

nimoTM

display tubes



Single



Six Decade



Four Decade

An Industry first from



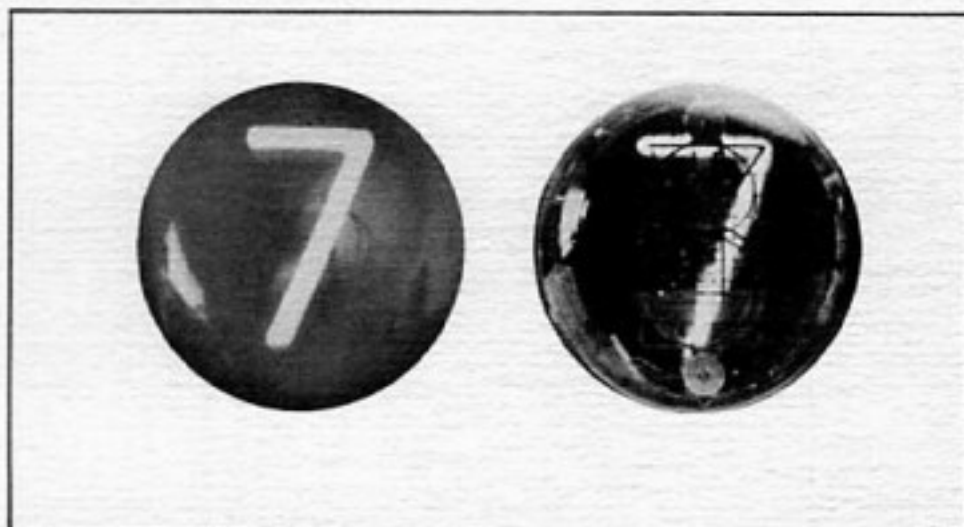
Nimo . . . a 10 Gun CRT providing a numerical display unsurpassed in brightness and clarity • Independent character control • Superb legibility in direct sunlight • Powerless control grid switching • Extremely low power consumption (under 300 milliwatts) • Low voltage character selection • Exceptionally wide viewing angle • Easily controlled brightness with no external focusing required • The ultimate for your readout applications, from one through six decades.

All About nimo

The Nimo display tube developed by IEE employs a unique concept which combines the display characteristics of the CRT with the character generation philosophy of the rear projection readout. Fundamentally, Nimo is a 10 gun cathode ray display tube.

Nimo offers inherent advantages not characteristic to other commonly used numerical display devices. Among these are:

- Appearance and wide viewing angle
- Single plane display
- Color and special character availability
- Minimum power dissipation
- High intensity presentation
- Easily variable display brightness
- High reliability
- High impedance control interface
- Time sharing capability
- Near zero RFI generation (per MIL-I-26600)

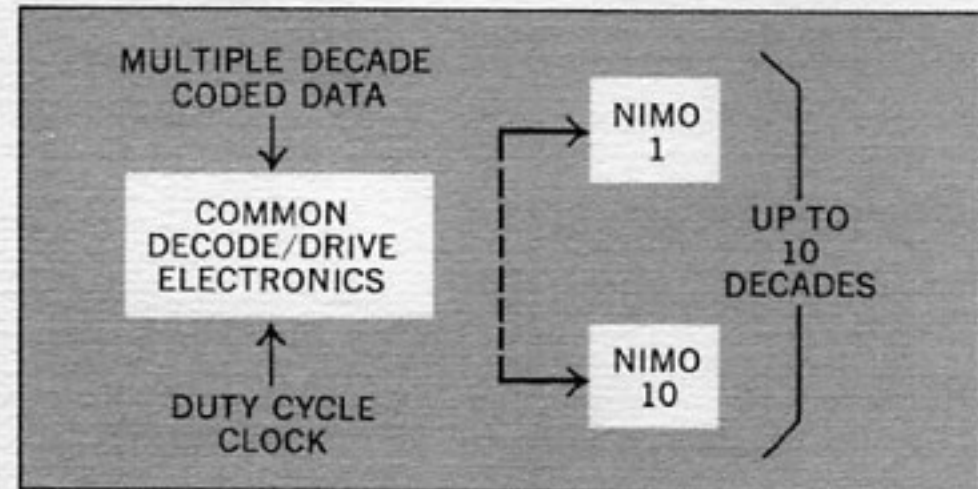


Optimum Legibility – Each gun of the 10-gun Nimo is independent. Every character appears on the same sharp, clear plane, no image ambiguity, no ambient light worries, no external positioning or focusing.

Short Term Storage Characteristics

One of the unique advantages of Nimo is its ability to store information temporarily. This feature results from the relatively long decay time of the phosphor screen once excited. Thus, if a character position is actuated with a pulse, the character will remain on the screen for a period of time after the control signal is removed. This is exactly the same phenomena used to develop an oscilloscope or television picture.

This retention time, once the character is activated, is independent of control grid bias or filament voltage. Thus, it is possible to remove all input information from the tube and maintain the character display for brief periods.



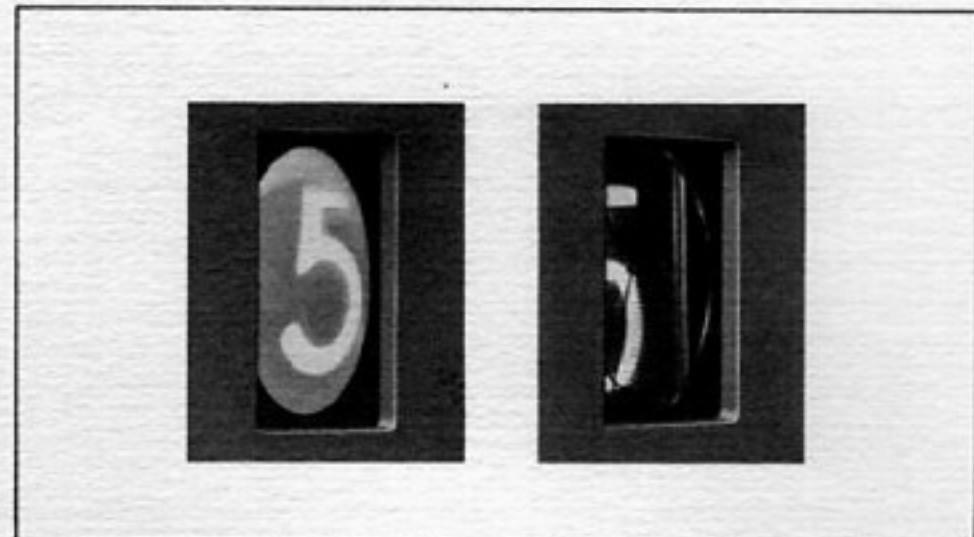
Temporary Data Storage – The P-31 phosphor has a decay time of 10 ms before a 25% loss of intensity is noticeable. A pulse-actuated character will remain on screen after the control signal is removed. A duty cycle of 10% or more is enough to maintain ample brilliance.

Multiple Decade Presentation

The IEE MODEL SA Nimo has been developed to display FOUR DECADES of data while the MODEL BA Nimo is intended for SINGLE DECADE presentation.

The two devices are structurally identical except for an abbreviated anode in the MODEL SA Nimo. This fore-shortened anode structure coupled with smaller characters (0.625 inch – BA; 0.35 inch – SA) allows the shaped beam of the Model SA Nimo to be *electromagnetically deflected* from its normal center-screen target; thereby displaying multiple decades. Consequently, four decades of 0.35 inch high characters are uniquely displayed on the face of the SA Nimo.

Beam deflection, decade channel selection, blanking, and BCD to decimal decoding are provided by IEE Model 7700-04 Display Logic.



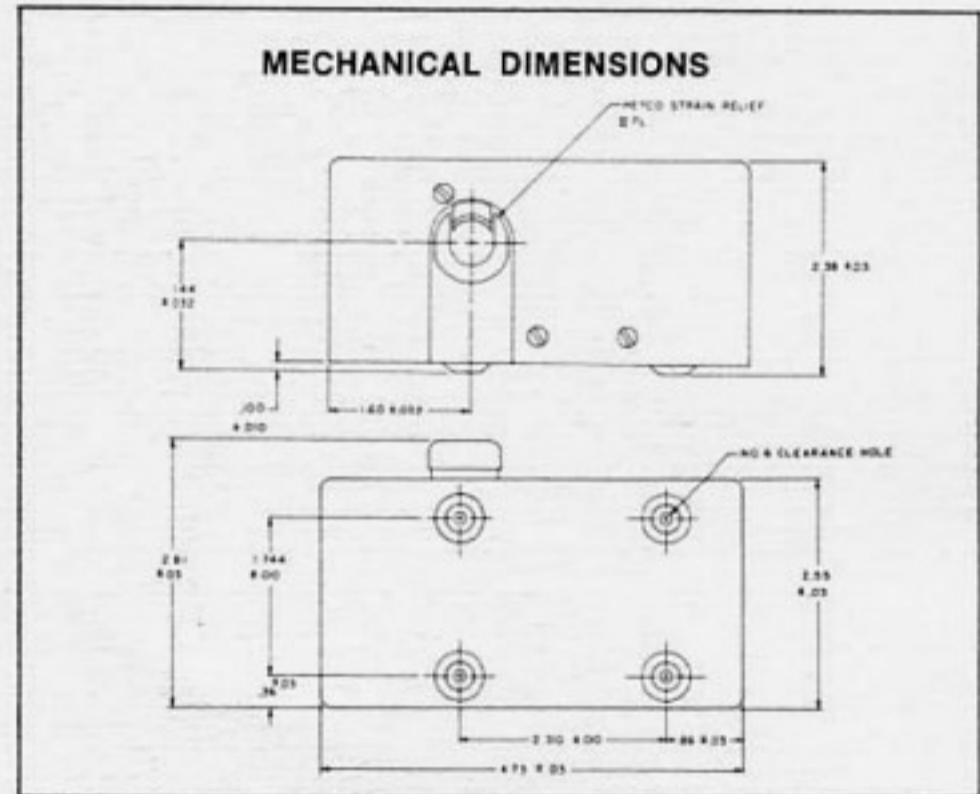
Wider viewing angle – The Nimo CRT uses a single etched mask to collect and shape beams of electrons into characters. Because the resulting image is *on* the screen, not on different planes behind it, the viewing angle approaches 180°.

Electro/Mechanical Characteristics

Electrical — Models BA and SA Nimo

Filament voltage, AC or DC	1.1V ± .15V
Filament current	0.2 A
Anode voltage (Normal, BA only)	1750 VDC
Anode current (Normal, BA only)	30 microamps
Normal brightness (Note 1)	100 FTL
<small>(For other than normal intensities refer to brightness vs. anode voltage curve.)</small>	
Grid voltage (Cut-Off) (Note 2)	-4.0 VDC
Selected grid voltage (Full "On") Note 3,	+3.5 VDC

Note 1— Tubes will not be replaced as a result of burned phosphor.
 Note 2— Negative grid voltage in excess of 20V not recommended.
 Note 3— Positive grid voltages drawing more than a few microamps of grid current may cause permanent screen damage.



Phosphor (Standard)	P31
Other phosphors available on special order	
Fluorescence	Green
Persistence	Medium

Environmental — Models BA and SA Nimo

(Results of preliminary tests)

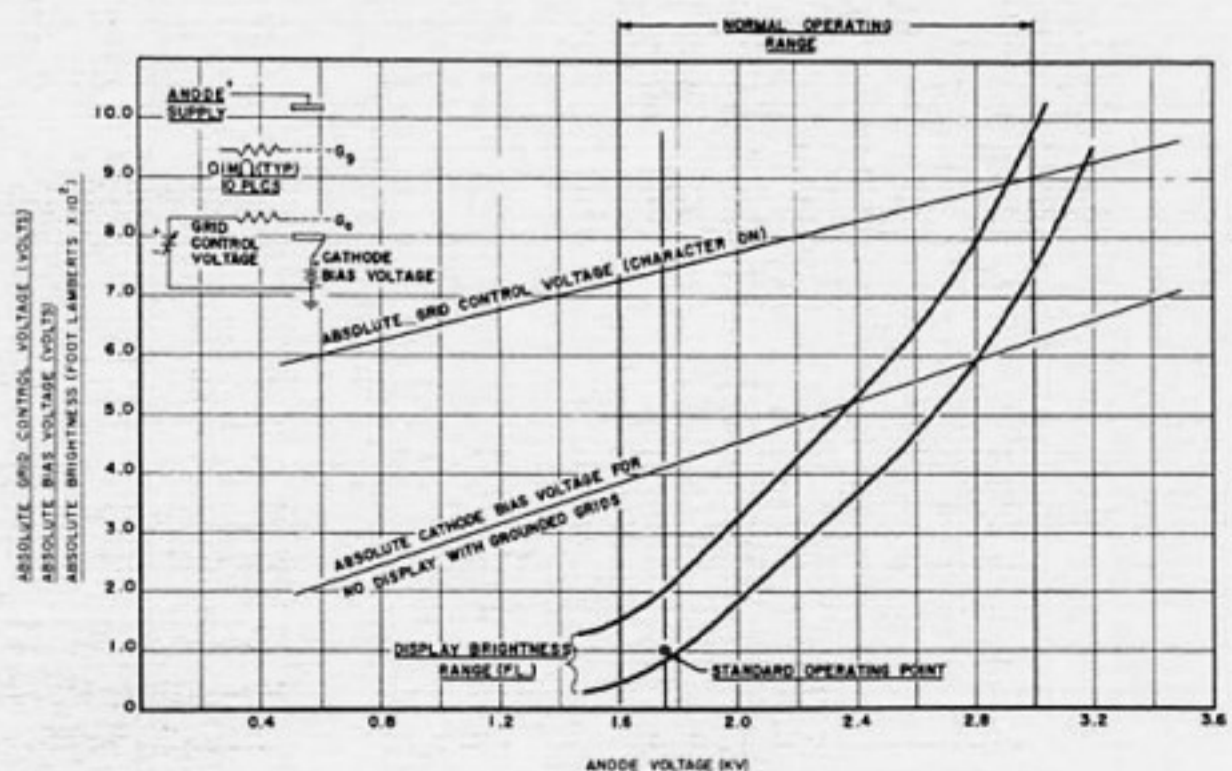
Vibration	10-50-10 cps at .06" D.A. x1, x2 and x3 axis
Shock	100g's 11 milliseconds
RFI	MIL-I-26600
Life	Calculated to be 25,000 hours at nominal brightness (Ref. VT/1002)

Power Supply Specifications

Input Voltage	117 VAC
Input Current	90 ma
Input Frequency	60 Hertz
Output Anode Voltage (one Nimo), Max.	3.2 KVDC
Output Anode Voltage (10 Nimos), Max.	2.4 KVDC
Output Filament Voltage	1.1 VAC

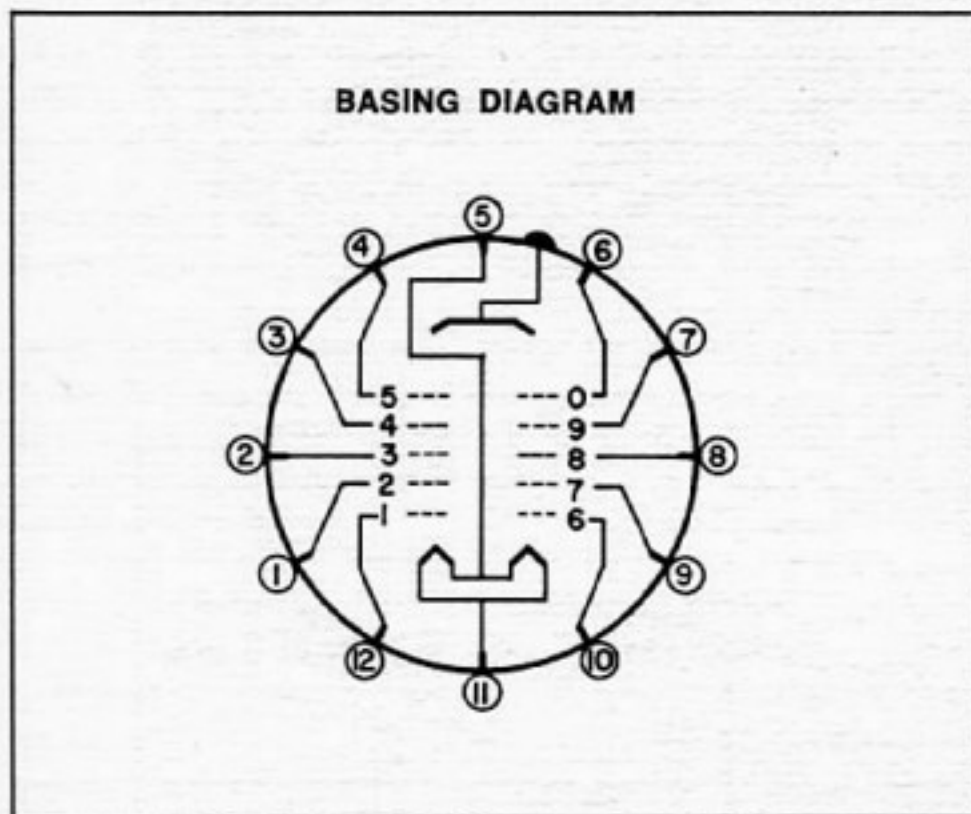
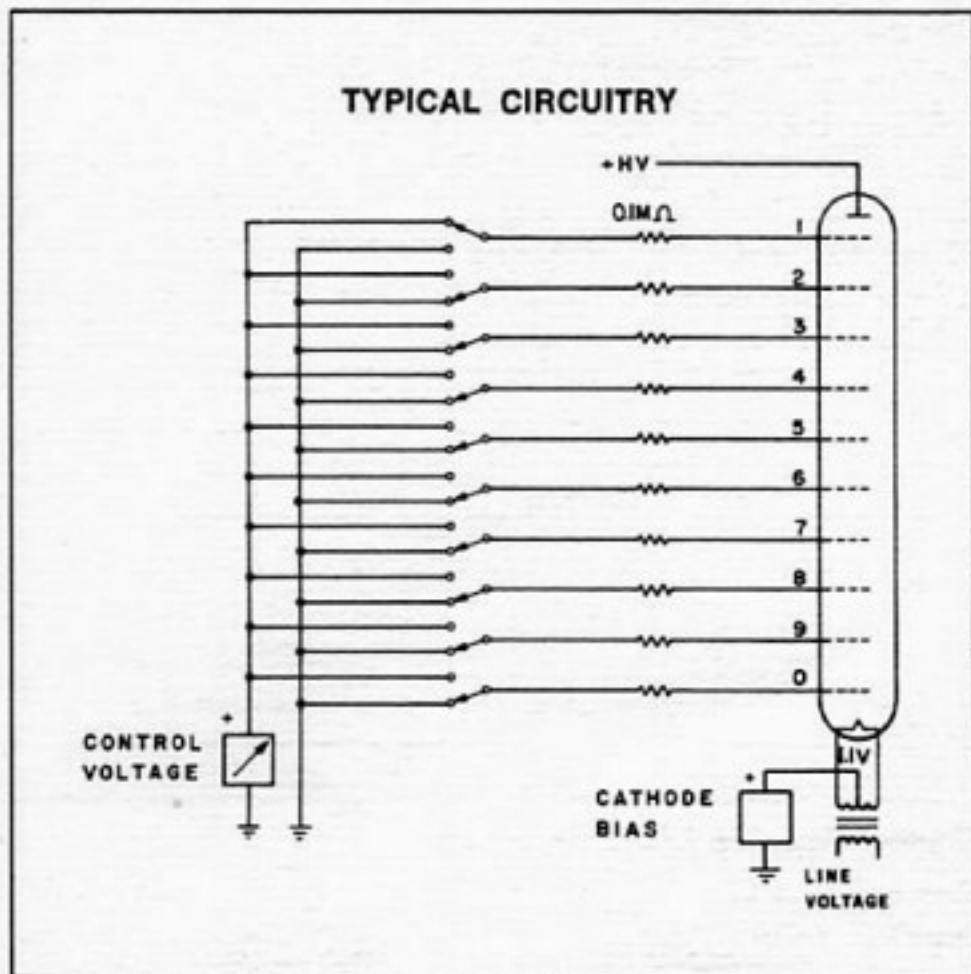
NOTE: 1. Power supply will operate a maximum of 10 Nimos.
 2. Output voltage internally adjustable to be set at desired range. Rheostat or equivalent may be used for external brightness control.
 3. Other power supply configurations available on request. Consult factory.

NIMO CHARACTERISTICS MODEL BA



nimo

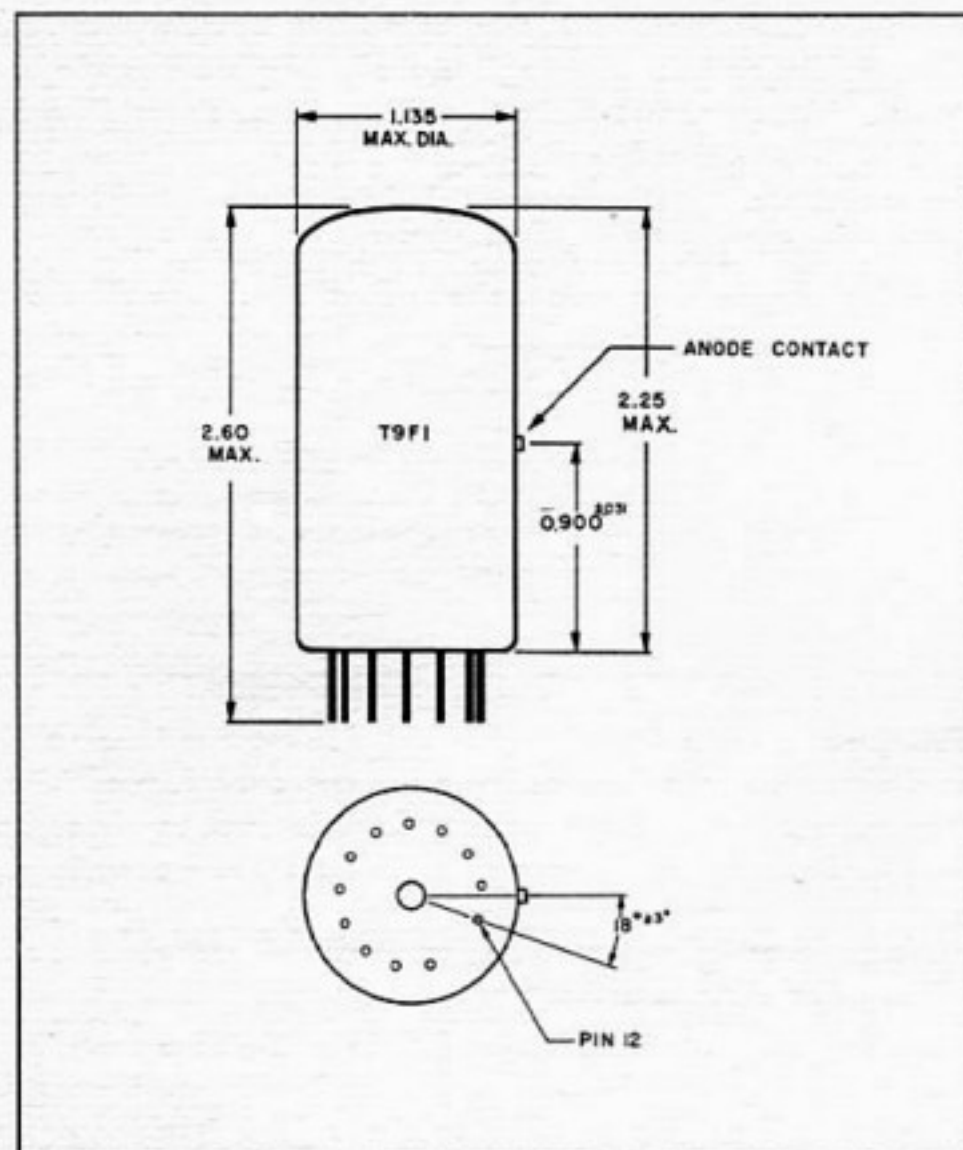
Decimal Input



Terminal Connection

Pin 1.....Number 2	Pin 7.....Number 9
Pin 2.....Number 3	Pin 8.....Number 8
Pin 3.....Number 4	Pin 9.....Number 7
Pin 4.....Number 5	Pin 10.....Number 6
Pin 5.....Filament	Pin 11.....Filament
Pin 6.....Number 0	Pin 12.....Number 1

Mechanical Characteristics



Display Characteristics — Model BA Nimo

Maximum number of Characters	10 (0-9)
Character Height	5/8 inch
Character Style	News Gothic III

(For other styles or symbols, consult IEE.)

Mechanical Characteristics

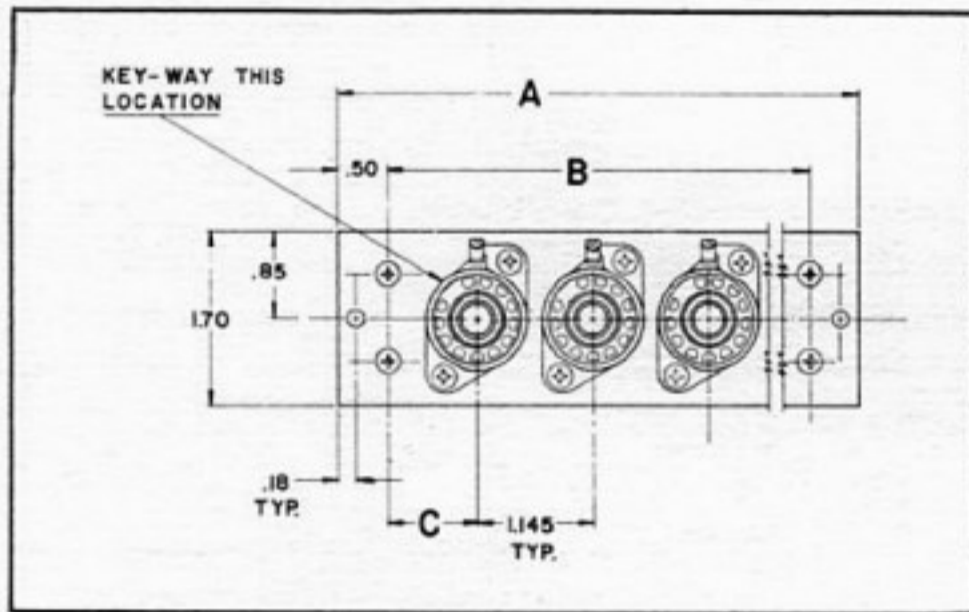
Operating position	Any
Envelope	T9 F 1 Special Top, Glass
Base	12 Pin
Anode connection	Side Button
Socket	Compactron
Maximum outside diameter	1.135"
Maximum overall length	2.60"
Seated height	2.25 ± 0.032"

Reference VT/1002 for life data.

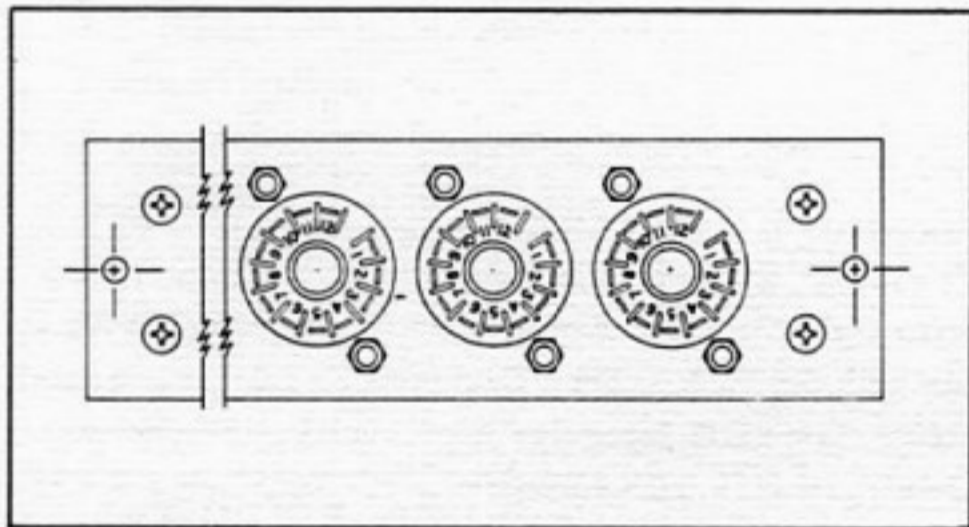
Mounting Hardware

Mounting hardware for assemblies of 1 through 10 units is considered standard, and is available from stock.

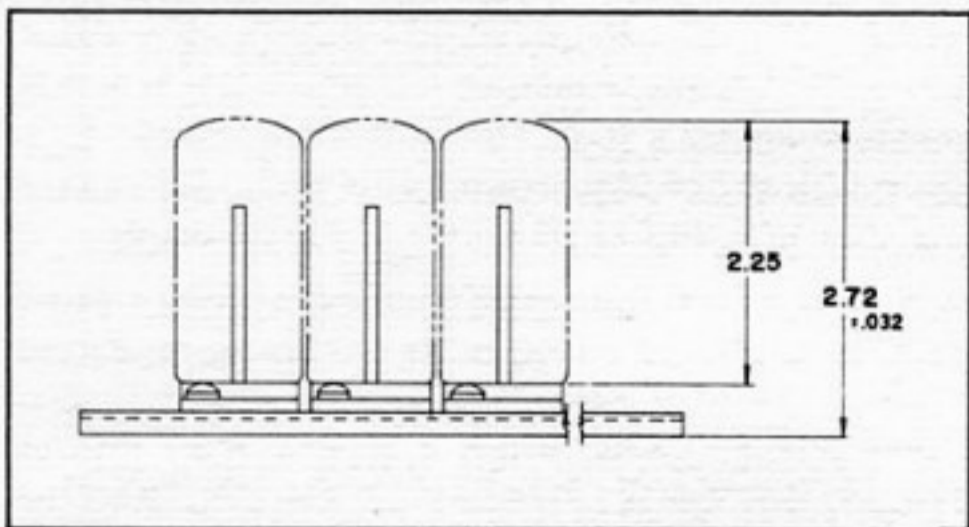
Assembly Installation



Mounting bracket (front view)

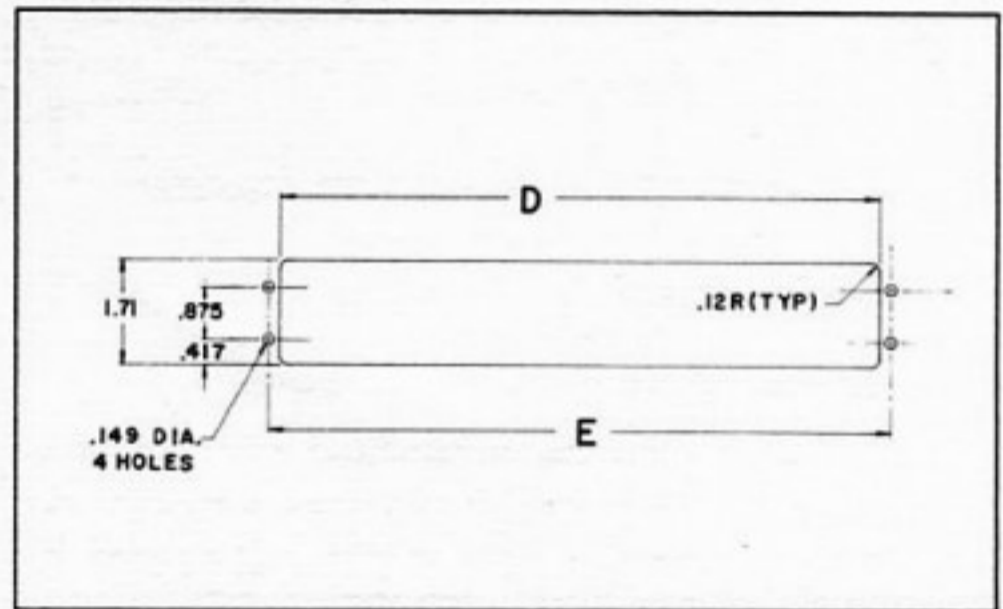


Mounting bracket (rear view) (note location of key-way.)



Mounting bracket (top view) shown with anode contacts in place.

Note: All dimensions are shown nominal.



Suggested customer panel cutout and mounting dimensions. Panel thickness .06-.25.

NO. OF NIMO UNITS IN ASSEMBLY	±.02 A	±.010 B	±.010 C	±.010 D	±.010 E
1	2.86	1.86	.930	1.46	1.86
2	3.93	2.93	.892	2.53	2.93
3	5.19	4.19	.948	3.79	4.19
4	6.33	5.33	.948	4.93	5.33
5	7.67	6.67	1.046	6.27	6.67
6	8.67	7.67	.971	7.27	7.67
7	9.66	8.66	.896	8.26	8.66
8	10.91	9.91	.948	9.51	9.91
9	12.47	11.47	1.156	11.07	11.47
10	13.54	12.54	1.118	12.14	12.54

Time Sharing

Time sharing Nimo (Reference VT/1001) is relatively simple due to Nimo's low power control characteristics. The following example has been developed relative to a 10-decade display to demonstrate the recommended circuit approach. No special considerations are required, as the standard Model BA Nimo is used.

Referring to Figure 1, the display logic is comprised of six basic elements. These are:

1. Input data channel gating
2. Data decoding
3. 10 Model BA CRT displays (like grids connected common)
4. Cathode bias control
5. Scan rate control circuitry
6. Filament and anode supplies (not shown)

Display information from ten remote BCD data sources is gated to the decoder through ten input data gates (1). This data may be changing at any rate as long as one complete scan cycle is allowed without a data value change before a static display is presented. The data to be displayed is selected by a *channel selection pulse* which is derived from the *Scan Rate Control* (5). Anode and filament voltages are derived from the respective sources.

A compatible pulse train is supplied to the *Scan Rate Control Circuit* (Note 1). This circuit produces 10 sequential signals stepped at the clock rate. Each of the 10 sequential outputs is connected to its respective *Cathode Bias Control* circuit. When each sequential output of the scan rate control is active, its output becomes low (0 volts). This output is connected to the *Cathode Bias Control* through resistor R2 and reduces the potential at the respective filament transformer center tap by the ratio of $\frac{V_b R_2}{R_1 + R_2}$ since no current is drawn by the filament transformer.

Because of the inherent phosphor decay rate, this system can be used to scan through an array of Model BA CRT display tubes at speeds in excess of 1 millisecond per tube as long as the duty cycle is maintained at 10% or greater. The result is greatly reduced control hardware costs with no degradation of performance.

The values of resistors R1 and R2 are adjusted to produce +6 V (Note 2) on the cathode of the selected display tube

Note 1: Scan rate clock to provide 1.0 ms min. on time/Nimo.

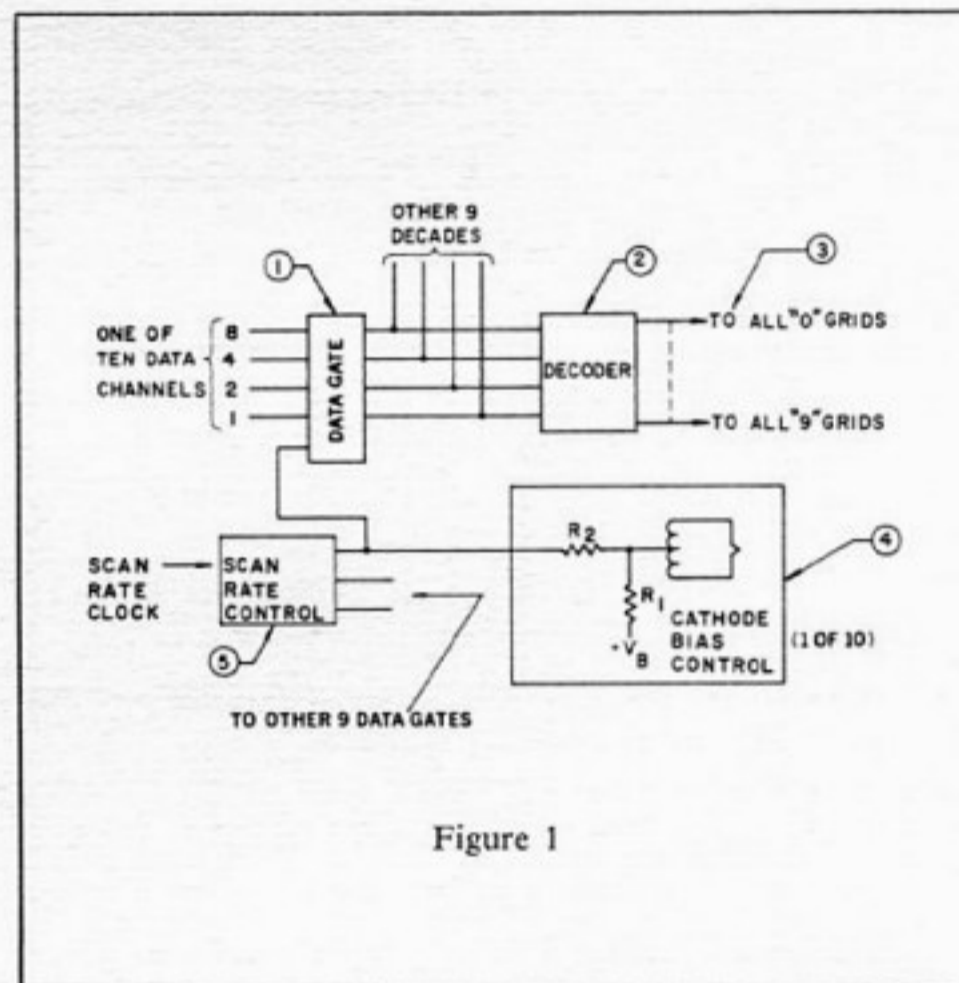


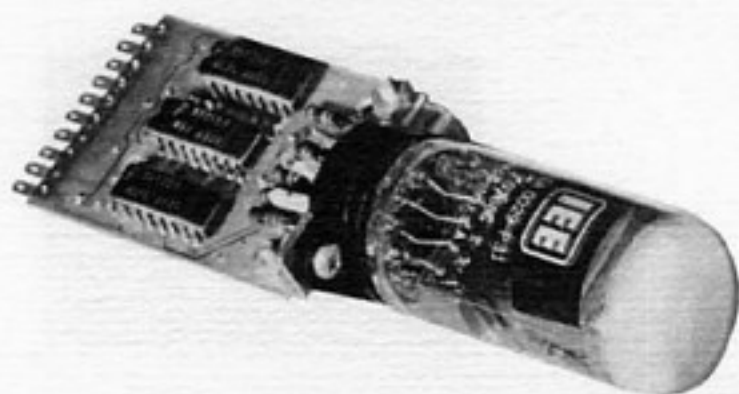
Figure 1

with respect to ground. V_b is selected to provide +18 V on the cathode, with respect to ground, when any tube is *not* selected and R2 is returned to an effective open circuit. A Nimo tube with +6 volts on the cathode (referred to ground) will display characters associated with control grids having a potential of +10 volts or greater (with respect to ground). Grounded grids will "see" a -6 volt bias and will be at "cut-off."

Raising the cathode voltage to +18 volts (reference ground) will inhibit normally selected grids; [10 V (selected grid) - 18 V (cathode voltage) = -8 V bias]. It is thus possible to display a single character on any desired CRT even though all like grids are connected in common and the same data is applied to all ten CRTs simultaneously.

The selection gate generated by the *Scan Rate Control* is also used (after inverting) to decode the proper decade for display on the selected CRT. Since the synchronization is automatic, no special timing is required other than as previously described in reference to the scan cycle. Also, the data may be updated asynchronously without any noticeable error in display. This, since the eye will not perceive a symbol displayed for 1/10 of a second.

Note 2: Voltages given are approximate—see characteristic curves for additional data.



Integrated Circuit Driver/Decoder

The driver/decoder is designed to complement the Nimo display by providing a "complete package," with high performance at low cost.

These particular driver/decoders are designed for BCD to decimal conversion through use of medium scale integration (complex electronic functions). The use of MSI provides for low power consumption, high reliability and system interface compatible with the latest integrated circuits.

The driver/decoders are of two types: with and without data storage.

1. Driver/Decoder without data storage — In this unit the output will directly follow the data at the input. Furthermore, the unit has forbidden code rejection causing the display to blank out when the equivalent decimal input is larger than 9. The input is compatible with DTL and TTL families of integrated circuits.

2. Driver/Decoder with data storage — This unit provides for additional address input to permit data entry. Once the data has been entered into the decoder, further changes in the data will not affect the output (display).

The address input consists of a single strobe pulse for data entry. This strobe pulse must coincide in time (minimum of 1.0 microsecond) with the data. Also, this model incorporates forbidden code rejection as described for the driver/decoder without data storage.

All Nimo driver/decoders are designed for optimum performance between +5°C to +55°C. (For extended temperature ranges, consult IEE.)

Most units utilize a single glass epoxy board construction for ease of maintenance

A comprehensive technical explanation of driver/decoder characteristics and applications is available in the IEE Driver/Decoder Manual (consult Factory).

In addition, complete product specifications for each driver/decoder are available. Each product specification lists full details on power requirements, physical characteristics, data input levels and other important parameters for proper system interface.

GENERAL SPECIFICATIONS

Integrated Circuit Type Driver/Decoder

SINGLE STATION MODELS AVAILABLE

7700-06	7700-08
7700-07	7700-09

BCD input code — Typical Input Levels

Binary "1"	+2.5 to +5.5 VDC
Binary "0"	−0.5 to +1.0 VDC

DECODING FORMAT				
CODED DATA				EQUIVALENT* DECIMAL DIGIT
8	4	2	1	
0	0	0	0	0
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
0	1	1	1	7
1	0	0	0	8
1	0	0	1	9
1	0	1	0	NOT POSSIBLE
1	0	1	1	
1	1	0	0	
1	1	0	1	
1	1	1	0	
1	1	1	1	
1	1	1	1	

*Reference only, character is function of Nimo mask

Typical signal interface (DTL, TTL compatible)

Data input level	Data current
+0.5 VDC	−2.0 ma
+5.0 VDC	+60 ma

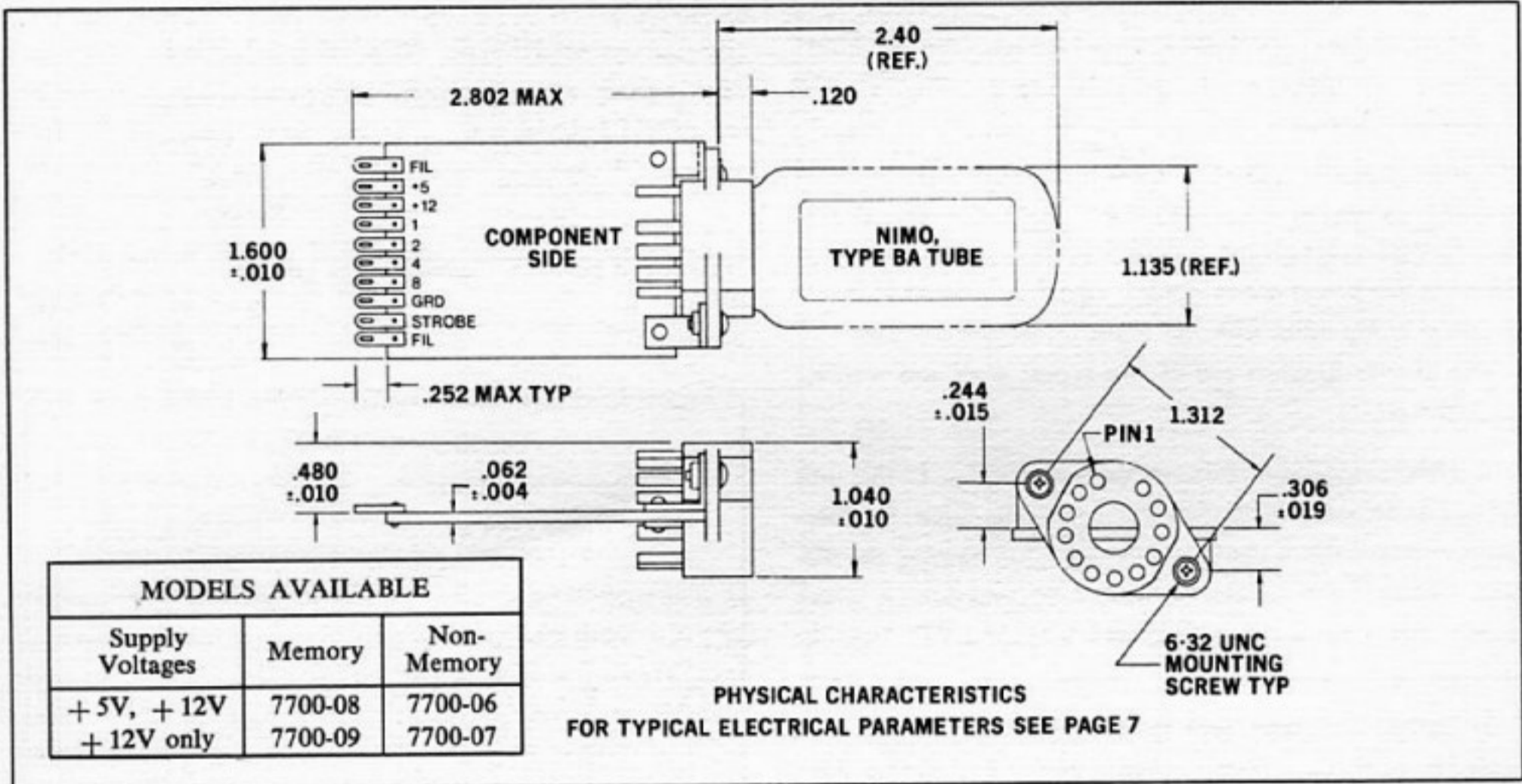
Typical Power Requirements

Logic Supply	
Voltage	+5.0 VDC
Current	+40 ma

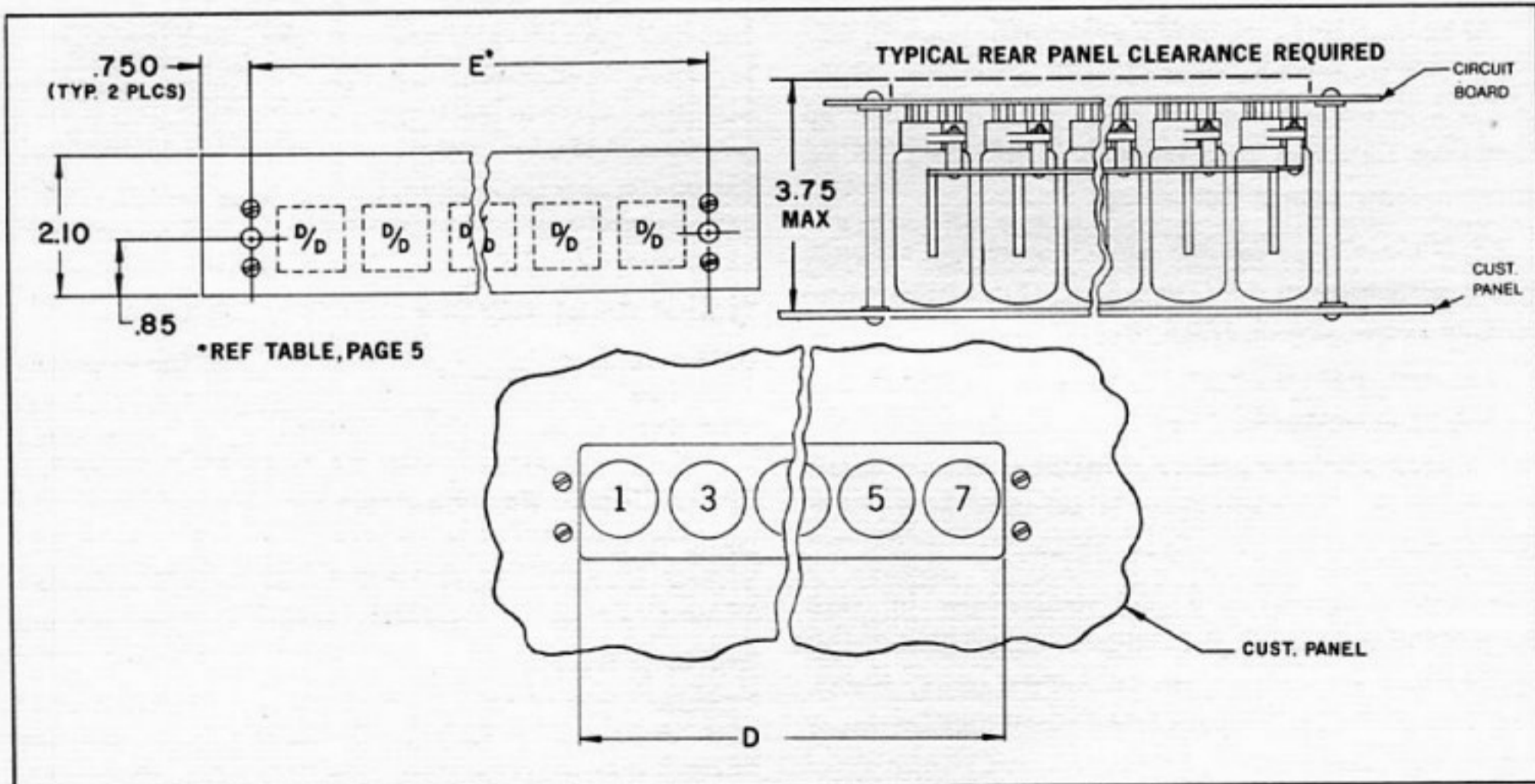
Grid Drive Supply	
Voltage	+12.0 VDC
Current	+37 ma
Physical characteristics ..	see page 8 for typical dimensions

nimo

Integrated Circuit Driver/Decoder



Other driver/decoder configurations and styles are available.
Shown below is a typical multiple station assembly. Consult factory for detailed data and part numbers.





Four Decade Numerical Display (Ref VT/1003)

A complete four decade display system using the IEE Model SA Nimo is diagrammatically shown in Figure 2. The display is comprised of:

1. IEE Model SA Nimo (1 required)
2. IEE Model 7700-04 Display Logic (1 required)
3. IEE Model 7900-03 Assembly (1 required)

The display logic module (7700-04) includes the beam deflection and data decoding circuitry. The logic module is intended to mount remotely. Figure 1 defines the mechanical configuration of the Model 7900-03 Assembly.

The display logic is divided into three independent functional blocks:

- a) Sequence control
- b) Yoke control
- c) Data decoding

The sequence control accepts a "Decade Control Clock" (reference Figure 3). This clock steps a "Mod-4 Counter" (1) on Figure 2, the output of which is decoded (2) and inverted (3) to produce "Channel Control Gates" 1 through 4. These gates are used to select the decade (or channel) to be displayed as well as position the character via the "Yoke Control" (5). The "Decade Control Clock" is also used to generate the "Blanking" pulse (4). This pulse provides "Z" Axis modulation to interrupt the Nimo beam while the "Decade Control Clock" is low by driving the cathode positive, thereby biasing all grids to cutoff. When the "Decade Control Clock" is high the "Blanking" pulse is removed and the control grid voltage levels are determined by the "Data Decoder" (6).

The "Yoke Control" (5) combines the first two outputs of the "Mod-4 Counter" with the 4 "Channel Gates" to control the magnitude and direction of the current through the yoke. The current changes in four steps from a positive to a negative through the yoke, causing the beam to be magnetically deflected from left to right across the face of the Nimo.

The "Data Decoding" section (6, Fig. 2) accepts 4 line BCD data (true terms) and decodes to decimal, inverts and drives the Nimo control grids. Since only a single set of ten grids is used (allowing the decoder to be time shared) all four data channels (decades) must be digitally multiplexed onto four common lines as shown by Figure 2. The channel gate signals are used to select the channel or decade to be displayed.

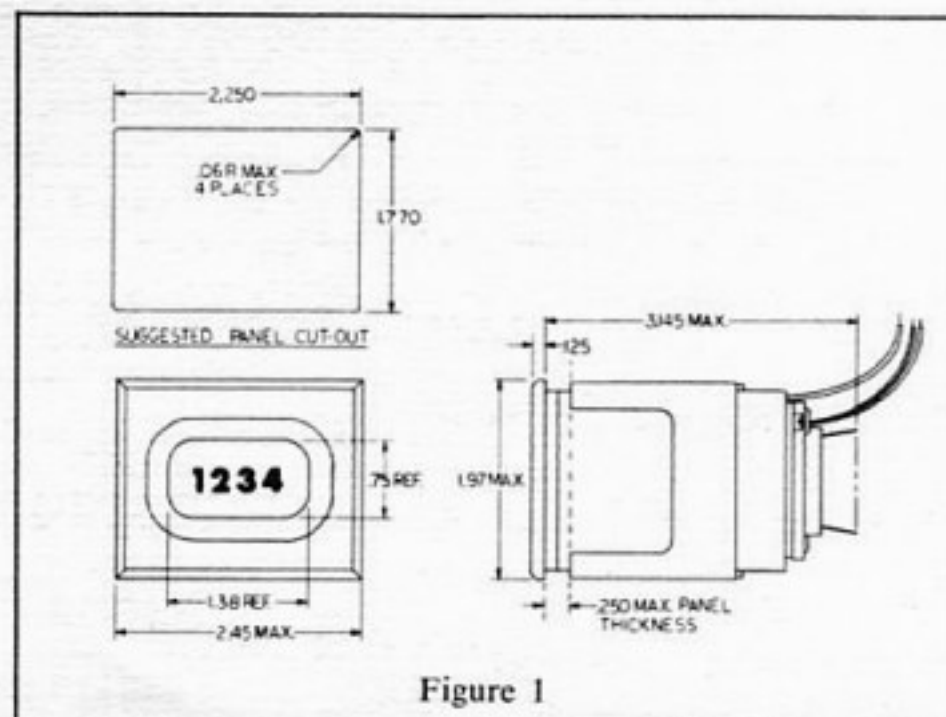


Figure 1

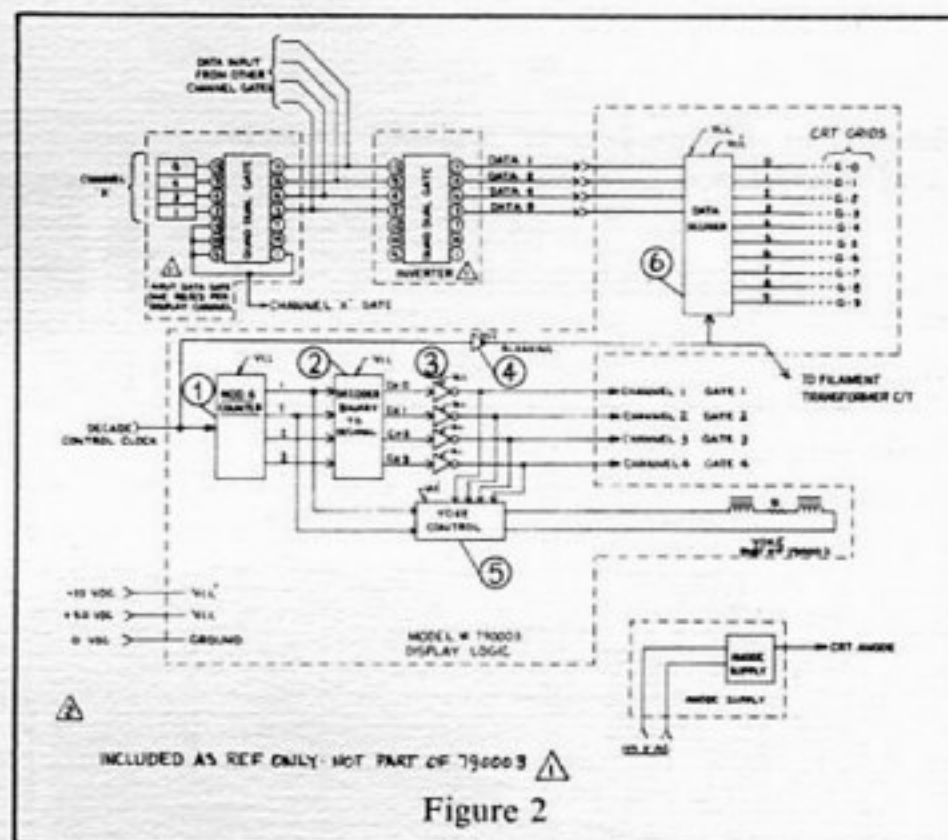


Figure 2

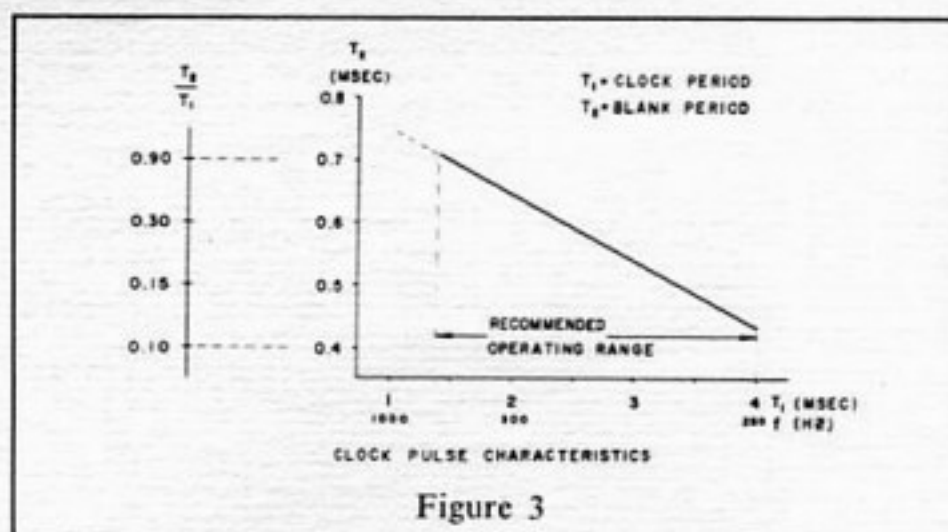


Figure 3

Ordering and Pricing Information

To order Nimo single decade

1. Tube Type BA 0006 P31

2. Character Display No. 0006 (0-9)*

3. Phosphor Color _____

Standard colors are
Green (P31), Blue (P7), and Red (P27).
For other types of phosphors contact IEE.

*Contact the factory for other standard character sets. If a new character mask is desired, a set-up charge is required on your first order.

To order Nimo four decade

	MODEL NUMBER	
STANDARD FOUR DECADE NIMO	SA - 0029 - P31	20.00
MOUNTING HARDWARE, SCREEN BEZEL AND YOKE	7900-03	20.00
REMOTE SWEEP LOGIC AND NON-MEMORY DECODER	7700-04	62.57
DISPLAY SYSTEM (includes above 3 units)	7900-14	102.57

To order Nimo power supply bezels and mounting hardware

No. of Nimo positions 5K** - 01 - 50

Mounting Kit _____

Bezel Color _____

Type of Power Supply _____

** Mounting hardware (K) is 2.00 per station.

AVAILABLE BEZEL COLORS	
Bezel assembly color code:	Similar to the following Fed. Std. No. 595 color Nos.
01 Slate HC	26231
02 Black HC	26044
03 Smoke Grey HC	26280
04 Light Grey HC	26357
05 Sand HC	23690
06 White HC	27875

To order individual power supply

specify part number and dash number as below.

Part No.	Input		Freq.	Output	Filament
	Voltage	Current			
14549-50	117 VAC	90 mA	60	3.2 KVDC	1.1 VAC
14549-51	6.3 VAC	1.7 A	60	3.2 KVDC	1.1 VAC
14549-52	220 VAC	48 mA	50	3.2 KVDC	1.1 VAC
14549-53†	117 VAC	90 mA	60	3.2 KVDC	1.1 VAC

† Floating Ground

Nimo Pricing (1-9)

MODEL	DESCRIPTION	PRICE
BA-0006-P31	Single Decade Nimo	20.00
SA-0029-P31	Four Decade Nimo	20.00
14549-50	Power Supply	18.00
14549-51	Power Supply	18.00
14549-52	Power Supply	18.00
14549-53	Power Supply	25.00
1-4 STA.	Bezel	5.00
5-8 STA.	Bezel	7.50
9-10 STA.	Bezel	10.00
7900-03	Mounting Hardware	20.00
7700-04	Remote Logic/Decoder	62.57
7900-14	Display System	102.57
7700-06***	Non Memory Decoder	35.00
7700-07	Non Memory Decoder 12V	35.50
7700-08***	Memory Decoder	56.98
7700-09	Memory Decoder 12V	56.66

*** Req. +12 & 5.0 DC voltage.

STANDARD DISCOUNT SCHEDULE			
1-9	100%	100-249	82%
10-24	95%	250-499	78%
25-49	90%	500-999	74%
50-99	86%	1000-2499	70%

Quantity Discounts on Extended Shipments

- To break an order down into more than one shipment, the order must total 100 or more display units.
- Each shipment must equal at least 10% of total order or 25 units (whichever is larger).
- Shipments on a particular order must be completed within 12 months from receipt of order.
- Quantity orders cancelled before completion will be billed at prices based on the price schedule for the number of displays actually shipped.

Terms and Conditions

- MINIMUM BILLING — \$15.00.
- F.O.B. — All prices F.O.B. our plant, Van Nuys, California.
- TERMS — 1/2 of 1% 10 days; net 30 days.
- DELIVERY — For standard displays, 30 days depending upon quantity.
- RETURN OF GOODS — Positively no products may be returned without factory authorization. All claims must be made within 10 days after receipt of goods.
- All prices subject to change without notice.

Schematics of IEE Model #7700-04 will be made available to customers who anticipate internal manufacture. Requests of this nature should be directed to the local IEE sales representative.

A Look to the Future....*lower cost displays*

The introduction of Nimo represented a significant technological breakthrough in the field of Information Display. It is characterized most specifically by greatly improved display capability and reduced cost per character.

A glance at the future of Nimo uncovers display system advances even more dramatic and desirable than those represented by either the single or the four-decade Nimo.

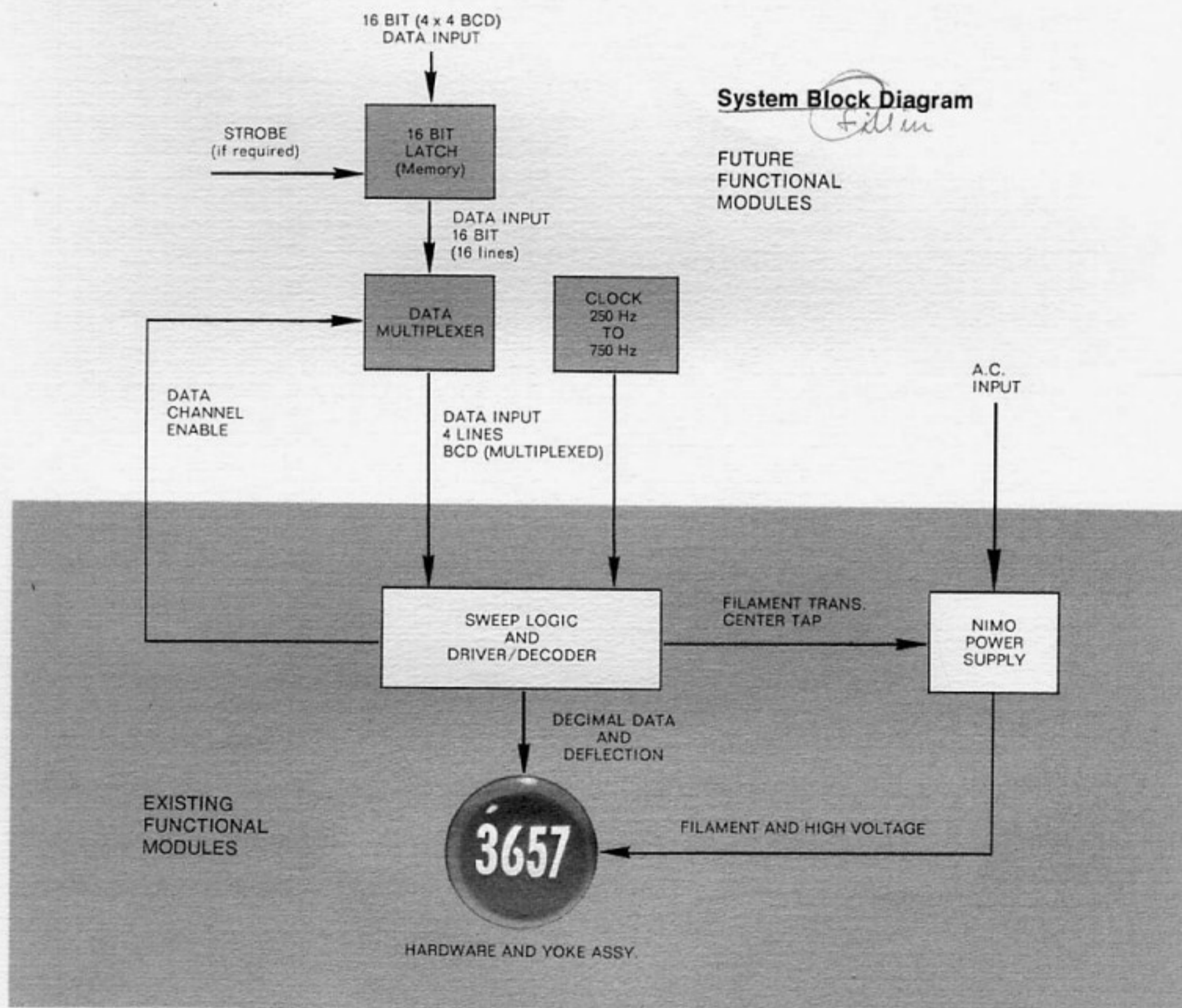
What will these be? Among many:

A six decade Nimo soon to be introduced, providing six independent decades, and costing even less per decade.

Power requirements will also be reduced.

In addition, we will soon see a Nimo that provides for punctuation within messages, plus polarity signs, slash marks and other symbols, as well as a *floating* decimal point. This will further reduce the complexity of your display system.

High among Nimo's future advances will be a 12 decade unit requiring only three square inches of panel space! The potential for Nimo is indeed unlimited. The demands of your future display needs will be enhanced every step by Nimo . . . *the uncommon readout.*



IEE SALES REPRESENTATIVES

Alabama — Huntsville Mekco Associates, Inc. Tel. (205) 881-3721	Kansas — Leawood Poly-Onics, Inc. Tel. (913) 648-4173	New York — Baldwin B. B. Taylor Corp. Tel. (516) 223-8000	Pennsylvania — Pittsburgh Russell F. Clark Co. Tel. (412) 242-9500
Arizona — Phoenix Gramer & Company Tel. (602) 279-1231	Maryland — Towson Biechler Associates, Inc. Tel. (301) 825-8222	New York — Rochester Ossmann Component Sales Corp. Tel. (716) 442-3290	Texas — Dallas Norvell Associates, Inc. Tel. (214) 357-6451
California — Los Angeles IEE Factory Sales Office Tel. (213) 787-0311	Maryland — Rockville Biechler Associates, Inc. Tel. (301) 762-6210	New York — Syracuse Ossmann Component Sales Corp. Tel. (315) 454-4477	Texas — Houston Norvell Associates, Inc. Tel. (713) 774-2568
California — Belmont IEE District Sales Office Tel. (415) 591-2551	Massachusetts — Lexington Kitchen & Kutchin, Inc. Tel. (617) 862-8230	New York — Red Hook Ossmann Component Sales Corp. Tel. (914) 297-7773	Utah — Salt Lake City Hyer Associates, Inc. Tel. (801) 487-7747
California — San Diego L. L. Stoakes, Inc. Tel. (714) 274-6281	Michigan — Southfield S. Sterling Company Tel. (313) 357-3700	New York — Vestal Ossmann Component Sales Corp. Tel. (607) 785-9949	Washington — Seattle Electronic Sales Corporation Tel. (206) 932-0330
Colorado — Englewood Hyer Associates, Inc. Tel. (303) 771-5424	Minnesota — St. Paul Magnuson Associates Tel. (612) 227-8495	North Carolina — Burlington Mekco Associates, Inc. Tel. (919) 226-7177	Canada — West Vancouver, B. C. Whittaker Electronics Ltd. Tel. (604) 926-3411
Connecticut — North Haven Kitchen & Kutchin, Inc. Tel. (203) 239-0212	Missouri — Hazelwood Poly-Onics, Inc. Tel. (314) 837-0597	Ohio — Cleveland S. Sterling Company Tel. (216) 442-8080	Canada — Ottawa, Ontario Whittaker Electronics Ltd. Tel. (613) 224-1221
Florida — Orlando Mekco Associates, Inc. Tel. (305) 841-2215	New Jersey — Wayne B. B. Taylor Corp. Tel. (516) 223-8000	Ohio — Dayton S. Sterling Company Tel. (513) 298-7573	Canada — Roxboro, Quebec Whittaker Electronics Ltd. Tel. (514) 683-3621
Illinois — Chicago Magnuson Associates Tel. (312) 622-6322	New Mexico — Albuquerque Hyer Associates, Inc. Tel. (505) 265-5961	Pennsylvania — Narberth Biechler Associates, Inc. Tel. (215) 667-1827	Canada — Weston, Ontario Whittaker Electronics Ltd. Tel. (416) 247-7454

FOREIGN:

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