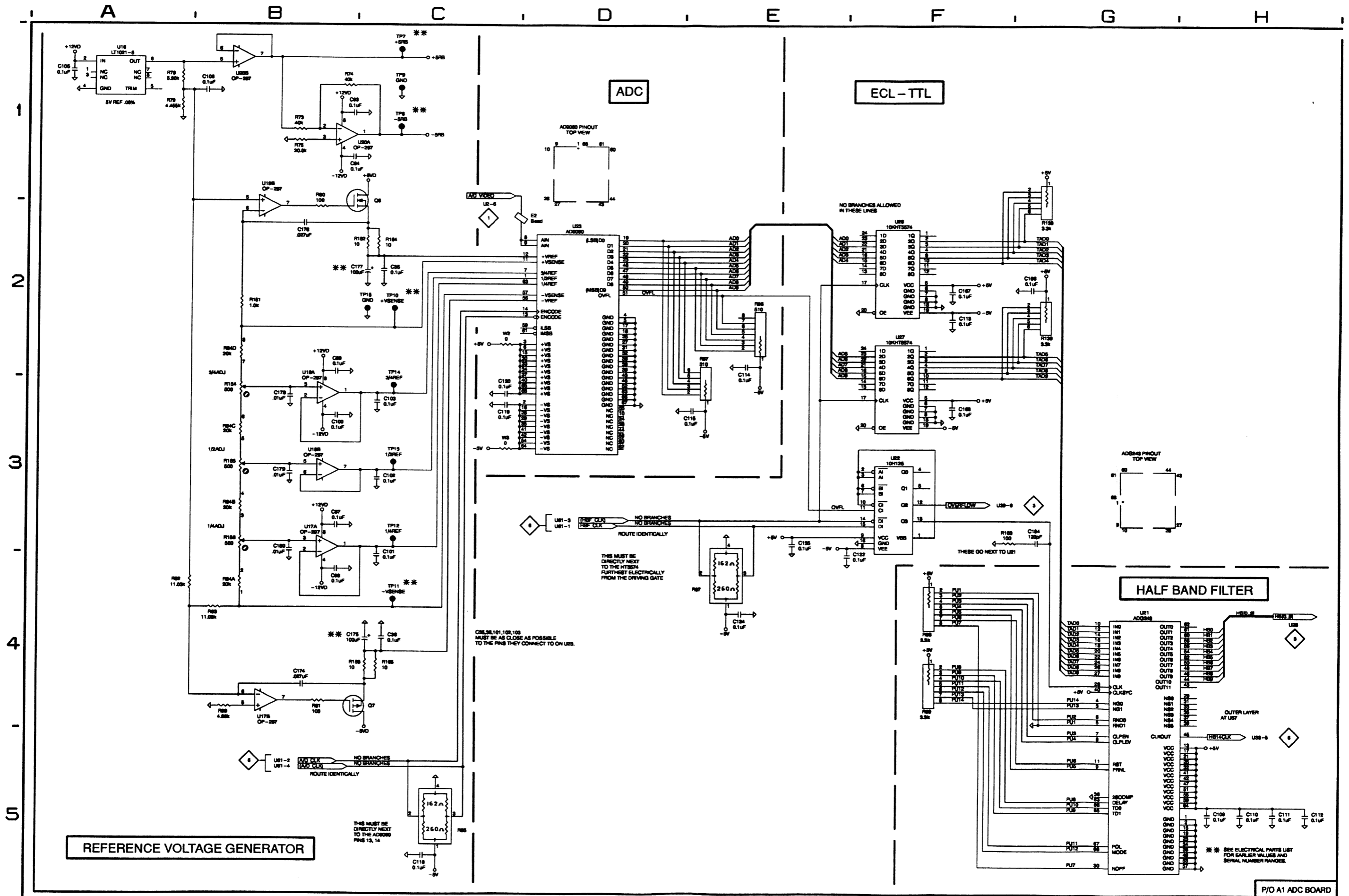
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FRONT OF BOARD																																							
C1	1	F2	E5	C59	3	C5	A4	C115	2	E3	H4	C174	2	B4	I5	L7	3	G4	J4	R46	1	E1	D5	R105	6	F2	A1	R164	2	C2	I6	U10	1	D4	C4	U58A	6	D4	L6
C2	1	F1	E6	C60	3	C5	L3	C116	3	D5	B2	C175	2	C4	H5	L8	3	G5	J4	R47	1	H3	E5	R165	2	C4	I5	R166	6	B2	C6	U11	1	G2	F5	U58B	6	D4	L6
C3	1	F1	F6	C61	4	E3	G1	C117	3	D5	G6	C176	2	B2	J6	L9	4	A4	B4	R48	1	H4	E4	R167	4	D1	D1	R168	1	E2	D5	U14	1	H4	E5	U58C	6	E3	L6
C4	1	F2	F6	C62	4	A4	B3	C118	2	C5	H6	C177	2	C2	I6	P1	1	B1		R49	1	H4	E5	R169	1	E2	D5	R170	1	E1	D5	U15A	1	E4	D4	U58D	6	E4	L6
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C9	1	B1	A6	C67	4	B5	A4	C123	2	E4	I3	C182	6	G1	E3	P30	5	B2		R54	1	F4	E4	R179	4	C5	B4	R180	4	C5	C4	U17A	2	B3	I5	U64A	4	C5	C3
C10	1	B1	A5	C68	4	C5	C4	C124	2	E4	H2	C183	6	G1	F2	P31	6	C3		R55	1	F4	E4	R181	5	A2	I1	R182	5	A2	I1	U17B	2	B4	I5	U64B	4	C5	C3
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C12	1	C1	B6	C70	4	B4	B3	C126	5	B2	H3	C185	6	E3	M5	Q5	4	C4	A3	R57	1	E4	C4	R185	1	D3	E5	R186	1	D3	E5	U18B	2	B3	I6	U65B	6	G2	L4
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C15	1	C1	C6	C73	4	F3	F2	C129	3	D3	C1	C188	1	E1	D6	R2	1	G4	E3	R60	1	F4	D4	R191	5	B3	I1	R192	5	B3	I1	U20A	2	B1	K5	U67	1	E1	D6
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C17	1	D1	C6	C75	3	F2	D2	C131	3	D5	B4	C190	6	B2	C6	R4	1	G3	E3	R62	1	E4	C3	R195	5	A1	I1	R196	5	A1	I1	U21	2	G4	G4	U69A	1	B4	C5
C18	1	E1	D6	C76	3	C4	C3	C132	3	D5	B4	C191	1	F2	D6	R5	1	G3	E3	R63	1	D4	C4	R197	4	C5	C4	R198	5	A2	I1	U22	2	F3	H2	U69B	6	B2	C5
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C20	1	C2	E6	C78	6	F4	K5	C134	6	C2	I3	C193	1	D2	E6	R7	1	G1	F6	R65	1	E5	D4	R201	5	E4	M1	R202	5	E4	M1	U24	2	F2	H4	U70B	6	A2	C1
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C24	1	H4	D4	C83	1	H4	E5	C138	3	F1	D2	CR2	4	C5	B3	R11	1	F2	F5	R69	1	E5	D4	R209	6	E4	M1	R210	6	E4	M1	U28	3	D1	D3	U74	1	D3	E5
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C26	1	F5	F3	C85	3	D4	D5	C140	3	F2	F3	CR4	4	C5	C4	R16	1	F2	F6	R71	1	E4	D4	R213	6	E4	M1	R214	6	E4	M1	U30	3	D2	B3	VR2	1	F2	E5
C27	1	B4	B5	C86	1	A4	E5	C141	3	D4	K3	CR5	4	C5	C4	R17	1	F2	F6	R72	1	E5	D4	R215	6	E4	M1	R216	6	E4	M1	U31	6	D1	B1	VR3	6	F4	M6
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C32	1	H2	E4	C91	1	F5	F5	C146	4	C5	B4	J1	1	B1	A5	R22	1	A3	D5	R77	2	B2	J6	R225	6	E4	M1	R226	6	E4	M1	U36	3	F1	E2	Y2	6	F4	M5
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C43	3	G4	I4	C96	1	E3	J5	C151	3	E4	L1	J6	1	G1	G6	R27	1	A4	D5	R82	2	A4	J6	R235	6	E4	M1	R236	6	E4	M1	U41	4	B4	B3				
C46	3	G5	I4	C97	2	B3	I5	C152	1	C4	B5	J19A	3	A1	A3	R28	1	A4	D5	R83	2	B4	J5	R237	6	E4	M1	R238	6	E4	M1	U42	4	B4	B3				
C47	3	G5	J4	C98	2	B4	I5	C153	6	C4	L3	J19B	3	A2	A3	R29	1	A4	D5	R84A	2	B4	J5	R239	6	E4	M1	R240	6	E4	M1	U43	4	C1	E1				
C48	3	G4	J4	C99	2	B2	I6	C154	6	D4	L5	J19C	3	A4	A3	R30	1	A4	C5	R84B	2	B3	J5	R241	6	E4	M1	R242	6	E4	M1	U44	4	C1	E1				
C49	3	G4	I4	C100	2	B3	I6	C155	6	C4	L5	J21	3	H1	A2	R31	1	C4	B5	R84C	2	B3	J5	R243	6	E4	M1	R244	6	E4	M1	U45	5	A2	L2				
C50	3	G5	I3	C101	2	C4	G5	C156	6	D4	L5	J28	5	B3	H1	R32	1	C4	B5	R84D	2	B2	J5	R245	6	E4	M1	R246	6	E4	M1	U46	5	D3	H2				
C51	3	G5	J3	C102	2	C3	G5	C157	6	C4	M5	J30	5	B2	M2	R33	1	C4	B5	R85	2	C5	H6	R247	6	E4	M1	R248	6	E4	M1	U47	5	G2	J2				
C52	3	G4	J4	C103	2	C3	G6	C158	6	E4	L5	J31	6	C3	M5	R34	1	B4	B5	R86	2	E2	I4	R249	6	E4	M1	R250	6	E4	M1	U48	5	C2	G2				
C53	1	F4	F4	C104	2	A1	K6	C159	6	E4	L5	J32	4	E1	D1	R35	1	B4	B5	R87	2	E3	H2	R251	6	E4	M1	R252	6	E4	M1	U49	5	F5	M1				
C54	3	E2	C3	C105	2	B1	K6	C160	3	E4	L4	L1	1	B1	A6	R36	1	B3	C5	R88	2	F4	G4	R253	6	E4	M1	R254	6	E4	M1	U50	5	F4	L1				
C55	3	C5	L3	C106	2	B1	K6	C161																															

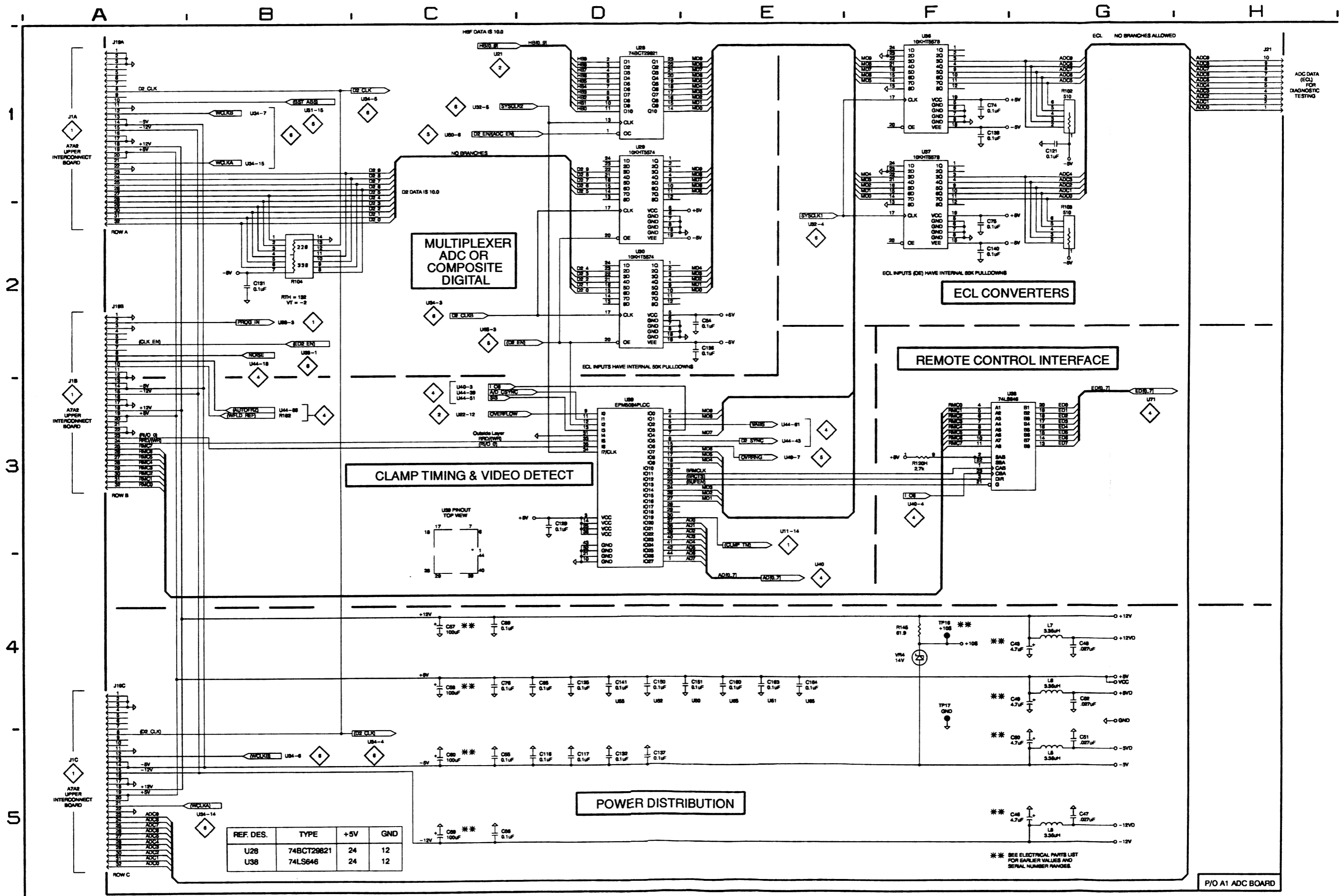
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5



REF. DES.	TYPE	+5V	GND
U68	74LS123	16	8

** SEE ELECTRICAL PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES.

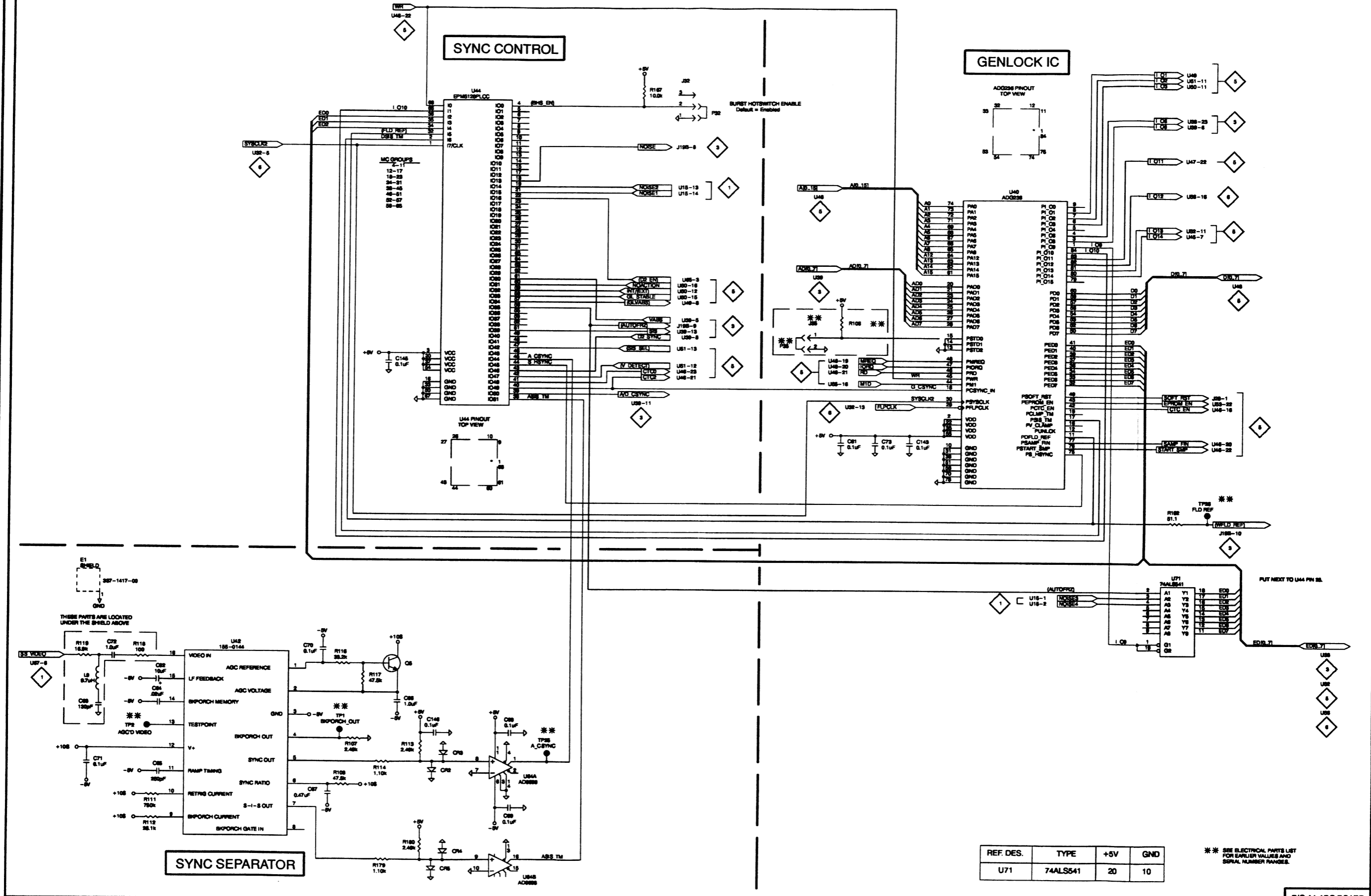




SYNC CONTROL

GENLOCK IC

SYNC SEPARATOR



REF. DES.	TYPE	+5V	GND
U71	74ALS541	20	10

** SEE ELECTRICAL PARTS LIST FOR EARLIER VALUES AND SERIAL NUMBER RANGES.

