

## SECTION 6. HIGH-VOLTAGE POWER SUPPLY (A1)

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### 6.1 DESCRIPTION

The High-Voltage Power Supply provides the CRT with bias and drive voltages. The power supply converts a nominal input voltage of 12.4 Vdc to output voltages of +4 kV and -2 kV. This power supply also contains control circuits for the CRT focus and intensity grids.

#### **WARNING**

The System Analyzer uses voltages of +4 kV and -2 kV in the High-Voltage Power Supply (A1) and near the cathode ray tube (CRT). Handle this monitor with extreme care to avoid electrical shock.

A wirelist of the High-Voltage Power Supply is shown at the end of this section in Table 6-1, a block diagram in Figure 6-1, a schematic in Figure 6-2, the printed wiring board assembly and parts list in Figure 6-3, and the assembly and parts list in Figure 6-4.

### 6.2 THEORY OF OPERATION

#### 6.2.1 VOLTAGE REGULATION CIRCUIT

At the center tap of the high-voltage transformer, the chopper switches 9 Vdc through the transformer primary winding at the rate of 20 kHz. The drive signals for the chopper originate in the Low-Voltage Power Supply's Control board (A4). One secondary transformer winding provides a CRT-heater voltage of 6.3 Vac. The other transformer winding provides 1 kV, which is then doubled to 2 kV. This voltage is regulated by comparing a reference voltage of 6.3V to a voltage divider placed across the 2-kV output. The

resultant signal controls the level of the dc input at the center tap of the high-voltage transformer.

#### 6.2.2 MULTIPLIERS

The 1-kV secondary winding is multiplied by 4 and by 2. The output of the  $\times 4$  multiplier, a nominal +4.25 kV, is the CRT-anode voltage. The output of the  $\times 2$  multiplier, a nominal -2 kV, provides the cathode voltage and is applied to the intensity and focus modulators.

#### 6.2.3 INTENSITY MODULATOR

The intensity modulator controls the grid voltage, with the control range set by VR1. The intensity modulator has two paths: one for low frequency and one for high frequency. The low-frequency path is the INTENSITY TRACKING VOLTAGE (TV), which drives the grid via an opto-isolator. This INTENSITY TV signal results from the comparison of the intensity sample signal and the high-voltage reference on the Scope Amplifier board (A2). The high-frequency path is the CRT Z-axis, which is capacitively coupled to the CRT grid.

#### 6.2.4 FOCUS MODULATOR

In response to the focus TV input signal, the focus modulator controls the focus voltage. The control range is set by resistor R5 in the bias divider. The focus TV signal drives the focus grid via an opto-isolator.

#### 6.2.5 TRANSIENT PROTECTOR (A1A2)

The Transient Protector provides over-voltage protection for the CRT's vertical and horizontal deflection plates. Figure 6-5 at the end of the section shows the assembly and parts list of the Transient Protector.

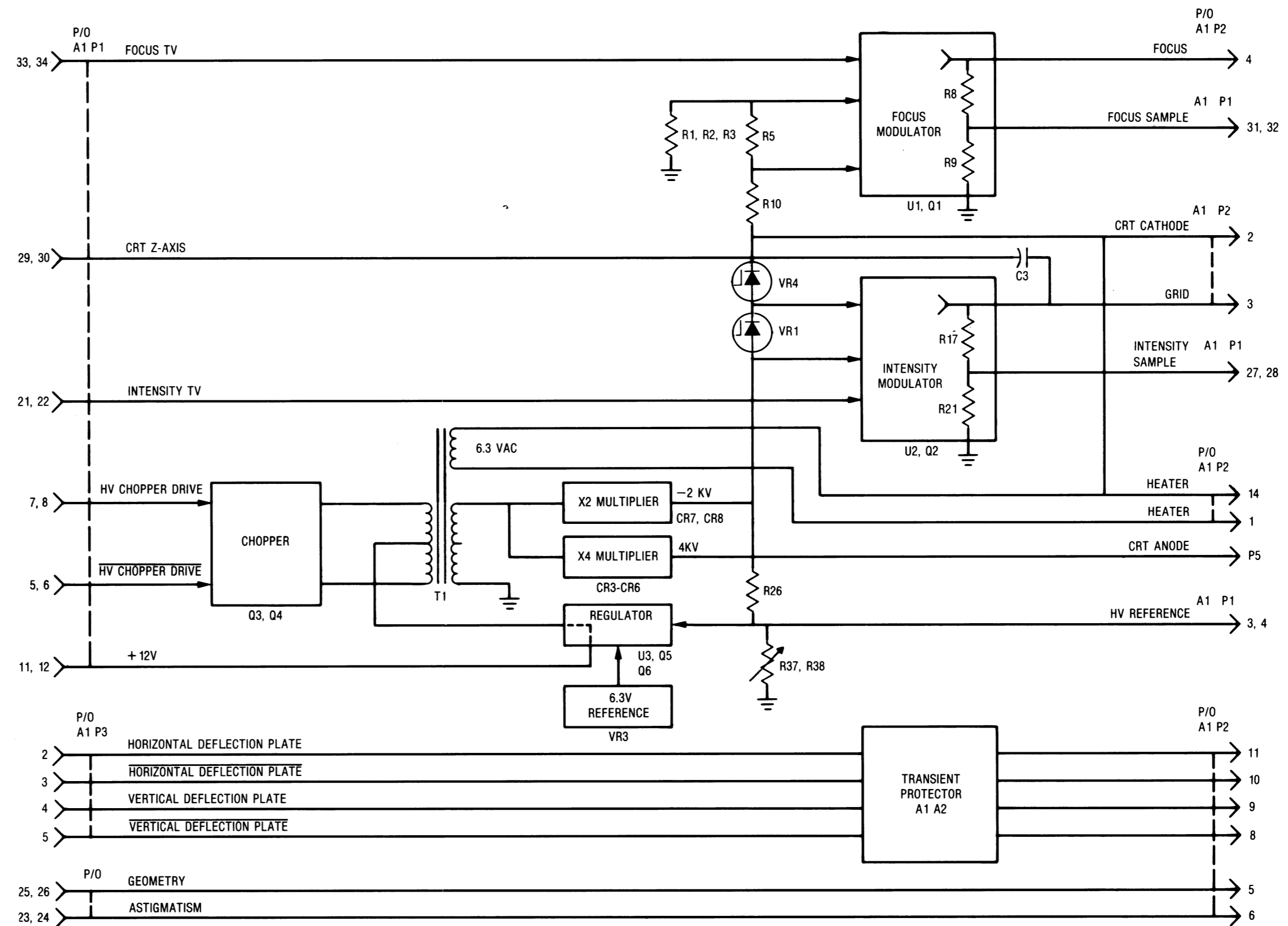
Table 6-1. Wirelist for the High-Voltage Power Supply

| 1        | 2     |          | 3         | 4            | 5    | 6            | 7                        | 8                    | 9            |
|----------|-------|----------|-----------|--------------|------|--------------|--------------------------|----------------------|--------------|
| WIRE NO. | COLOR | SIZE AWG | WIRE RUNS |              |      |              | FUNCTION ROUTING REMARKS | APPROX LENGTH INCHES | USE FIND NO. |
|          |       |          | FROM      | NOTE OR VIEW | TO   | NOTE OR VIEW |                          |                      |              |
|          | White |          | A1A2      | P2-1         | A1A1 | T1-4         |                          | 10.5                 | 4            |
|          | White |          | A1A2      | P2-2         | A1A1 | P2-2         |                          | 10.5                 | 4            |
|          | White |          | A1A2      | P2-3         | A1A1 | P2-3         |                          | 11                   | 4            |
|          | White |          | A1A2      | P2-4         | A1A1 | P2-4         |                          | 11.5                 | 4            |
|          | White | 24       | A1A2      | P2-5         | A1A1 | P2-5         |                          | 12.5                 | 5            |
|          | White | 24       | A1A2      | P2-6         | A1A1 | P2-6         |                          | 13                   | 5            |
|          | White | 24       | A1A2      | P2-7         | A1A1 | P2-7         |                          | 13                   | 5            |
|          | White | 22       | A1A2      | P2-8         | A1A2 | 8            |                          | 1                    | 2            |
|          | White | 22       | A1A2      | P2-9         | A1A2 | 9            |                          | 1                    | 2            |
|          | White | 22       | A1A2      | P2-10        | A1A2 | 10           |                          | 1                    | 2            |
|          | White | 22       | A1A2      | P2-11        | A1A2 | 11           |                          | 1                    | 2            |
|          | White |          | A1A2      | P2-14        | A1A1 | T1-5         |                          | 10.5                 | 4            |
|          | White | 24       | A1A2      | P2-1         | A1A2 | P2-2         |                          | 1.5                  | 5            |
|          | White | 22       | A1A2      | 2            |      | P3-2         |                          | 11                   | 2            |
|          | White | 22       | A1A2      | 3            |      | P3-3         |                          | 12                   | 2            |
|          | White | 22       | A1A2      | 4            |      | P3-4         |                          | 11.75                | 2            |
|          | White | 22       | A1A2      | 5            |      | P3-5         |                          | 13                   | 2            |
|          | White | 16       | A1A2      | 7            |      |              |                          | 4                    | 3            |

# HIGH-VOLTAGE POWER SUPPLY (A1)

(RTP-1007A)

Figure 6-1. Block Diagram



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# HIGH-VOLTAGE POWER SUPPLY (A1)

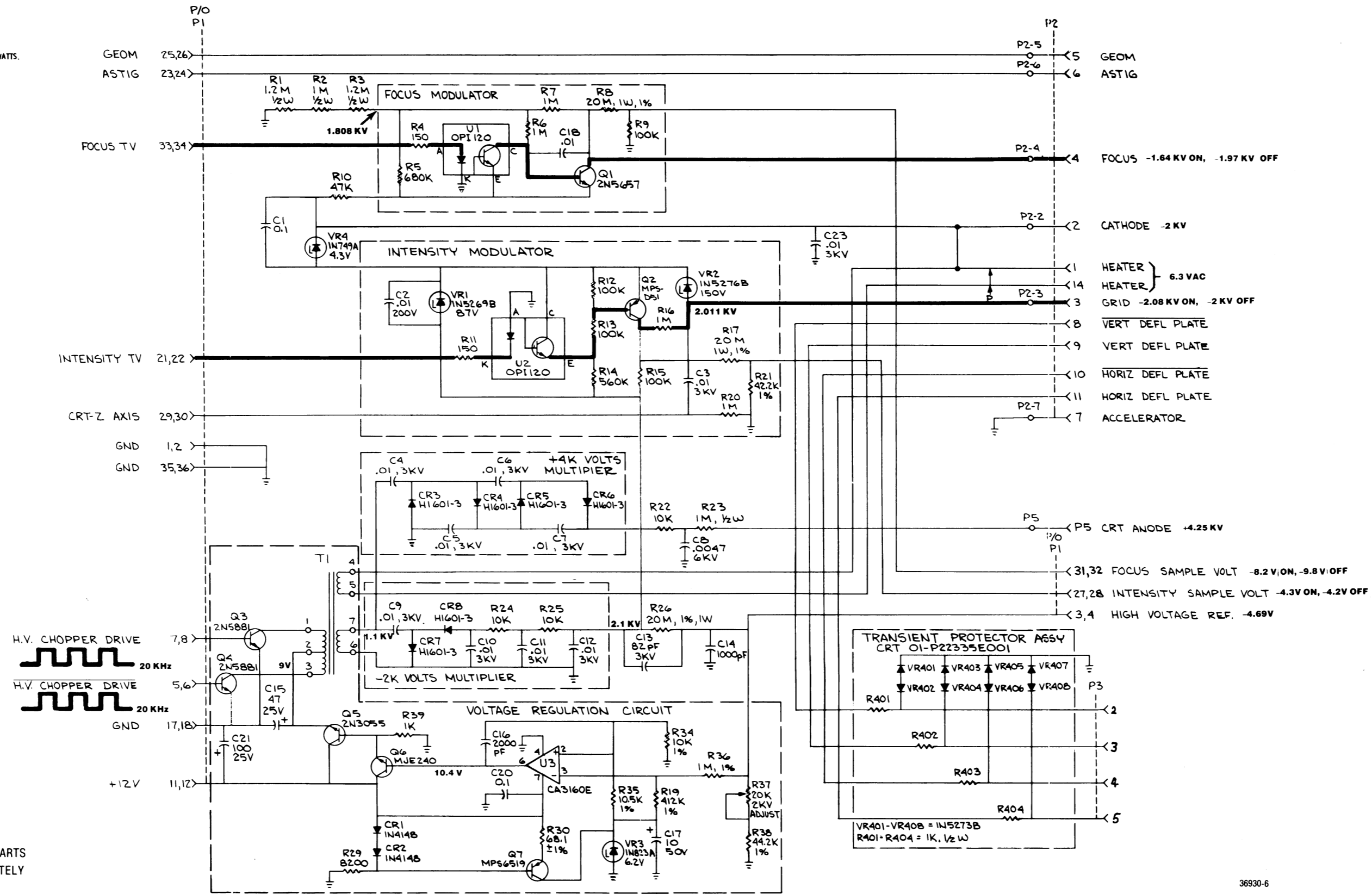
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Figure 6-2. Schematic

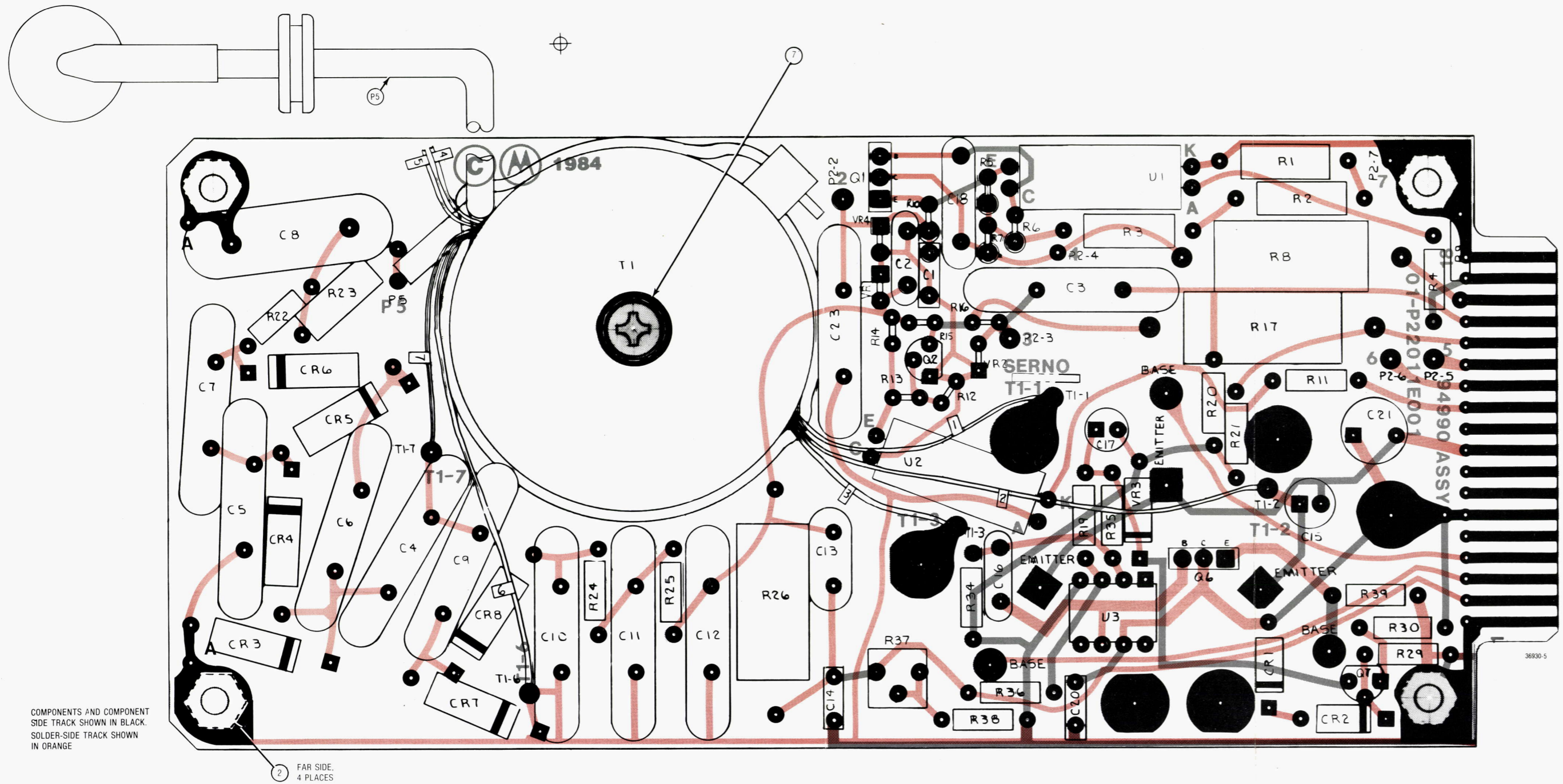
NOTES:

- PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. FOR COMPLETE DESIGNATIONS PREFIX WITH A1.
- FOR REFERENCE DRAWINGS REFER TO:  
01-P2201AE POWER SUPPLY ASSEMBLY  
01-P22011E POWER SUPPLY PWB ASSY
- UNLESS OTHERWISE SPECIFIED  
ALL RESISTORS ARE IN OHMS ± 5 PCT, 1/4 WATTS.  
ALL CAPACITORS ARE IN UF.  
ALL INDUCTORS ARE IN MH.  
ALL VOLTAGES ARE IN DC.

| LAST USED | NOT USED            |
|-----------|---------------------|
| C23       | C19, C22            |
| CRB       |                     |
| Q7        |                     |
| R39       | R18, 27, 28, 31, 32 |
| T1        |                     |
| U3        |                     |
| VR4       |                     |



**WARNING:**  
STATIC-SENSITIVE PARTS  
HANDLE APPROPRIATELY



HIGH-VOLTAGE POWER SUPPLY (A1A1)  
RTP-1007A

| Find No. | Qty. Req. | Part No.    | Nomenclature            | Part Value       |
|----------|-----------|-------------|-------------------------|------------------|
| 002      | 1         | 02-14048A02 | NUT (HOUSING)           |                  |
| 007      | 1         | 02-80340B72 | NUT, CLINCH             | 6-32             |
| C 001    | 1         | 21-80342B10 | CAPACITOR               | .1UF-20-50       |
| C 002    | 1         | 21-80396A52 | CAPACITOR, CERAMIC DISC | .01UF-20+80-200  |
| C 003    | 1         | 21-80343B45 | CAPACITOR               | .01UF+80-20-3KV  |
| C 004    | 1         | 21-80343B45 | CAPACITOR               | .01UF+80-20-3KV  |
| C 005    | 1         | 21-80343B45 | CAPACITOR               | .01UF+80-20-3KV  |
| C 006    | 1         | 21-80343B45 | CAPACITOR               | .01UF+80-20-3KV  |
| C 007    | 1         | 21-80343B45 | CAPACITOR               | .01UF+80-20-3KV  |
| C 008    | 1         | 21-80369A80 | CAPACITOR               | .0047-6000       |
| C 009    | 1         | 21-80343B45 | CAPACITOR               | .01UF+80-20-3KV  |
| C 010    | 1         | 21-80343B45 | CAPACITOR               | .01UF+80-20-3KV  |
| C 011    | 1         | 21-80343B45 | CAPACITOR               | .01UF+80-20-3KV  |
| C 012    | 1         | 21-80343B45 | CAPACITOR               | .01UF+80-20-3KV  |
| C 013    | 1         | 21-80343B44 | CAPACITOR               | 82PF-3KV         |
| C 014    | 1         | 21-80341B92 | CAPACITOR               | 1000PF-10-100    |
| C 015    | 1         | 23-80341B13 | CAPACITOR               | 47UF-20-25       |
| C 016    | 1         | 21-82428B36 | CAPACITOR               | 2000PF-10-200    |
| C 017    | 1         | 23-80341B15 | CAPACITOR               | 10UF-20-50       |
| C 018    | 1         | 21-82428B19 | CAPACITOR               | .01UF-10-500     |
| C 020    | 1         | 21-80342B10 | CAPACITOR               | .1UF-20-50       |
| C 021    | 1         | 23-84665F03 | CAPACITOR               | 100UF-20-25      |
| C 023    | 1         | 21-80343B45 | CAPACITOR               | .01UF+80-20-3KV  |
| CR001    | 1         | 48-84463K02 | DIODE                   |                  |
| CR002    | 1         | 48-84463K02 | DIODE                   |                  |
| CR003    | 1         | 48-80339B90 | DIODE                   |                  |
| CR004    | 1         | 48-80339B90 | DIODE                   |                  |
| CR005    | 1         | 48-80339B90 | DIODE                   |                  |
| CR006    | 1         | 48-80339B90 | DIODE                   |                  |
| CR007    | 1         | 48-80339B90 | DIODE                   |                  |
| CR008    | 1         | 48-80339B90 | DIODE                   |                  |
| P 005    | 1         | 30-80343B89 | CABLE                   | HIGH VOLTAGE     |
| Q 001    | 1         | 48-00869747 | TRANSISTOR              |                  |
| Q 002    | 1         | 48-80340B88 | TRANSISTOR              | MPSD51           |
| Q 006    | 1         | 48-80368A87 | TRANSISTOR              |                  |
| Q 007    | 1         | 48-80340B85 | TRANSISTOR              | MPS6519          |
| R 001    | 1         | 06-00125B24 | RESISTOR                | 1.2M-5-1/2       |
| R 002    | 1         | 06-11045B22 | RESISTOR                | 1M-5-1/2         |
| R 003    | 1         | 06-00125B24 | RESISTOR                | 1.2M-5-1/2       |
| R 004    | 1         | 06-11009C29 | RESISTOR                | 150-5-1/4        |
| R 005    | 1         | 06-11009D18 | RESISTOR                | 680K-5-1/4       |
| R 006    | 1         | 06-11009D22 | RESISTOR                | 1M-5-1/4         |
| R 007    | 1         | 06-11009D22 | RESISTOR                | 1M-5-1/4         |
| R 008    | 1         | 06-80331A37 | RESISTOR                | 20M-1-1          |
| R 009    | 1         | 06-11009C97 | RESISTOR                | 100K-5-1/4       |
| R 010    | 1         | 06-11009C89 | RESISTOR                | 47K-5-1/4        |
| R 011    | 1         | 06-11009C29 | RESISTOR                | 150-5-1/4        |
| R 012    | 1         | 06-11009C97 | RESISTOR                | 100K-5-1/4       |
| R 013    | 1         | 06-11009C87 | RESISTOR                | 100K-5-1/4       |
| R 014    | 1         | 06-11009D16 | RESISTOR                | 560K-5-1/4       |
| R 015    | 1         | 06-11009C97 | RESISTOR                | 100K-5-1/4       |
| R 016    | 1         | 06-11009D22 | RESISTOR                | 1M-5-1/4         |
| R 017    | 1         | 06-80331A37 | RESISTOR                | 20M-1-1          |
| R 019    | 1         | 06-10621E48 | RESISTOR                | 412K-1-1/4       |
| R 020    | 1         | 06-11009D22 | RESISTOR                | 1M-5-1/4         |
| R 021    | 1         | 06-10621D52 | RESISTOR                | 42.2K-1-1/4      |
| R 022    | 1         | 06-11009C73 | RESISTOR                | 10K-5-1/4        |
| R 023    | 1         | 06-11045B22 | RESISTOR                | 1M-5-1/2         |
| R 024    | 1         | 06-11009C73 | RESISTOR                | 10K-5-1/4        |
| R 025    | 1         | 06-11009C73 | RESISTOR                | 10K-5-1/4        |
| R 026    | 1         | 06-80331A37 | RESISTOR                | 20M-1-1          |
| R 029    | 1         | 06-11009C71 | RESISTOR                | 8.2K-5-1/4       |
| R 030    | 1         | 06-10621D72 | RESISTOR                | 68.1-1-1/4       |
| R 034    | 1         | 06-10621C81 | RESISTOR                | 10K-1-1/4        |
| R 035    | 1         | 06-10621C93 | RESISTOR                | 10.5K-1-1/4      |
| R 036    | 1         | 06-10621E85 | RESISTOR                | 1M-1-1/4         |
| R 037    | 1         | 18-83452F16 | RESISTOR, VARIABLE      | 20K              |
| R 038    | 1         | 06-10621D54 | RESISTOR                | 44.2K-1-1/4      |
| R 039    | 1         | 06-11009C49 | RESISTOR                | 1K-5-1/4         |
| T 001    | 1         | 25-80342B54 | TRANSFORMER             |                  |
| U 001    | 1         | 51-80396A14 | INTEGRATED CIRCUIT      | OPI120 SCREENED  |
| U 002    | 1         | 51-80396A14 | INTEGRATED CIRCUIT      | OPI120 SCREENED  |
| U 003    | 1         | 51-80345A02 | INTEGRATED CIRCUIT      | CA3160E SCREENED |
| VR001    | 1         | 48-80345A86 | DIODE, ZENER            | 87V-5-5          |
| VR002    | 1         | 48-80345A87 | DIODE, ZENER            | 150V-5-5         |
| VR003    | 1         | 48-80368A98 | DIODE, ZENER            | 6.2V-5-4         |
| VR004    | 1         | 48-83461E13 | DIODE, ZENER            | 4.3V-5-5         |

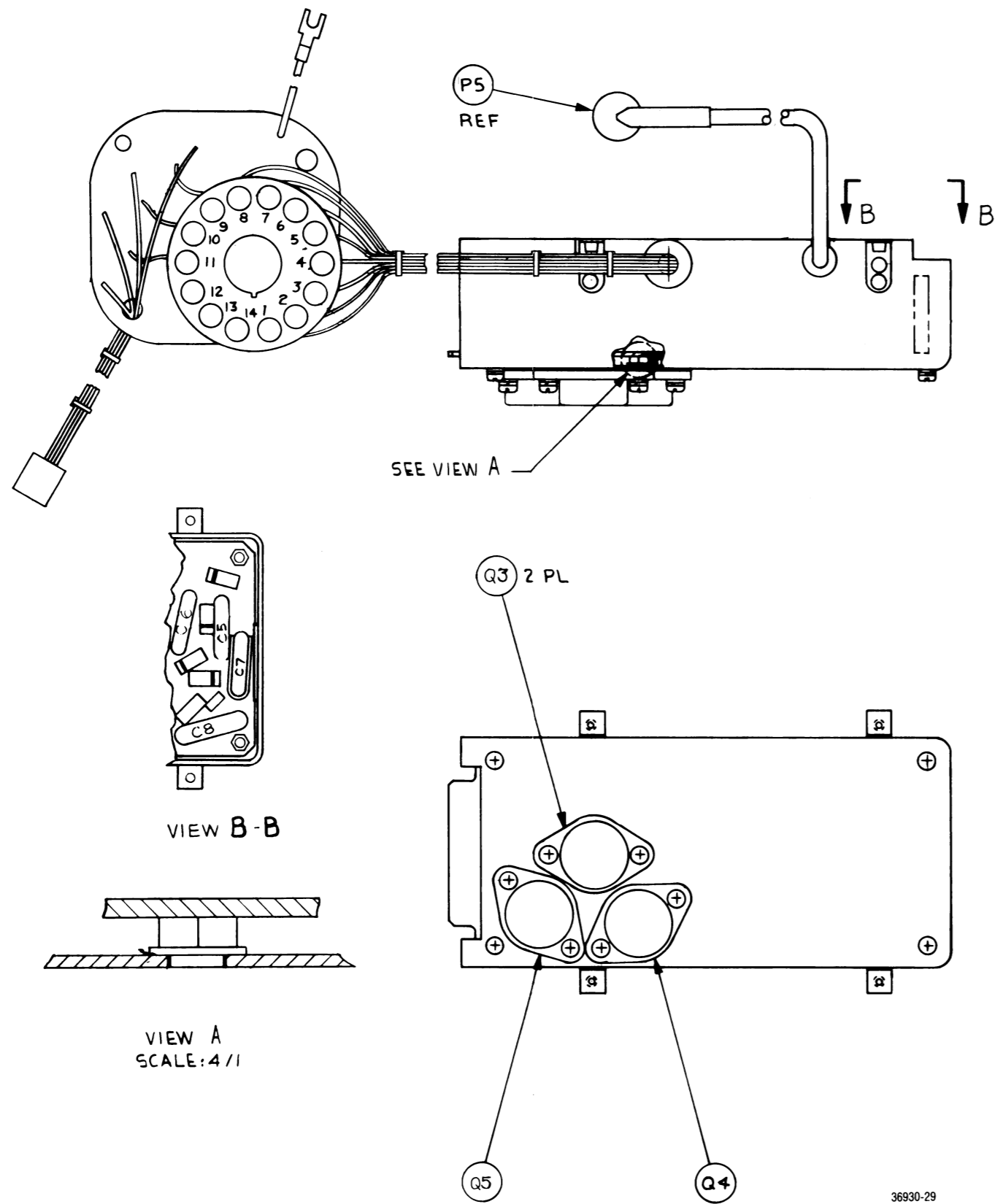
HIGH-VOLTAGE  
POWER SUPPLY (A1A1)

(RTP-1007A)  
Figure 6-3. Printed Wiring Board Assembly  
and Parts List

**HIGH-VOLTAGE  
POWER SUPPLY (A1)**

(RTP-1007A)

Figure 6-4. Assembly and Parts List



**HIGH-VOLTAGE POWER SUPPLY (A1)  
RTP-1007A**

| Find No. | Qty. Req. | Part No.    | Nomenclature | Part Value |
|----------|-----------|-------------|--------------|------------|
| Q 003    | 1         | 48-80396A25 | TRANSISTOR   |            |
| Q 004    | 1         | 48-80396A25 | TRANSISTOR   |            |
| Q 005    | 1         | 48-00869302 | TRANSISTOR   |            |

TRANSIENT PROTECTOR (A1 A2)

HIGH-VOLTAGE POWER SUPPLY

TRANSIENT PROTECTOR (A1A2)

Figure 6-5. Assembly and Parts List

| Find No. | Qty. Req. | Part No.    | Nomenclature   | Part Value |
|----------|-----------|-------------|----------------|------------|
| P 002    | 1         | 09-80343B74 | CONNECTOR, CRT |            |
| R 401    | 1         | 06-11045A49 | RESISTOR       | 1000-5-1/2 |
| R 402    | 1         | 06-11045A49 | RESISTOR       | 1000-5-1/2 |
| R 403    | 1         | 06-11045A49 | RESISTOR       | 1000-5-1/2 |
| R 404    | 1         | 06-11045A49 | RESISTOR       | 1000-5-1/2 |
| VR401    | 1         | 48-80368A95 | DIODE, ZENER   | 120V-5-5   |
| VR402    | 1         | 48-80368A95 | DIODE, ZENER   | 120V-5-5   |
| VR403    | 1         | 48-80368A95 | DIODE, ZENER   | 120V-5-5   |
| VR404    | 1         | 48-80368A95 | DIODE, ZENER   | 120V-5-5   |
| VR405    | 1         | 48-80368A95 | DIODE, ZENER   | 120V-5-5   |
| VR406    | 1         | 48-80368A95 | DIODE, ZENER   | 120V-5-5   |
| VR407    | 1         | 48-80368A95 | DIODE, ZENER   | 120V-5-5   |
| VR408    | 1         | 48-80368A95 | DIODE, ZENER   | 120V-5-5   |

