

SECTION 10

HORIZONTAL DEFLECTION MODULE

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SECTION 10

HORIZONTAL DEFLECTION MODULE

10.1 TECHNICAL DESCRIPTION

10.1.1 General Description

The Horizontal Deflection module splits the incoming composite sync video signal into horizontal and vertical components. The vertical sync pulse is fed to the Vertical Deflection module. The horizontal sync pulse is used by the auto-frequency lock, bandswitch and horizontal processor circuitry to form a horizontal drive pulse. This pulse, H DRIVE, is fed to the Power Deflection modules.

The Horizontal Deflection module also produces a regenerated sync pulse which is used by the MOVE key on the keypads to shift the projected image.

10.2 SERVICING AND ALIGNMENT

10.2.1 Disassembly and Access

WARNING**STATIC SENSITIVE COMPONENTS
STATIC CONTROLLED WORK STATION REQUIRED**

Module Location: rear panel card rack
Tools & Equipment Required: Phillips screw driver

- Remove the back panel as described in Section 5.2.
- Locate the Horizontal Deflection Module in the rear panel card rack. Using the printed circuit board extractor (from the tool pouch), pull the module from the card rack as described in Section 5.2.

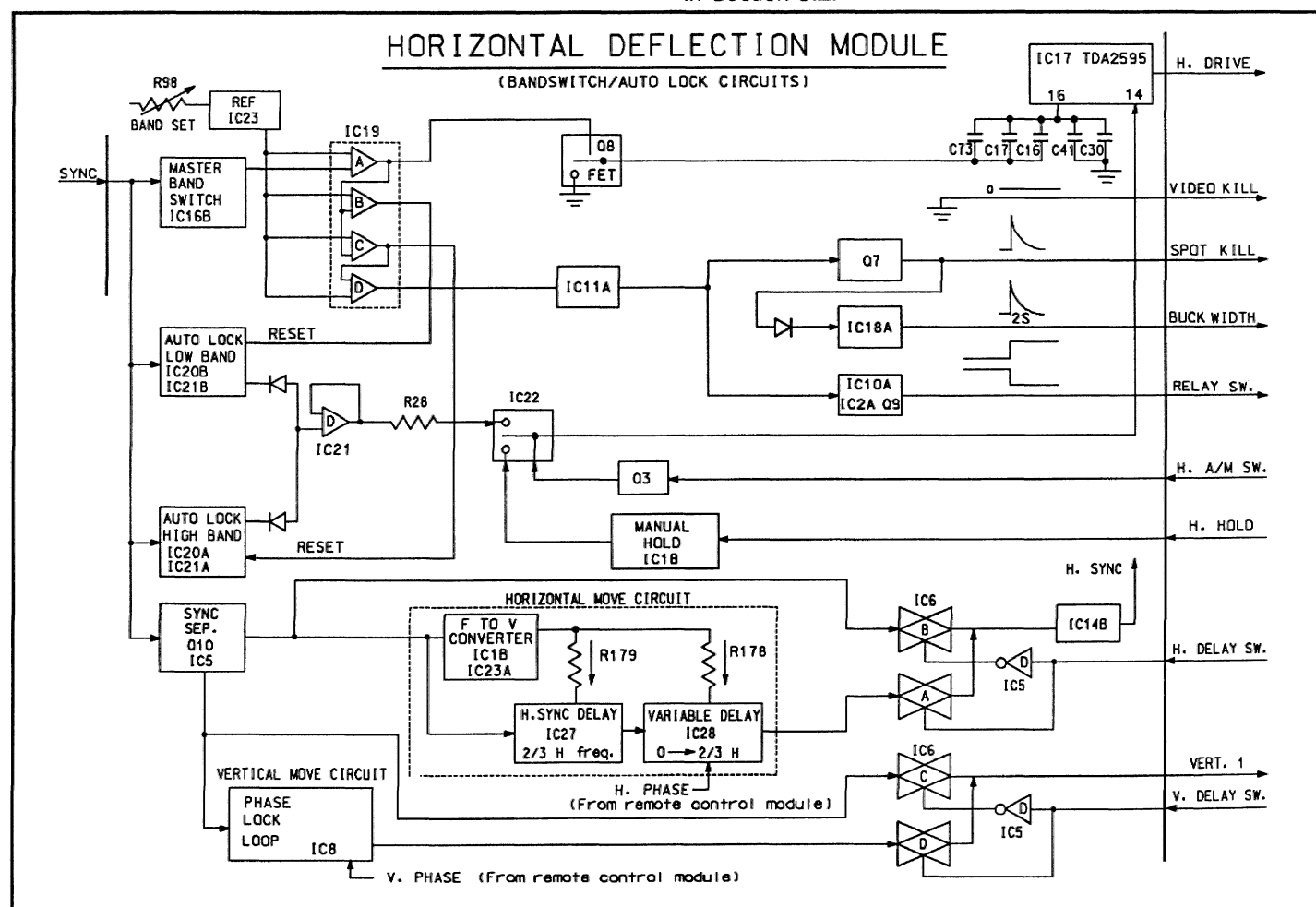


FIGURE 10-1. Horizontal Deflection Function Diagram

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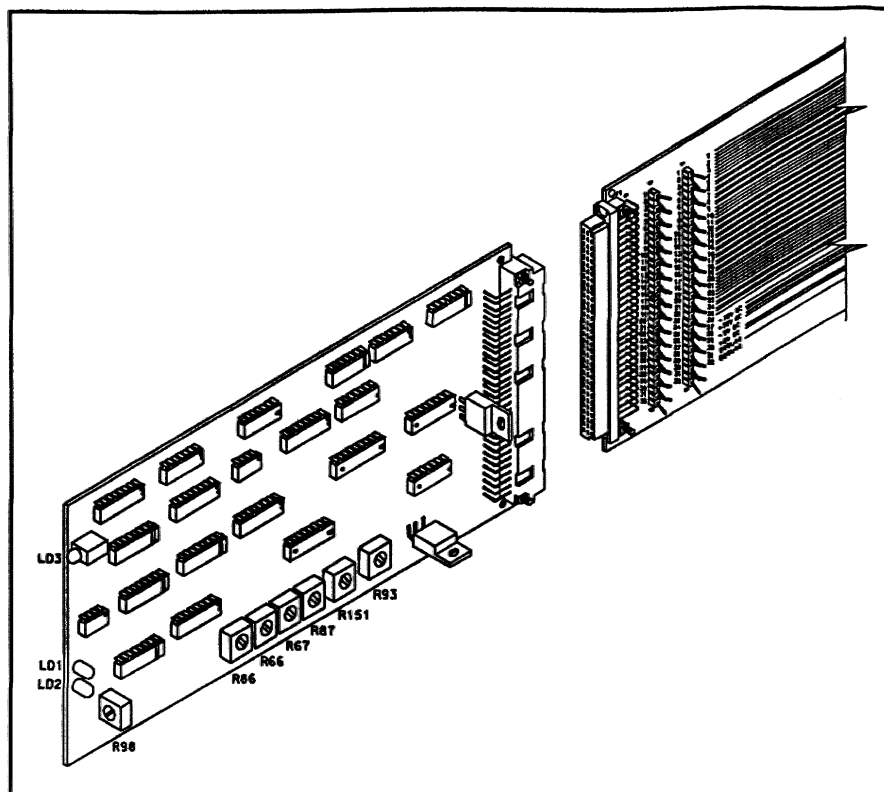


FIGURE 10-2. Horizontal Deflection Module Alignment

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10.2.2 Alignment

Module Location:

- rear panel card rack

Tools & Equipment Required:

- printed circuit board extractor
- extender board, Vidikron Part # A-03-230330-01P
- digital voltmeter
- dual channel oscilloscope
- video source

STEP 1 - Remove Horizontal Deflection

- Hook the printed circuit board extractor into the hole in the outside corner of the Horizontal Deflection module. Pull the module out of its slot.
- Insert the extender board into the Horizontal Deflection module slot. Connect the Horizontal Deflection module to the extender board.

STEP 2 - Regulation Adjust

- Connect the digital voltmeter between ground and test point P7. Adjust R93 to produce a reading of 12.4 ± 0.15 VDC.

STEP 3 - Reference Voltage Adjust

- Apply a 27 KHz signal to the projector.
- Adjust R98 until the green (LD1) and red (LD2) LEDs are lit and at equal brightness.

NOTE: If the projector is to be used with a 27 KHz computer source, it may be necessary to offset the R98 adjustment.

STEP 4 - Autolock Alignment (High Band)

Note: If the high band lock-in range is functional, ignore this step and proceed to Step 5.

- From the keypad, set the projector to automatic horizontal hold mode. The amber H MANUAL LED should be OFF.
- Short test points P3 and P4 together. This short will remain throughout autolock alignment and serves to disable the sync and AFC of the horizontal processor IC. This allows alignment assessment on the free running frequency of the horizontal oscillator.
- Connect the voltmeter between test point P6 and ground.

d) Apply a 28 KHz signal to the projector. Adjust R87 until the image is locked in. Observe the voltmeter reading.

e) Adjust R87 until the voltmeter reading drops by 0.2 to 0.3 VDC.

f) Apply a 54 KHz signal to the projector.

g) Adjust R67 to lock in the image. Observe the voltmeter reading.

h) Adjust R67 until the voltmeter reading drops by 0.2 to 0.3 VDC.

NOTE: R87 and R67 are interactive controls. It may be necessary to switch between the above frequencies and adjust the controls accordingly until autolock is achieved.

i) Remove the short between pins P3 and P4.

STEP 5 - Autolock Alignment (Low Band)

NOTE: If the low band lock-in range is functional, ignore this section and proceed to the reference voltage adjust section.

a) From the keypad, set the projector to automatic horizontal hold mode. The amber H MANUAL LED should be OFF.

b) Short test points P3 and P4 together. This short will remain throughout autolock alignment and serves to disable the sync and AFC of the horizontal processor IC. This allows alignment assessment on the free running frequency of the horizontal oscillator.

c) Connect the voltmeter between test point P6 and ground

d) Apply a 15.72 KHz signal to the projector.

e) Adjust R86 to lock in the image. Observe the voltmeter reading.

f) Adjust R86 until the voltmeter reading drops by 0.2 to 0.3 VDC.

g) Apply a 26 KHz signal to the projector.

h) Adjust R66 to lock in the image. Observe the voltmeter reading.

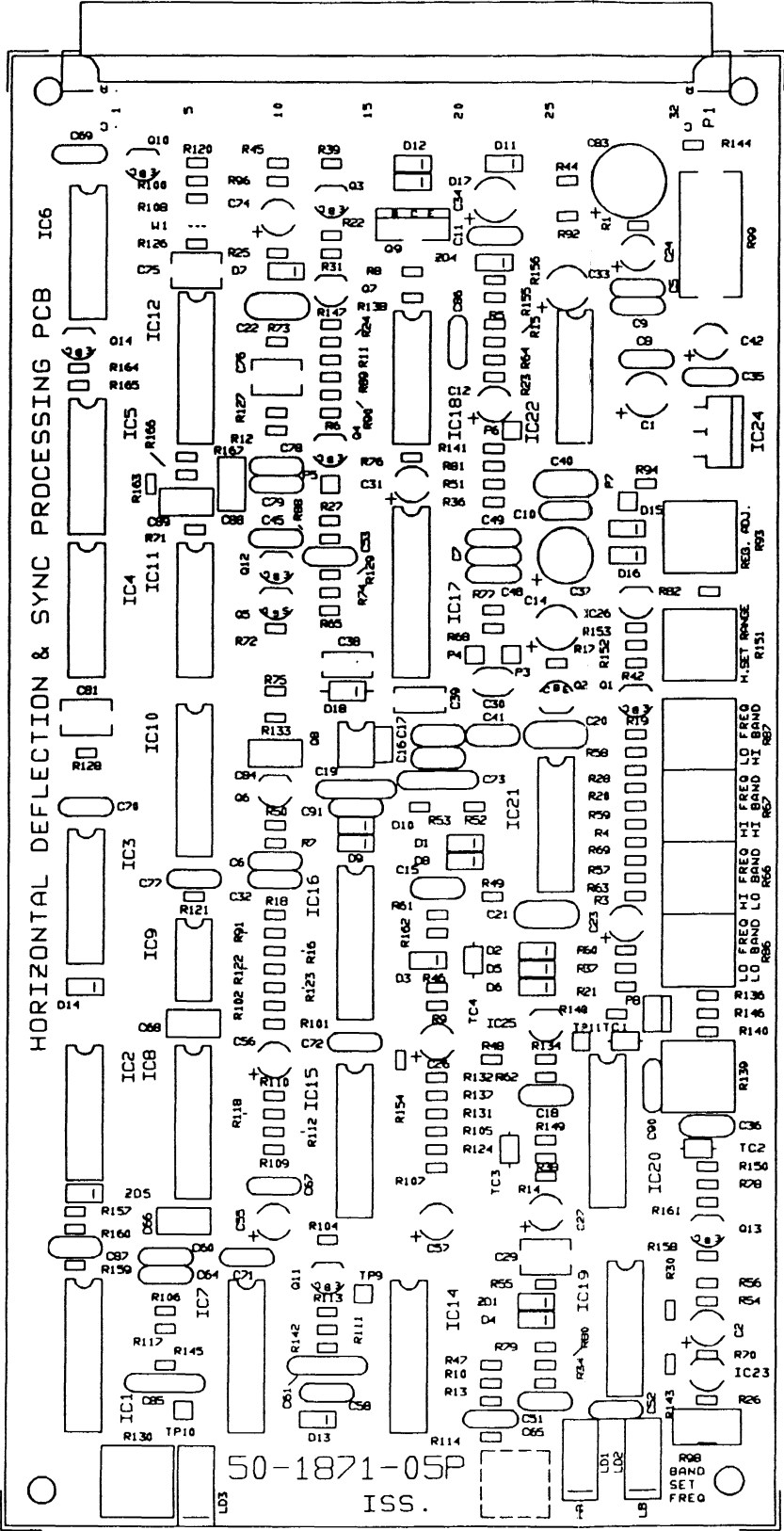
i) Adjust R66 until the voltmeter reading drops by 0.2 to 0.3 VDC.

NOTE: R66 and R86 are interactive controls. Repeat the above steps several times until autolock is achieved at both frequencies.

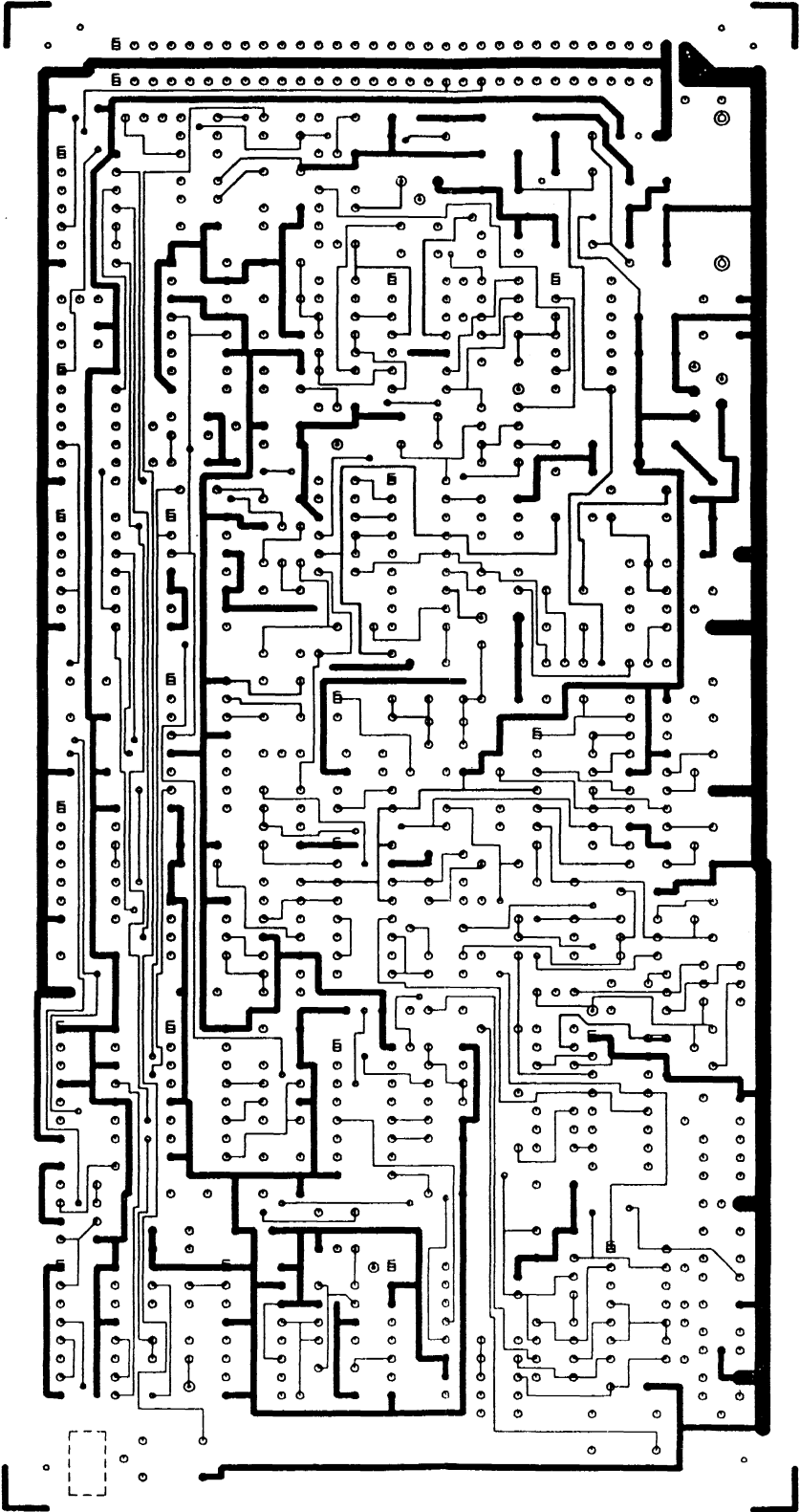
j) Remove the short between pins P3 and P4.

10.3 COMPONENT LAYOUT AND SCHEMATICS

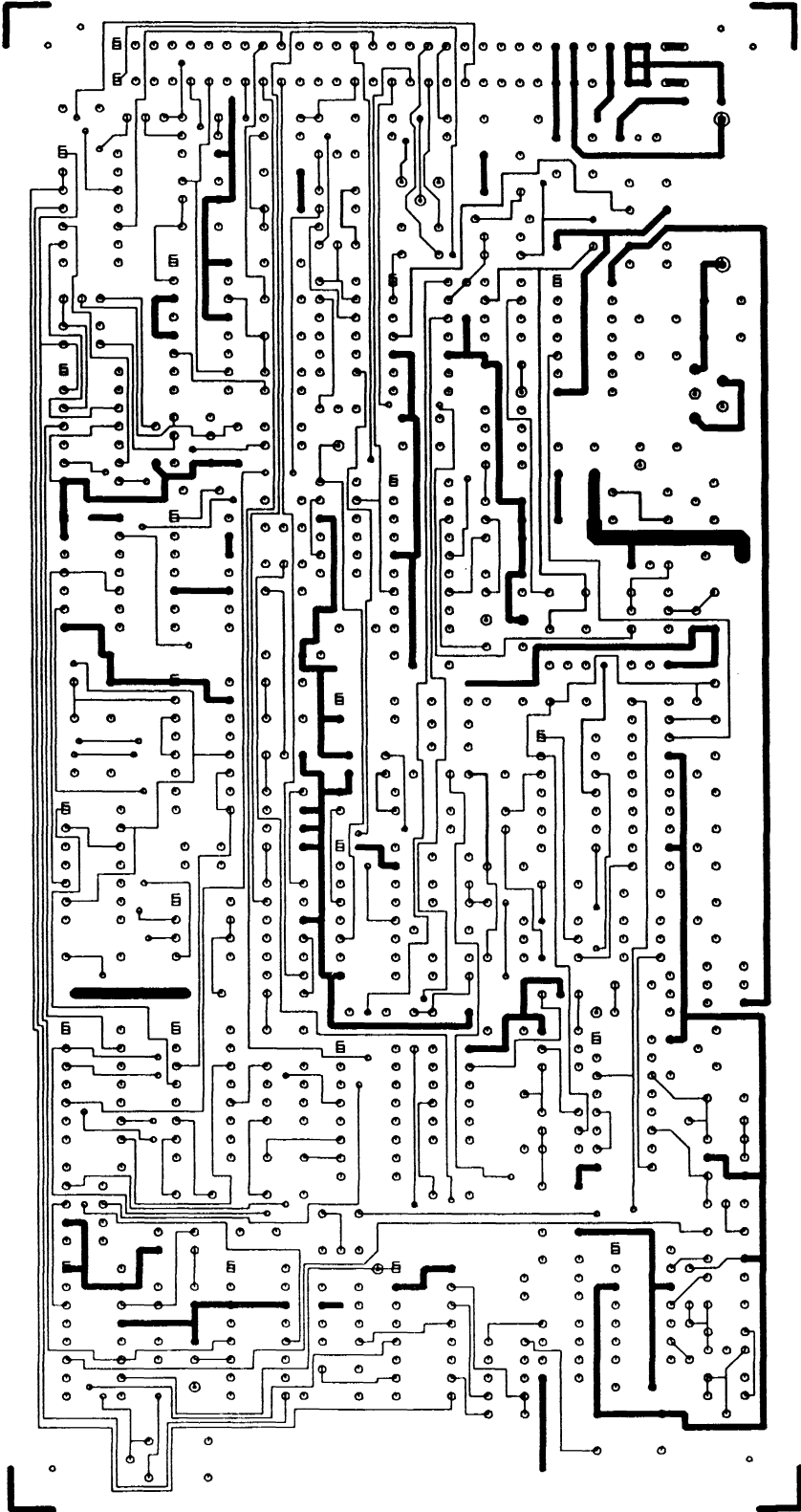
Refer to the following pages for component layouts and schematics of the Horizontal Deflection module.



Component Layout



Solder Side
(Viewed from Component Side)



Component Side

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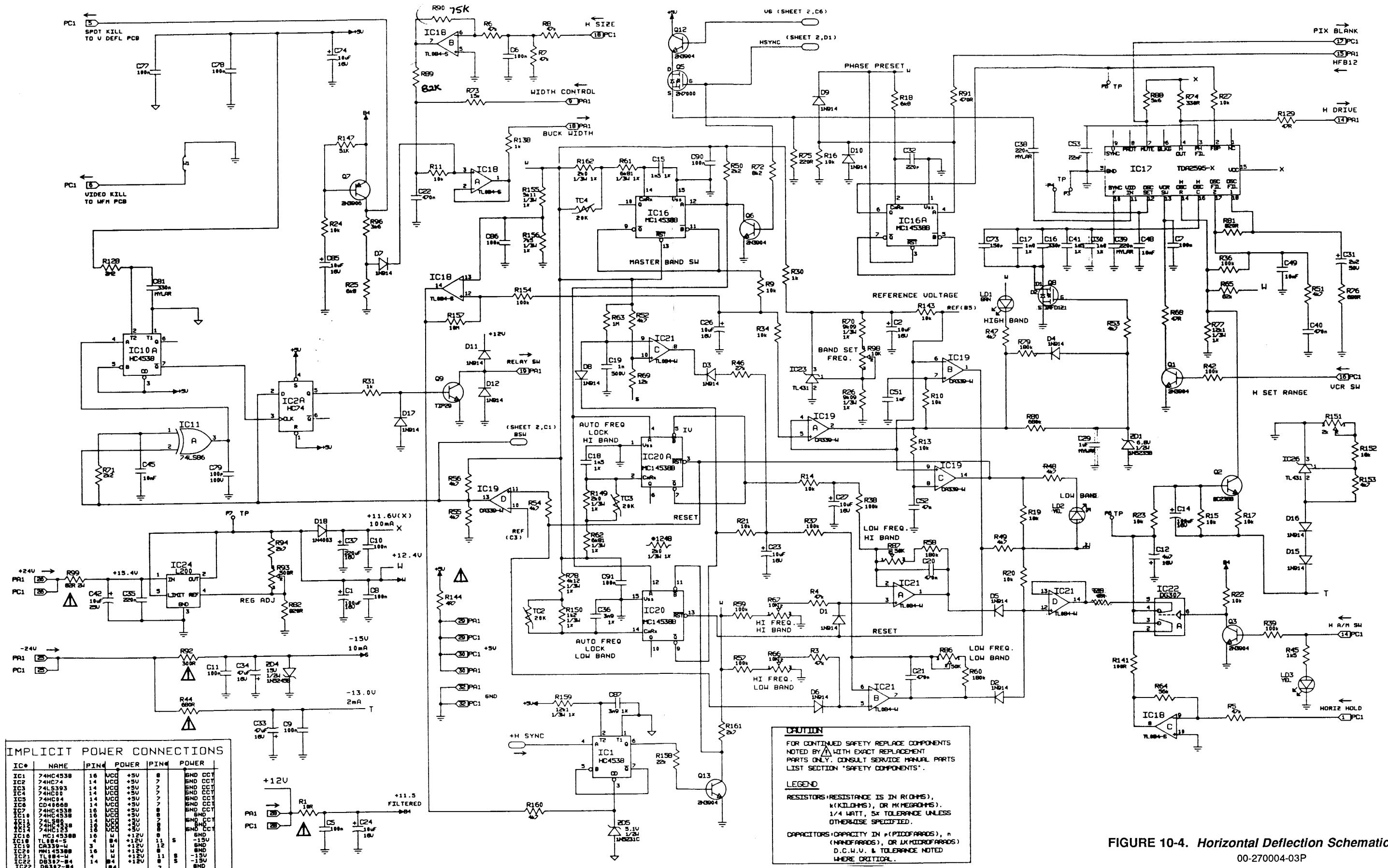
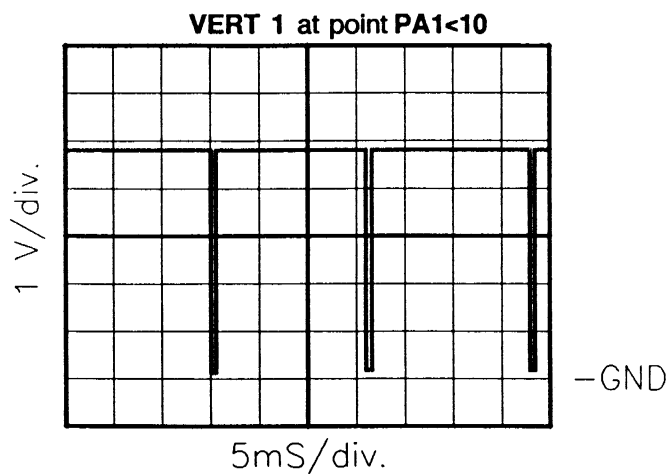
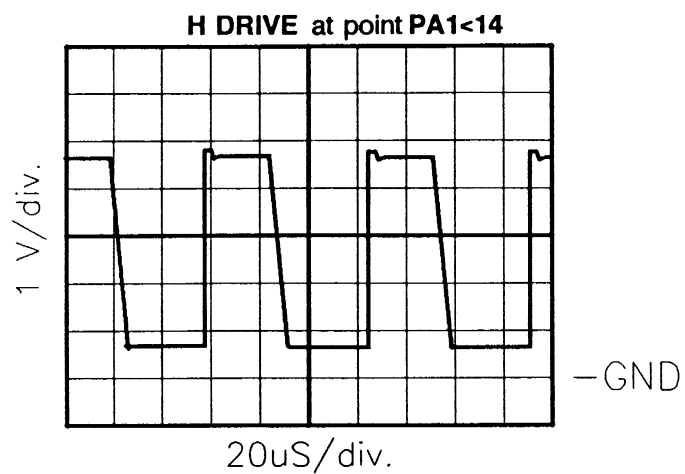
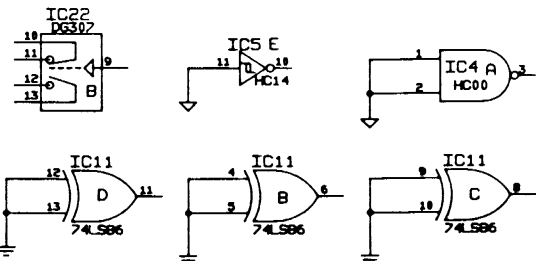


FIGURE 10-4. Horizontal Deflection Schematic (1 of 2)
00-270004-03P

SCHEMATIC REFERENCE





00-270004-03P

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10.4 PARTS LIST

▲ - CRITICAL SAFETY COMPONENT
(REPLACE WITH IDENTICAL PART)

Item Ref.	Part No.	Description
Integrated Circuits		
IC1,IC10	IC-14-A04041-01P	MM14538B, CMOS, precision dual monostable
IC2	IC-14-A04007-01P	74HC74, H-CMOS dual flip-flop
IC3	IC-14-004688-01P	74LS393, dual 8 bit digital TTL
IC4	IC-14-A04001-01P	74HC00, quad 2-input NAND gate
IC5	IC-14-A04073-01P	74HC14, hex schmitt trigger inverter
IC6	IC-14-A03008-01P	CD4066BM, I/F CMOS quad biFET latch
IC8	IC-14-A02006-02P	MC14046, CMOS phase lock loop
IC9	IC-14-A04069-01P	TLC555C, CMOS digital timer
IC11	IC-14-004620-01P	74LS86, quad EXOR gate
IC14	IC-14-A04062-01P	74HC123, dual monostable multivibrator
IC16,IC20	IC-14-A04041-02P	MC14538B, CMOS, precision dual monostable
IC17	IC-14-002824-01P	TDA2595, linear horizontal combination
IC18,IC21	IC-14-002104-01P	TL084CN, quad biFET linear op amp
IC19	IC-14-002154-01P	CA339, quad linear voltage comparator
IC22	IC-14-A03009-01P	DG307CJ, I/F analog CMOS gate switch
IC23	IC-14-002813-09P	TL082BC, linear op amp
IC25,IC26,IC30	IC-14-002833-01P	TL431C, precision shunt regulator
IC27,IC28	IC-14-002168-01P	LM322, precision timer
Transistors and Diodes		
Q1,Q3,Q6,Q10-Q14	TR-14-000881-06P	2N3904, NPN, 40V, 0.2A, 0.35W
Q2	TR-14-000723-01P	BC238B, NPN transistor
Q5,Q18	TR-14-A00705-01P	2N7000, TMOS, 60V, 0.2A, 4W
Q7,Q16,Q17	TR-14-000873-82P	2N3906, PNP, small signal
Q8	TR-14-A00700-01P	1RFD1Z0, hex FET, 100V
Q9	TR-14-000966-23P	TIP29B, NPN transistor, 80V, 1A 2W
D1-D12,D15-D17	D-14-000513-01P	1N914, diode, 0.075A, 75V
D18	D-14-000525-53P	1N4003, rectifier, 1A, 200V
LD1	DLED-14-001005-02P	LED, 3V, 0.09A, green
LD2	DLED-14-001005-03P	LED, 3V, 0.06A, yellow
LD3	DLED-14-001016-03P	LED, 3V, 0.06A, yellow
ZD1	DZ-14-000531-32P	1N5235B, zener diode, 6.8V, 5%, 1/2W
ZD4	DZ-14-000530-38P	1N5245B, zener diode, 15V, 1/2W
ZD5	DZ-14-000515-98P	1N5231, zener diode, 5.1V, 1/2W, 2%, T
Capacitors		
C1,C14	C-84-410104-03P	100 μ F, 25V, electrolytic
C2,C23,C24,C26,C27, C42,C55,C56,C74,C85	C-84-410004-01P	10 μ F, 25V, electrolytic
C5-C11,C69-C72,C77, C86,C90,C91,C98,C99	C-89-000032-03P	100 nF, 50V, 20%, ceramic, multi layer
C12	C-84-447506-01P	4.7 μ F, 50V, electrolytic
C15,C18,C41,C94,C95	C-89-000033-04P	1.5 nF, 1%, NPO, ceramic, multi layer
C16	C-89-000033-06P	330 pF, 5%, NPO, ceramic, multi layer
C17,C30,C88	C-89-000033-02P	1.0 nF, 50V, 1%, ceramic, multi layer
C19	C-86-310213-02P	1 nF, 500V, 10%, Z5P
C20-C22,C40	C-89-000032-02P	0.47 μ F, 50V, \pm 20%, ceramic, multi layer

10.4 PARTS LIST (cont.)

▲ - CRITICAL SAFETY COMPONENT
(REPLACE WITH IDENTICAL PART)

Item Ref.	Part No.	Description
Capacitors (cont.)		
C29,C93	C-88-171053-12P	1 μ F, 50V, mylar
C31	C-84-422506-01P	2.2 μ F, 50V, 20%, electrolytic
C32,	C-89-000033-07P	220 pF, 100V, 5%, NPO, ceramic, multi layer
C33,C34	C-84-447004-02P	47 μ F, 25V, electrolytic
C35	C-89-000032-01P	0.22 μ F, 50V, ceramic, multi layer
C36,C87	C-89-000033-05P	3.9 nF, 1%, NPO, ceramic, multi layer
C37	C-84-422104-03P	220 μ F, 25V, electrolytic
C38,C39	C-88-172240-02P	220 nF, 50V, 10%, mylar
C45,C48,C49	C-89-000032-04P	10 nF, 50V, 20%, ceramic, multi layer
C51	C-89-000032-05P	1 nF, 50V, 20%, ceramic, multi layer
C52	C-89-000032-09P	4.7 nF, 50V, 20% Z5U, ceramic, multi layer
C53	C-89-000032-10P	22 nF, 50V, 20%, ceramic, multi layer
C58,C97	C-86-610134-04P	100 pF, 100V, NPO, ceramic
C60	C-86-682034-04P	82 pF, 2%, 100V, ceramic
C66,C84	C-88-171031-12P	10 nF, 100V box type, mylar
C68	C-88-176821-03P	6800 pF, 100V, \pm 5%, mylar
C73	C-89-000033-03P	150 pF, 50V, 5%, ceramic, multi layer
C81	C-88-173340-02P	330 nF, 63V, 10%, mylar
C83	C-44-447102-05P	470 μ F, 10V, electrolytic
C89	C-88-172721-02P	2.7 nF, 100V, 10%, mylar
C92	C-84-422004-01P	22 μ F, 25V, electrolytic
C96	C-84-000210-05P	47 μ F, 10V, non-polar mini, electrolytic

Resistors

R1	R-80-110095-11P	10R, 1/2W, 5%, metal film
R3-R8,R118,R168	R-80-147025-11P	47K, 1/2W, 5%, metal film
R9-R11,R13-R17, R19-R24,R27,R34,R51, R100-R102,R104,R143, R166,R178,R179	R-80-110025-11P	10K, 1/2W, 5%, metal film
R18,R25	R-80-168015-11P	6.8K, 1/2W, 5%, metal film
R26,R70,R72	R-80-182015-11P	8.2K, 1/2W, 5%, metal film
R28,R68,R129	R-80-147095-11P	47R, 1/2W, 5%, metal film
R30,R31,R138,R171, R173,R174	R-80-110015-11P	1K, 1/2W, 5%, metal film
R36-R39,R42,R57,R59, R154	R-80-110035-11P	100K, 1/2W, 5%, metal film
R44,R76	R-80-168005-11P	680R, 1/2W, 5%, metal film
R45	R-80-115015-11P	1.5K, 1/2W, 5%, metal film
R46,R113	R-80-127025-11P	27K, 1/2W, 5%, metal film
R47-R49,R52-R56,R108, R153,R160,R164,R169, R170,R183	R-80-147015-11P	4.7K, 1/2W, 5%, metal film
R50,R71	R-80-122015-11P	2.2K, 1/2W, 5%, metal film
R58,R60,R79	R-80-118035-11P	180K, 1/2W, 5%, metal film
R61,R62	R-82-368111-29P	6.81K, 1/3W, 1%, metal film
R63	R-80-110045-11P	1M, 1/2W, 5%, metal film
R64,R111,R117	R-80-156025-11P	56K, 1/2W, 5%, metal film
R65,R89	R-80-162025-11P	62K, 1/2W, 5%, metal film

10.4 PARTS LIST (cont.)

▲ - CRITICAL SAFETY COMPONENT
(REPLACE WITH IDENTICAL PART)

Item Ref.	Part No.	Description
Resistors (cont.)		
R66,R67	VR-41-000344-10P	10K, carbon trim pot.
R69	R-80-112025-11P	12K, 1/2W, 5%, metal film
R73	R-80-115025-11P	15K, 1/2W, 5%, metal film
R74	R-80-133005-11P	330R, 1/2W, 5%, metal film
R75	R-80-122005-11P	220R, 1/2W, 5%, metal film
R77,R159,R184,R180	R-82-312121-29P	12.1K, 1/3W, 1%, metal film
R78,R186	R-82-341211-29P	4.12K, 1/3W, 1%, metal film
R80,R110	R-80-168035-11P	680K, 1/2W, 5%, metal film
R81,R82	R-80-182005-11P	820R, 1/2W, 5%, metal film
R86,R87	VR-41-000344-13P	50K, carbon trim pot.
R88	R-80-156015-11P	5.6K, 1/2W, 5%, metal film
R90,R112	R-80-139025-11P	39K, 1/2W, 5%, metal film
R91	R-80-147005-11P	470R, 1/2W, 5%, metal film
R92	R-80-130005-11P	300R, 1/2W, 5%, metal film
R93	VR-41-000344-06P	500R, carbon trim pot.
R94,R161	R-80-127015-11P	2.7K, 1/2W, 5%, metal film
R96,R109	R-80-136015-11P	3.6K, 1/2W, 5%, metal film
R98	VR-41-000344-40P	10K, carbon trim pot
R99	R-42-000134-04P	82R, 2W, 5%, CS
R120	R-80-175095-11P	75R, 1/2W, 5%, metal film
R121,R122,R165	R-80-151015-11P	5.1K, 1/2W, 5%, metal film
R123	R-80-147035-11P	470K, 1/2W, 5%, metal film
R128	R-80-122045-11P	2.2M, 1/2W, 5%, metal film
R133	R-80-136025-11P	36K, 1/2W, 5%, metal film
R141	R-80-110005-11P	100R, 1/2W, 5%, metal film
R144	R-80-110085-11P	1R, 1/2W, 5%, metal film
R147	R-080-151025-11P	51K, 1/2W, 5%, metal film
R149,R162	R-82-320011-29P	2.0K, 1/3W, 1%, metal film
R150	R-82-312111-29P	1.21K, 1/3W, 1%, metal film
R151	VR-41-000344-08P	2K, carbon trim pot
R152	R-80-116025-11P	16K, 1/2W, 5%, metal film
R155	R-82-351111-29P	5.11K, 1/3W, 1%, metal film
R156	R-82-375011-29P	7.5K, 1%, 1/3W, 5%, metal film
R157	R-40-121065-31P	10M, 1/4W, 5%, metal film
R158,R172	R-80-122025-11P	22K, 1/2W, 5%, metal film
R167	R-80-175015-11P	7.5K, 1/2W, 5%, metal film
R181	R-82-352311-29P	5.23K, 1/3W, 1%, metal film
R182	R-82-361911-29P	6.19K, 1/3W, 1%, metal film
R185	R-82-390911-29P	9.09K, 1%, 1/3W, metal film
R187	R-80-120025-11P	20K, 1/2W, 5%, metal film
R188	R-80-130025-11P	30K, 1/2W, 5%, metal film
TC2-TC4	TC-42-000079-10P	20K, thermistor, 2%

10.5 SPECIFICATIONS

Connector P1, Row A:

Pin 9 analog input **WIDTH**

NOTE: horizontal size control voltage from Power Deflection module

Pin 10 analog output **VERT1**

NOTE: +ve going vertical sync pulse
signal level 0 to 5V $\pm 10\%$

Pin 14 analog output **H DRIVE**

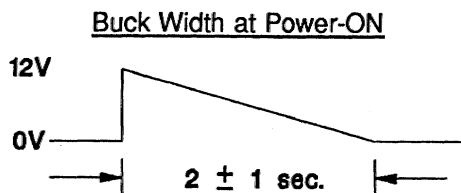
NOTE: horizontal drive pulse from IC17
signal level (500 Ω load) 5V peak $\pm 10\%$

Pin 15 analog input **HFB**

NOTE: see Power Deflection module
signal level 0 to 12V

Pin 18 analog output **BUCK WIDTH**

NOTE: control voltage for horizontal regulator
normal condition 3.5 to 3.9V
during bandswitch 5.4V max



Pin 19 analog output **RELAY SW**

Pin 25-24V power supply **-24 VDC**
current level 55 mA max

Pin 26+24V power supply **+24 VDC**
current level 100 mA max

Pin 27-12V power supply **-12 VDC**
current level 0 mA max

Pin 28+12V power supply **+12 VDC**
current level 30 mA

Pin 29+5V power supply **+5 VDC**
total current 50 mA max

Pin 30 connected to Pin 29 +5 VDC

Connector P1, Row C:

Pin 1 analog input **H HOLD**
horizontal oscillator lock-in range
manual mode @ SW = 5V
low band 15.7 to 35 KHz
high band 24 to 54 KHz
auto mode @ SW = 0V
lock-in range 15.7 to 54 Hz
pull-in range 500 Hz min

Pin 5 analog output **SPOT KILL**
signal at turn-on 10V min.
time on 2.5s min.

Pin 6 analog output **VIDEO KILL**

Pin 8 analog input **SYNC**
composite -ve sync 1V peak min

Pin 9 analog input **H PHASE**
horizontal phase delay control 0 to 10VDC

Pin 10 analog input **V PHASE**
vertical phase delay control 0 to 10VDC

Pin 13 analog output **CLAMP**
positive back porch clamping 0 to 12VDC
pulse width 1 μ s min.

Pin 14 analog input **H A/M SW**
NOTE: horizontal auto/manual switch
signal level 0 to 5V

Pin 16 analog input **VCR SW**
NOTE: fast/slow time base switching signal
signal level 0 to 5VDC

Pin 18 analog input **H SIZE**
NOTE: size control from Remote Control module
signal level 0 to 10VDC

Pin 20 analog input **H DELAY SW**
NOTE: turns horizontal phase delay circuit ON or OFF
signal level 0 to 5VDC

Pin 21 analog input **V DELAY SW**
NOTE: turns vertical phase delay circuit ON or OFF
signal level 0 to 5VDC