

NOTICE - WHEN GOVERNMENT DRAWINGS, SPECIFICATIONS, OR OTHER DATA ARE USED FOR ANY PURPOSE OTHER THAN IN CONNECTION WITH A DEFINITELY RELATED GOVERNMENT PROCUREMENT OPERATION, THE UNITED STATES GOVERNMENT THEREBY INCURS NO RESPONSIBILITY NOR ANY OBLIGATION WHATSOEVER, AND THE FACT THAT THE GOVERNMENT MAY HAVE FORMULATED, FURNISHED, OR IN ANY WAY SUPPLIED THE SAID DRAWINGS, SPECIFICATIONS OR OTHER DATA IS NOT TO BE REGARDED BY IMPLICATION OR OTHERWISE AS IN ANY MANNER LICENSING THE HOLDER OR ANY OTHER PERSON OR CORPORATION, OR CONVEYING ANY RIGHTS OR PERMISSION TO MANUFACTURE, USE, OR SELL ANY PATENTED INVENTION THAT MAY IN ANY WAY BE RELATED THERETO.

#### NOTES:

#### 1. GENERAL REQUIREMENTS:

- A. UNIT SHALL BE IN ACCORDANCE WITH MIL-S-19500 IN ADDITION TO THE REQUIREMENTS HEREIN.
- B. ABSOLUTE MAXIMUM RATINGS AT 25°C AMBIENT:
- (1) VOLTAGE TO PIN 8: PLUS 10.0 VOLTS WITH RESPECT TO PIN 4.
  - (2) VOLTAGE APPLIED TO ANY INPUT PIN (1, 3, OR 5): PLUS OR MINUS 4 VOLTS WITH RESPECT TO PIN 4.
  - (3) THERMAL RESISTANCE, JUNCTION-CASE, ( $\theta_{JC}$ ): 200°C/WATT.
  - (4) THERMAL RESISTANCE, JUNCTION-AMBIENT, ( $\theta_{JA}$ ): 500°C/WATT.
- C. TEMPERATURE:
- (1) TEMPERATURE RANGE, JUNCTION, OPERATING: -55°C TO +125°C.
  - (2) TEMPERATURE RANGE, JUNCTION, STORAGE: -65°C TO +150°C.
  - (3) TEMPERATURE, SOLDERING LEADS: +250°C (1 MINUTE MAX).
- D. MARKING: UNITS SHALL BE MARKED IN ACCORDANCE WITH STANDARD MIL-STD-130, WITH THE MANUFACTURER'S IDENTIFICATION, DATE CODE, AND THE NUMBER 771. THE NASA DRAWING NUMBER AND REVISION LETTER SHALL BE MARKED ON EACH INTERIOR AND EXTERIOR SHIPPING CONTAINER AS WELL AS ON A TAG TO BE INCLUDED IN EACH SHIPPING CONTAINER.

#### 2. CONSTRUCTION REQUIREMENTS:

- A. SEMICONDUCTOR: SILICON, NPN.
- B. ENCLOSURE: METAL CASE WITH GLASS HEADER, HERMETICALLY SEALED, REF. JEDEC (TO-47) OUTLINE.
- C. LEADS: LEAD MATERIAL SHALL BE IN ACCORDANCE WITH NASA DOCUMENT PS 1015402. A CERTIFICATE OF COMPLIANCE FOR LEAD MATERIAL SHALL ACCOMPANY EACH LOT SHIPPED.
- D. PIN 4 SHALL BE ELECTRICALLY CONNECTED TO THE CASE. PIN MAY BE WELDED TO HEADER.

#### 3. QUALITY ASSURANCE REQUIREMENTS:

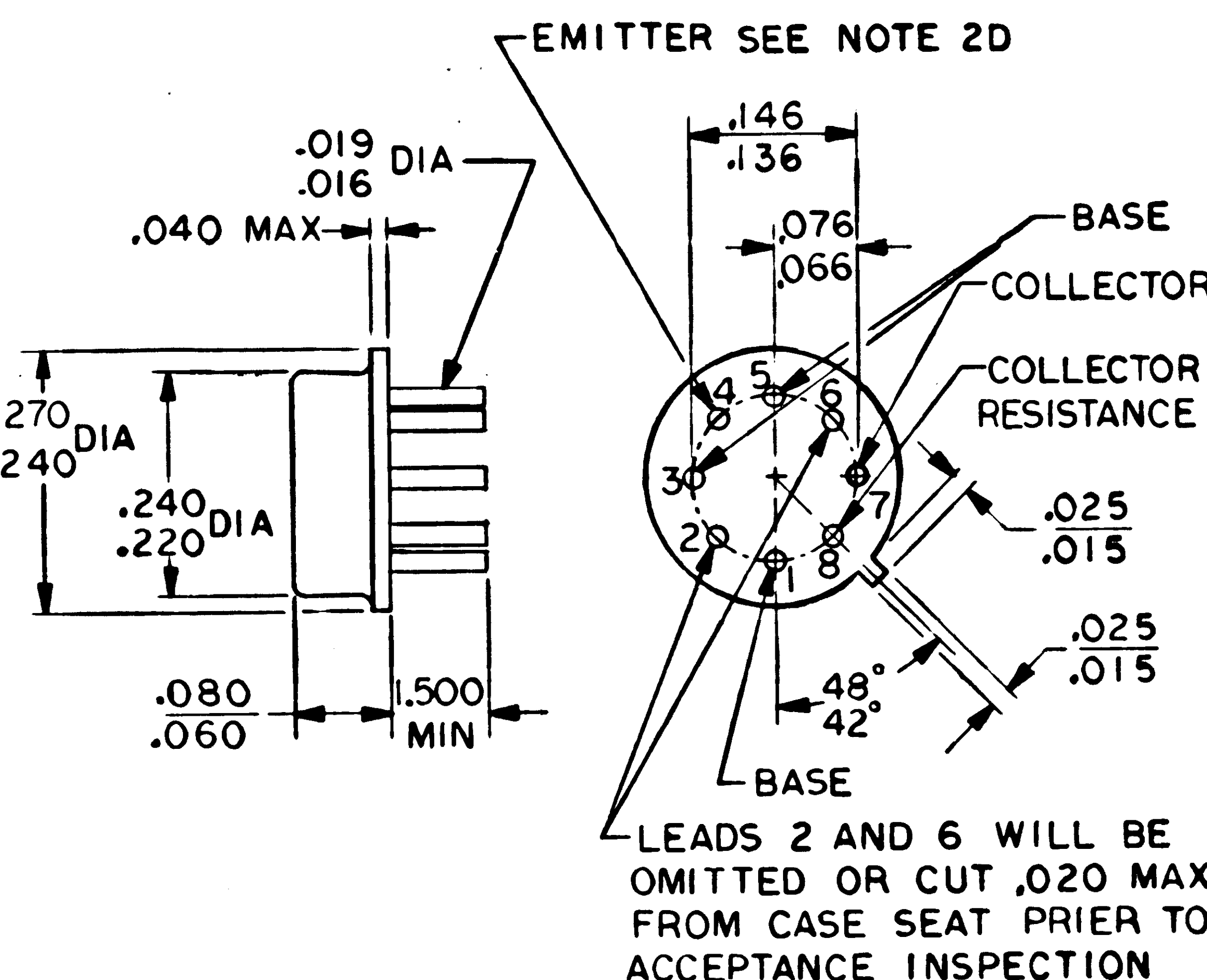
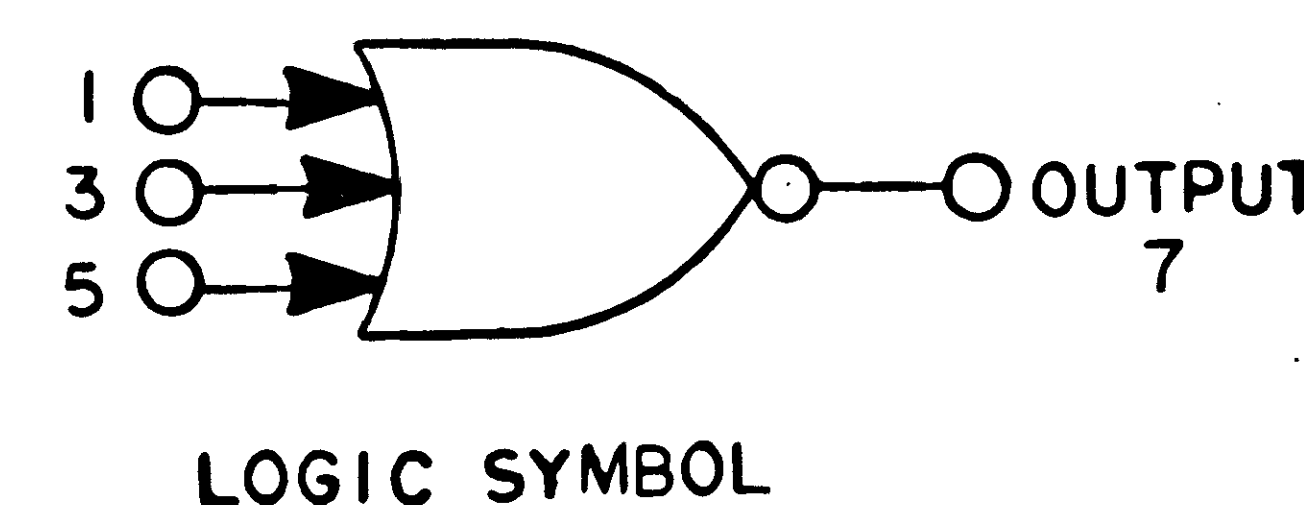
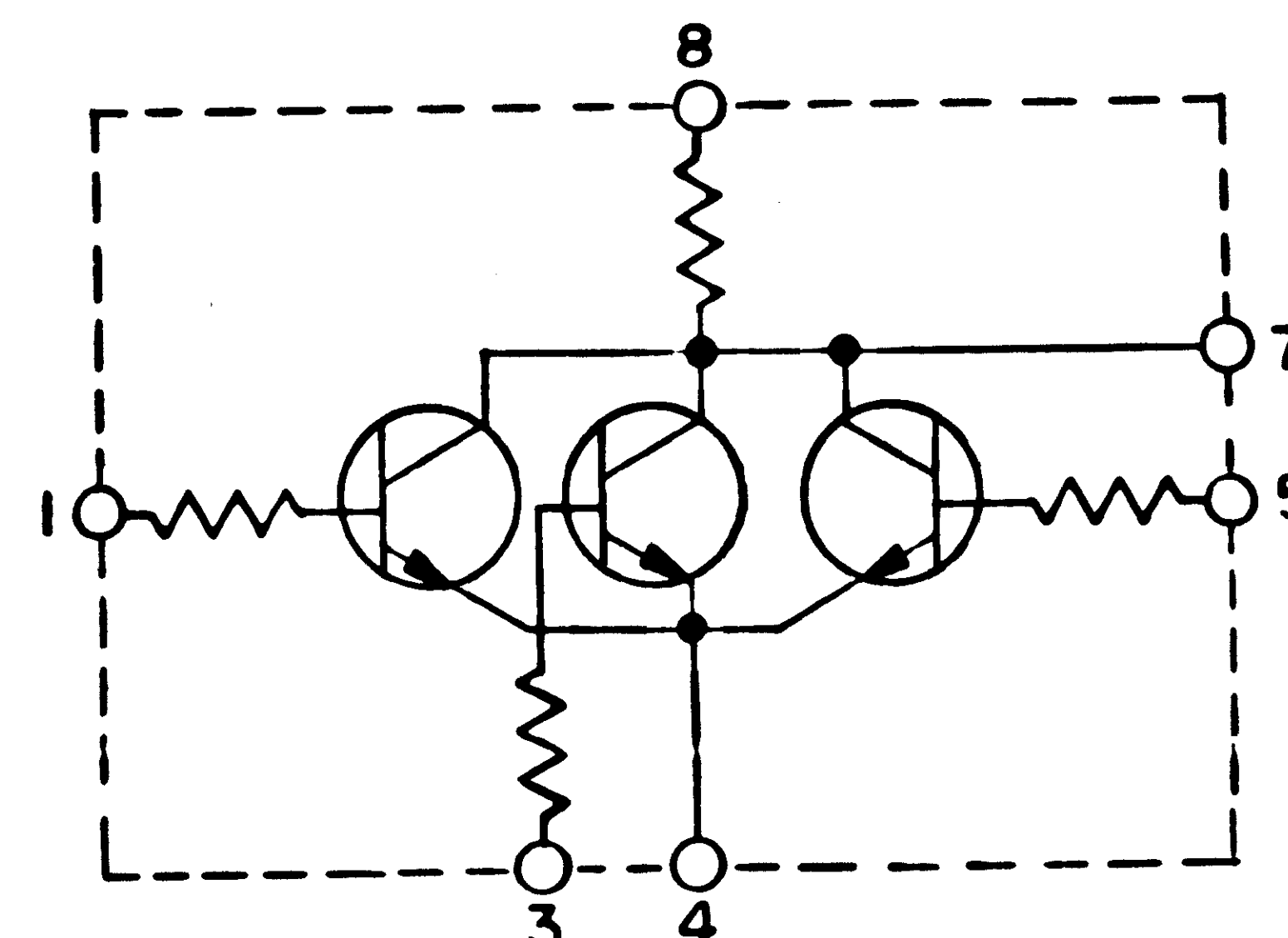
- A. LOT: A LOT IS DEFINED AS A GROUP OF PARTS IN A SINGLE PROCUREMENT SELECTED FROM A SINGLE CONTINUOUS PRODUCTION RUN USING LIKE MATERIALS WHICH ARE CONTROLLED USING A PROCESS WHICH IS THE SAME FROM THE BEGINNING TO THE END OF THE RUN. MAXIMUM NUMBER OF UNITS IN ANY LOT WILL BE 5000 UNITS.
- B. INSPECTION CONDITIONS: UNLESS OTHERWISE SPECIFIED HEREIN ALL ELECTRICAL TESTS SHALL BE MADE AT AN AMBIENT TEMPERATURE OF PLUS 25 PLUS OR MINUS 1/2 DEGREE CENTIGRADE.
- C. ACCEPTANCE INSPECTION: PER TESTS IN TABLES I, II AND III AS INDICATED BELOW.
- (1) THE PRE-ELECTRICAL TEST PROCESSING DEFINED IN TABLE I SHALL BE PERFORMED IN THE SEQUENCE INDICATED BEFORE THE TESTS OF TABLE II ON ALL LOTS NUMBERING LESS THAN 501 UNITS.
  - (2) UNITS USED IN QUALITY DEMONSTRATION TESTS OF TABLE III WILL NOT BE SHIPPED AS PART OF THE DELIVERY SCHEDULE BUT WILL BE FORWARDED ALONG WITH TEST DATA UNDER SEPARATE COVER, TO THE PURCHASER, ATTENTION: RELIABILITY MANAGER.
  - (3) UNITS USED IN TABLE III, SUBGROUPS 1 AND 5 MAY BE ELECTRICAL REJECTS FROM THE SAME LOT.
  - (4) ACCEPTABLE UNITS USED IN TESTING SUBGROUP 2 OF TABLE II SHALL BE USED IN SUBGROUPS 2, 3 AND 4 OF TABLE III. IN TABLE III ACCEPTABLE UNITS FROM SUBGROUP 2 ARE USED IN SUBGROUP 4.
  - (5) AFTER COMPLETION OF TESTS, UNITS USED IN SUBGROUP 3 OF TABLE III SHALL BE USED IN SUBGROUP 6 OF TABLE III.

PROCURE ONLY FROM APPROVED SOURCES LISTED ON ND 1002034 FOR THIS DRAWING.

H 1229001

#### REVISIONS

SYM	DESCRIPTION	DATE	APPROVAL
H	REPLACES REV G WITH CHANGES AND UPGRADED TO CLASS A RELEASE PER TDRR 00562	3-13-63	WR



MASTER

(H) REPLACES REV G WITH CHANGES

H	H	H	H
SHEET 1	SHEET 2	SHEET 3	SHEET 4

#### REVISION STATUS OF SHEETS

		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ON
		FRACTIONS DECIMALS ANGLES
		± ± ±
		DO NOT SCALE THIS DRAWING
		MATERIAL
		SEE NOTES
		HEAT TREATMENT
		NONE
		FINAL FINISH
		NONE
NEXT ASSY	USED ON	
APPLICATION		

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
LIST OF MATERIALS			
MIT INSTRUMENTATION LAB CAMBRIDGE, MASS.		MANNED SPACECRAFT CENTER HOUSTON, TEXAS	
DRAWN <i>R. K. H. H.</i> DATE <i>12/2/63</i>		MICRO-NOR GATE (TO 47 SIZE)	
CHECKED <i>R. H. H.</i>		SPECIFICATION CONTROL DRAWING	
APPROVAL <i>R. H. H.</i>		CODE IDENT NO. SIZE	
APPROVAL <i>R. H. H.</i>		NASA DRAWING NO. 1006771	
NASA APPROVAL <i>R. H. H.</i>		SCALE NONE WT	
MIT APPROVAL <i>R. H. H.</i>		SHEET 1 OF 4	

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NOTES (CONTINUED):

3. D. TEST METHODS: (REF. MIL-STD-750 WITH EXCEPTIONS NOTED BELOW).

- (1) LEAD FATIGUE: LEADS SHALL BE CAPABLE OF WITHSTANDING THE FOLLOWING LEAD BEND TEST. THE UNIT SHALL BE HELD IN A VERTICAL POSITION WITH A ONE POUND WEIGHT SUSPENDED FROM THE LEAD TO BE TESTED. TWO CYCLES OF BENDING SHALL BE PERFORMED, A CYCLE CONSISTING OF MOVING THE BODY OF THE UNIT, 90 DEGREES FROM THE VERTICAL IN ONE DIRECTION, AND BACK 90 DEGREES TO THE ORIGINAL POSITION. NO MECHANICAL DAMAGE SHALL BE EVIDENCED AFTER THE TEST.
- (2) LEAD TENSION: EACH LEAD SHALL BE CAPABLE OF WITHSTANDING AN AXIAL PULL OF 4 POUNDS MINIMUM FOR 30 SECONDS. NO MECHANICAL DAMAGE SHALL BE EVIDENCED AFTER THE TEST.
- (3) SEAL TEST: THE UNITS SHALL BE SUBJECTED TO A HELIUM OR RADIFLO LEAK DETECTION TEST WITH A SENSITIVITY OF AT LEAST  $1 \times 10^{-7}$  CC/ATM/SEC. A LEAKAGE RATE OF  $1 \times 10^{-6}$  CC/ATM/SEC OR GREATER SHALL CONSTITUTE A FAILURE.
- (4) AVERAGE PROPAGATION DELAY ( $T_p$ ): MEASUREMENTS SHALL BE PERFORMED ON ANY ONE INPUT USING TEST CIRCUIT SPECIFIED IN FIGURE 1 MADE UP OF ACCEPTABLE UNITS WHERE  $T_p = (T_1 + T_2)/2$ . VOLTAGE PIN 8 TO PIN 4, 3 V  $\pm$  10%.
- (5) POWER BURN-IN: AN ODD NUMBER OF UNITS (GATES) SHALL BE CONNECTED IN SERIES WITH THE OUTPUT OF THE LAST UNIT SUPPLYING THE INPUT TO THE FIRST UNIT, THUS FORMING A "RING" AS SHOWN IN FIGURE 2. WHEN 8 V  $\pm$  5% DC IS APPLIED TO THE POWER TERMINALS OF ALL UNITS IN THE CIRCUIT ("RING"), OSCILLATION SHALL OCCUR AT THE INITIATION OF THE TEST.
- (6) VISUAL AND MECHANICAL EXAMINATION: MARKING SHALL BE LEGIBLE, THE CASE FINISH SHALL HAVE NO PITS, FLAKING OR CHIPPING, LEADS SHALL BE FREE FROM KINKS AND NICKS AND COMPLY WITH THE SPECIFIED LEAD MATERIAL REQUIREMENT. GLASS IN HEADER SHALL HAVE NO CRACKS, CHIPS OR BUBBLES.
- (7) THE UNITS WILL BE OPENED AND EXAMINED UNDER 80X MAGNIFICATION FOR DEFECTS IN THE METALIZED INTERCONNECTION PATTERNS WHICH ARE OR COULD BE DUE TO MECHANICAL ABRASION OR CHEMICAL REACTION WITH CONTAMINATE SUBSTANCES. DEFECTS IN THE METALIZATION WILL BE CAUSE FOR REJECTION.

E. THE SUPPLIER SHALL CONFORM TO THE QUALITY ASSURANCE PROVISIONS SPECIFIED IN ND 1015404, CLASS 1.

4. INTERPRET DRAWING IN ACCORDANCE WITH STANDARDS PRESCRIBED BY MIL-D-70327.

H 1229001

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
H	REPLACES REV E WITH CHANGES PER TDRR 00562	3-13-63	WJ

TABLE I

PRE-ELECTRICAL TEST PROCESSING			
TEST	TEST CONDITIONS	LOT	
		1 TO 500	OVER 500
THERMAL SHOCK	METHOD 1056, CONDITION B (+150°C TO -65°C, 3 CYCLES)	100%	NO REQUIREMENT
HIGH TEMPERATURE BAKE	TEMPERATURE = 150° $\pm$ 5°C, 72 $\pm$ 8 HOURS.	↑ 100% ↓	↑ NO REQUIREMENT ↓
CONSTANT ACCELERATION	METHOD 2006 (20,000 G) Y <sub>1</sub> DIRECTION ONLY.		
POWER, BURN-IN	METHOD 1026 SEE NOTE 3 D (5) AND FIGURE 2 T <sub>A</sub> = +22°C MIN; IN FREE AMBIENT AIR t = 168 $\pm$ 12 HOURS		
SEAL TEST	SEE NOTE 3 D (3)	100%	NO REQUIREMENT

MASTER

(H) REPLACES REV E WITH CHANGES

QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	FIND NO.
LIST OF MATERIALS			
MIT INSTRUMENTATION LAB CAMBRIDGE, MASS.		MANNED SPACECRAFT CENTER HOUSTON, TEXAS	
DRAWN <i>R. K. Goss</i> DATE <i>12/2/63</i> CHECKED <i>R. W. Hanley</i> APPROVAL <i>R. W. Hanley</i> APPROVAL <i>John D. May</i> 3/13/63		MICRO-NOR GATE (TO 47 SIZE)  SPECIFICATION CONTROL DRAWING	
HEAT TREATMENT		CODE IDENT NO.	SIZE
NASA APPROVAL <i>W. J. Springer</i> 13 March 63			C
FINAL FINISH		NASA DRAWING NO. 1006771	
MIT APPROVAL <i>W. J. Springer</i> 13/1/63		SCALE NONE	WT
APPLICATION		SHEET 2 OF 4	

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H 1229001		<table border="1"> <thead> <tr> <th colspan="4">REVISIONS</th> </tr> <tr> <th>SYM</th> <th>DESCRIPTION</th> <th>DATE</th> <th>APPROVAL</th> </tr> </thead> <tbody> <tr> <td>H</td> <td>THIS SHEET ADDED REV H PER TDRR 00562</td> <td>3-17-63</td> <td>Wk</td> </tr> </tbody> </table>		REVISIONS				SYM	DESCRIPTION	DATE	APPROVAL	H	THIS SHEET ADDED REV H PER TDRR 00562	3-17-63	Wk
REVISIONS															
SYM	DESCRIPTION	DATE	APPROVAL												
H	THIS SHEET ADDED REV H PER TDRR 00562	3-17-63	Wk												

### ACCEPTANCE INSPECTION

\* LTPD PER MIL-S-19500C, TABLE IV

1 2 3 4 5 6 7 8 9 10 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 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035 1036 1037 1038 1039 104

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TABLE III

QUALITY DEMONSTRATION TESTS			
TEST	TEST CONDITION	LOT	
		1 TO 500	OVER 500
SUBGROUP 1 PHYSICAL DIMENSION	SEE NOTE 3 C (3) METHOD 2066	NO REQUIREMENTS	LTPD* = 20 MAX ACC NO. = 1
SUBGROUP 2 ** THERMAL SHOCK	SEE NOTE 3 C (4) METHOD 1056, CONDITION B (150° TO -65°C, 5 CYCLES)		LTPD* = 10 (COMBINED) MAX ACC NO. = 3
SEAL TEST	SEE NOTE 3 D (3)		LTPD* = 10 (COMBINED) MAX ACC NO. = 3
SUBGROUP 3 ** STORAGE LIFE	SEE NOTE 3 C (4) METHOD 1031 Tstg = 150° ± 5°C, 1000 HOURS		
SHOCK	METHOD 2016, 1500 G, 0.5 MSEC 5 BLOWS EACH IN X1, Y1, Y2, Z1 DIRECTIONS 20 BLOWS TOTAL		
VIBRATION VARIABLE FREQUENCY	METHOD 2056, 30 G FROM 5 TO 2000 CPS LIMITED TO 0.12 DOUBLE AMPLITUDE, 3 CYCLES, 15 MINUTES PER CYCLE MINIMUM.	NO REQUIREMENTS	λ* = 10 MAX ACC NO. = 3
CONSTANT ACCELERATION	METHOD 2006, (20,000 G) Y1 AXIS ONLY		
SUBGROUP 4 OPERATION LIFE	SEE NOTE 3 C (4) METHOD 1026 SEE NOTE 3 D (5) AND FIGURE 2 T <sub>A</sub> = +22°C MIN IN FREE AMBIENT AIR t = 1000 HOURS		
SUBGROUP 5 ** LEAD TENSION LEAD FATIGUE	SEE NOTE 3 C (3) SEE NOTE 3 D (2) SEE NOTE 3 D (1)	NO REQUIREMENTS	LTPD* = 20 (COMBINED) MAX ACC NO. = 1
SUBGROUP 6 ** VISUAL INTERNAL INSPECTION	SEE NOTE 2 C (5) AND NOTE 3 D (7)		LTPD* = 7 MAX ACC NO. = 1

\* LTPD AND λ PER MIL-S-19500C, TABLE IV

\*\* TEST TO BE PERFORMED IN SEQUENCE INDICATED

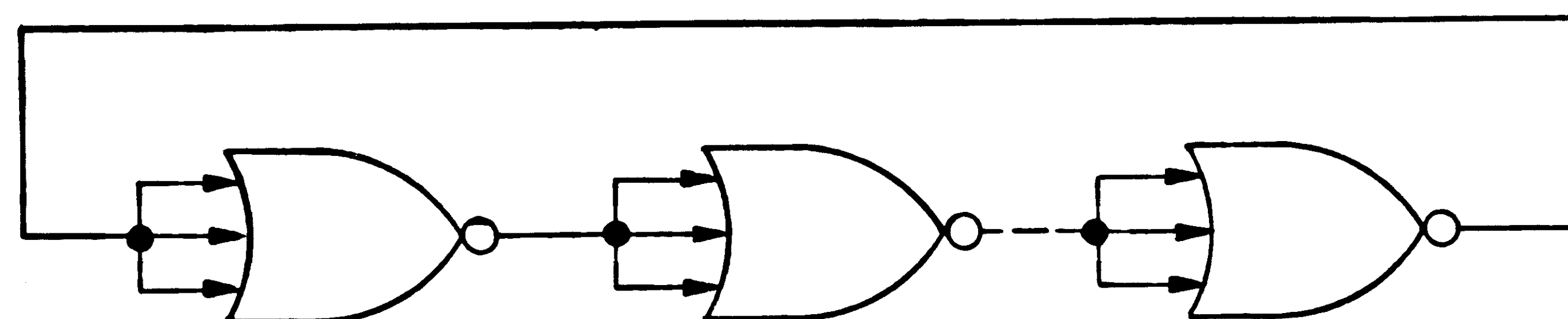


FIGURE 2  
TEST CIRCUIT - POWER BURN-IN

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REVISIONS			
SYM	DESCRIPTION	DATE	APPROVAL
H	THIS SHEET ADDED REV H PER TDRR 00562	3-15-63	Wll.

TABLE III (CONTINUED)

TEST	SYMBOL	TEST CONDITIONS	LIMIT		UNITS
			MIN	MAX	
END POINTS FOR SUBGROUPS 2, 3 AND 4					
OUTPUT VOLTAGE, PIN 7	V <sub>O</sub>	SAME AS SPECIFIED IN TABLE II	-	350	mV
OUTPUT VOLTAGE, PIN 7	V <sub>O</sub>		-	350	mV
OUTPUT VOLTAGE, PIN 7	V <sub>O</sub>		-	350	mV
OUTPUT CURRENT, PIN 7	I <sub>O</sub>		2.90	-	mA
COLLECTOR EMITTER THRESHOLD CURRENT	I <sub>CEX</sub>		-	200	uA
BASE CURRENT, I <sub>1</sub>	I <sub>B1</sub>		-	370	uA
BASE CURRENT, I <sub>3</sub>	I <sub>B3</sub>		-	370	uA
BASE CURRENT, I <sub>5</sub>	I <sub>B5</sub>		-	370	uA

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LIST OF MATERIALS			
MIT INSTRUMENTATION LAB CAMBRIDGE, MASS.		MANNED SPACECRAFT CENTER HOUSTON, TEXAS	
DRAWN <i>R. Kage</i> DATE <i>12/2/63</i> CHECKED <i>P. D. Hanley</i> APPROVAL <i>P. D. Hanley</i> APPROVAL <i>P. D. Hanley 3/13/63</i>		MICRO-NOR GATE (TO 47 SIZE)	
NASA APPROVAL <i>W. J. Supina</i> <i>13 March 1963</i>		CODE IDENT NO.	NASA DRAWING NO.
MIT APPROVAL <i>W. J. Supina</i> <i>13 March 1963</i>		SIZE C	1006771
APPLICATION		SCALE NONE	WT
		SHEET 4 OF 4	

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