NEW FROM BURROUGHS!

LOW COST SELF-SCAN® II PANELS FOR DATA TERMINALS 480, 240 AND 40 CHARACTER DISPLAYS

You can see the difference

Apr 77

SELF-SCAN® II panel displays are second-generation versions of the highly-successful and time-proven SELF-SCAN alphanumeric displays. The popularity of these devices results from three significant advantages: (1) their exceptional readability and esthetically pleasing appearance (2) the ease with which they may be designed into virtually any system and (3) the large number of features they offer which provide the designer with great versatility and excellent cost-effectiveness.

The new SELF-SCAN II Panels can help you create a high level of excitement and interest in your product at an affordable price. All three units (40, 240 and 480 characters) offer many advantages for applications in data terminals. Characters are bright, sharp and easy to read — even at distances up to 20 feet from the terminal. Their small size and thin cross-section can cut terminal depth over 50% compared with CRT displays. Their many optional features including MOS memory, character blinking capability, the diversity of character fonts available, plus their unique design features offer you a variety of means to enhance the saleability and profitability of your products.

If you are interfacing with a microprocessor-based system, our helpful applications literature can save you time and money. Whatever your requirements, Burroughs will work closely with you to optimize your design.

SELF-SCAN II Panels . . . versatile, attractive and cost-effective.

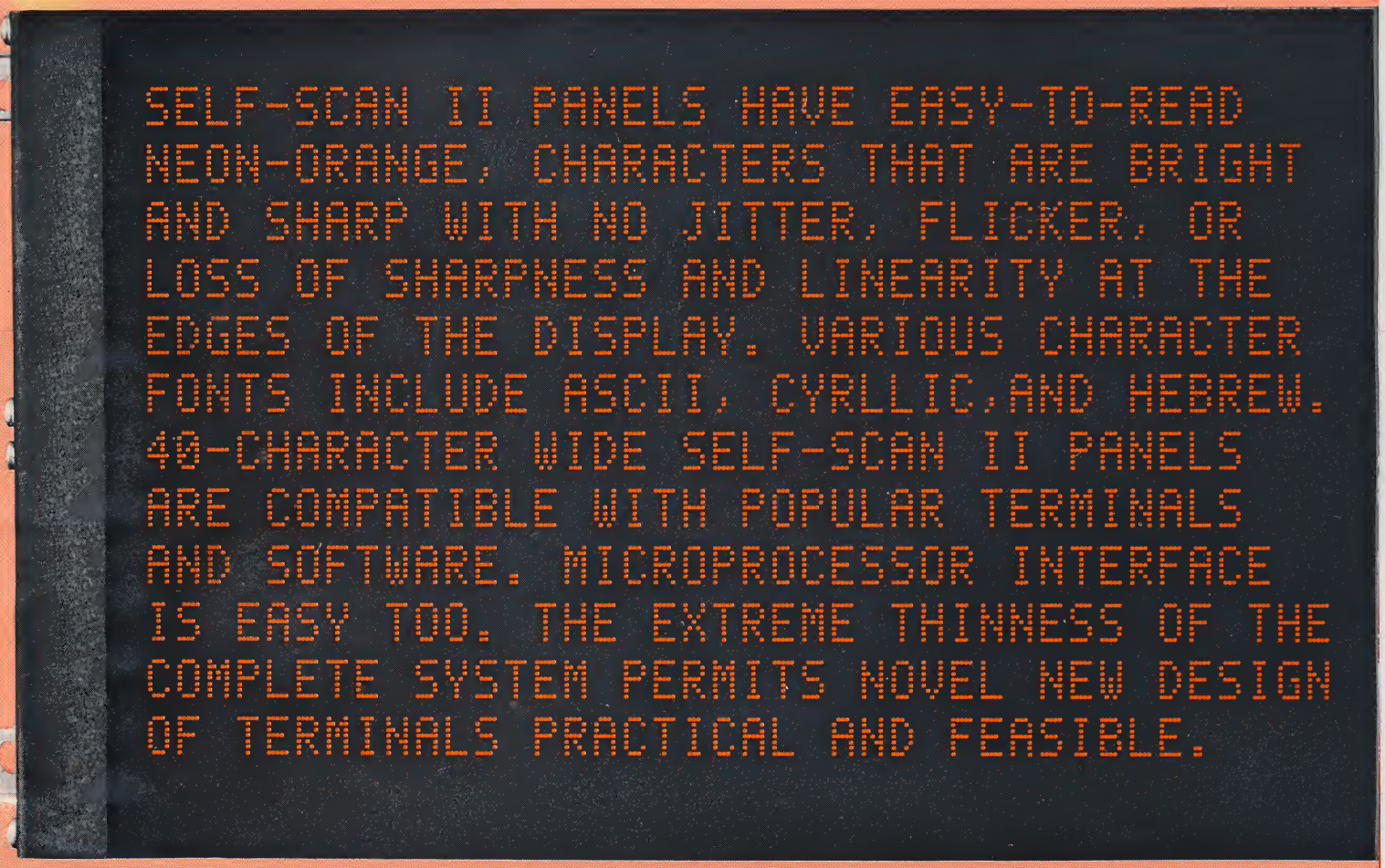
240-character SELF-SCAN II Panel Available Fall 1976.

480-character SELF-SCAN II Panel. Available Fall 1976.

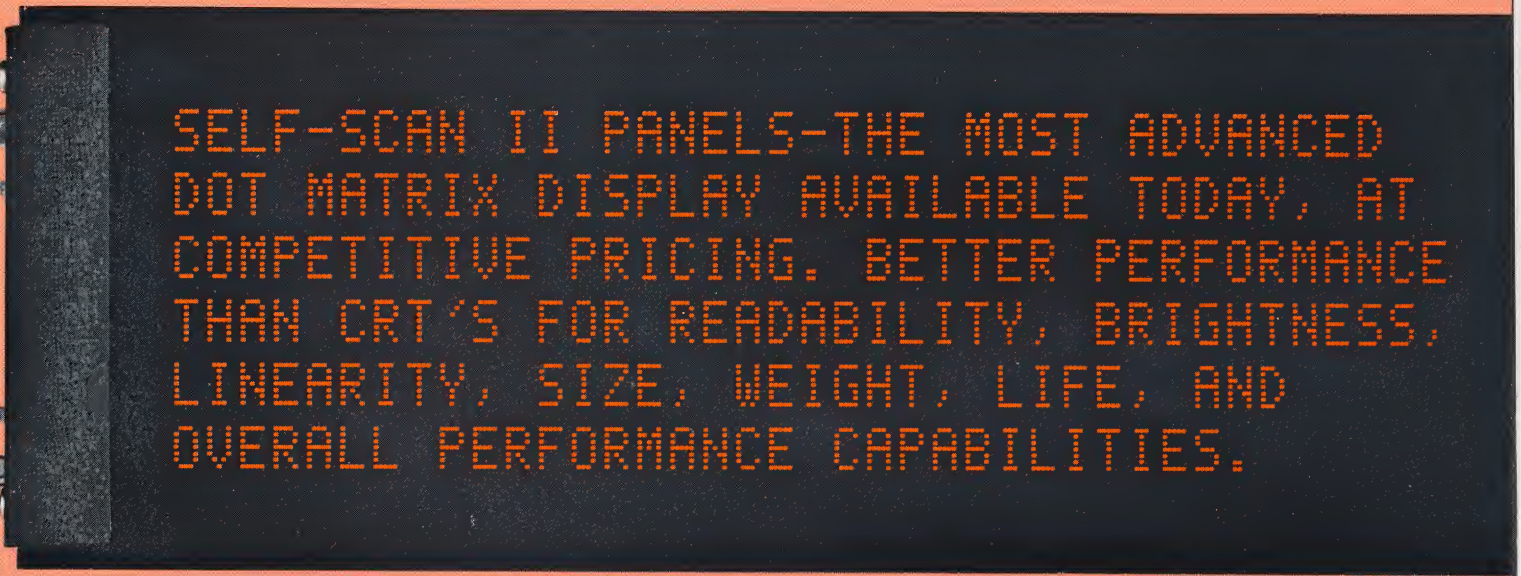
40-character SELF-SCAN II Panel. Available fourth quarter 1976.

SELF-SCAN Panels are compact!

Top terminal is typical of those employing CRT displays. Lower terminal uses SELF-SCAN II Panel. Note the significant savings in size and weight.



SELF-SCAN II 480-character panel.



SELF-SCAN II 240-character panel.

Advantages of SELF-SCAN II Panel Displays by Burroughs.

Appearance/Readability.

SELF-SCAN II Panels provide eye-pleasing, highly readable information display. Characters are large and extremely uniform in size for easy viewing even at a glance. The 0.26″ x 0.14″ characters are readable at distances of up to 20 feet in high ambient light at viewing angles to 120°. Characters are distinct with no fuzziness and no distortion at the edge of the panel as with CRT displays. Illumination of each letter or digit is extremely uniform and free from intensity variations. Characters remain in fixed positions with no jitter from external disturbances. Their neon-orange character color is highly visible in bright light and at night, yet does not glare or produce reading fatigue, even when viewed for extended time periods.

Flexibility

The many standard features and available options enable SELF-SCAN II Panels to produce a variety of display effects and to be easily adapted to your requirements.

As many as 140 different languages including Cyrillic, Hebrew and Katakana, plus special characters such as math symbols, fractions and geometric symbols can be produced and displayed simultaneously or sequentially using either currently-available or custom-developed memories or software for character generation.

Refresh memory is optionally available. Another optionally available memory enables an additional 3 pages of data to be stored in the 240 and 480 character models. New character input to the 40 character models can be from left-to-right or vice-versa and data input rate may be slowed, if desired, to produce a "moving message" appearance. Blinking of words, lines or the whole message can be programmed to achieve special attention-getting effects.

SELF-SCAN II Panels are fully formatted which enables them to display graphics using special character generators or software. In addition, the number of characters and their matrix configuration can be changed to increase character count, decrease spacing between letters, etc.

The normal neon-orange color can be altered by the use of filters in front of the screen and brightness of the characters can be decreased, if desired.

SELF-SCAN II Panels can be vertically-oriented and are remotable using non critical cable. They can easily be mounted on a movable support for tilting, turning or movement into and out of a cabinet.

Design advantages

SELF-SCAN II Panels can be designed into virtually any system due to their compact size and convenient electrical and mechanical specifications.

Physical size of SELF-SCAN II Panels is small compared with CRT's and many other displays. The 480-character panel, for example, measures only 11″ x 6″ yet is only 1 1/4 inches deep including drive electronics. Complete dimensions for all panels are given elsewhere in this brochure. Each unit is compact and provides high-character density per unit of space. The 40-character width is compatible with currently available software.

A minimum of 9 electrical connections are required — a significant time and cost saving feature compared with LED displays. Interface to computers or microprocessors is straightforward with software requirements only a small portion of the total programming. Data entry can be at high speed — up to 1,000,000 characters per second in units with memory.

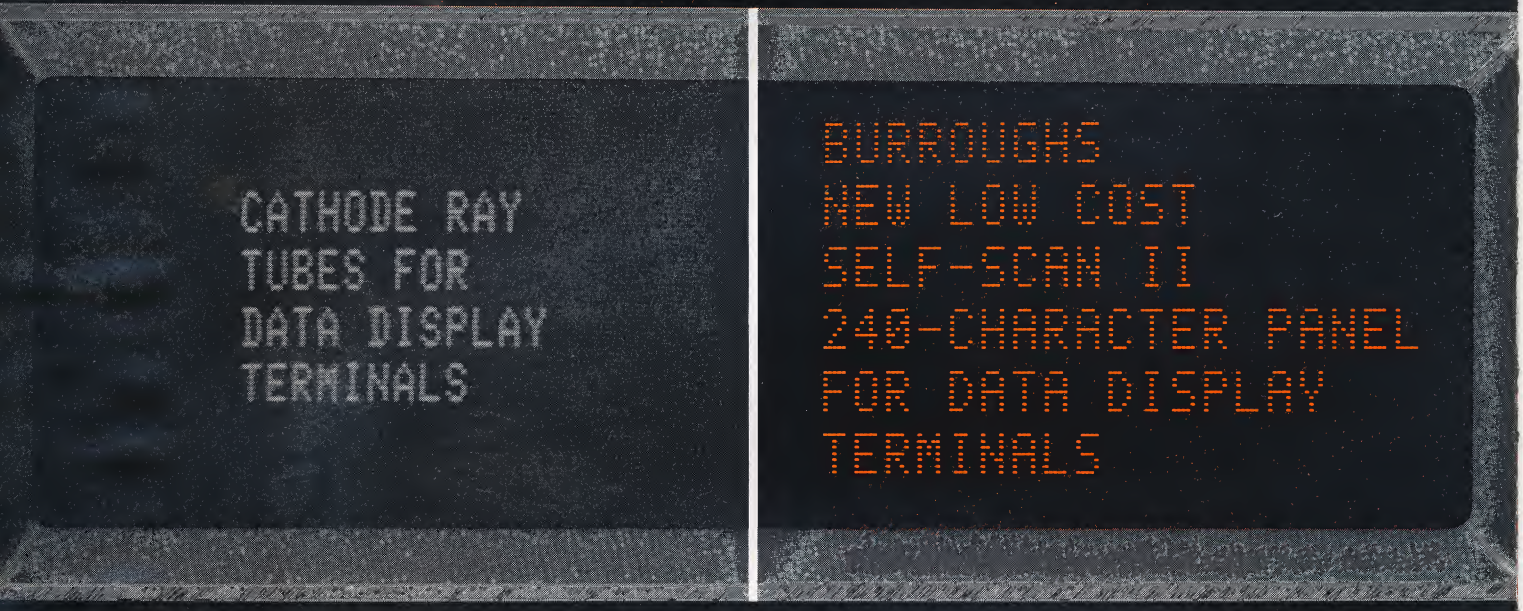
Electrical input requirements are +5V and -12V, which are available in most systems today and -250V which can be obtained through the use of a low-cost DC to DC converter. Current requirements are modest and thus excessive heat buildup from display operation is not a significant concern.

Each display subsystem is supplied complete with all necessary drive electronics and character generator although it may be obtained without these items. A visual cursor is provided on the multi-register displays for data editing. Optionally available are I/O connectors and mounting hardware.

Reliability

SELF-SCAN displays are currently in service in a broad variety of systems, including mobile ones. Their rugged design provides long service even under difficult environmental conditions of vibration, temperature, humidity, etc. The new SELF-SCAN II Panels feature several design advances which will further enhance reliability. Unlike CRT displays, the panels hold no danger of implosion, require no dangerously high voltages and produce no X-ray radiation hazard.

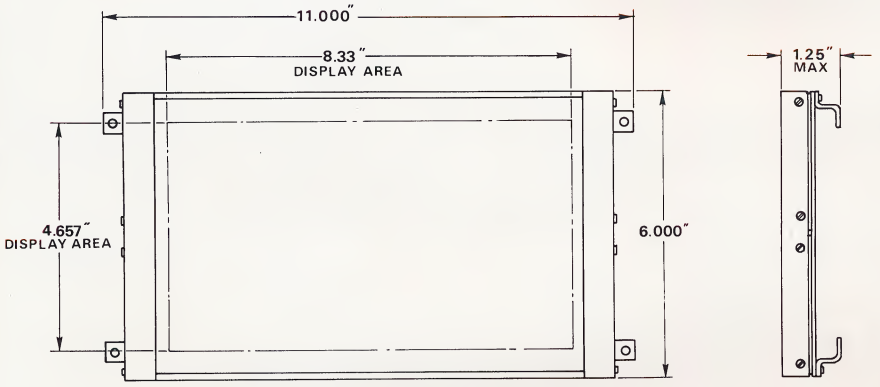
Some of the many advantages of SELF-SCAN II Panels for data terminals. Direct comparison with CRT displays.



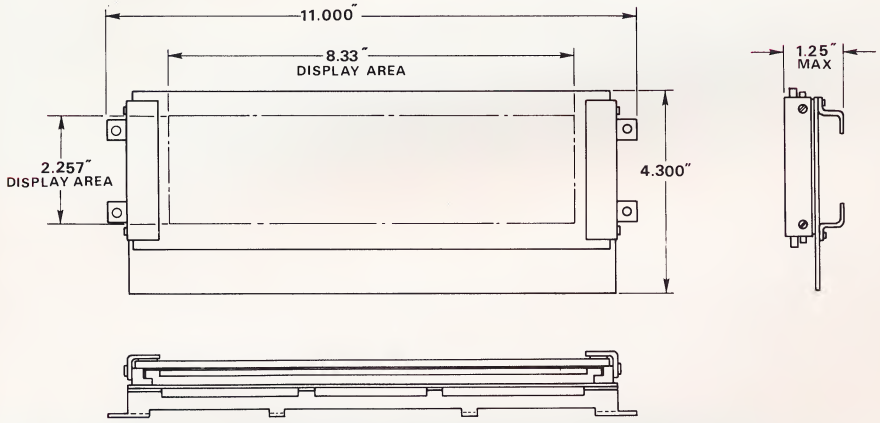
	CRT	SELF-SCAN II
Life expectancy	20,000 hrs.	50,000 hrs.
Character readability	Acceptable under certain operating conditions. More difficult to read in most applications.	Excellent under all operating conditions. No fuzziness, splash, smear. Readable from long distances.
Legibility	Characters uniform ± 10 or 20% except at display boundaries.	Distortion free, extremely uniform characters.
Driving voltage	High voltage, X-ray hazard.	Medium and low voltages
Message display area	(5″ tube) 10 square inches	(480 character panel) 20.6 square inches
Character height	Variable. Most commonly, .20 inch.	240 & 480 character panels: 0.26 inch
Cost	Slightly lower.	Small cost advantage in favor of CRT's
Resolution	Very high	To 60 lines/inch
Light output	Very high light output (with limited life)	Bright without eyestrain
Effect of outside influences	Affected by magnetic fields	Not affected by magnetic fields
Size	Bulky, inconvenient size especially where space saving is important	Compact, flat panel
Data capacity	High data density; often much unused capacity	To 480 characters or more; acceptable for many applications
Weight	Up to 50 times heavier with electronics	Low
Maintenance	Periodic maintenance required to adjust focus, pin cushioning and centerings	No periodic maintenance required; no pin cushioning or focus problems

Dimensions

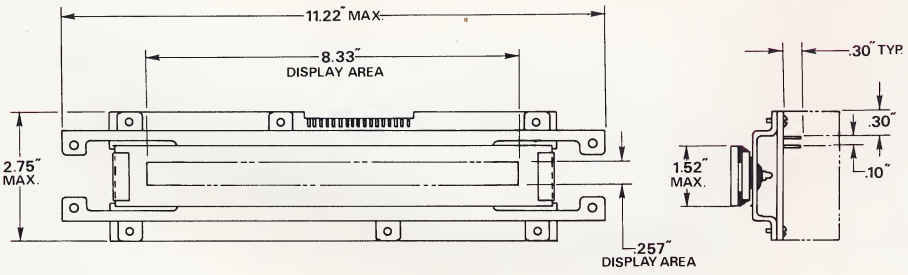
480-character SELF-SCAN II Panel



240-character SELF-SCAN II Panel



40-character SELF-SCAN II Panel



Abbreviated Specifications SELF-SCAN II Panel Displays

Panel viewing area:
12 x 40: 8.4″ W x 4.8″ H
6 x 40: 8.4″ W x 2.4″ H
1 x 40: (approx.): 8.4″ W x 0.4″ H

Panel viewing angle: 100° minimum

Character format/size: 5 x 7 dot matrix, 0.26″ H x 0.14″ W

Vertical Pitch: .040″

Horizontal Pitch: .030″

Dot size: 0.017 x 0.022 inch (nom.)

Character spacing: 2 blank columns of dots between characters. This may be altered, if desired.

Data input required: ASCII or dot pattern (TTL-compatible).

Power input required: +5, -12; -250V DC (nominal). An available dc/dc converter can be used to provide the -250V DC.

Input connector: Berg No. 65268-009 or equivalent.

Operating environment: 32-140°F (0-60°C) @ 10-90% relative humidity, no condensation allowed. Barometric operating pressure 20 in. (10,000 ft. altitude) to 32 in. (500-800 mm Hg).

Operating vibration tolerance: Sinusoidal 0.018 in. double amplitude 5-50 Hz; 2 g acceleration 50-100 Hz; 2 directions; 10 min. each axis.

Non-operating shock tolerance: Half sine wave 20 g; 11 milliseconds, Y axis.

Subsystem weight: (Approx.)
12 x 40: 6 lbs
6 x 40: 3.5 lbs.
1 x 40: 1 lb.

Refresh memory & character generator: Optionally available

Blanking: Panel blanking capability provided.

Dimming: 5:1 display dimming capability provided.

Light output: Neon-orange; contrast ratio >5:1.

Interface: 8 bit, data bus oriented.

For further information, reference this bulletin number and call or write for detailed specifications. Burroughs Corporation, Electronic Components Division, P.O. Box 1226, Plainfield, New Jersey 07061; or call one of our special sales/applications numbers, (201) 757-5000 in New Jersey, (714) 835-7335 in California.

International: Contact Burroughs ECD International, Astronaut House, Feltham, Middlesex, England. Telephone (01) 890-9441.

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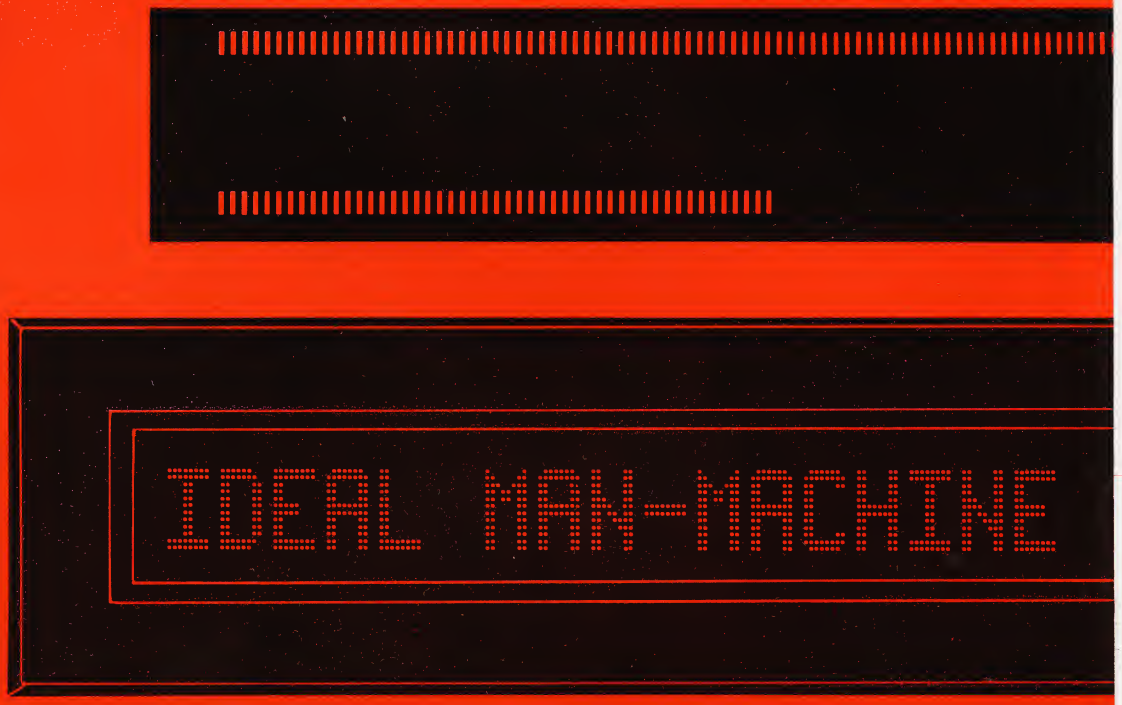
DISPLAYS AND READOUTS

Condensed catalog

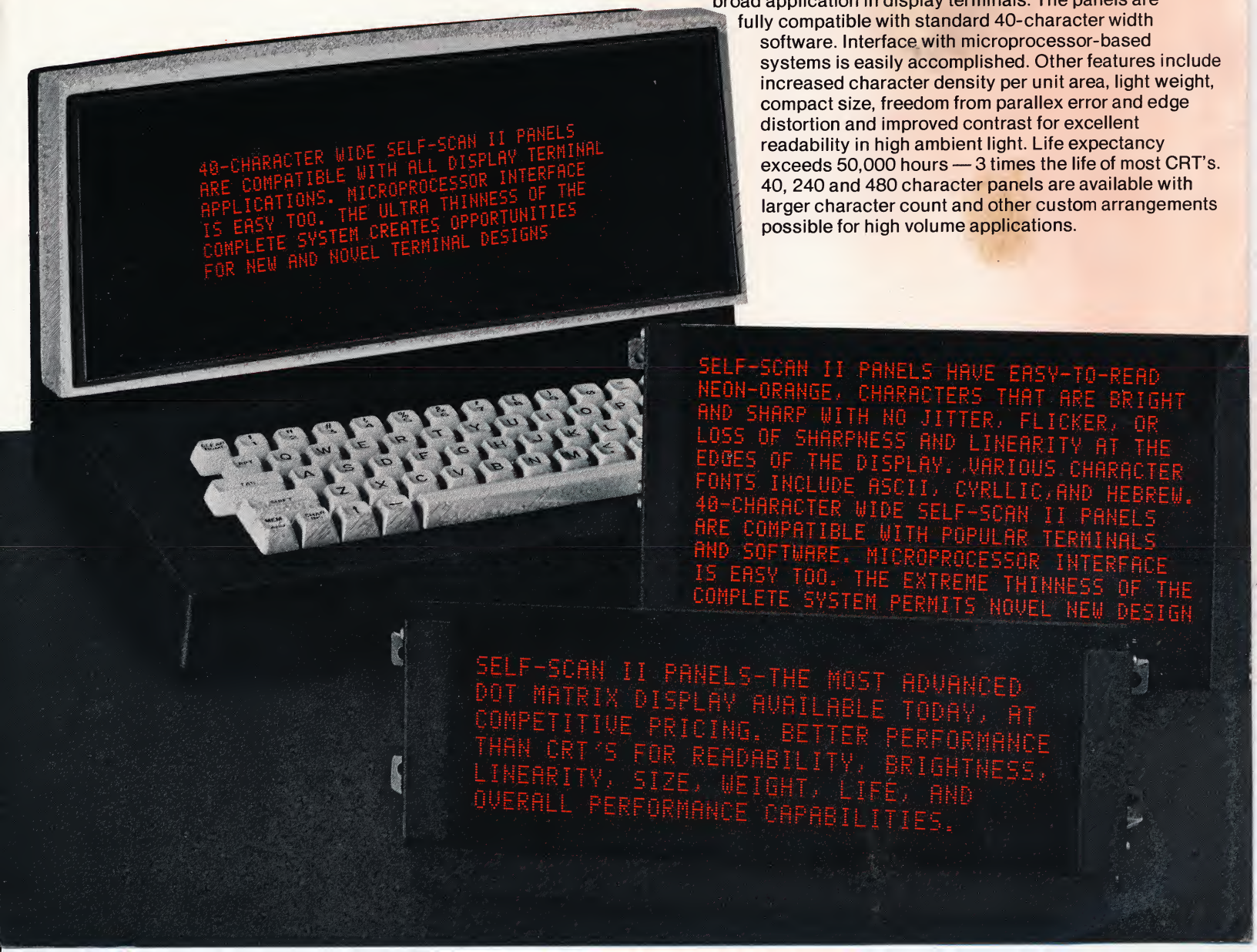


...WORLD LEADER IN GAS PLASMA

For more than twenty years Burroughs has been the world's largest producer of gas plasma displays. These numeric and alphanumeric panels offer many advantages in terms of ease of installation, reliability, performance and cost compared with displays using other techniques. Exceptional readability with uniform character brightness plus the ability to select from literally thousands of different languages and display panel configurations plus easy microprocessor interface have helped build the world-wide popularity of Burroughs' displays. Contact your nearest Burroughs Representative for assistance; he'll work with you to help you select the best display for your application.

SELF-SCAN® II Panels for Data Terminals provide high readability, low cost, exceptional reliability and help you reduce terminal size.

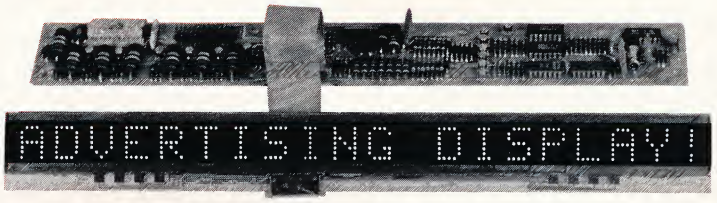
This new line of Burroughs SELF-SCAN alphanumeric panels gives you the exceptional readability of gas plasma displays at a lower cost than ever before available. Their competitive pricing and many other features combine to produce a display suitable for broad application in display terminals. The panels are fully compatible with standard 40-character width software. Interface with microprocessor-based systems is easily accomplished. Other features include increased character density per unit area, light weight, compact size, freedom from parallex error and edge distortion and improved contrast for excellent readability in high ambient light. Life expectancy exceeds 50,000 hours — 3 times the life of most CRT's. 40, 240 and 480 character panels are available with larger character count and other custom arrangements possible for high volume applications.



DISPLAYS.

SELF-SCAN II displays for medium-to-large audience information systems.

These 20- and 40-character panels fill the need for low-cost displays wherever data must be easily and accurately viewed. Their soft, neon-orange character color is bright, flicker-free and highly visible yet easy on the eyes. Less than 5 cm. (2 in.) in depth. Only 18 connections required. Easily interfaced to microprocessors and computers. No parallex distortion. The 40-character panels have broad application in data terminals, word processors and instruments.



The 20-character panels, like building blocks, can be stacked vertically and butted horizontally to form easy-to-update electronic signs capable of displaying hundreds of characters. Applications include arrival/departure signs, directories and announcement bulletin boards, sporting events signs and similar large-area displays.

SELF-SCAN 16 and 32 character panels are low-cost, high readability solutions to display needs in hundreds of applications from computers to production equipment to amusement devices.

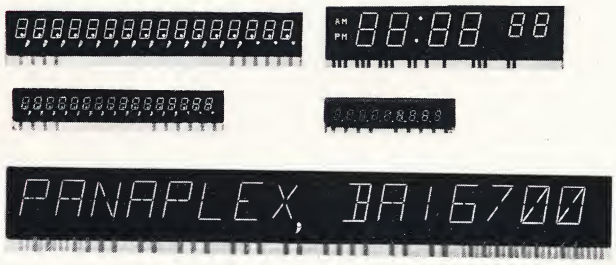
SELF-SCAN displays are thin-cross-section, multi-character, alphanumeric gas plasma devices offering superior legibility and visibility. Available in 16 and 32 character panels with character heights of 5.1 and 10.2 mm. (0.2, 0.4 inch). Full character repertoire including wide variety of languages. Readable to 7.6 meters (25 ft.) Low cost per character. Bright, distinctive appearance. Refresh memory available.

New User-Programmable SELF-SCAN Panels, with built-in PROM's, provide low-cost method of displaying *any* language or symbol set desired.

Excellent for prototype work and both high and lower volume applications. Display 32 characters with 64 or 128 character repertoire. Additional features as described above.

PANAPLEX® 4-16 character displays are compact panels for use in portable instruments, clocks, calculators, scales, point-of-sale devices and many other applications.

PANAPLEX displays are a family of multi-digit, segmented devices for applications requiring 4 to 16 characters. Standard numeral/letter heights of 5 to 18 mm (0.2-0.7 inch) are available. PANAPLEX displays offer exceptional readability, high brightness at low power, 7 and 14 segment formats, uniform brightness between segments and characters and MOS compatibility.



Burroughs' Bar Graphs are easy-to-read analog indicators with digital accuracy.

Applications for these versatile, high readability displays include instrumentation, process control systems, auto and aircraft indicators. Burroughs Bar Graphs are available in 100- and 200-element linear versions plus a 120- element circular display.

New Dual-Reset Bar Graphs display minimum, maximum and actual measured values so that you can create upper and lower set points on one bar and compare them with actual measured values on the other bar.

Dozens of unique configurations have already been developed for manufacturers requiring high readability replacements for conventional analog meters. Contact your Burroughs Representative for assistance with your design.

DC/DC converters provide proper voltage for Burroughs displays.

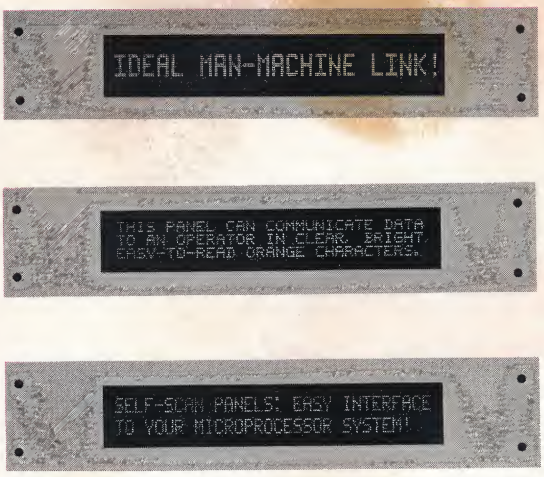
This low-cost, compact converter takes your -12 VDC and converts it for display operating voltage requirements. Easily mounted on any PC board.

Variable-format SELF-SCAN displays.

With Burroughs C4000 series SELF-SCAN panels you get, in a single gas plasma panel, the capability for display of several different character sizes.

Model C4101 panels can be programmed for 19 8x12 matrix characters 12.7 mm. (0.5 in.) high or 96 5x5 matrix characters in 3 rows of 32 characters, 6.8 mm. (0.27 in.) high. Model C4075 panels display one line of 16 8x12 matrix characters 7.6 mm. (0.30 in.) high or two lines of 5x7 matrix characters.

C4000 series SELF-SCAN panels require only 23 connections and weigh only 283 grams (10 oz.).



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SELF-SCAN® PANEL DISPLAYS

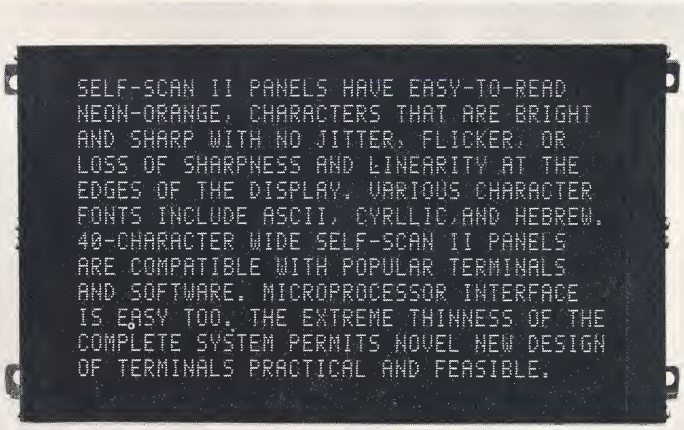
480-CHARACTER DISPLAY WITH DRIVE ELECTRONICS

MODEL

SII-1240PD2

The SII-1240PD2 Display Module consists of a flat gas plasma display panel and drive circuitry. The panel can display up to 480 alpha-numeric characters arranged in 12 registers of 40 characters in each register. Each character is formed within a 5x7 matrix with two blank columns between matrixes. Each register has seven rows of display anodes and 283 cathode columns (2 reset cathodes, 280 display cathodes and 1 scan monitor cathode). Only one of the reset cathodes is addressed. The drive circuitry accepts bit serial binary column information at a 2 MHz rate. The data input is terminated with a 50 ohm source impedance which is designed to be driven with an open collector source with passive pull-ups.

The display panel driver board contains phase drivers which control the panel reset and the cathode busses; 12 integrated display driver packages each containing a serial input shift register, seven storage latches and seven high voltage display drivers which control the display anodes on the front of the panel blanking circuit; and a scan monitor circuit. The serial input shift registers combined with the storage latches provide 84 bits of dot pattern storage. An option has also been provided to allow for external dimming control of the panel.



DRIVER BOARD PRINCIPLES OF OPERATION

A block diagram of the display system is shown in Figure 2. The driver board consists of integrated display anode drivers, phase drivers, two level scan current control, scan monitor circuitry, blanking, and dimming control circuitry.

Cathode Phase Drivers

The PHASE CLOCK input is fed to the phase generator logic circuit to develop the 12 phase clock signals to control addressing of the cathodes via the cathode driver circuitry. Each clock period, a different set of cathodes is selected. During the pre- and post- blanking periods of each cathode address, the outputs of all 84 display drivers are blanked by a signal generated on the driver board. At the completion of the blanking period, the new anode data is displayed at the appropriate column. Since multiple columns are selected

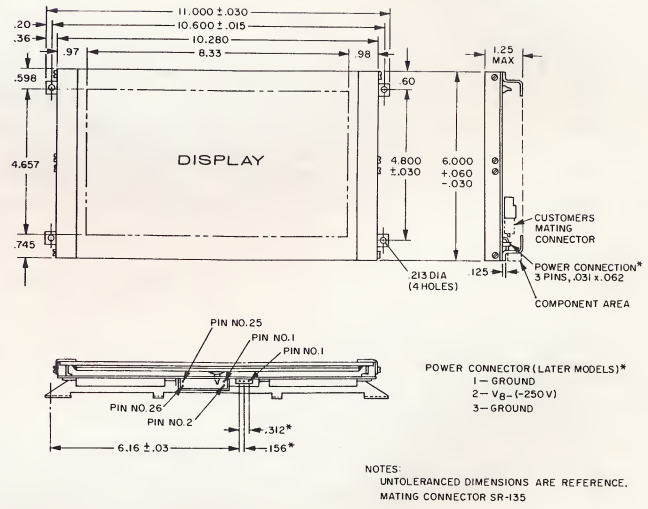


FIGURE 1. OUTLINE DRAWING

OPTICAL CHARACTERISTICS

Panel Viewing Area	4.80"Wx8.33"L
Number of Characters	480
Standard Character Format	5 x 7 dot matrix
Standard Character Size	0.14"Wx0.26"H
Dot Dimensions	0.022"x0.017"
Center-to-Center Dot Spacing, Vertical	0.040" nom.
Center-to-Center Dot Spacing, Horizontal	0.030" nom.
Standard Character Spacing	2 blank columns of dots between successive characters.

Scanning Rate	75 Hz max.
Nominal Luminous Intensity	36 microcandelas (Note 4)
Contrast Ratio	8:1 nom. (Note 5)
Light Output	Neon Orange
Viewing Angle, Horizontal	100^{o} min. (Note 6)
Viewing Angle, Vertical	45^{o} min. (Note 6)
Focusing	None required
Panel Dimming	Fixed or variable from 36 microcandelas to at least 20% of same. (Note 7).

ENVIRONMENTAL CHARACTERISTICS (Note 8)

Temperature and Humidity Range: The display assembly meets or exceeds the following requirements:

Operating Environment	32°F to 140°C (0° to 60°C) RH 10 to 90%. The conditions of relative humidity shall not include condensation. The absolute temperature of the panel must not exceed 70°C during operation.
Non-Operating Environment	The assembly is capable of withstanding non-operating environments of transportation and storage at −40°F to 85°C) indefinitely. The conditions of relative humidity shall not include condensation.
Barometric Pressure Range	The disaply assembly shall meet or exceed the following requirements.
Operating Environment	20 in. (10,000 ft. altitude) to 32 in. (500 mm to 800 mm of Hg).
Non-Operating Environment:	8 in. (33,000 ft. altitude) to 32 in. (250 mm to 800 mm of Hg).
Atmospheric Pollutants	The display assembly shall meet or exceed the following requirements: Dust (non-conductive and non-corrosive) - The display assembly shall be capable of operating in conditions where the density of particles does not exceed 100 mg/100 cubic feet of air by weight. Corrosion and Rust - The display assembly, either operating or non-operating. shall not be subjected to atmospheres which contain materials causing corrosion or rust when these materials are present in concentrations exceeding normal metropolitan-area levels.

by a single column clock, each selected column is presented in parallel, with the same anode data. However, in normal operation only a single column of glow discharge can exist in the scan section of the panel, advancing one column at a time every clock period. The 282 columns of the panel are therefore addressed sequentially one column at a time once every scan period. Each cathode phase is driven by a Darlington array. These Darlington transistors switch from an off-bias voltage to the most negative power supply voltage (−250V typically). Four lines of BCD TTL signals that generate the logic phase signals are level shifted down to the phase decoder which operates at the −250V level.

Display Anode Addressing

The panel display operates in a column scanning mode. The 84 bits of dot pattern information, representing the selected cells in all 12 registers, must be simultaneously presented to the display anode drivers. The data must remain unchanged for the active display time of each column. The column active time during which the display anodes are driven is equal to the column time minus the blanking time.

This dot pattern INPUT DATA is loaded into the serially interconnected shift registers of the 12 integrated display driver packages used on the board. These devices accept and store the serial INPUT DATA and convert that data to high voltage signals to address the 84 display anodes. The displayed column data is skewed one column time later than the column time being loaded and is transferred from the serial input shift registers to the parallel anode outputs on the beginning of each column change. The first display column corresponds to column 2 of the device, thus, during RESET a logic one must be entered into all 84 bits of the 12 integrated drivers or the BLANKING INPUT must be logic zero for the duration of column one.

Each display anode is driven by a current source output of the integrated driver. The input of this integrated circuit is active low to light a dot. The display anode current is a direct function of the programmed input current of these integrated circuits. Lowering this current decreased the display anode current. The lowest level current for the standard panel is limited to approximately 20 percent of the maximum value for satisfactory display appearance.

Two Level Scan Anode Current Control

In order to conserve power and minimize temperature gradients on the board, the scan anode current is reduced after a pre-determined duration in each column time. This function is accomplished using a transistor switch across a Zener diode. The transistor is switched on at the beginning of each phase by a monostable multivibrator. This provides adequate scan anode current for priming the display cell. After the data is presented to the display anodes, the transistor is switched off and the voltage drop across the Zener diode reduces the scan anode current during the remaining display time.

Panel Dimming Circuit

The light output of the panel is controlled by limiting the average cell current. The light output will then approximate a linear function of cell current. The upper limit will be a function of the maximum allowable cell current and by the cell geometry. Provision for this type of external variable brightness control is incorporated in the standard driver circuit board with the external connections available on stakes.

Figure 7 shows a method of using this feature.

Misscan Detection Circuit

To detect malfunctioning of the cathode phase drivers a PANEL SCAN MONITOR signal is generated on the driver board and brought out to the pin connector for monitoring. The PANEL SCAN MONITOR output is a TTL signal which is in the logic one state whenever the 281st cathode of the display is scanned. In normal operation, this output is high (logic one) for one clock period on each scan cycle.

The user should monitor the periodicity of this output. The absence of a pulse or presence of more than one pulse in each scan period indicates malfunctioning. In the event that misscanning is detected, the SCAN DISABLE input must be placed in the logic zero state. Doing so will turn off all the display and scan anodes and phase drivers.

Failure to provide the required SCAN DISABLE signal during a misscan will reduce panel life.

The scan monitor circuit consists of a simple current amplifier and TTL inverter connected to the 281st cathode of the display. Whenever the 281st cathode is scanned, current will flow into the base of the current amplifier and cause the TTL inverter to switch to the logic one state.

NOTE: The PANEL SCAN MONITOR should be ignored for the first three seconds after initial power-up to allow the panel to start the proper scan sequence.

INTERFACE

The inputs to the driver board are standard TTL compatible.

Drive Lines

These signal interface lines must be driven by buffer gates such as SN7437 or SN7440 types. The interconnections can be up to 84 inches in length. The PHASE CLOCK, RESET, DATA INPUT and DATA SHIFT lines are terminated by a low impedance.

Input Signals

The following signals are required for proper operation (Figure 3, 4, 5 and 6).

Phase Clock (2)

This input performs two functions: it increments the counter controlling the 12 cathode bus drivers and transfers data to the latches in the anode drivers. This input must be continuously pulsed to step the scan across the panel. The clock increments on the positive transition of this signal.

Reset Input (2)

One reset pulse must be supplied after each complete scan to initiate the scan of the panel. The RESET time must be at least one clock period but not more than two clock periods. The negative edge of the RESET pulse must occur after six Phase Clock time slots following the end of the 281st cathode column time.

Serial Input (2)

The seven bits of data representing one full column of character information for each of the 12 registers must be serially entered and transferred down the chain of 12 serially interconnected I.C. driver packages. The information enters at the lowest bit position and is advanced one row with each Data Shift pulse.

Data Shift (2)

Dot pattern data present at the Data Input will be entered into the registers on the positive transition of this signal.

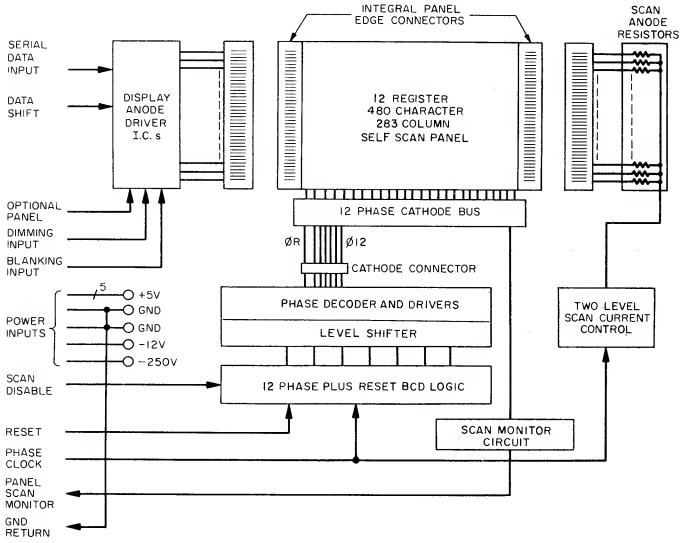


FIGURE 2. SYSTEM BLOCK DIAGRAM

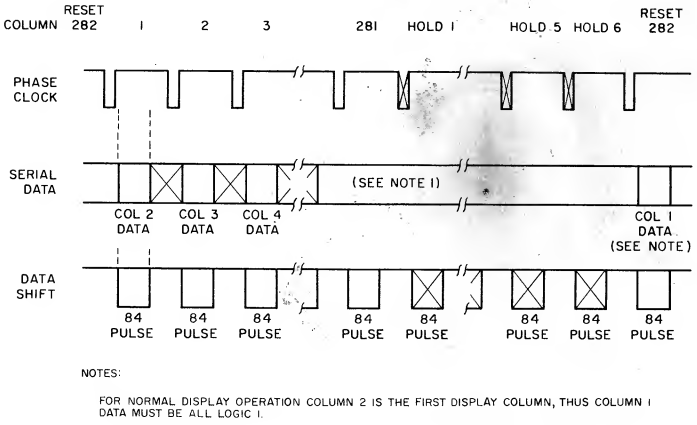


FIGURE 4. ANODE SIGNAL TIMING

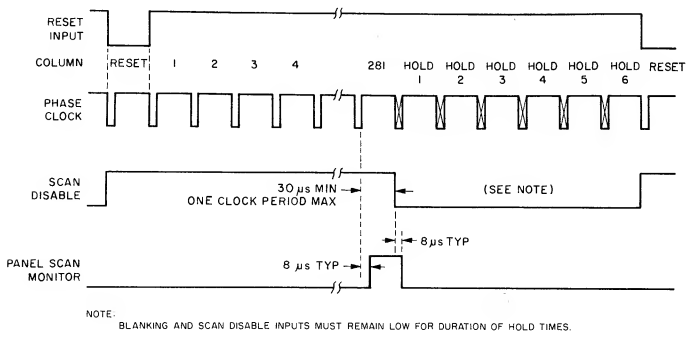


FIGURE 3. SIGNAL TIMING

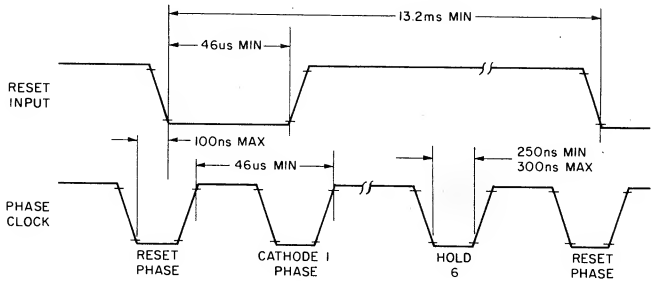


FIGURE 5. CATHODE INPUT TIMING

This input must be pulsed 84 times during each column time to transfer the 84 bits of display information into the proper register positions.

Optional Dimming Input (2)

As supplied, the display will operate at maximum brightness. For variable brightness control, a linear taper potentiometer must be connected across the dimming input stakes as shown in Figure 7.

Blanking Input (1)

The logic zero level on this line will blank all the display dots on the panel.

Scan Disable Input (1)

A logical zero placed at this input will turn off all scan anodes, display anodes and phase driver This input must be logic zero for six Phase Clock periods following the end of the 281st column or when a misscan is detected (Fig. 3).

OUTPUT SIGNALS

Panel Scan Monitor (1)

This output is logic one whenever the 281st cathode of the display is scanned. The repetition of this signal at the scan rate indicates that the panel is scanning properly. The absence of this pulse, or the presence of more than one pulse per scan period (288 clock periods) is the indication of failure. This output should be ignored for the first three seconds after power-up.

MECHANICAL CHARACTERISTICS

The display consists of a SELF-SCAN panel mounted directly to a printed wiring board. The wiring board contains all the required drive electronics. All input and power connections are made via a 26-pin connector (Figure 8). The panel and standard driver board cannot be operated separated from each other since the driver board is a mating part of the SELF-SCAN panel connector. The panel may be mounted in any position with equal performance as long as provision is made for adequate air circulation. Two holes are provided in each corner of the housing to facilitate mounting from supports or directly to the front panel. When mounting directly to the front panel, install four .60 inch minimum length standoffs to prevent tube damage.

Outline: Figure 1
Weight: 3 pounds

For further information, reference this bulletin number and write to Burroughs Corporation, Electronic Components Division, P. O. Box 1226 Plainfield, New Jersey 07061; or call one of our special sales/applications assistance numbers, (201) 757-5000 in New Jersey, or (714) 835-7335 in California. For overseas inquiries, write to Burroughs ECD International, 11-15 Betterton Street, Drury Lane, London WC2H 9BS, England, Tel. (01) 240-1479.

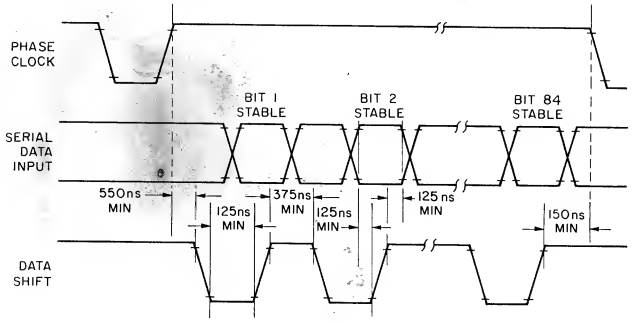


FIGURE 6. INPUT DATA TIMING

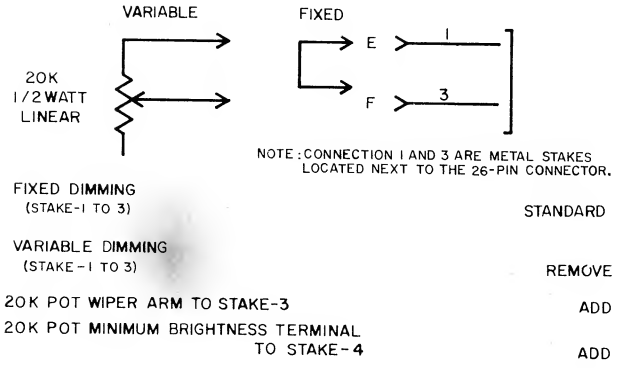


FIGURE 7. DIMMING CONTROL CONNECTION

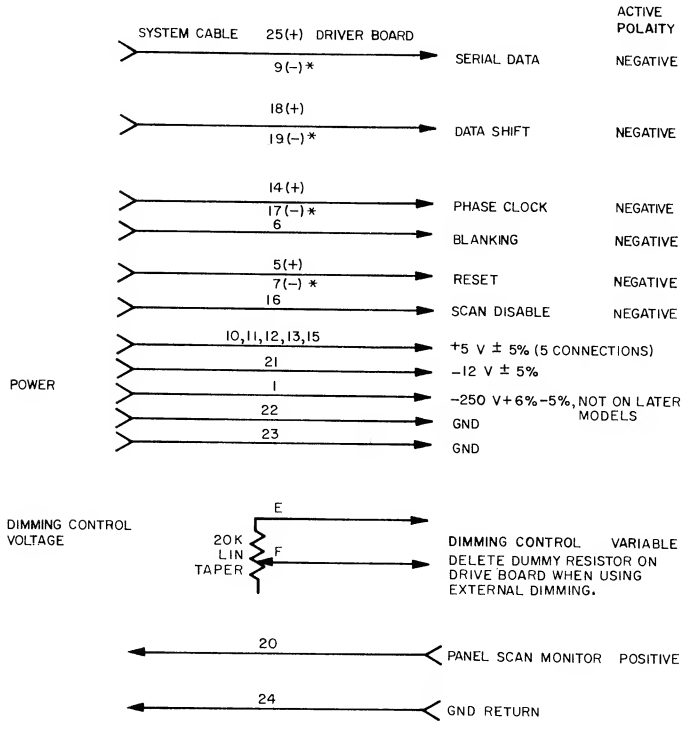


FIGURE 8. INTERFACE SIGNALS & PIN CONFIGURATION

ELECTRICAL CHARACTERISTICS (Note 1)

Absolute Maximum Ratings - the values beyond which life and performance may be impaired.

PARAMETER	SYM.	MIN.	MAX.	UNIT
Positive Logic Supply Voltage	V_{cc}	+4.75	+5.25	V
Negative Logic Supply Voltage	V_{gg}	−11.4	−12.6	V
Negative Display Supply Voltage	V_{B-}	−237.4	−265	V
All Signal Inputs		−0.5	+5.5	V
Operating Temperature		0	60	°C
Storage Temperature		−40	85	°C
Panel Temperature			70	°C

Input Signals (Notes 2, 3 and 9)

Phase Clock Input (Figures 3, 5)

WARNING: The PHASE CLOCK must be provided whenever high voltage is on, or permanent damage to the panel driver may result.

Logic 0 Voltage	0.8V max.
Logic 1 Voltage	2.0V min.
Logic 0 Current (V_{IN}= 0.4V)	−30 mA max.
Logic 1 Current (V_{IN}= 2.4V)	− 7 mA max.
Phase Clock Low Duration	250 ns min., 300 ns max.
Period	46 us min.

Reset Inputs (Figures 3,5)

Logic 0 Voltage	0.8V max.
Logic 1 Voltage	2.0V min.
Logic 0 Current (V_{IN}= 0.4V)	−30 mA max.
Logic 1 Current (V_{IN}= 2.4V)	− 7 mA max.
Duration	46 us min.
Period	13.25 ms min.
Phase Clock to Reset Propagation Delay	100 ns max.

Serial Data Inputs (Figures 4,6)

Logic 0 Voltage	0.8V max.
Logic 1 Voltage	2.0V min.
Logic 0 Current (V_{IN}= 0.4V)	−30 mA max.
Logic 1 Current (V_{IN}= 2.4V)	− 7 mA max.
Set-Up Time, t_{ds}	125 ns min.
Hold Time, t_{dh}	125 ns min.

Data Shift Inputs (Figures 4,6)

Logic 0 Voltage	0.8V max.
Logic 1 Voltage	2.0V min.
Logic 0 Current (V_{IN}= 0.4V)	−30 mA max.
Logic 1 Current (V_{IN}= 2.4V)	− 7 mA max.
Data Shift High Duration, t_{pw} (1)	375 ns min.
Data Shift Low Duration, t_{pw} (0)	125 ns min.

Scan Disable Input

Logic 0 Voltage	0.8V max.
Logic 1 Voltage	2.0V min.
Logic 0 Current (V_{IN}= 0.4V)	−10 mA max.
Logic 1 Current (V_{IN}= 2.4V)	− 3 mA max.

Blanking Input

Logic 0 Voltage	0.8V max.
Logic 1 Voltage	2.0V min.
Logic 0 Current (V_{IN}= 0.4V)	−10 mA max.
Logic 1 Current (V_{IN}= 2.4V)	− 3 mA max.

Power Requirements

Logic Supply Voltage	+4.75V min., +5.0V nom., +5.25V max.
Logic Supply Current	450 mA nom., 875 mA max.
MOS Supply Voltage	−11.4V min. −12.0V nom. −12.6V max.
MOS Supply Current	−180 mA nom., −260 mA max.,
Panel Supply Voltage	−237.5V min., −250V nom., −265V max.
Panel Supply Current	−35 mA min., −120 mA nom., −200 mA max.**

Output Signals

Panel Scan Monitor Output

Logic 0 Voltage	0.4V max.
Logic 1 Voltage	2.4V min.
Logic 0 Current (V_{OUT}=0.4V)	−16 mA max.
Logic 1 Current (V_{OUT}=2.4V)	400 uA max.
Power Dissipation	30 watts nom.

****Corresponds to all dots on the panel lighted.**

NOTES

1. All voltages referenced to ground, V_{DD} = 0 V.
2. All currents into the unit are defined as positive.
3. All limits apply over the operating temperature range and the power supply variation range.
4. Luminous intensity is the typical time-averaged luminous intensity per dot, operated at recommended conditions.
5. Contrast ratio is defined as the ratio of the luminous intensity of an on-dot to an off-dot. Contrast ratio may be checked by measuring the luminous intensity of a cell in an "on" and "off" condition while illuminated by a circular light source located under the panel. The angle from the edge of the source to the cell under test shall be 45^{o}. The illumination at the panel surface shall be 50 ft C.
6. The viewing angle is determined by the angles from normal at which the luminous intensity falls to 20 percent of the on-axis value.
7. At the extreme range of the external dimming potentiometer, a panel may operate at light output less than 20 percent of its nominal output. As the brightness is reduced below 20 percent of its nominal value some of the addressed cells may fail to fire for each scan or may remain extinguished all the time. Cells firing irregularly from cycle to cycle result in a time variation of their brightness. If the cells do not fire at all in any scan cycle, missing dots will appear in the data and there may be a significant variation in the light output from cell to cell.
8. Operating at low temperature is not recommended as this may result in shortened panel life.
9. The unit is tested by generating interface signals using typical TTL buffers.

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