

1.0 SCOPE

This specification defines a cathode ray display tube capable of presenting any of 64 independent messages, characters or symbols. The device is identified by the trade name "nimo".

2.0 NOMENCLATURE

2.1 IEE Model #: $\frac{6500}{\text{Basic Series}} - \frac{1}{\text{Style}} \frac{X}{\text{Color Code}} - \frac{XXXX}{\text{Mask No. (Factory Assigned)}}$
(See 4.9)

2.2 Description: Trade Name "nimo"
IEE 6500 Series Display
Component.

3.0 APPLICATION FIELD

The IEE 6500 Series "nimo" is primarily intended for use in applications where alpha-numeric information is to be displayed, since it has the capability of presenting the entire typewriter keyboard. It is well suited for all applications where a large number of messages or customer designed symbols have to be displayed to an operator. Color is predicated upon phosphor selection. Display positions are activated by means of X-Y selection on a control grid matrix. The IEE Series 6500 is ideally suited for high ambient light conditions.

3.1 Function: The IEE Series 6500 "nimo" is a sixty four electron gun cathode ray display device, utilizing a shadow mask for character generation.

3.2 Related Military Specification: None

4.0 DISPLAY CHARACTERISTICS

4.1 Display Type: 64 gun, shadow mask, cathode ray vacuum tube.

4.2 Intensity: (green phosphor only)

4.2.1 The intensity of the Series 6500 nimo display is a function of the applied anode voltage. Reference Figure 1 for characteristics of anode voltage versus display intensity.

4.2.2 Control of display intensity may be accomplished through variation of the anode supply voltage within the limits defined by Figure 1.

4.2.3 When an electron beam is projected through an aperture onto a phosphor screen, there is a phenomenon called gaussian distribution of brightness. Also there is a maximum brightness for a given phosphor at any given anode voltage. If the brightness of an illuminated stroke is measured, the values will increase from approximately "0" to some peak value along a smooth curve. Then remain at the peak until the gaussian distribution of the opposite side is reached, then it will taper off on a mirror image curve.

When stroke widths become small enough, the gaussian distribution of the two-sides meet before the peak brightness can be reached. For this reason there is a variation in brightness from large characters to small characters.

4.3 Display Positions: Sixty-four.

6500-1X-0103 is standard, containing 26 letters, 10 numerals, 27 symbols, and conforms to EBCDIC code requirements. (Reference Figure 2).

6500-1X-0104 is standard, containing 26 letters, 10 numerals, 28 symbols, and conforms to USASCII code requirements. (Reference Figure 3).

6500-1X-0107 is a universal mask demonstrating both alphanumeric, messages & symbol capability of the device. (Reference Figure 4).

4.4 Character Style: Modified Alternate Gothic #3 (AGC) for multi letter messages and F4 (futura demi) for single characters.

4.5 Display Area: .65" x .65" Maximum.

4.6 Character Height & Message Capability: See Pages 4 and 5.

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ALL INFORMATION ON THIS SHEET IS REFERENCE ONLY AND
PERTAINS TO ACTUAL DISPLAY

LETTER/ SYMBOL HEIGHT	AVER. NO. OF CHARACTERS PER LINE	MAX. LINES PER MESSAGE	WIDTH FACTOR BASED ON AVERAGE CHARACTER	EXAMPLE OF MESSAGES	HEIGHT TOLERANCE LETTER (NON-ACCUM.)	TOTAL (MAX)
.126	(1) 7	4	5.150	C.O.D. AMOUNT TO BE CHARGED	±.010	±.025
.147	(1) 6/7	3	4.400	DRIVER LICENSE /STATE	±.010	±.025
.177	(1) 5	3	3.672	ENTER TAX TOTAL	±.010	±.025
.221	(2) 4	2	2.940	TEST LINE	±.015	±.020
.295	(2) 3		2.200	KWH	±.015	±.015
.442	(2) 2	1	1.470	MΩ	±.015	±.015
.500	(2) 1	1	1.300	\$	±.020	±.020
.562	(2) 1 (STANDARD)	1	1.000	W	±.020	±.020

(1) BI-METAL MIN TIE BAR .018, STROKE .027

(2) ETCH MIN TIE BAR .027, STROKE .036

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CHARACTER WIDTH FACTOR ASSIGNMENT CHART

(1) FOR ALTERNATE GOTHIC #3 MODIFIED BASED ON 1.000 HIGH CHARACTERS

(2) WIDTH FACTOR	1.086	.913	.820	.793	.762	.732	.700	.650	.486	.340	.182
C				A	B	C	2	E	J	1	!
H	W	M	X	Q	K	D	3	F			:
A				V	S	G	5	L			,
R				Y	4	H	6				.
A						N	7				(
C						O	8				)
T						P	9				,
E						R	0				;
R						T					
/						U					
S						Z					
Y											
M											
B											
O											
L											

- NOTES: (1) THIS CHART IS INTENDED AS A REFERENCE ONLY. THE APPROXIMATE CHARACTER HEIGHT OF THE DISPLAYED MESSAGES CAN BE DETERMINED BY FINDING THE SUM OF THE REQUIRED CHARACTER WIDTHS (SPACING INCLUDED) THEN DIVIDE THE SPACE AVAILABLE (.65 MAX) BY THE SUM OF THE CHARACTER WIDTHS. THIS WILL GIVE THE APPROXIMATE DISPLAYED HEIGHT. DUE TO MANY COMBINATIONS OF CHARACTERS IT IS NOT PRACTICAL TO SPECIFY ANY SPECIFIC NUMBER OF CHARACTERS PER LINE IN THIS SPECIFICATION.
- (2) AVERAGE CHARACTER WIDTH 0.734.
- (3) IN NO CASE SHOULD THE COMPUTED CHARACTER HEIGHT BE LESS THAN .125 INCH HIGH.

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- 4.7 Character Alignment: Horizontal and vertical registration of displayed information will be maintained within + .030" relative to center of screen.
- 4.8 Angular Alignment: The angularity of displayed information will be maintained within $\pm 2^\circ$ of the vertical center line. The vertical is defined as 60° CW from pin #1 center line, when viewed from displayed end.
- 4.9 Display Color:
- 4.9.1 Green, color code -2-, standard.
- 4.9.1.1 Fluorescence: Green
- 4.9.1.2 Persistence: Medium-Short
- 4.9.1.3 Spectral Peak: 5200 Angstroms
- 4.9.2 Display color is determined by the type of phosphor. Color code -2- is standard and provides maximum screen life. Other phosphors and colors are available on special order.
- 4.9.3 Optional Colors:
- 4.9.3.1 Color Code 3-Red
- 4.9.3.2 Color Code 4-Blue
- 4.10 Phosphor Defects: Individual blemishes in screen faceplate shall be considered a defect if they have a diameter of more than .030. Only that portion of a blemish which affects the useful display area shall be used in computing its diameter.
- 4.11 Faceplate Characteristics:
- 4.11.1 Configurations: Curved, approximately 1.125" R. (Standard T-12 Envelope)
- 4.11.2 Clarity: As molded. Bull's eye defects shall not be cause for reject unless character distortion results.
- 4.12 Useful Display Area: The useful display area is defined as the area centered on the tube screen which is not hidden behind a bezel. Message splashover is acceptable outside this area.

5.0 ELECTRICAL PARAMETERS - SERIES 6500 nimo
(Measured per Test Circuit - Figure 5)

CHARACTERISTIC

(All Electr. Parameters are referred to Cathode Potential)

UNITS

MEASURED PARAMETER @
2 KVDC ANODE POTENTIAL*

MEASURED PARAMETER @
2,5 KVDC ANODE POTENTIAL*

		MIN	TEST	MAX	MIN	TEST	MAX
5.1 Intensity: Average Measured 5 Places on Display	Foot Lambert	20					
5.2 Filament Voltage	VAC/ RMS VDC	1.60 1.60	1.75 1.75	1.90 1.90	1.60 1.60	1.75 1.75	1.90 1.90
5.3 Filament Current @ 1.75 Vac rms	AMPS ±10%		0.700			0.700	
5.4 Anode Current (One Message = Displayed)	MICRO AMPS	10		100			125
** 5.5 Aperture Grid (OFF) Isolation Resistance R4 (Figure 5)	OHMS ±50%		470K			470K	
** 5.6 Blanking Grid (OFF) Isolation Resistance R3 (Figure 5)	OHMS ±50%		For power supply protection			470K	
** 5.7 Aperture Grid (ON) Isolation Resistance R1 (Figure 5)	OHMS ±20%		For power supply protection			470K	
** 5.8 Blanking Grid (ON) Isolation Resistance R2 (Figure 1)	OHMS ±20%		For power supply protection			470K	
5.9 Aperture Grid "OFF" Control Voltage (No Display)	VDC	-12.5	-12.5	-16	-14	-14.0	-18
5.10 Blanking Grid "OFF" Control Voltage	VDC	-12.5	-12.5	-16	-14	-14.0	-18

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5.0 ELECTRICAL PARAMETERS - SERIES 6500 Himo Continued
(Measured per Test Circuit - Figure 5)

CHARACTERISTIC

(All Electr. Para-meters are referred to Cathode Potential)

	UNITS	MEASURED PARAMETER @ 2 KVDC ANODE POTENTIAL*			MEASURED PARAMETER @ 2.5 KVDC ANODE POTENTIAL*		
		MIN	TEST	MAX	MIN	TEST	MAX
5.11 Aperture Grid "ON" Control Voltage (Full Display)	VDC	+ 2.0	+2.5	+ 3.0	+ 2.0	+2.5	+ 3.0
5.12 Blanking Grid "ON" Control Voltage (Full Display)	VDC	+ 2.0	+2.5	+3.0	+ 2.0	+2.5	+ 3.0
5.13 Aperture Grid "OFF" Control Current (No Display)	MICRO AMPS			0.25			0.25
5.14 Blanking Grid "OFF" Control Current (No Display)	MICRO AMPS			0.25			0.25
5.15 Aperture Grid "ON" Control Current (Full Display)	MICRO AMPS			2.0			2.0
5.16 Blanking Grid "ON" Control Current (Full Display)	MICRO AMPS			20.0			20.0

** As close to socket as possible
* Anode voltage measured at tube socket

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6.0 ENVIRONMENTAL CHARACTERISTICS

- 6.1 Vibration: 10-50-10 cps at 0.06 inch
Double amplitude on all three
axis.
- 6.2 Shock: 35 g magnitude;
11 millisecond duration
- 6.3 RFI: Meets MIL-I-26600 requirements
- 6.4 Operating Life: (Green, standard phosphor only).
The limit of useful life for the nimo display
is defined as the point at which the intensity
has degenerated to a measured value of 50%
of the original intensity. (This represents
a 25% reduction in visual intensity). This
time span is a function of the phosphor deteri-
oration rate. Expected life is therefore
dependent upon phosphor type and average
beam current density. All life data con-
tained herein is related to the standard,
green phosphor which produces maximum useful
life as defined above.
- 6.4.1 The rated useful operating life of the
Model 6500 nimo is given by Table 1
for three operating conditions:

RATED LIFE (COLOR CODE)	ANODE VOLTAGE	BRIGHTNESS	
		INITIAL	FINAL
-2-			
20,000 HRS	1.75 KVDC	10 FL	5 FL
15,000 HRS	2.00 KVDC	20 FL	10 FL
10,000 HRS	2.50 KVDC	40 FL	20 FL

- 6.5 Operating Temperature Range: 0°C to +85°C
- 6.6 Humidity: Up to 95% relative humidity
- 6.7 Storage Temperature Range: -20°C to +125°C

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7.0 MECHANICAL CHARACTERISTICS (Ref. Figure 6)

7.1 Operating Position: Any

7.2 Envelope: Standard, Tl2ZD1, Lime Glass

7.3 Base: 26 Pin (Ref. Figure 7)

PIN NO.	FUNCTION	
14	Aperture Control Grid No. 1	
1	Aperture Control Grid No. 2	
12	Aperture Control Grid No. 3	
2	Aperture Control Grid No. 4	
11	Aperture Control Grid No. 5	
3	Aperture Control Grid No. 6	
9	Aperture Control Grid No. 7	
5	Aperture Control Grid No. 8	
4	Blanking Grid No. 1	
20	Blanking Grid No. 2	
21	Blanking Grid No. 3	
7	Blanking Grid No. 4	
22	Blanking Grid No. 5	
23	Blanking Grid No. 6	
10	Blanking Grid No. 7	
13	Blanking Grid No. 8	
6	Filament Voltage	Pin No. 24 & 25
15	Filament Voltage	are internally
17	Anode Voltage	connected and
		maybe used for
		electr. interlock
		purpose.

7.4 Physical Size: Reference Figure 6

7.5 Socket: IEE Part Number 21049 (Reference Figure 8)

8.0 MARKING

The IEE 6500 Series nimo shall be legibly and permanently identified with:

IEE's Trademark
The Trade Name "nimo"
Model Number
Color Code
Mask Number
Country Manufactured
IEE's Address
Patent Information
Manufacturing Code

OPTIONAL: Customer Part Number upon special request only.

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FIGURE 1

ANODE VOLTAGE vs DISPLAY INTENSITY

NOMINAL VALUES FOR SINGLE IMAGE
 .56 HIGH WITH STROKE WIDTH OF
 APPROX. .08 WIDE

INTENSITY (FL)

1000

100

10

1.0

RECOMMENDED
 OPERATION
 LIMIT

ANODE VOLTAGE

REV I S 6500-1X
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EUGENE DIETZEN CO.
 MADE IN U. S. A.

NO. 340R-LS10 DIETZEN GRAPH PAPER
 5 CYCLES X 10 DIVISIONS PER INCH

SP H & Q - Y O 8
 A I J R / Z 1 9
 B ¢ K ! S 2 :
 C . L \$ T , 3 #
 D < M * U % 4 ©
 E (N) V _ 5 '
 F + O ; W > 6 =
 G I P 7 X ? 7 "

FIGURE 2

nimo # 6500-IX-0103

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SCALE FULL

REV D

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© P SP O H X (8
 A Q ! 1 I Y) 9
 B R " 2 J Z * :
 C S # 3 K E + ;
 D T \$ 4 L \ , <
 E U % 5 M] - =
 F V & 6 N ^ · >
 G W ' 7 O _ / ?

FIGURE 3

nimo # 6500-1X-0104

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SCALE

FULL

REV

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FIGURE 4

nimo #6500-1X-0107

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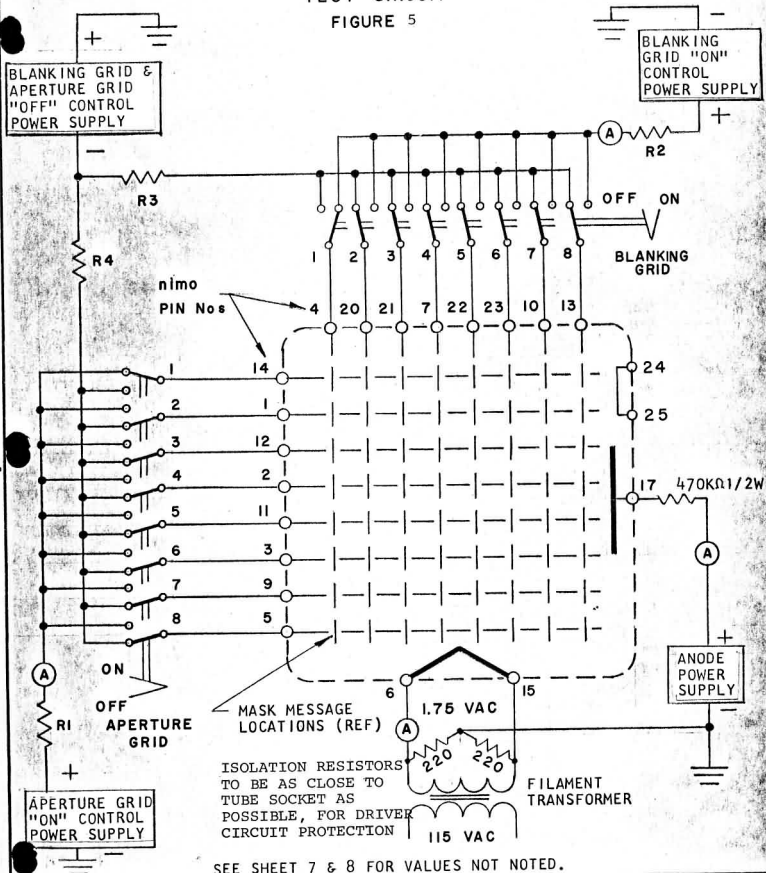
SCALE FULL

REV D

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TEST CIRCUIT

FIGURE 5



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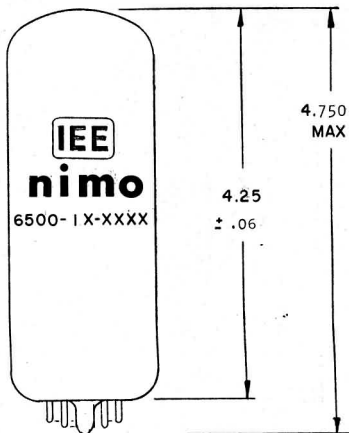
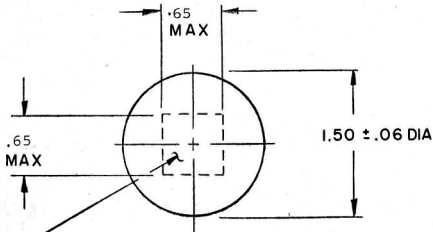
S 6500-IX

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REV E

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MESSAGE
DISPLAY
AREA



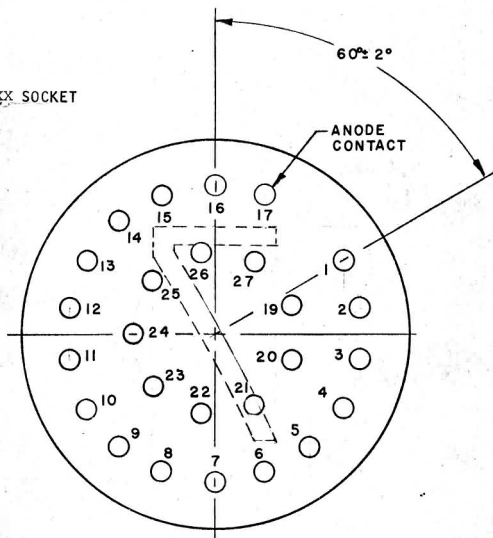
SEE SHEET 17 FOR
PIN ORIENTATION
AND ANODE CONTACT

FIGURE 6

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PINS MATE WITH
IEE P/N 21049-XX SOCKET
(SEE FIG. 8)



PIN LAYOUT
REAR VIEW

FIGURE 7

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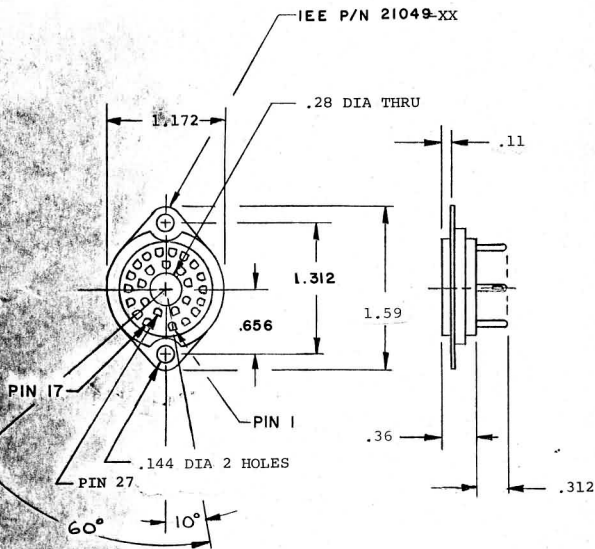
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NOTE: ALL DIMENSIONS REF

FIGURE 8

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