

LCG-399 / A
PAL PATTERN GENERATOR
SERVICE MANUAL

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NOTE

These servicing instructions are for use by qualified personnel only. To avoid electrical shock, do not perform any servicing other than that contained in the service manual unless you are qualified to do so.

1. Test equipment required

The following test equipment is required for calibration and servicing of the Model LCG-399. The suggested specifications are the minimum necessary for proper calibration of this instrument.

TEST EQUIPMENT	MINIMUM SPEC.
• Digital Multimeter	3-1/2 digit Accuracy $<\pm 0.25\%$
• Frequency Counter	8 digit
• Oscilloscope	5mV Sensitivity 20MHz Band width With High Impedance Probe
• Spectrum Analyzer	50-190MHz
• Color TV	PAL system
• Vectorscope	PAL system
• FM Linear Detector	5MHz-7MHz

2. Calibration Procedure

- * Calibration should be performed after a 30 minute warm-up period. It should also be confirmed that the unit is connected to the rated power line voltage.
- * All adjustment should be completed in the given order, because some adjustments interact with others.
- * During the adjustment procedure, remove the case only when necessary and replace immediately after making an adjustment. This will maintain all circuit at constant operating temperature.

1) Power Supply Check

- a) Connect DC voltmeter to test point and chassis.
- b) Check the voltage at each test point given in Table-1.

Voltage	Tolerance	Ripple	Test point
+5V	$\pm 0.25V$	5mVp-p	TP003
+12V	$\pm 0.5V$	20mVp-p	TP002
-12V	$\pm 2\%$ of reading of +12V line	20mVp-p	TP001

Table-1

2) Bias Voltage Adjustment

- a) Depress LUMINANCE button of pattern selector.
- b) Connect DC voltmeter to TP801.
- c) Adjust VR801 for a reading of $-2.00V \pm 0.05V$.

d) Connect DC voltmeter to TP802.

e) The voltage reading should be +1.89V to +2.20V.

3) X'tal Oscillator Adjustment

a) Connect frequency counter to TP101.

b) Adjust VC101 so that frequency reading is 35.468950MHz
 $\pm 10\text{Hz}$.

4) Frequency Check of SCOPE TRIGGER (Divider circuit testing)

a) Connect frequency counter to SCOPE TRIGGER.

b) Set the SCOPE TRIGGER switch to LINE.

c) Check the frequency reading is 15.625MHz.

d) Set the SCOPE TRIGGER switch to FIELD.

e) Set the function of frequency counter to period measurement.

f) Check the period by Table-2

Pattern selector	Period
CONVERGENCE, ALIGNMENT	19.968mS
Others	19.999mS

Table-2

5) Composite Signal Adjustment

- a) Set: Pattern selector CONVERGENCE
 COMPOSITE VIDEO LEVEL PRESET
- b) Connect oscilloscope to COMPOSITE VIDEO OUTPUT through 75ohm termination.
- c) Adjust VR801, 802, 803 and 805 to obtain a waveform as shown in Figure-1.

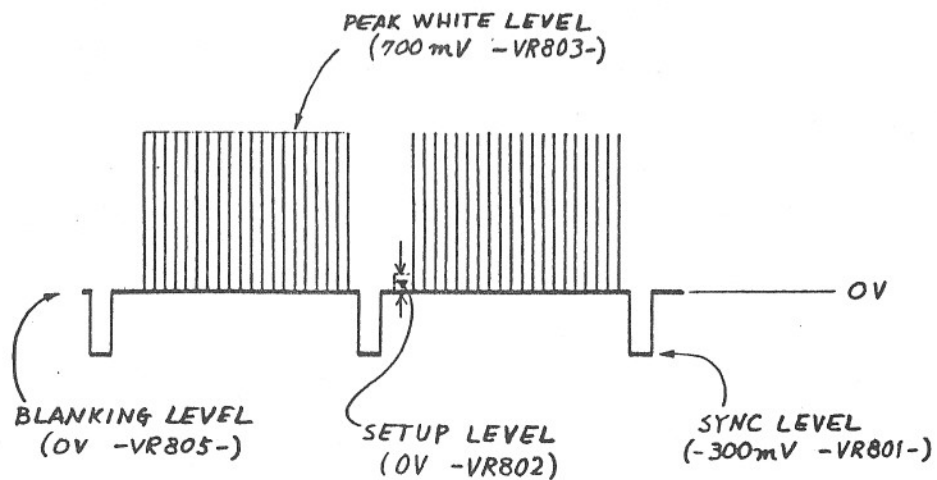


Figure-1

CHK. Subcarrier at IC555 pin 14

6) Carrier Balance Adjustment (Nulling)

- a) Depress CONVERGENCE button of pattern selector.
- b) Connect oscilloscope to COMPOSITE VIDEO OUTPUT through 75ohm termination.
- c) Adjust VR701-704 to obtain the minimum sub-carrier leakage on the black level of composite video signal as shown in Figure-3. (VR701 only works when No.1 of COLOR BAR PROGRAM switch is ON)

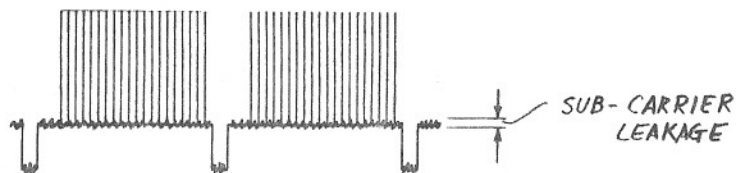


Figure-3

7) Chroma Level Adjustment

- a) Depress CHROMINANCE button of pattern selector.
- b) Connect vectorscope to COMPOSITE VIDEO OUTPUT through 75ohm termination.
- c) Adjust VR760, 761 and 780 to obtain the vector pattern as shown in Figure-4

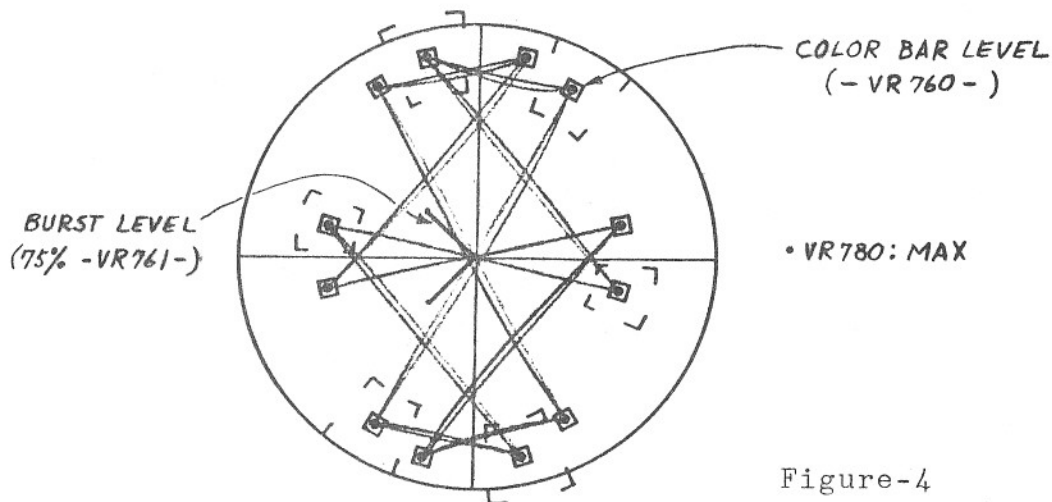


Figure-4

12) Adjustment of Sound Unit

A. 1kHz Adjustment

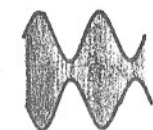
- a) Connect oscilloscope and frequency counter to Q952 emitter.
- b) Adjust VR950 for reading of 1kHz.
- c) Check the waveform is sinewave.

B. VCO Adjustment

- a) Connect oscilloscope to IC954 pin2.
- b) Adjust VR953 for reading of +0.8V.
- c) Connect oscilloscope to IC954 pin13.
- d) Adjust VC901 for reading of +0.8V.
- e) Connect frequency counter to IC954 pin8.
- f) Check the frequency is changeable from 5.5MHz to 6.5MHz by rotating the SOUND switch on the rear panel.

C. AM Adjustment

- a) Set SOUND switch to AM 6MHz.
- b) Connect oscilloscope to R997.
- c) Adjust VR952 and 954 alternately to obtain the modulated waveform as shown in Figure-7



Correct



Incorrect

Figure-7

D. FM Deviation Adjustment

- a) Set SOUND switch to FM 6MHz.
- b) Connect FM linear detector to R997.
- c) Adjust VR951 for a deviation of 25kHz within ± 5 kHz.

13) Adjustment of RF Unit

A. Frequency Adjustment

- a) Set RF BAND switch to LOW.
- b) Set VHF dial to 60MHz.
- c) Connect spectrum analyzer to RF OUTPUT.
- d) Adjust L901 so that frequency is 60MHz.
- e) Depress HIGH button of RF BAND.
- f) Set VHF dial to 190MHz.
- g) Adjust L902 so that frequency is 190MHz.

NOTE: Impossible to measure the RF frequency by frequency counter. Because RF signal is modulated by video signal, therefore frequency counter makes miscount.

B. Modulation Adjustment

- | | |
|--------------------------|-----------|
| a) Set: Pattern selector | ALIGNMENT |
| SOUND | OFF |
| RF BAND | LOW |
| VHF dial | 65MHz |
| MODULATION POLARITY | NEGATIVE |

- b) Connect oscilloscope to RF OUTPUT through 75ohm termination.
- c) Adjust VR901 to obtain the modulated waveform as shown in Figure-8

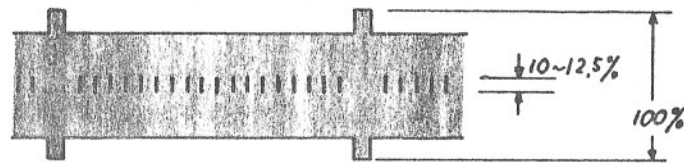


Figure-8

- d) Set MODULATION POLARITY switch to POSITIVE.
- e) Adjust VR902 to obtain the modulated waveform as shown in Figure-9.

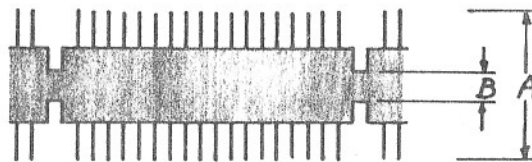
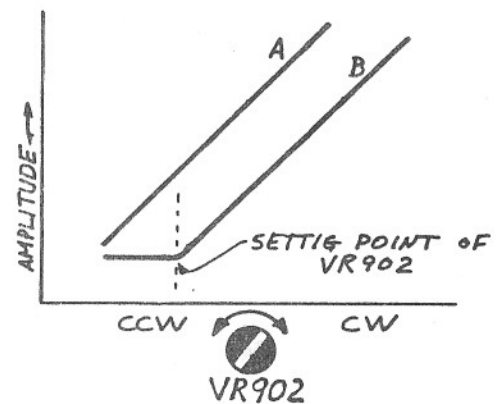


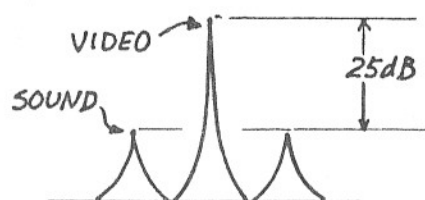
Figure-9



C. Carrier Level Adjustment

- a) Set: Pattern selector RASTER
 RED/GRREN/BLUE=ON
 RF BAND HIGH
 VHF dial 190MHz
 SOUND FM 6.5MHz
 Connect spectrum analyzer to RF OUTPUT.

- b) Adjust VR955 to obtain the sound signal level as shown in Figure-10.



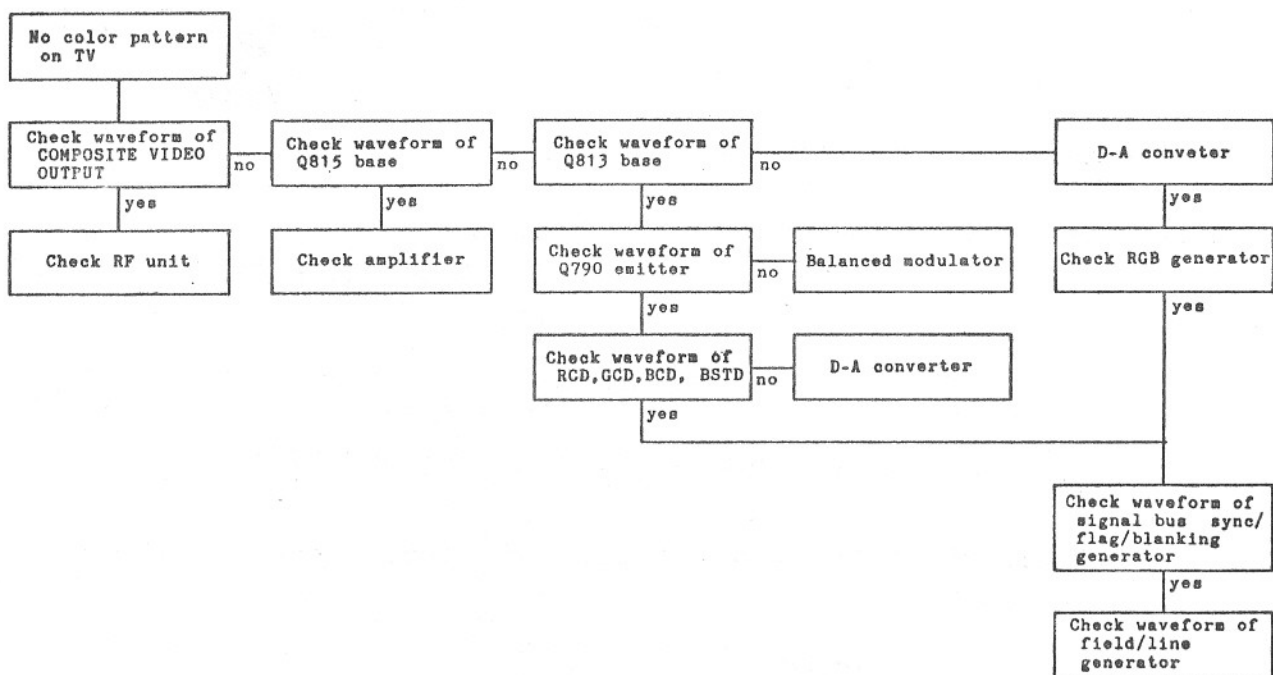
color Bust off
Sound on
 Figure-10

3. Troubleshooting Procedure

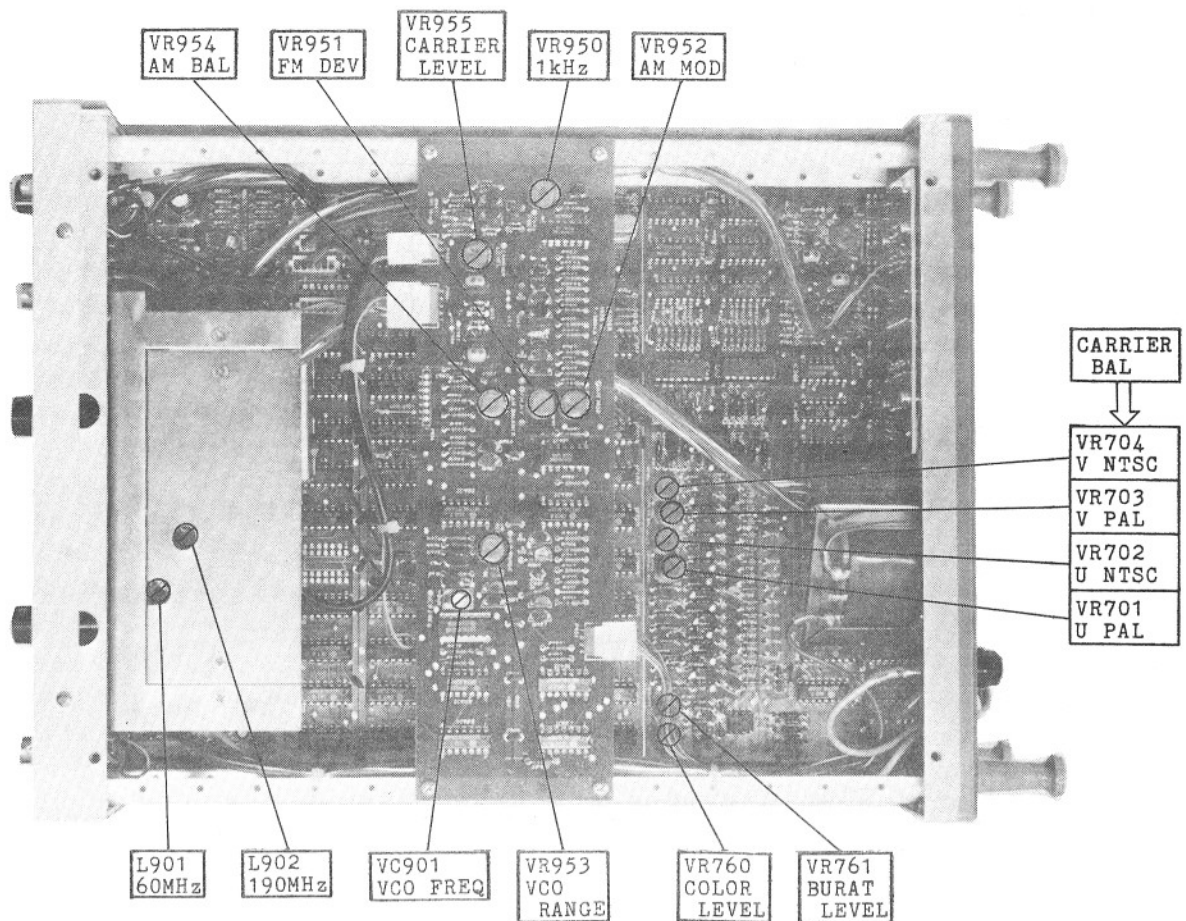
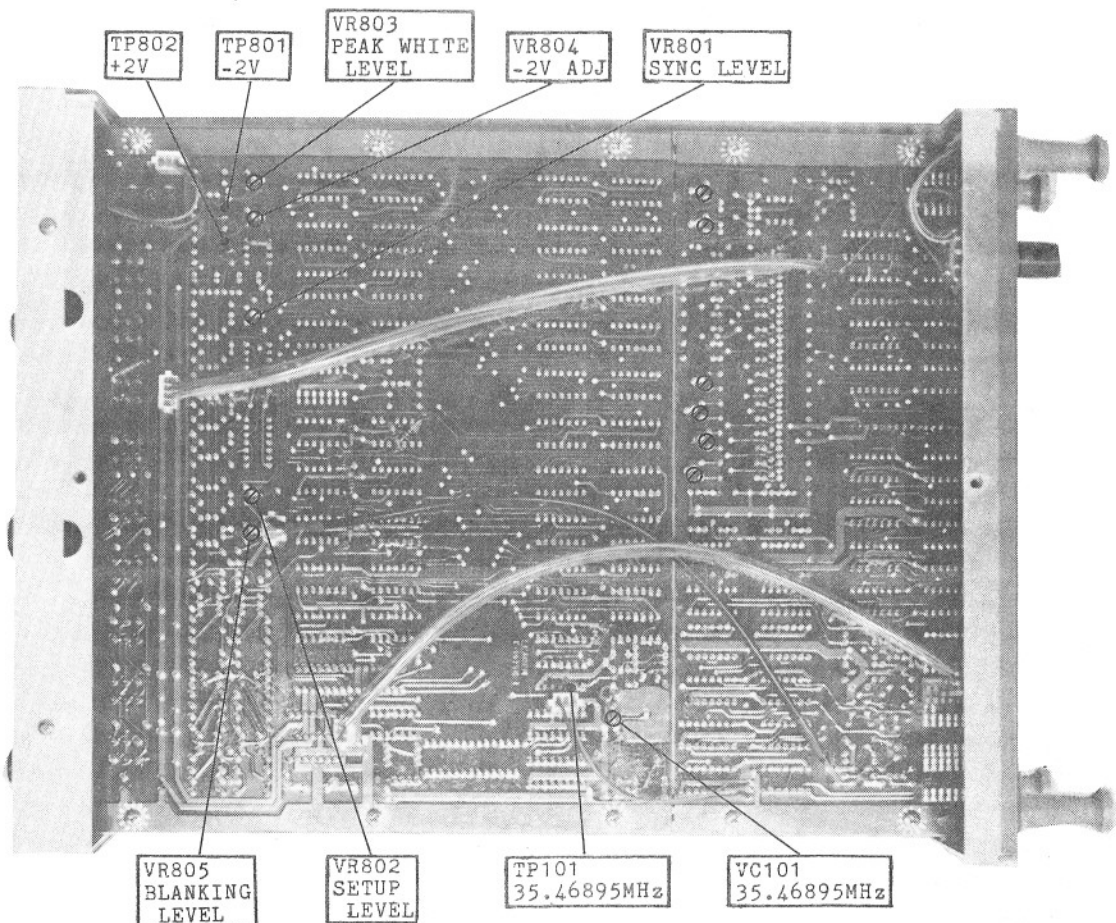
1) Troubleshooting Aids

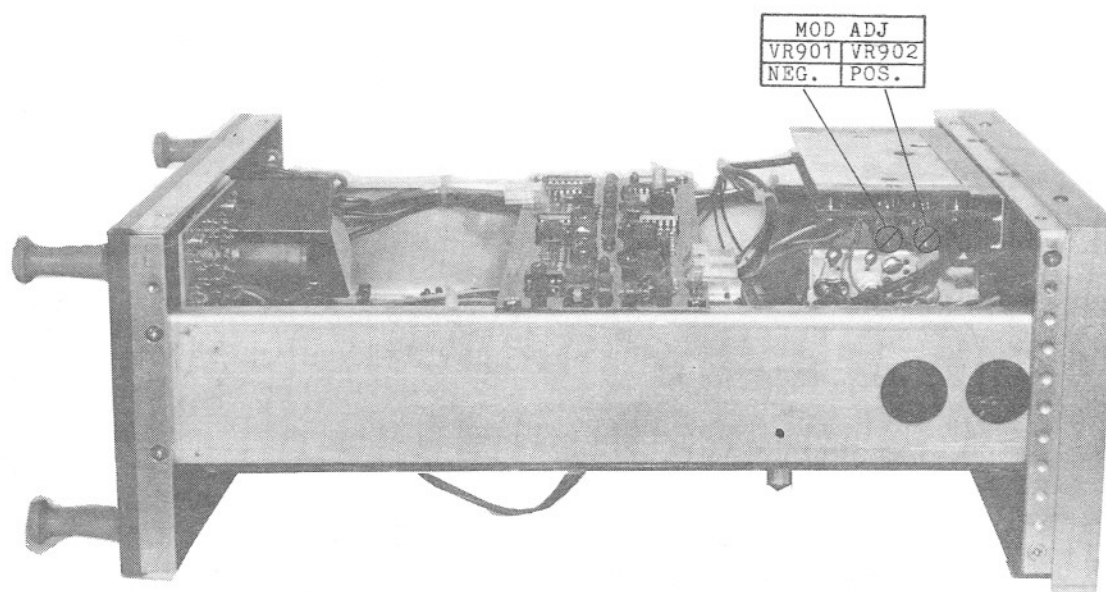
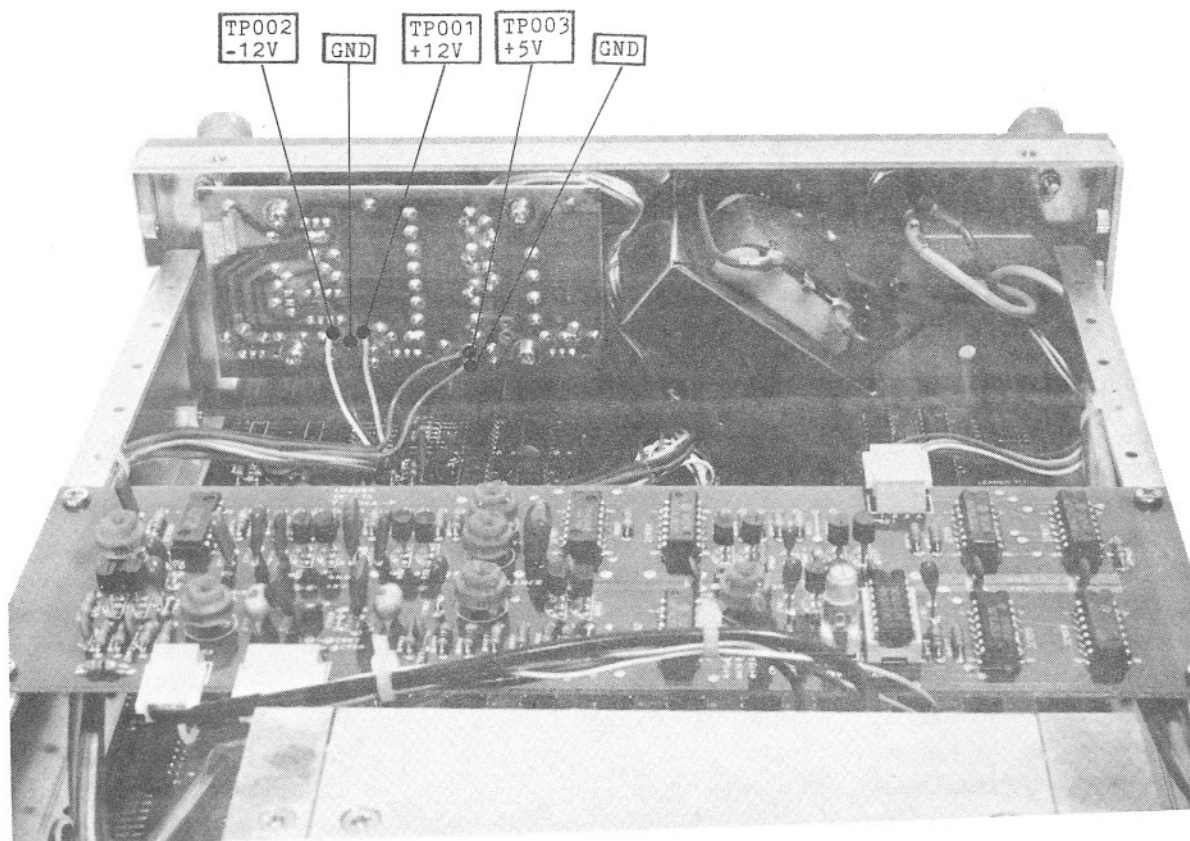
- a) Check all control settings, because an incorrect setting can make a good unit appear defective.
- b) Some trouble can be solved with proper adjustment.
- c) Check the voltage and waveform as shown on the schematic diagram to locate the defective circuit.
- d) Check all circuit for visual defects such as broken components, loose connection, open wire, poor soldering etc.

2) Troubleshooting Chart

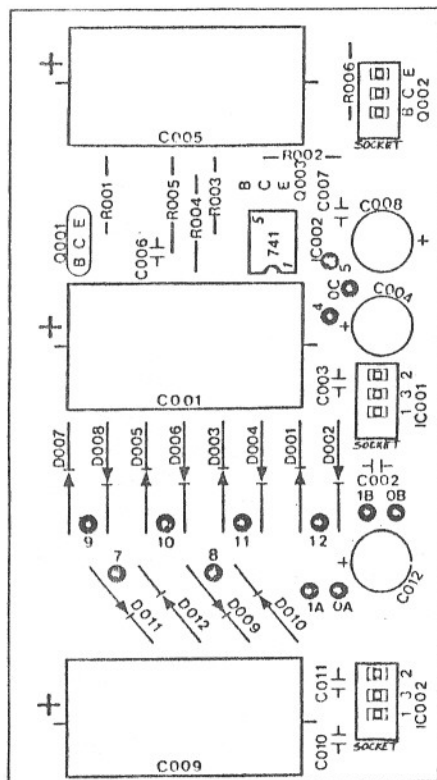


4. Location of Adjustment

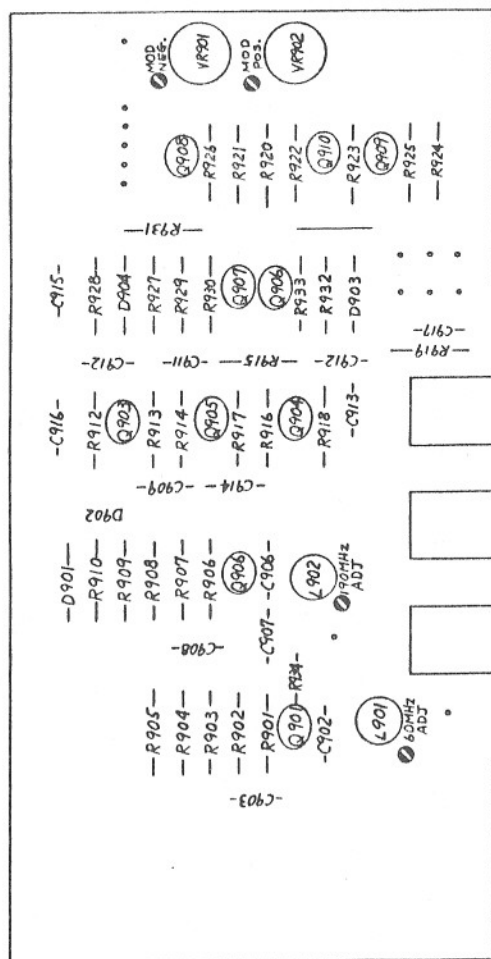




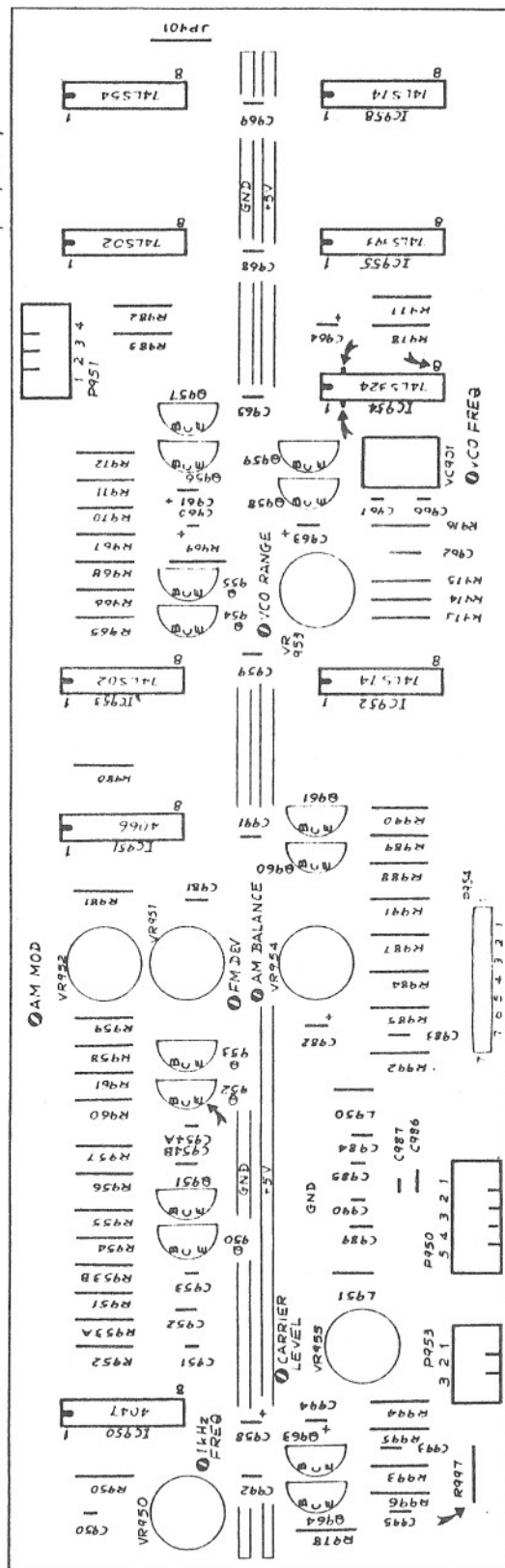
-13-
LCG-399



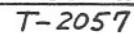
T-1456

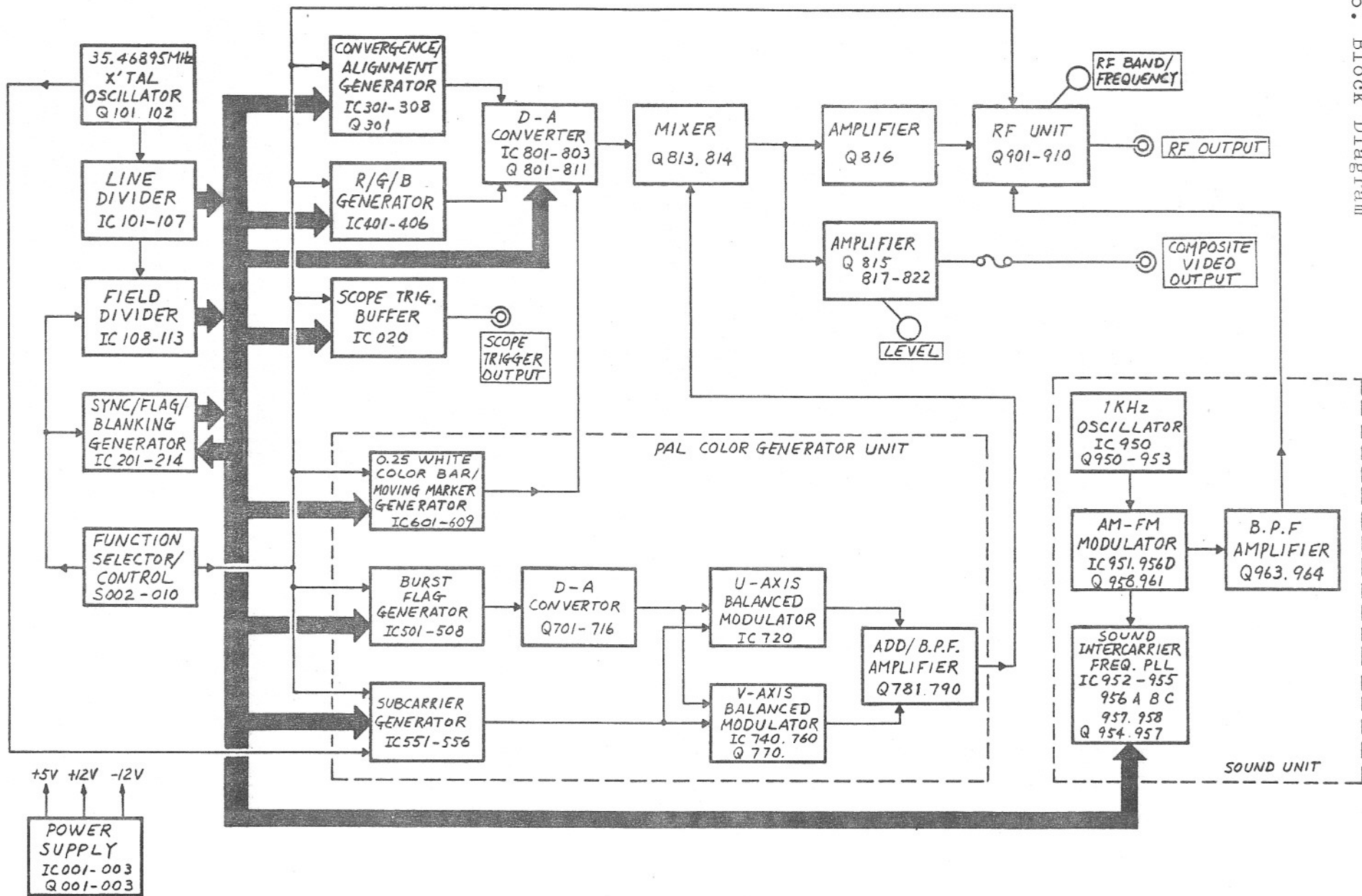


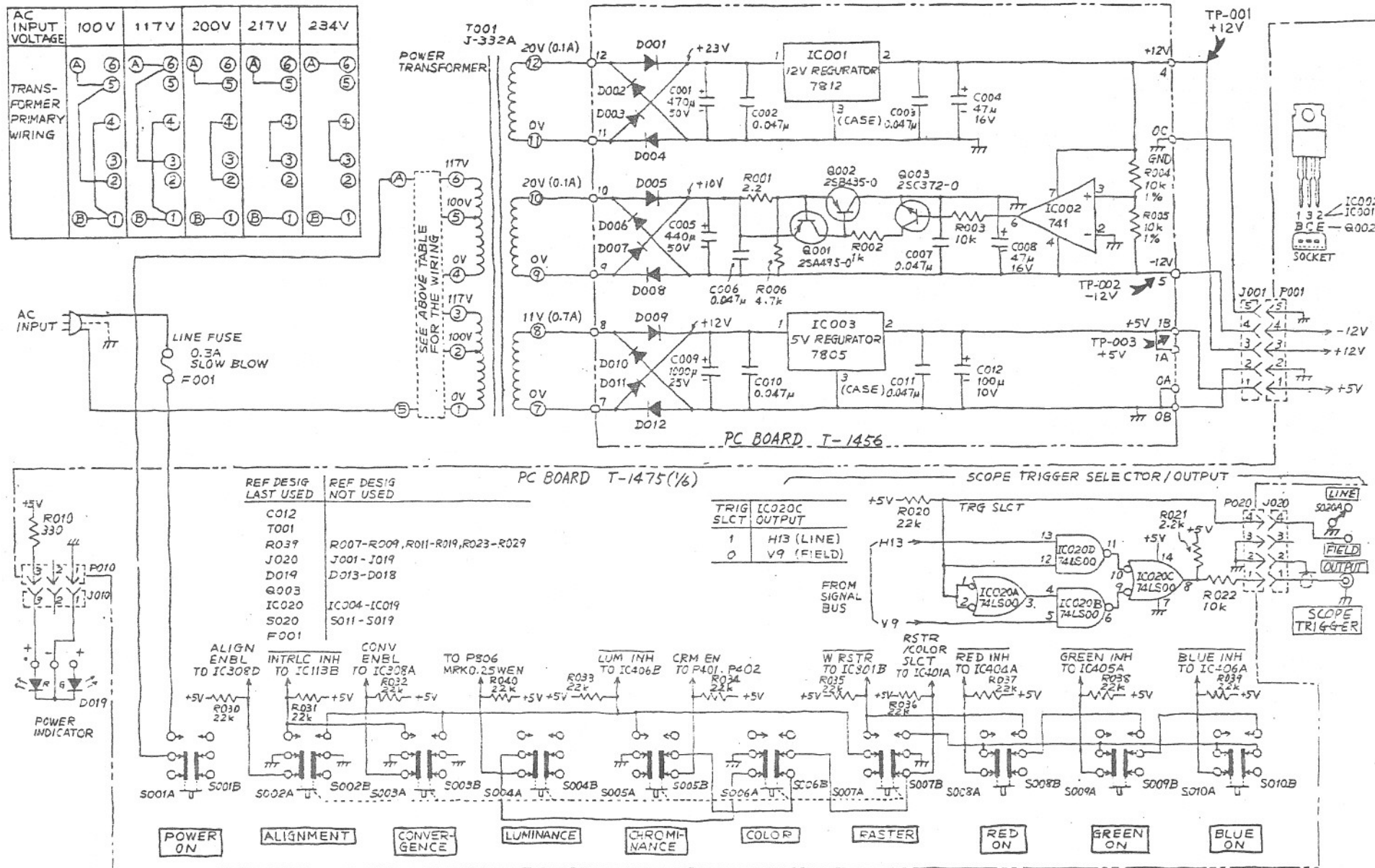
T-1466



T-1804

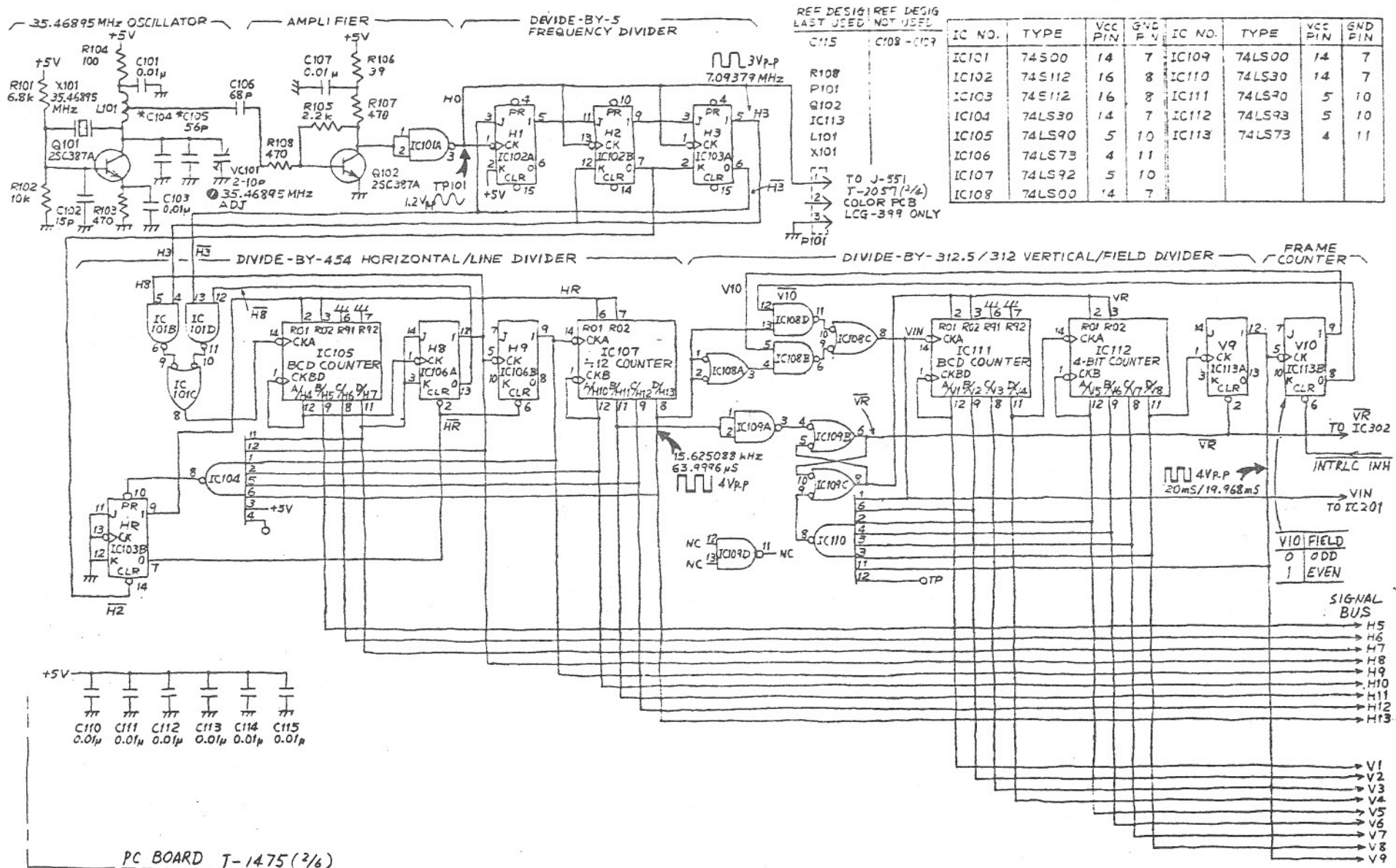


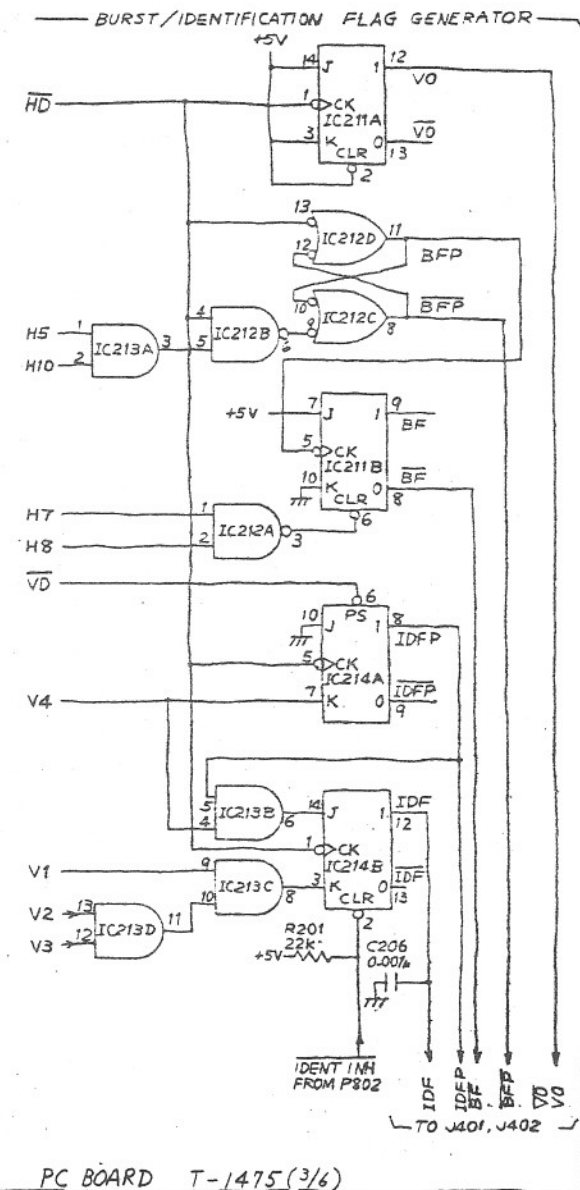
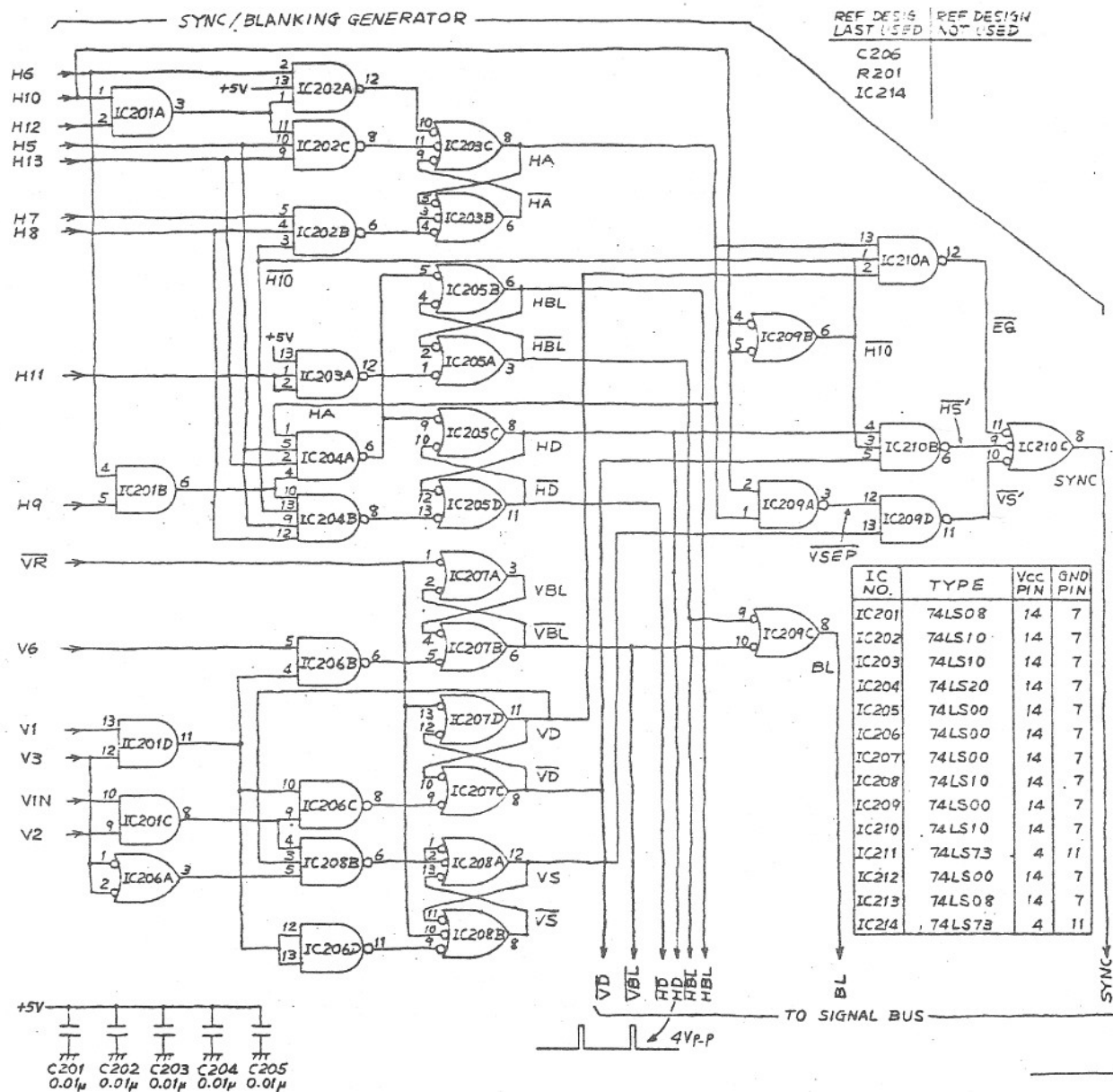




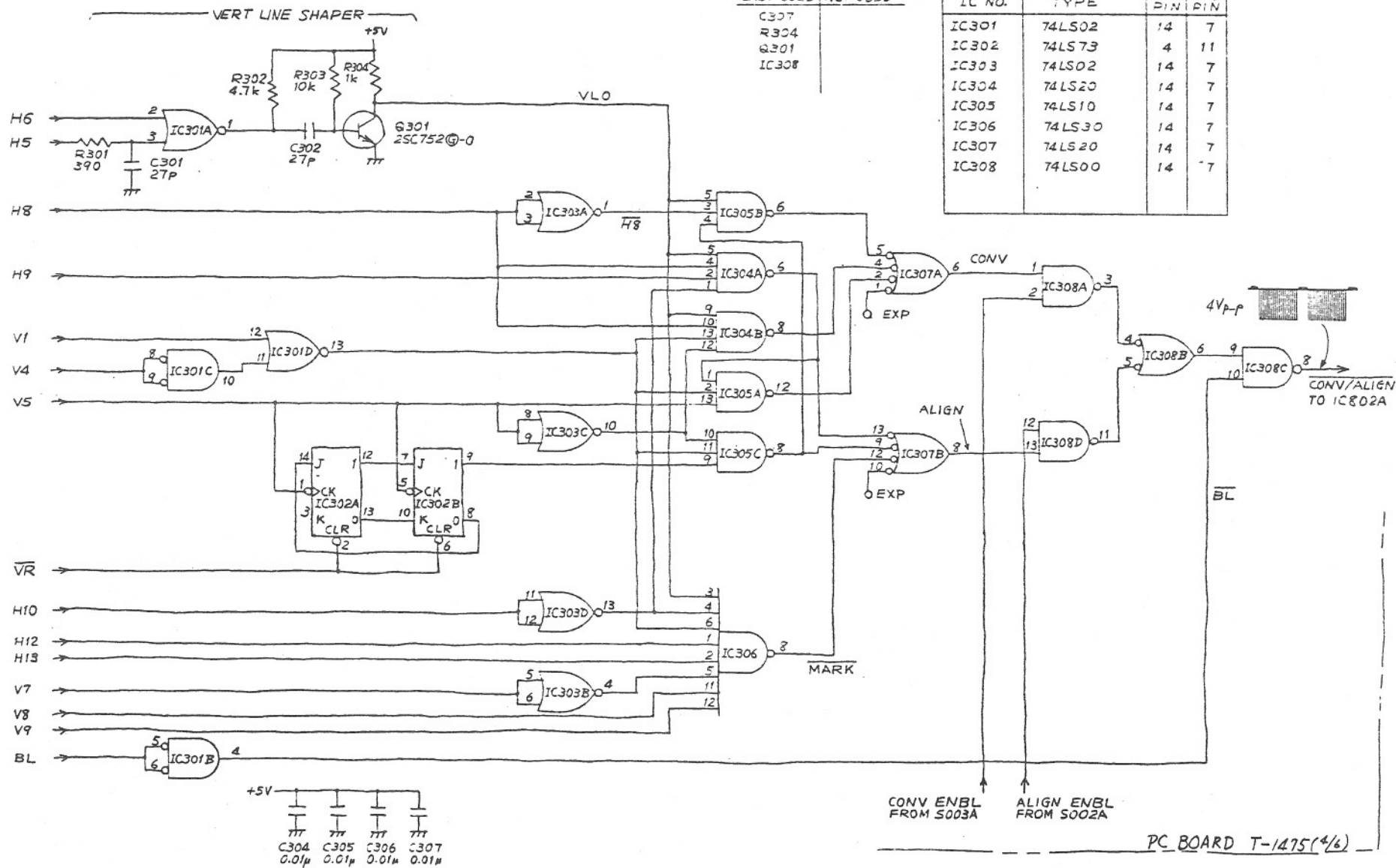
7. Schematic diagram

POWER SUPPLY/CONTROLS





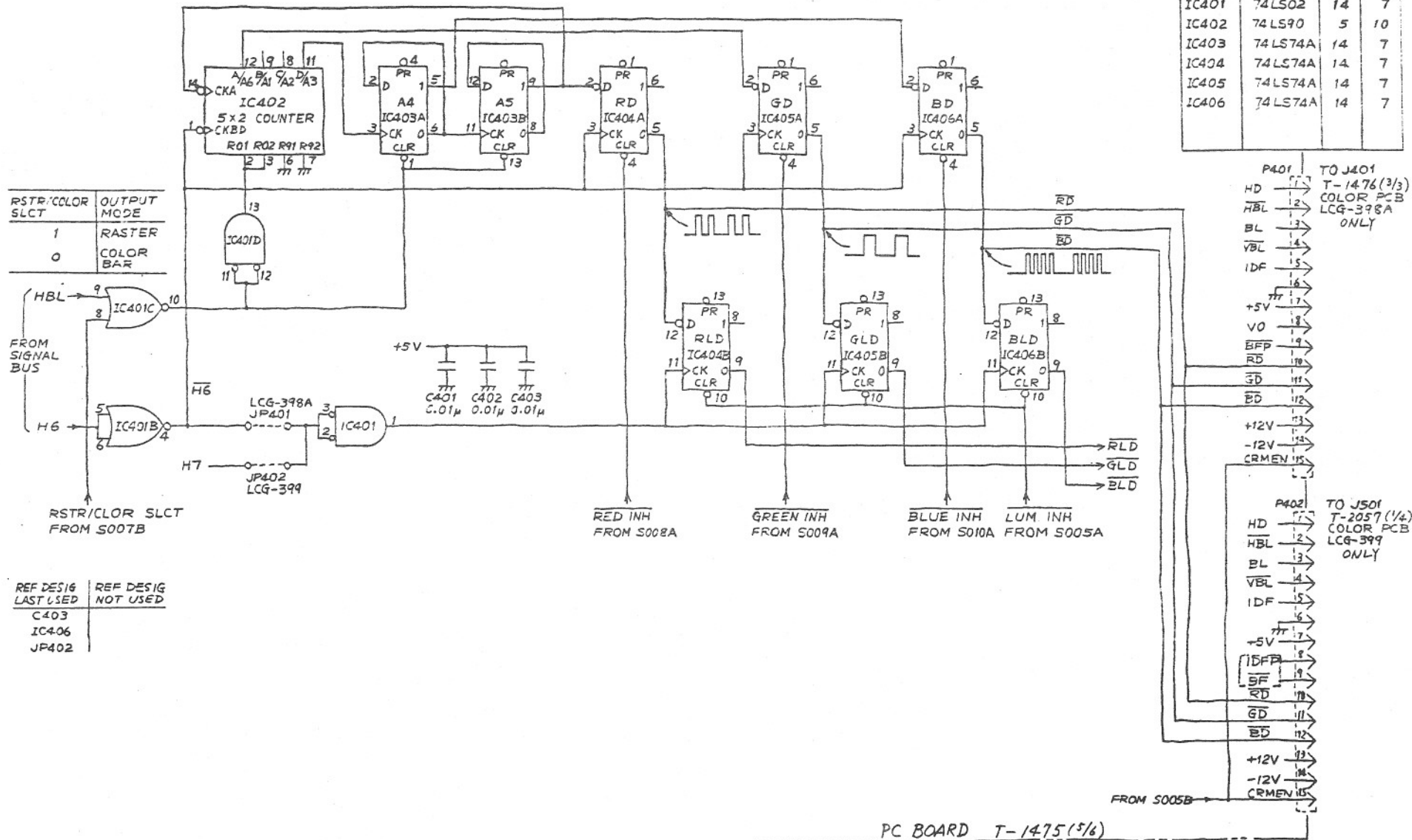
SYNC GENERATOR



CONVERGENCE/ALIGNMENT GENERATOR

COLOR BAR TIMING GENERATOR

IC NO.	TYPE	VCC PIN	GND PIN
IC401	74LS02	14	7
IC402	74LS90	5	10
IC403	74LS74A	14	7
IC404	74LS74A	14	7
IC405	74LS74A	14	7
IC406	74LS74A	14	7



COLOR BAR TIMING GENERATOR



REF DESIGN LAST USED	REF DESIGN NOT USED
R863	R817, R829, R831, R838

C829 C811~C814, C819, C820, C822, C823
C826, C827, C809

Q822 6812
IC803
53 VR806
0 F801

5803
J805
P806
D808

LCG-398A

COLOR

LCG-399

IDENT INH P802 J802
TOIC214 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000

[illegible]

P803 J802 COMPOSITE VIDEO

70

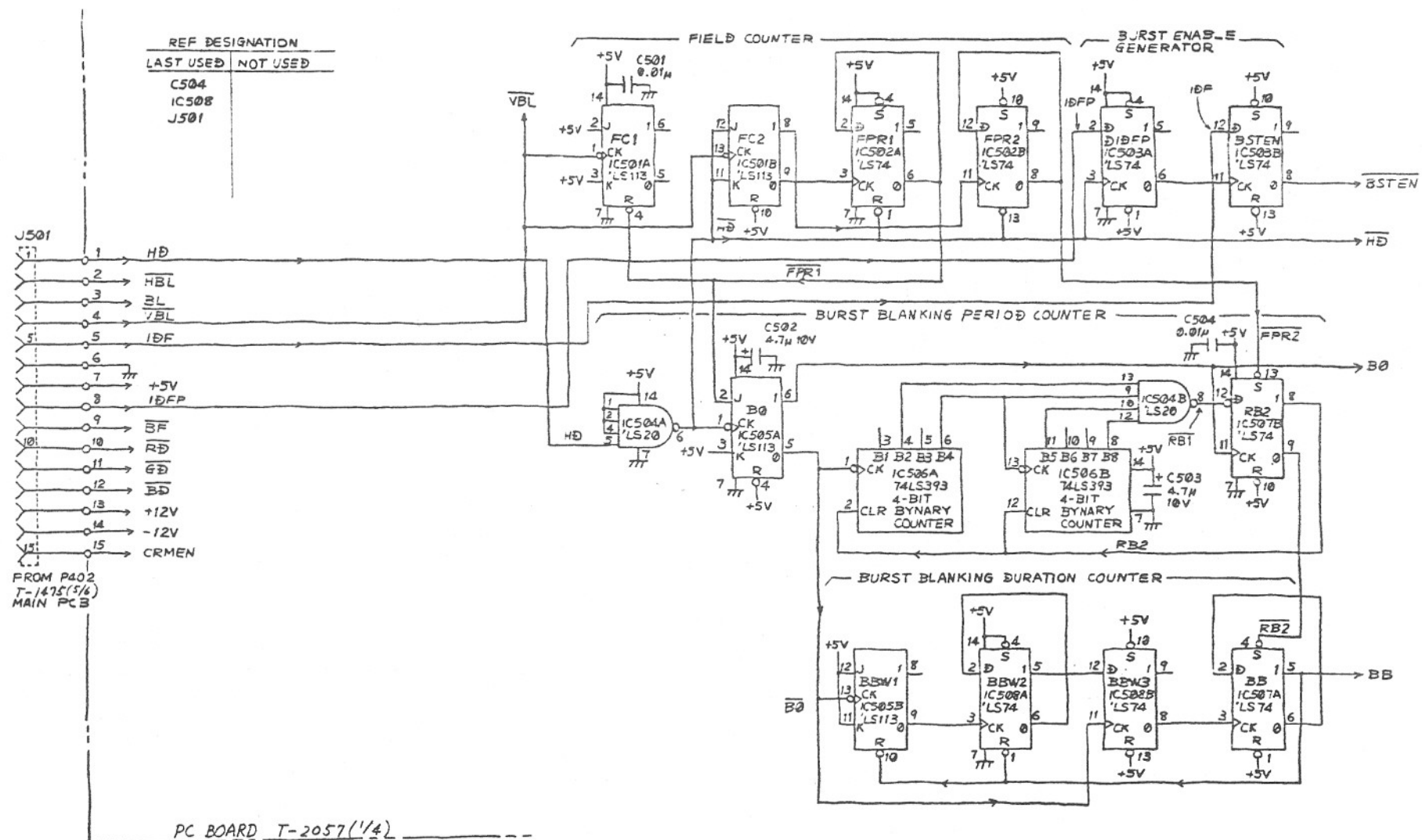
21
31

AE083

BE083

+12V — 3 — 3' —> +12V
-12V — 4 — 4' —> -12V
5 — 5' —> TO RF UNIT
T-1466

16 → GND
6 → CMP.VIDEO

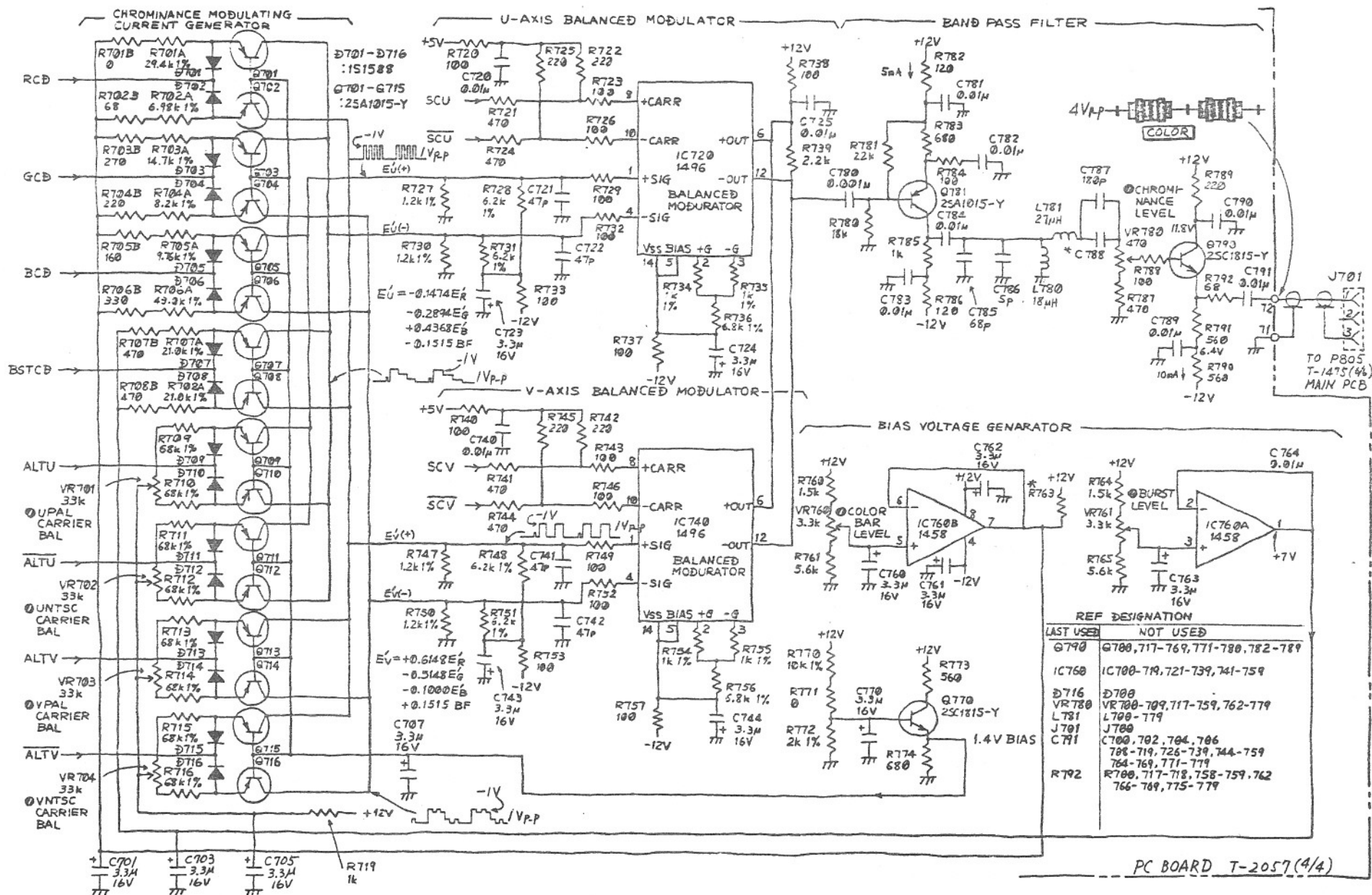




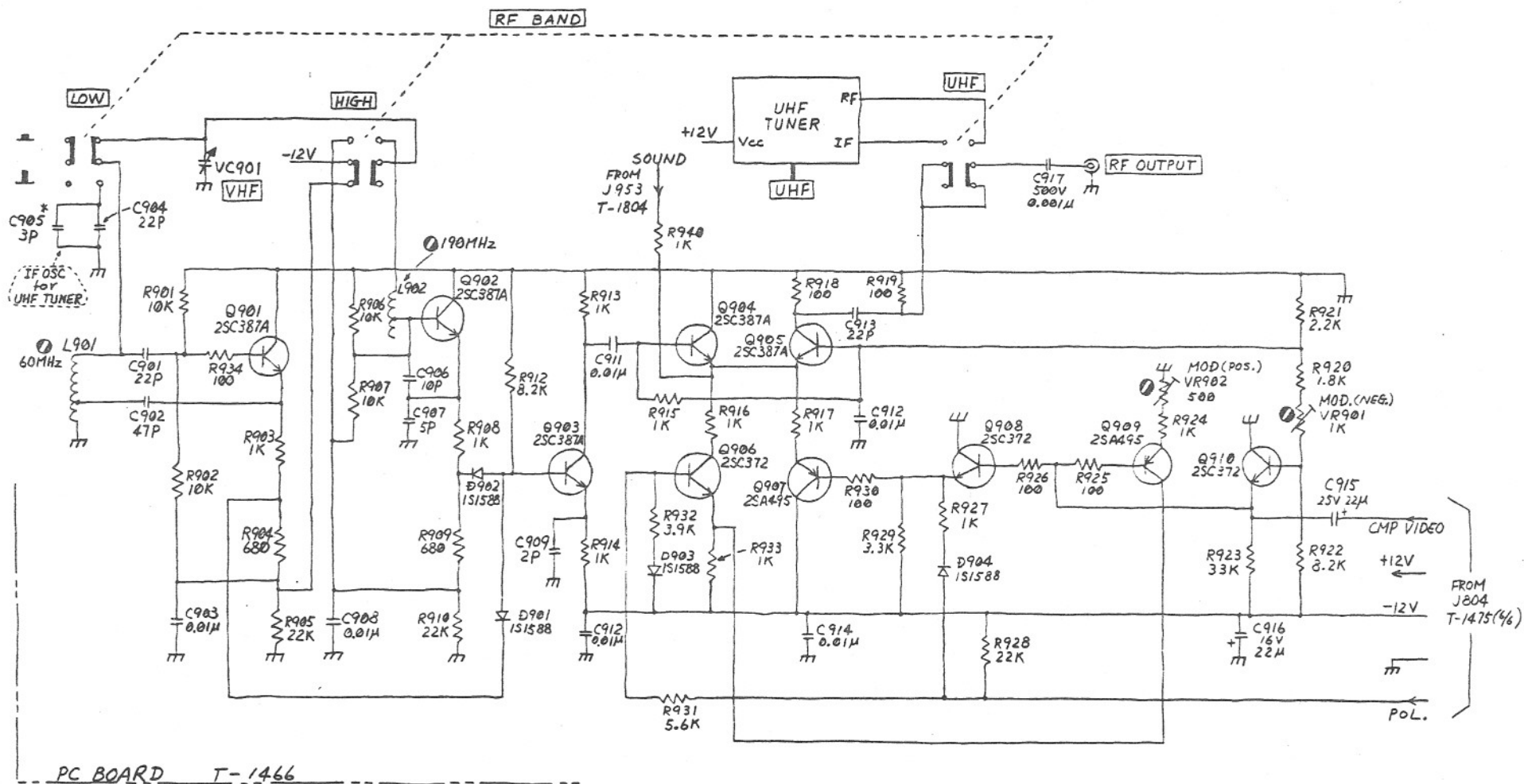
REF DESIGNATION	
LAST USED	NOT USED
R558	
C553	
IC356	
J551	



REF DESIGNATION	
LAST USED	NOT USED
C605	C604
IC609	
J601	







RF UNIT

ADDENDUM for SERVICE MANUAL
Model: LCG-399 PAL Pattern generator
LCG-398A SECAM Pattern generator

This addendum contains the informations of Circle Pattern generator as listed below.

1. Calibration procedure.
2. Components layout/Adjustment locations.
3. Schematic diagram.

NOTE: LCG-399A = LCG-399 + Circle pattern generator
LCG-398B = LCG-398A + Circle pattern generator

1. Calibration Procedure

- Control settings

Depress ALIGNMENT button of the Pattern Selector.

Set the CIRCLE SELECT switch on the Circle Pattern Board to DOUBLE CIRCLE position.

- Connect the video monitor to COMPOSITE VIDEO OUTPUT connector on the front panel. Use 75 ohm feed-through termination if necessary.

- Adjust following adjustments to obtain a circle pattern as shown in Figure below.

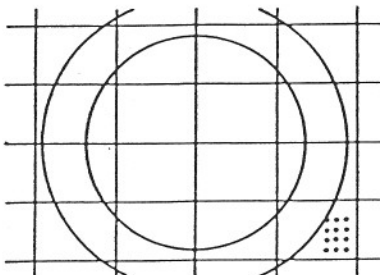
- VR50: Horizontal position
- VR51: Vertical position
- VR52: Circle height
- VR53: Circle balance
- VR55: Inner/outer circle size
- VR54: Outer circle size
- VR56: Circle line thickness

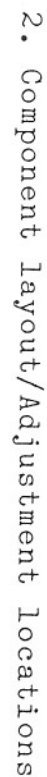
Adjust VR50 and VR51 to position the circle to the center of the crosshatch pattern.

Adjust VR52 and VR53 for a perfect circle.

Adjust VR55 and VR54 for a correct circle size.

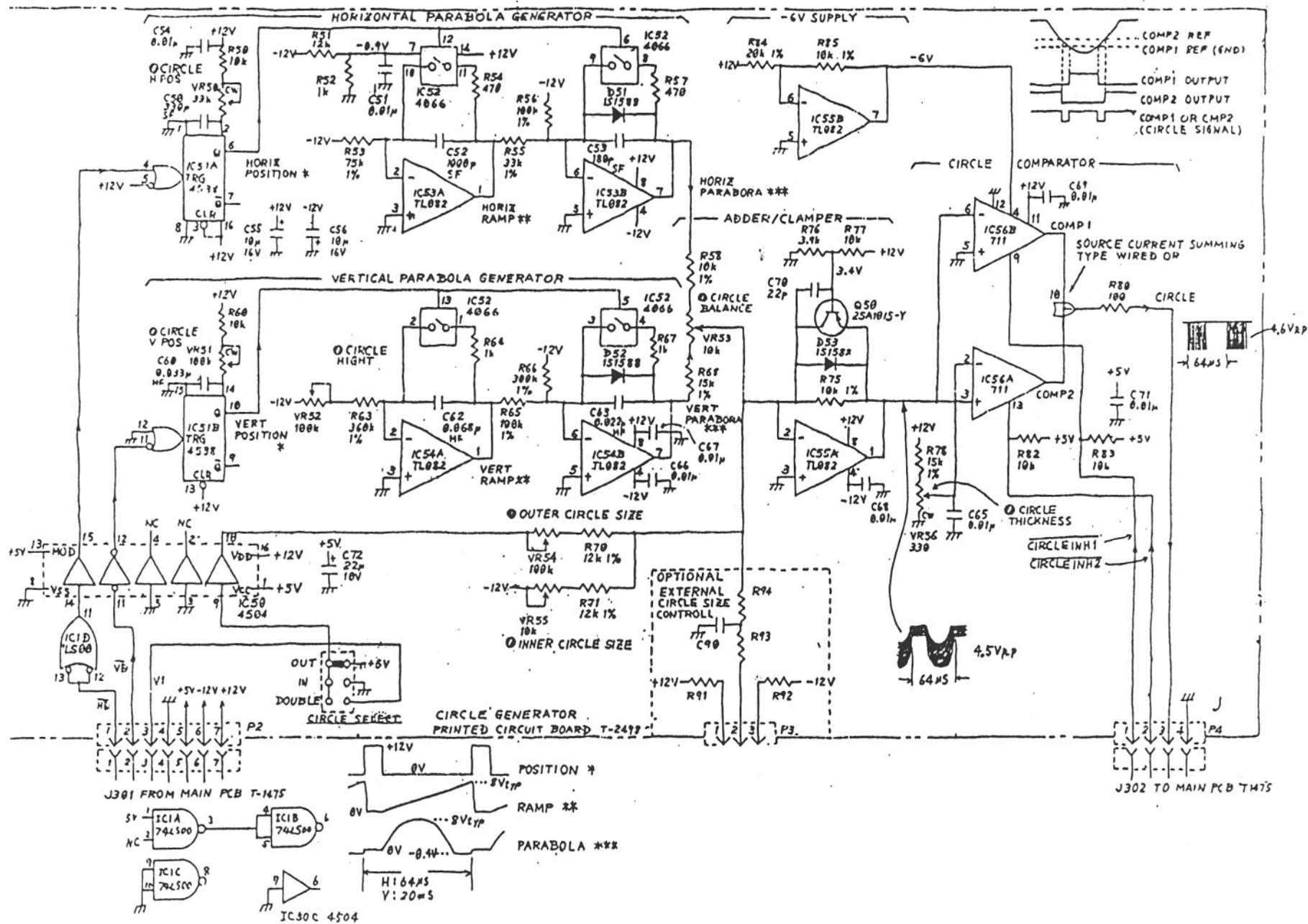
Adjust VR56 so that the circle line thickness is about 1.5 times of the vertical line.





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3. Schematic diagram

CIRCLE PATTERN GENERATOR

-4-



Refer to the Schematic diagram,
"CONVERGENCE/ALIGNMENT GENERATOR"
in the LCG-399 or the LCG-398A
Service manual as needed.