

Errata

Title & Document Type: 1715A/25A TV Sync Oscilloscope Operating Note

Manual Part Number: 5957-2256

Revision Date: July 1981

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TV SYNC OSCILLOSCOPE

for HP Models 1715A/1725A)

Models
1715A/1725A

OPERATING NOTE/JULY 1981

1. INTRODUCTION.

2. This operating note provides operating and service information for the HP Model 1715A/1725A Option 005, the TV Sync aspect of the Option 535/534, and the TV SYNC OPTION/MODIFICATION KIT 10029A.

3. DESCRIPTION.

4. TV Sync Option 005 enables the 1715A/1725A oscilloscopes to trigger on composite video waveforms, which aids in viewing and measuring video signals. Option 005 is used in several different markets including television, display systems, and video systems. This enhanced version of HP 1715A/1725A oscilloscopes is frequently found in production, test, and development.

5. INSTALLATION INSTRUCTIONS FOR INSTALLING TV SYNC OPTION MODIFICATION KIT 10029A.

6. **MODIFICATION SUMMARY.** Modification kit 10029A adds TV SYNC option to existing 1715A/1725A oscilloscopes by the following steps:

- a. Remove 1715A/1725A top cover and drill holes, per template (last page).
- b. Assemble panels and hardware on front and rear castings.
- c. Mount standoffs on instrument top cover, then attach PC board to standoffs.
- d. Install assembled front and rear castings on 1715A/1725A top cover.
- e. Wire BNC connectors and pot, then connect power cable to TV SYNC board.
- f. Connect power harness between 1715A/1725A and A200 board, then mount cover on 1715A/1725A.
- g. Check per PERFORMANCE TEST.

7. **MODIFICATION KIT MATERIAL LIST.** The material list for modification kit is included in Replaceable Parts list.

8. **MODIFICATION INSTRUCTIONS.** Perform the following instructions in the sequence that follows:

a. Remove 1715A/1725A top cover from instrument, and accessory case from top cover.

b. Mark and drill scope top cover holes using template as a guide. Note, preferably grommet hole of 19 mm (0.75 in.) for ease of power harness installation, but use smaller grommet if tooling limits hole size.

c. Install front and rear panels in front and rear frames (castings). Mount J201 through J204, R201, MP203, MP208, MP209 on panels as shown in mechanical views.

NOTE

Solder lugs mount on J201 and J204, and MP203 bracket mounts on J202.

d. Install threaded standoffs on instrument top cover with 2360-0113 (6-32 x 0.250) screws. Mount PC board on standoffs using same (H201) screws.

e. Mount assembled front and rear castings on instrument top cover using five P/N 2200-0105 (4-40 x 0.31) pan head screws and one P/N 2200-0166 flat head screw in countersunk hole.

f. Solder the following wires to BNC connectors or solder lugs and connect square pin connector to square pins indicated.

NOTE

Resistor color codes are used to indicate wire numbers.

Yellow (4) wire from TV INPUT BNC to square pin (4) near A200R4.

Longer black (0) wire from solder lug on TV INPUT BNC to square pin (0) near A200R4.

Green (5) wire from TV VERTICAL OUT BNC to square pin (5) near A200R27.

Shorter black (0) wire from solder lug on TV VERTICAL OUT BNC to square pin (0) near A200R27.

White/green (95) wire from MAIN TRIGGER BNC and to square pin (95) near A200C14.

White/yellow (94) wire to DELAYED TRIGGER BNC and square pin (94) near A200C11.

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9. Wire R201 pot with red (2) wire to center terminal and the white/red (92) wire to terminal c/w of center terminal when viewed from rear. Connect red (2) and white/red (92) wires to square pins near A200R3.

10. Install grommet in top cover hole, then thread W200 power harness through grommet and connect W200 to A200J1 (902 wire toward A200R2, 7 wire toward instrument back).

11. Mount push button MP207 on push button switch A200S1.

12. Connect W200 power harness to 1715A/1725A A8 horizontal sweep board. Refer to 1715A/1725A Operating and Service Manual List of Illustrations under "Service Information, Main Sweep Trigger, P/O Assembly A8" to locate A8P2 and A8P3. Connect violet (7) wire to A8P2 Pin 4 (-15 volts). Connect black (0) wire to A8P2 Pin 9 (ground). Connect white/black/red (902) wire to A8P3 Pin 4 (+15 volts).

13. Check TV SYNC performance per PERFORMANCE TEST.

14. Install TV SYNC top cover. Install 1715A/1725A top cover onto oscilloscope.

15. OPERATION.

16. Option 005 adds the circuits and controls that enable the oscilloscope to trigger on a composite video signal and display the signal on either channel A or B. The oscilloscope's main time base triggers on the vertical interval of the composite video signal, which it receives by connecting the MAIN TRIGGER output BNC to the Main EXT TRIG input BNC. The delayed time base triggers on horizontal line sync pulses by connecting the DELAYED TRIGGER BNC to the Delayed EXT TRIG input. Composite video signals are connected to the 75Ω TV INPUT. They are ac coupled to the TV VERTICAL OUT BNC with approximately unity gain. TV VERTICAL OUT BNC is connected to the oscilloscope's CHANNEL A or B vertical INPUT (don't use 50Ω coupling). Figure 1 shows the added controls and connectors, and a description of the operation of each. Refer to the 1715A/1725A Operating and Service Manual for a description of the remaining controls and indicators.

17. SPECIFICATIONS.

18. The specifications in table 1 apply to the HP 1715A/1725A Option 005.

19. RECOMMENDED TEST EQUIPMENT.

20. The following test equipment is required in addition to that listed in the Operation and Service Manual:

Composite TV Sync Signal Generator

Table 1. Option 005 Specifications

TV INPUT	
Max Input:	5 VRMS (Need neg sync pulses)
Min Input:	0.25 V p-p
75Ω Input Impedance:	±3%
TV CLAMP:	AC coupled, neg clamping to ground
MAIN TRIGGER and DELAYED TRIGGER Output	
	Rectangular wave with a peak voltage range of $0.75 < V_{peak} < 1.0$ V

21. PERFORMANCE TEST.

22. The following performance test is in addition to those in the 1715A/1725A oscilloscopes Operating and Service Manuals.

a. Connect TV signal generator to TV INPUT 75Ω make the following connections as shown in figure 2 and set oscilloscope controls as follows:

MAIN TIME/DIV	2.0 msec
DELAYED TIME /DIV	10.0 μsec
MAIN	engaged
Delayed TRIG LEVEL	detent
TIME INTERVAL	ΔT off
Main Triggering	EXT
Delayed Triggering	EXT
CHAN A VOLTS/DIV	as required
	for at least 2 div display

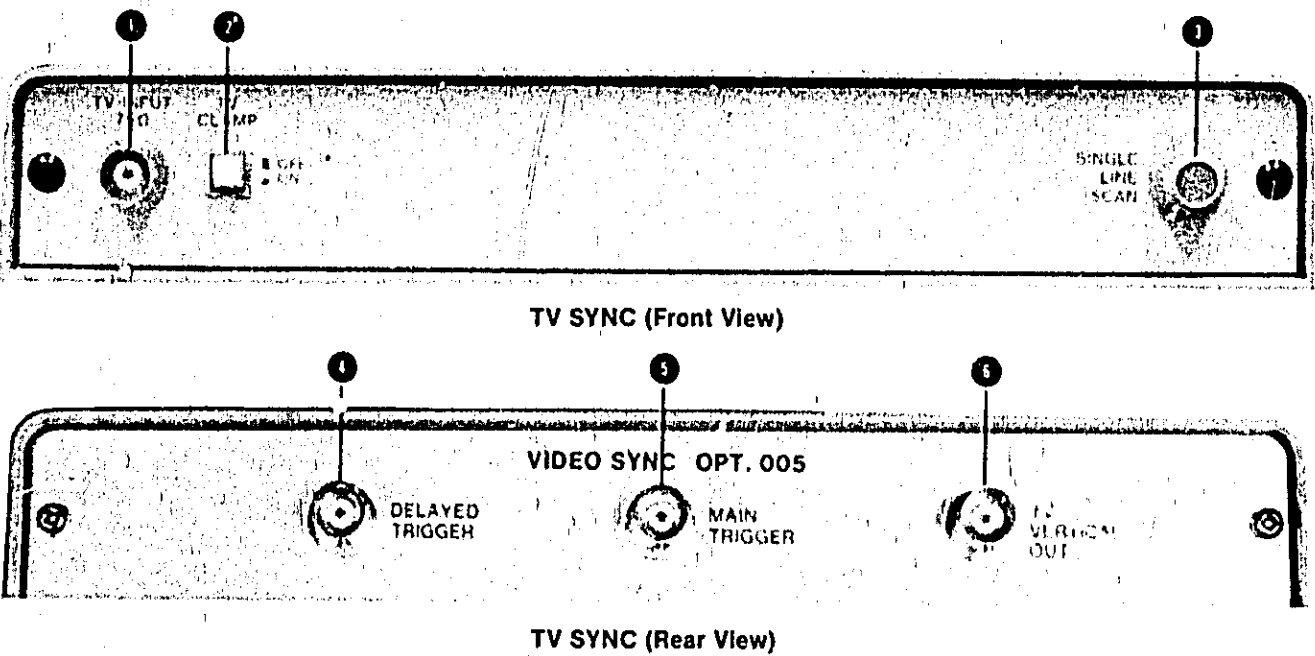
b. Adjust Main TRIG LEVEL for stable display. If a stable display is observed, the field reference portion of the TV sync circuitry is operating properly.

c. Try both slope triggering modes ± and observe that display remains stable.

d. Press DLY'D sweep and observe individual line sync pulses are displayed on CRT (adjust intensity as needed).

e. Adjust the TIME INTERVAL STOP potentiometer and observe that line sync pulses move slowly across CRT.

f. Set Delayed TRIG LEVEL to obtain a stable display (Delayed slope select to -). TIME INTERVAL STOP potentiometer adjustment now provides about five divisions of discrete delay changes. Adjust SINGLE LINE SCAN and note the continuous control of horizontal position.



- 1 TV INPUT 75Ω. This input matches the impedance of most TV transmission lines (75Ω).
- 2 TV CLAMP. TV CLAMP clamps the composite video signal to the bottom of the output sync pulses. This eliminates vertical position shifting caused by changing video levels, which allows viewing of the VITS (Vertical Interval Test Signals) without vertical movement of the display. Note TV VERTICAL OUT BNC must be used to provide clamping.
- 3 SINGLE LINE SCAN. In DLY'D display mode, with the delayed time base in neg slope triggered mode (TRIG LEVEL in nondetent), the expanded portion of the waveform jumps from line sync pulse to line sync pulse as TIME INTERVAL STOP potentiometer is turned. To fine tune the horizontal position in a continuous manner, use SINGLE LINE SCAN, which allows a 3 to 50 μsec delay window with respect to each delayed trigger point for precise measurements.
- 4 DELAYED TRIGGER. Provides a delayed trigger event derived from each horizontal line sync pulse.
- 5 MAIN TRIGGER. Provides a main trigger event derived from the vertical interval of each field.
- 6 TV VERTICAL OUT. This is the ac coupled and clamped (if TV CLAMP is engaged) version of the input waveform connected to TV INPUT 75Ω.

Figure 1. Controls and Connectors

23. TV SYNC OSCILLOSCOPE FUNCTIONS.

24. MAIN TRIGGER. This function is useful in both Main and Dly'd Sweep modes. Main trigger locks in on one complete frame (2 interlaced fields) of video and displays field 1 or field 2. Switching Main POS/NEG (\mathcal{N}) will transfer the display to the opposite field in the frame. This feature operates similarly in Dly'd Sweep mode. When individual lines are examined in Dly'd, changing Main POS/NEG (\mathcal{N}) will display the corresponding lines in the opposite field. This application is typically used when inspecting "VITS" signals. For example, when viewing the multiburst signal (located on line 17 of field 1), POS/NEG (\mathcal{N}) switches the display to the color bars (line 17 of field 2).

25. TIME INTERVAL STOP POTENTIOMETER. This control has several operating modes that provide numerous useful functions. In MAIN INTEN mode with TRIG LEVEL in detent, TIME INTERVAL STOP continuously

moves the intensified portion of main sweep to the desired area for expansion. The brightened segment expands to full screen when the DLY'D button is pressed. In DLY'D mode, the STOP control provides continuous vernier control of the expanded region. This allows a magnified scanning of a waveform to inspect and measure lines or segments of lines. When Dly'd TRIG LEVEL is in the nondetent position the STOP control moves the brightened (MAIN) or expanded (DELAYED) display in discrete jumps from line sync pulse to line sync pulse.

26. DELAYED GATE Output (Rear Panel). This output can be used to superimpose an intensified marker on the video monitor as a reference for line selection. The DELAYED GATE Output is connected to the monitor with a BNC "T" connector where the video signal source feeds into the monitor, thus superimposing the delayed gate output on the video signal. This generates a white line on the monitor's display. Setting main sweep to 2

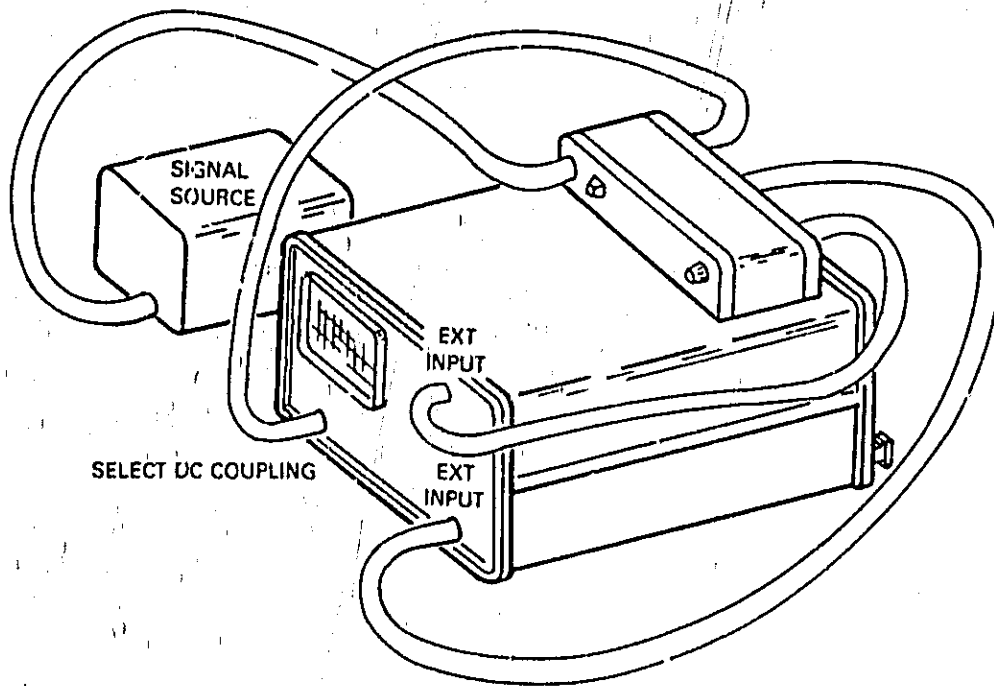


Figure 2. TV Sync Hookup

msec/div delayed sweep to 5 μ sec/div and selecting MAIN INTEN, displays a narrow white line across the screen of the monitor. The width of the white line varies with the Dly'd sweep speed, and the position of the white line can be adjusted with the STOP potentiometer. The amplitude of the video signal may be DC offset by the delayed gate signal, which will give an intensified and DC offset (MAIN INTEN) marker.

27. REPLACEABLE PARTS.

28. Table 2 lists the replaceable parts for Option 005, and figure 3 shows the mechanical view. Refer to Section VI in the oscilloscope Operating and Service Manual for other parts and for ordering information.

29. SERVICE.

30. **MANUAL CHANGES.** When the 1715A/1725A Operating and Service Manual has been changed to include the information in this operation note, the manual applies to Option 005.

31. THEORY OF OPERATION.

32. Refer to figure 4 and 5. The TV Sync Separator provides additional circuits to allow triggering on a composite video signal. The Main Time Sweep triggers on a field reference pulse derived from the vertical interval, and the delayed time base triggers on individual horizontal line sync pulses. TV Sync Separator, A200, converts the composite video signal to a field sync

reference to the main time base, and a linesync reference to the delayed time base.

33. The composite video signal is ac coupled through A200C5 and clamped by A200CR1, if switch A200S1 is pressed, from the TV INPUT to the TV VERTICAL OUT.

34. After amplification, level shifting, and clamping, the composite video signal is applied to Stripping Amplifier A200Q3. With the emitter connected to ground, all video information is removed leaving only negative going composite sync pulses at the collector. A200U1 triggers on the negative going transitions of each line sync pulse to produce a positive going pulse which is delayed about 40 μ s from trigger source and has a variable width controlled by SINGLE LINE SCAN R201. As potentiometer R201 is adjusted, the width varies at the trailing edge from approximately 3 μ sec to 50 μ sec. If the oscilloscope is set for triggered delayed sweep with a negative slope, adjusting SINGLE LINE SCAN provides a fine tuned delay of the triggered waveform.

35. The Field Sync Integrator filters out the line sync pulses and integrates the vertical interval serrated pulses into a positive trigger that is applied to the clock input of A200U2. The output of A200U2 is a square wave with each half-cycle synchronous to a vertical interval of a field. Changing POS/NEG (A200) from one slope to the other changes the main time base trigger reference from one field to the other.

Table 2. Option 005 Replaceable Parts

Action	Ref. Desig.	HP Part No.	C D	Qty	Description
ADD	A200	01715-66501	6	1	BD ASSY-TV SYNC
ADD	H200	2200-0762	9	6	MS 4-40 0.250 LG
ADD	H201	2360-0113	2	5	MS 6-32 0.250 LG *(Qty ± 10 for Retrofit)
ADD	H202	2200-0103	2	2	MS 4-40 0.250 LG
ADD	H203	2200-0166	7	1	MS 4-40 0.312 LG
ADD	H204	2200-0105	4	5	MS 1-40 0.31 LG
ADD	H205	2950-0072	3	1	NUTH 1/4-32 0.062
ADD	H206	2950-0013	8	4	NUTH 3/8-32 0.093
ADD	H207	2190-9016	3	2	WIL .377 .507 .02
ADD	H208	0360-1632	0	2	LUG SOLDER
ADD	H209	0400-0001	1	1	GROMMET 0.750
ADD	H209	0400-0010	2	1	GROMMET 0.375 *(Retrofit)
ADD	H210	0380-0112	1	5	HEX SPACER 6-32 X .500 *(Retrofit)
ADD	J201	1250-0118	3	4	CONNRF BNC BHDJ
ADD	J202	1250-0118	3		CONNRF BNC BHDJ
ADD	J203	1250-0118	3		CONNRF BNC BHDJ
ADD	J204	1250-0118	3		CONNRF BNC BHDJ
DELETE	MP25	01720-01120	2	1	COVER-TOP-STD
DELETE	MP65	1540-0292	9	1	CASE ACCESSORY
ADD	MP201	01715-00203	7	1	FRT PNL TV SYNC
ADD	MP202	01715-00204	8	1	REAR PNL TV SYNC
ADD	MP203	01715-01201	7	1	BRACKET-REAR PNL
ADD	MP204	01715-04101	2	1	TOP COVER-SCOPE (Option 005)
ADD	MP204	01715-04102	3	1	TOP COVER-SCOPE (Option 534/535, which is the Option 005 and DVM)
ADD	MP205	01715-04103	4	1	TOP COV-TV SYNC
ADD	MP206	01726-20503	5	2	FRAME REAR
ADD	MP207	0370-0603	4	1	P. B. M GRAY SQ
ADD	MP208	0370-1005	2	1	KNOB-JADE GREY
ADD	MP209	0370-2626	5	1	BEZEL-PB GRAY
ADD	MP210	1540-0325	9	1	CASE CRVG HANDLE
ADD	R201	2100-1530	9	1	RV CCC 200K
ADD	W206	01715-61601	7	1	CABLE-POWER
ADD	W207	8150-0298	5	1	*WIRE 24 GA GRN
ADD	W208	8150-0299	6	1	*WIRE 24 GA YEL
ADD	W209	8150-0301	1	1	*WIRE 24 GA RED
ADD	W209	8150-0303	3	2	*WIRE 24 GA BLK
ADD	W210	8150-1038	3	1	*WIRE 24 GA WHL-RED
ADD	W211	8150-1040	7	1	*WIRE 24 GA WHT-YEL
ADD	W212	8150-1041	8	1	*WIRE 24 GA WHT-GRN
ADD	A200	01715-66501	6	1	BD ASSY-TV SYNC
ADD	A200C1	0160-2055	9	3	CF CE 0.01 UF 100V

Table 2. Option 005 Replaceable Parts (Cont'd)

Action	Ref. Desig.	HP Part No.	$\frac{C}{D}$	Qty	Description
ADD	A200C2	0180-0116	1	2	CF TA 6.8 U 35V
ADD	A200C3	0160-2055	9		CF CE 0.01 UF 100V
ADD	A200C4	0160-2055	9		CF CE 0.01 UF 100V
ADD	A200C5	0160-0576	5	1	CF 0.1 UF 20% 50V
ADD	A200C6	0180-0116	1		CF TA 6.8 U 35V
ADD	A200C7	0140-0204	4	1	CF MI 47P 500V
ADD	A200C8	0160-3456	6	2	CF CE 1000 1KV
ADD	A200C9	0160-0939	4	1	CF MI 430P 300V
ADD	A200C10	0140-0199	6	1	CF MI 240P 300V
ADD	A200C11	0140-0191	8	2	CF MI 56P 300V
ADD	A200C12	0160-3457	7	2	CF 2000 PF 250 VDC
ADD	A200C13	0160-3457	7		CF 2000 PF 250 VDC
ADD	A200C14	0160-3456	6		CF CE 1000 1KV
ADD	A200C15	0140-0191	8		CF MI 56P 300V
ADD	A200CR1	1901-0040	1	1	DGP SI 30 200M
ADD	A200CR2	1901-0518	8	1	DIO-SCHOTTKY
ADD	A200CR3	1901-0535	9	1	DIODE SCHOTTKY
ADD	A200J1	1251-5971	8	1	CONN-WAFER 3
ADD	A200Q1	1854-0215	1	2	QN S PL 5 2N3904
ADD	A200Q2	1853-0036	2	2	QP S PS 5 2N3906
ADD	A200Q3	1854-0215	1		QN S PL 5 2N3904
ADD	A200Q4	1853-0036	2		QP S PL 5 2N3906
ADD	A200R1	0683-2225	3	1	RF 0.25 CC 2200 5
ADD	A200R2	0683-1005	5	2	RF 0.25 CC 10 5
ADD	A200R3	0683-1005	5		RF 0.25 CC 10 5
ADD	A200R4	0757-0710	4	1	RF 0.25 MF 75 1
ADD	A200R5	0683-2705	4	1	RF 0.25 CC 27 5
ADD	A200R6	0757-0280	3	2	RF 0.12 MF 1K 1
ADD	A200R7	0757-0442	9	8	RF 0.12 MF 10K 1
ADD	A200R8	0757-0457	6	2	RF 0.12 MF 47.5K 1
ADD	A200R9	0757-0200	7	1	RF 0.12 MF 5.62K
ADD	A200R10	0757-0401	0	1	RF 0.12 MF 100 1
ADD	A200R11	0757-0280	3		RF 0.12 MF 1K 1
ADD	A200R12	0757-0459	8	3	RF 0.12 MF 56.2K 1
ADD	A200R13	0757-0442	9		RF 0.12 MF 10K 1
ADD	A200R14	0757-0457	6		RF 0.12 MF 47.5K 1
ADD	A200R15	0757-0442	9		RF 0.12 MF 10K 1
ADD	A200R16	0757-0465	6	1	RF 0.12 MF 100K 1
ADD	A200R17	0757-0458	7	2	RF 0.12 MF 51.1K 1
ADD	A200R18	0757-0442	9		RF 0.12 MF 10K 1
ADD	A200R19	0759-0442	9		RF 0.12 MF 10K 1
ADD	A200R20	0757-0459	8		RF 0.12 MF 56.2K 1
ADD	A200R21	0757-0459	8		RF 0.12 MF 56.2K 1

Table 2 Option 005 Replaceable Parts (Cont'd)

Action	Ref. Desig.	HP Part No.	C D	Qty	Description
ADD	A200R22	0698-4530	8	1	RF 232K OHM 1
ADD	A200R23	0757-0450	9	1	RF 0.12 MF 22.1K 1
ADD	A200R24	0757-0442	9		RF 0.12 MF 10K 1
ADD	A200R25	0757-0458	7		RF 0.12 MF 51.1K 1
ADD	A200R26	0757-0442	9		RF 0.12 MF 10K 1
ADD	A200R27	0757-0442	9		RF 0.12 MF 10K 1
ADD	A200S1	3101-1400	5	1	SWPB 2 POLE 1 STA
ADD	A200U1	1820-1485	8	1	IC-MM74C22IN
ADD	A200U2	1820-0939	5	1	IC DUAL D FF
ADD	A200VR1	1902-0041	4	1	DZ 5.11 5 400M
ADD	A200XU1	1200-0607	0	1	SOCKET-IC 16 PIN
ADD	A200XU2	1200-0638	7	1	SOCKET-IC 14 PIN

* Points out those portions of the parts list which refer to parameters which are unique to the TV SYNC RETROFIT KIT.

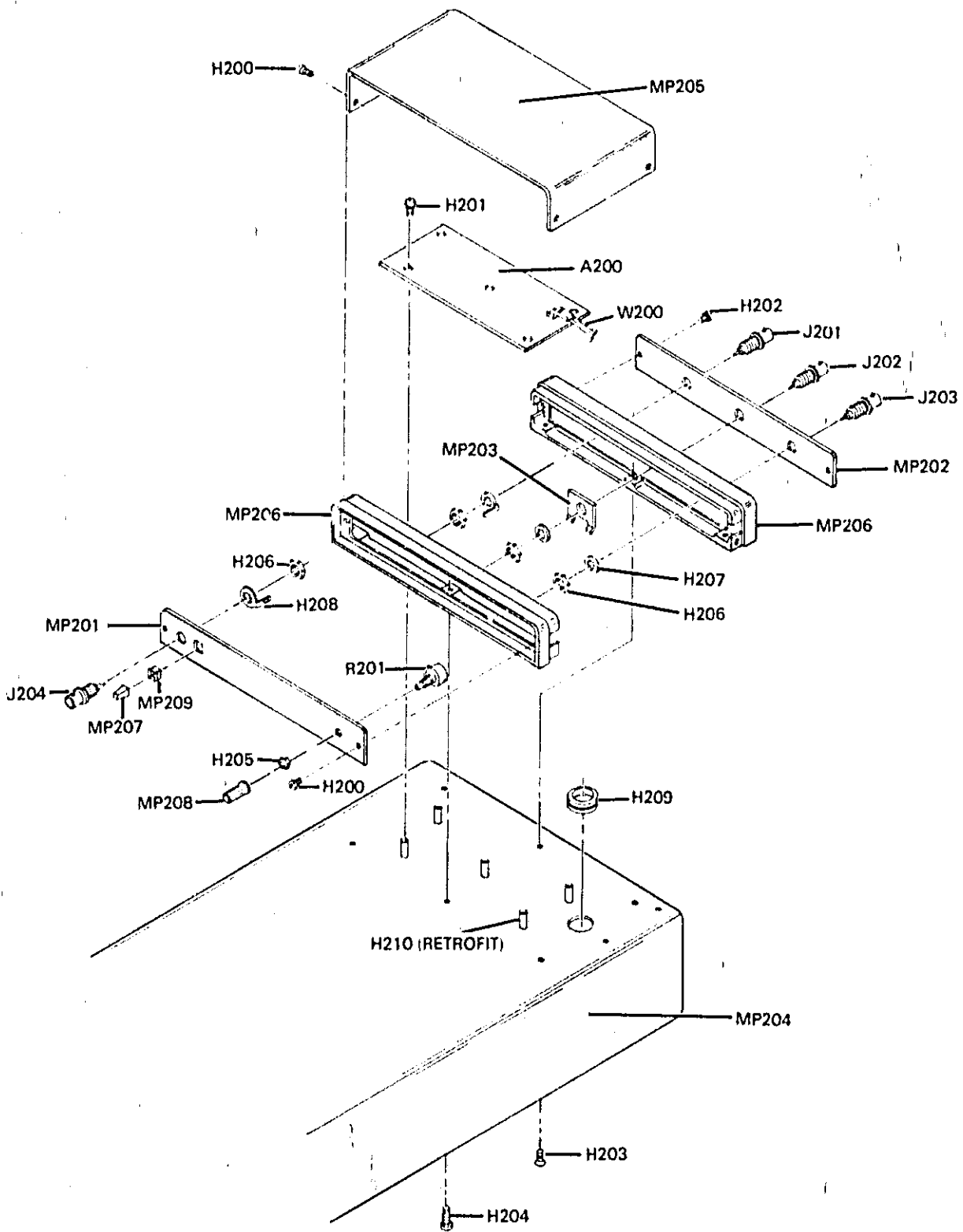


Figure 3. Mechanical View

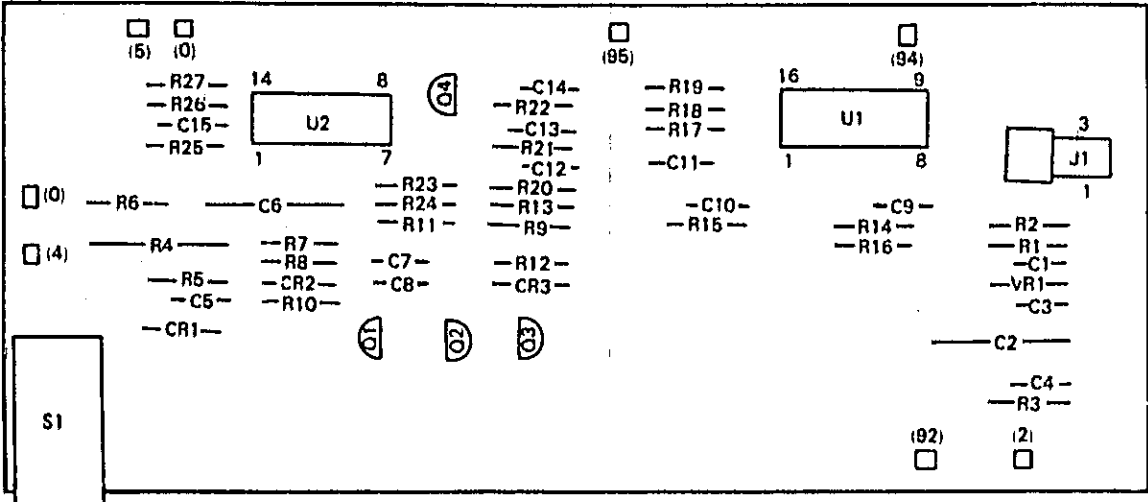


Figure 1. A200 Component Locator

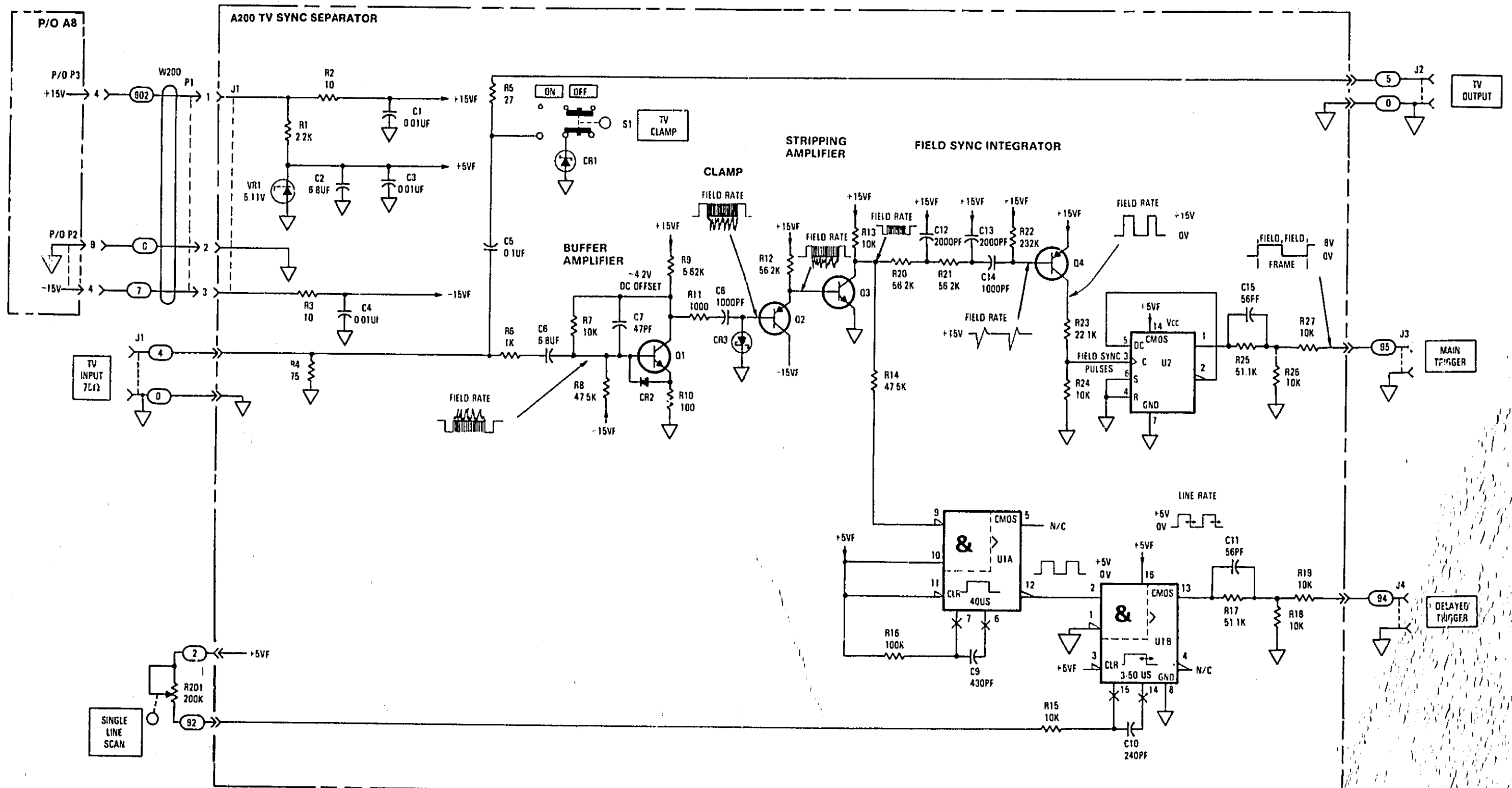


Figure 5.
TV Sync Separator, A200 Schematic (Option 005)
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USE EXISTING COVER HOLES FOR REF HOLES

BACK OF COVER

REF HOLES

REF HOLES

CENTER LINE

COUNTER SINK FROM BOTTOM OF COVER

CENTER LINE

HOLE SIZES

3.5 mm (.136 in.) 11 Holes

19mm (0.75 in.) if available
or 9.5mm (0.375 in.) for
GROMMET

19mm (0.75 in.) or
9.5mm (0.375 in.)
FOR GROMMET

Top Cover Drill Template

