

SP-452

0.5" (12,77 mm) Character Height, Gas Discharge Display

The SP-452 is a 14-segment alphanumeric gas discharge display for use in point-of-sale, instrumentation and other applications where the capability of displaying alphanumeric messages of up to 16 characters is needed. Its 14-segment digit format provides a display set of 55 commonly used characters, including the ten numerals, the uppercase alphabet and many special symbols. The SP-452's flat screened image design provides a wide 130° angle of visibility and its bright neon-orange, half-inch high characters spell readability in all but the most extreme viewing environments.

Use of an edgeboard mounting design minimizes display thickness. SP-452 requires only 0.8 inch of mounting depth, including tubulation, at its thickest point. Total display package measures 1.55" by 8.90" (39.4 by 226.1 mm).

Features

The SP-452 is a standard member of the SP-400 line of Screened Image Displays. Its features include:

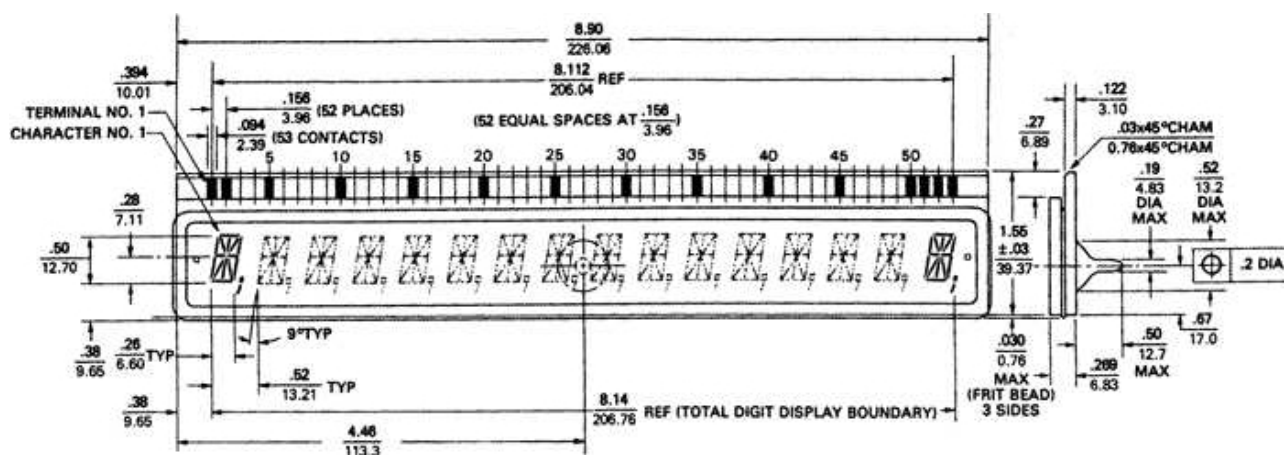
- 0.5 inch (12,7 mm) character height
- 14-segment alphanumeric characters
- 16 character field width
- 105 footlamberts brightness (1/8 duty cycle)
- Neon-orange color
- 130° viewing angle
- Edgeboard connection
- Decimal point with each character
- Comma with each character
- Low power consumption

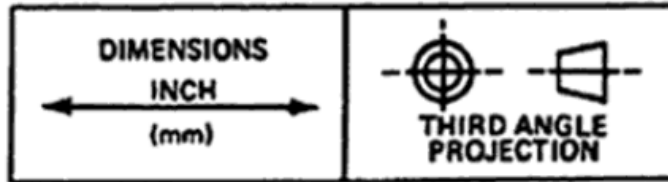
Applications

The SP-452 display is designed for multiplexed operation. Because of its 16 character field width, use of the keep alive cathode is required. Various ways of accomplishing the necessary decoding and driving, and a schematic diagram of a multiplex circuit are provided in this technical bulletin.

Several 8-segment buffer-drivers, among them the Motorola MC3491, Dionics DI-300 and National DM 8889 are suitable for use as cathode drivers. Advantage may be taken of the two unused outputs to drive the decimal point and comma. As few as two cathode drivers are required for multiplexed drive.

Figure 2 - SP-452 Outline Drawing





Tolerances unless otherwise specified
 $\pm .005$ inch and $\pm 0,127$ mm
angular $\pm 2^\circ$

Metric equivalents, based upon 1 inch = 25,4 mm are rounded to the same number of decimal places as in the original English units and are provided for general information only.

Segment Designation (typ)



Recommended Operating Conditions

Parameter	Min	Typ	Max	Unit
Anode Supply Voltage	170	180	240	Vdc
Anode-to-Anode Differential Voltage		60		Vdc
Anode-Anode Cathode Voltage Drop (1)		155		Vdc
Anode Voltage Swing		60		Vdc
Cathode Voltage Swing	50	80		Vdc
Cathode Currents (2) Reference Segment (b)	0.63	0.83	1.05	mAdc
Keep Alive	25			μ Adc
Decimal Point, Comma	0.39	0.52	0.65	mAdc
Anode On Time (1 or 16 duty cycle)	200		600	μ s
Anode On Time (1 of 8 duty cycle)	300		1200	μ s
Interdigit Blanking Time		55		μ s
(segment b current = 0.83 mA at 180 V)				
Refresh Period			10	ms
Initial Ionization Time ($V_s = 180V$)			5	s
Operating Temperature	0		55	$^{\circ}C$
Storage Temperature	-40		70	$^{\circ}C$

Notes

1. Cathode current at segment b of 0.83 mAdc, 1/8 duty cycle is assumed.

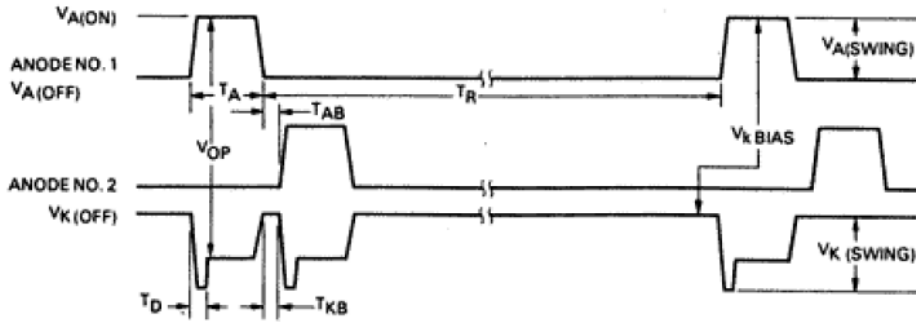
2. For uniform segment brightness, currents must be proportioned according to respective segment areas. Ratio other segments against segment b (the minimum current specified for segment b is the lowest which will produce an even glow).*

Figure 4 - Table of Connector/Segment Interconnections

Term No.	Segment Function Characters 1 - 8	Current Ratio*	Term No.	Segment Function Characters 9 - 16	Current Ratio*
1	Anode/Keep Alive (Left)		28	Comma	
2	Keep Alive (Left)		29	Anode/Char. 9	
3	Anode/Char. 1		30	n	1.12
4	n	1.12	31	m	0.60
5	h	0.92	32	Anode/Char. 10	
6	Anode/Char. 2		33	a	1.10
7	m	0.60	34	k	1.00
8	Decimal		35	f	1.00
9	Anode/Char. 3		36	Anode/Char. 11	
10	k	1.00	37	j	0.83
11	d	1.10	38	e	1.27
12	Anode/Char. 4		39	Anode/Char. 12	
13	a	1.10	40	d	1.10
14	j	0.83	41	h	0.92
15	e	1.27	42	Anode/Char. 13	
16	Anode/Char. 5		43	b	1.00
17	g	0.61	44	c	1.38
18	f	1.00	45	g	0.61
19	Anode/Char. 6		46	Anode/Char. 14	
20	c	1.38	47	Decimal	
21	r	1.16	48	r	1.16
22	Anode/Char. 7		49	Anode/Char. 15	
23	b	1.00	50	p	1.18
24	p	1.18	51	Anode/Char. 16	
25	Anode/Char. 8		52	Keep Alive (Right)	
26	Comma		53	Anode/Keep Alive (Right)	
27	Not Used				

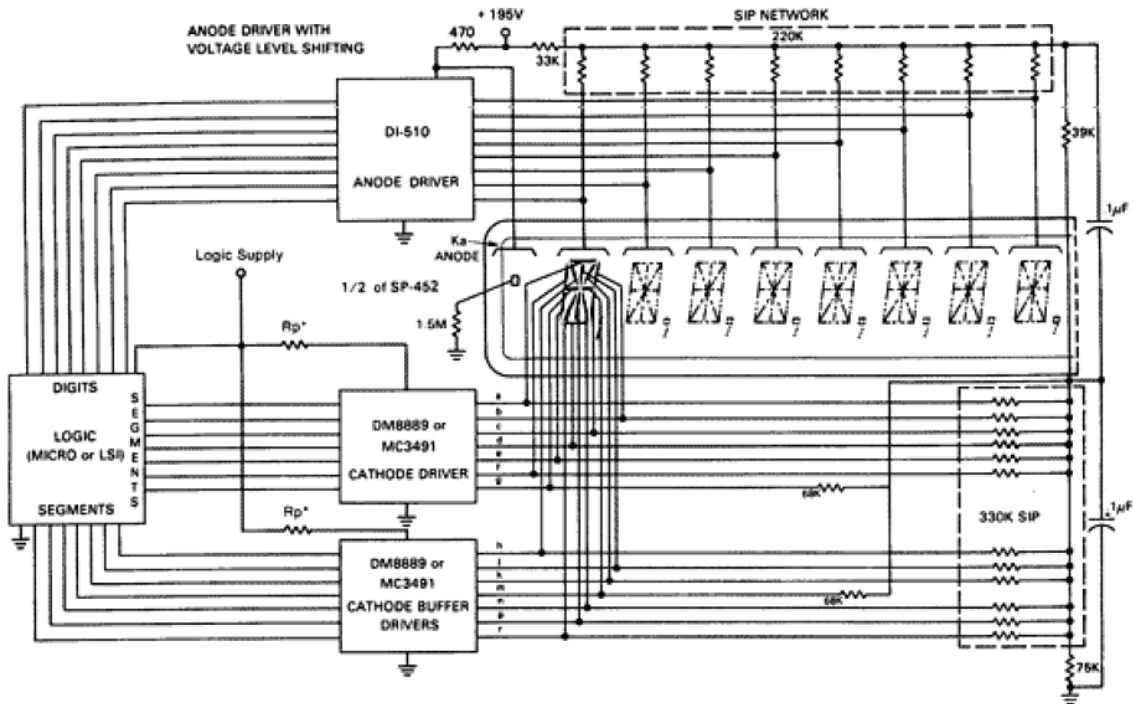
For most applications, it is not necessary to adjust segment currents in precise proportion to the reference segment current. The majority are within 20% of each other and can be driven from a single current sink. However, segments m and g differ sufficiently to require reduced current. As shown in Figure 6, the current sink is programmed slightly above nominal to insure that segments c and e are not run below minimum current. Similar current shunting can be used when driving the decimal point and comma.

Figure 5 - Multiplex Circuit Waveforms, Sequential Scan



- $V_{A(ON)}$ = ANODE ON VOLTAGE
- $V_{A(OFF)}$ = ANODE OFF VOLTAGE
- $V_{K(OFF)}$ = CATHODE OFF VOLTAGE
- V_{OP} = TUBE OPERATING VOLTAGE
- T_D = TUBE TURN-ON DELAY
- T_A = ANODE ON TIME
- T_R = ANODE OFF TIME (REFRESH PERIOD)
- T_{AB} = ANODE BLANKING TIME
- T_{KB} = CATHODE BLANKING TIME
- $V_{K(BIAS)}$ = CATHODE BIAS VOLTAGE
- $V_{K(SWING)}$ = CATHODE VOLTAGE SWING
- $V_{A(SWING)}$ = ANODE VOLTAGE SWING

Figure 6 - SP-452 In A Typical Multiplex Application



NOTE: This drives 1/2 of SP-452 to get maximum brightness from a 1/8 duty cycle. Could also use 1/16 duty cycle with reduction in brightness.

* Select R_p for 0.95 ma per segment.

Maximum brightness is obtained from this circuit by driving the SP-452 from a 1/8 duty cycle. The DI-510 Anode Driver level-shifts the digit signals from logic levels to the + 195V supply. The 220K SIP network provides a 40-50 volt anode pull-down. To interface the logic to the display cathodes, the DM8889 or MC3491 Cathode Drivers are used as constant-current segment drivers. The 330K SIP network provides cathode pull-up.

As shown in Figure 6, the display field is eight digits long, even though the SP-452 contains a field of 16 digits. However, it is configured in two sets of cathodes, allowing for either a 1/8 or 1/16 duty cycle. By adding one DI-510, this circuit may be expanded to a 1/16 duty cycle. Or, by adding two DM8889's, all 16 digits may be operated at a 1/8 duty cycle. If the latter is chosen, each of the second group of eight anodes would be connected to corresponding anodes of the first group of eight, creating two parallel scans of eight digits each.

* Items in bold and with an asterik (e.g. **RST***) indicates negative true logic (typically denoted by an overbar).

Figure 1



For further information, contact your local Babcock Representative or the factory.

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Specifications subject to change without notice.

SPECIAL HANDLING INSTRUCTIONS

MOS circuit components in this assembly are susceptible to damage from static electricity and high voltage transients. A shorting pad of conductive foam has been installed across the interface connector. The shorting pad should not be removed until the terminating connector is wired and ready to be connected to the assembly. The interface connector should always be terminated with either the shorting pad or the terminating connector. DO NOT TOUCH the interface connector with fingers or tools in the absence of the shorting pad or the terminating connector unless properly grounded. The data connector should not be connected or disconnected while power is applied to the unit.

LIMITED WARRANTY

All Babcock displays have a one year limited warranty. Disassembly of the product will void the warranty. Damaged displays should be returned to the factory for analysis. Contact the factory for further details. Specifications are for reference only.
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