




## FOREWORD

The purpose of Application Note 32 is to provide a guide for selecting Hewlett-Packard and Dymec\* digitizing instruments when a specific application or combination of measurement functions is in mind. It serves as a guide in choosing those output-indicating instruments, such as digital recorders and remote indicators whose input requirements are compatible with  and Dymec\* digitizing equipment.

Application Note 32 demonstrates the simplicity with which Hewlett-Packard and Dymec\* equipment may be used, individually as well as conveniently interconnected, to form a great many basic instrumentation systems.

Moreover, versatility and compatibility of different instrument types, an essential element in any instrument system, is also shown by Hewlett-Packard and Dymec\* in several ways:

1. Plug-in units allow a wide variety of applications from one basic instrument.
2. Standard catalog equipment is easily interconnected in "building-block" form for instrumentation systems, without special furnishings or custom engineering charges: Electronic counters or digital voltmeters, adequate for initial purposes, can be supplemented at any time with more specialized equipment, such as remote readouts, punched card or tape recording, multiple digital comparison, go-no-go testing, electric typewriter recording, or other measuring devices.
3. Operational obsolescence is reduced between instrument models by carry-over design advances, based on human engineering precepts.
4. Constant attention to quality and exhaustive development testing extends the reliable scope of equipment beyond the lab--to van, production, and field applications--without special precautions or degradation in performance.

## INTRODUCTION

GENERAL:


Application Note 32 is made up of six related divisions: three charts and a table, a capsulated discussion on printer control design, and a section about digital recorder print-wheels.

(1) Chart "1" lists different possible measurement functions (e.g. FREQUENCY, PERIOD, PHASE ANGLE) along the side of the chart, and lists such things as possible accuracies, instruments, and display at the top.

(2) Chart "2" lists different output-indicating instrument (i.e. digital recorders and remote indicators) along the side along with compatible digitizing instruments; and at the top are listed the particular requisites of operation.

(3) Chart "3" lists specific digitizing instruments along the side, with the compatible output equipment listed at the top.

(4) The Speed Measurement Table is simply a tabulation of different tachometers for use in reciprocation or rotational speed measurements, having a short introduction of measurement prerequisites.

(5) Section I is a brief enumeration of design considerations when building transistor control circuitry for 565A Printers, essentially the same type mechanism used in  digital recorders.

(6) Section II discusses the variety of characters and symbols available that may be ordered on special print-wheels for the digital recorders; a classification of stocked, special print-wheels is at the end.

DEFINING THE MEASUREMENT NEED:

Before selecting equipment for any particular measurements, the quantitative problem should first be defined and isolated as best as available information will allow. This not only precludes shortcomings in the

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final results, but prevents wasted dollar value; that is, it prevents acquiring equipment whose full potential will never be used. On the other hand, additional quantities may be discovered, necessitating more equipment later on, which could then be included in the final analysis for choosing perhaps one instrument suitable for all applications. Some measurement considerations are these:

1. Particular measurement required (phase, period, voltage, etc.)
2. Frequency range covered
3. Accuracy required
4. Recording needs
5. Monitor or control action
6. Alternate applications

#### SELECTING EQUIPMENT:

As a rule of thumb, first considerations in selecting digitizing measurement equipment center about the electronic counter or digital voltmeter that can make the desired measurement with the required accuracy. After that, factors like indication, remote readout, recording, and alternate applications can be evaluated in their order of relative importance.

By referring to Chart "1", Chart "2", and Chart "3" it will be possible to determine and evaluate this type of information for both digitizing and output recording equipment. Chart "1" is arranged by measurement function in order of increasing frequency on one axis and increasing accuracy on the other axis along with related information. Chart "2" is arranged so that the most suitable digital recorder can be chosen for use with the digitizing instrument selected. And Chart "3" is essentially the reverse of this procedure, the digitizing instruments being listed first for compatibility with output-indicating equipment, which are listed at the top of the chart.

All charts are similarly constructed in that information is contained along separate axes, being cross-correlated by a system of dots in a columnar arrangement: to determine the requirements for a particular measurement, or to see the combination possibilities of instruments, first, read along the selected column while observing the position of all the dots; second, change axis direction and trace along each column which intersects that where a dot is positioned for the associated heading in the column. By using this criss-cross method, fixed quantities can be selected for reference with different measurement variables.

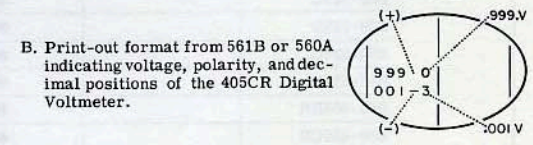
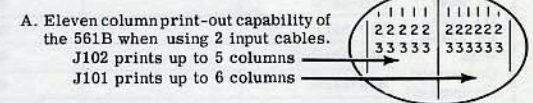




Digitizing Model	Number of 562A BCD or 560A Comparator Boards Required	Digitizing Model Option Number		Option 13 (See Note 5)				Cable Furnished			Additional Cable Required		Analog Output 0-100 mv dc 0-1 ma dc (See Note 9)	Dual Input Couplers (See Note 6) K07-560A K08-560A (Rack Mount)		1-6 Column Output (See Note 7)	1-11 Column Output (For 12 Column See Note 8)	
		01 (See Note 4)	02	One Option 30 BCD Input Connector Assembly (9 column)	One Option 31 BCD Input Connector Assembly (6 column)	Two Option 32's Input Cables (9 column) BCD or 3 10-line	Eleven Option 21's BCD Boards (+1-2-2-4 "1" State Positive)	562A-16C	561B-16A	560A-16H	561B-16A	560A-16H						
														01	02			
562A (BCD) Operation With Companion Equipment: (Note 2)	H80-521A	4			•	1		•										
	H80-521C	5			•	1		•										
	H80-521D	4			•	1		•										
	H80-521E	5			•	1		•										
	H80-521G	5			•	1		•										
	H80-522B	5			•	1		•										
	H80-523C	6			•	1		•										
	H80-523D	6			•	1		•										
	H80-524C	8			•		1		•									•
	H80-524D	8			•		1		•									•
	5212A	5				•	1		•									
	5512A	5				•	1		•									
	5232A	6				•	1		•									
	5532A	6				•	1		•									
	5233L	6				•	1		•									
	5243L (Note 1)	10			•		1		•									•
	5245L (Note 1)	10			•		1		•									•
	5275A	7			•		1		•									•
	H80-405BR	5				•	1		•									•
	DY 2401	8			•		1		•									
DY 2500 (Note 2)	5																	
DY 2503 (Note 2)	5																	
562A (BCD) Operation From 2 Sources		1-11			•	•		•	•									•
561B (10 Line) Operation With Companion Equipment:	521D				•				•									•
	521E				•				•									•
	523C				•				•									•
	524C				•				•									• <sup>A</sup>
	405CR								•									• <sup>B</sup>
561B (10 Line) Operation From 2 Sources				•					•	•								• <sup>A,B</sup>
560A (Staircase) Operation With Companion Equipment: (Note 3)	521A	4		•					•									•
	521C	5		•					•									•
	521D	4		•					•									•
	521E	5		•					•									•
	521G	5		•					•									•
	522B	5		•					•									•
	523C	6		•					•									•
	523D	6		•					•									•
	524C	8		•					•									• <sup>A</sup>
	524D	8		•					•									• <sup>A</sup>
	405CR	5		•					•									• <sup>B</sup>
	DY 2500								•									•
	DY 2503								•									•
	560A (Staircase) Operation From 2 Sources (with Option 05)									•	•		•	•				

NOTES

- 562A with Option 14 will accept 10-column information from 5243L and 5245L (8 digits, decimal and actual measurement unit). The 9-column operation omits the decimal and uses standard print wheel for measurement unit information. For 562A 12-column capacity, order H24-562A. For 561B 12-column capacity, order H12-561B.
- (For DY2500 and DY2503) Requires Dymec option M21 and special cable furnished by Dymec.
- Model 560A has 11 print wheels and is supplied with 6 plug-in comparators for 6-column operation unless otherwise specified. Additional comparators (Model 560A-58) may be plugged in at any other time (Model 560A-58A, \$25.00 each).
- To adapt Model 521A and 521C having serial numbers 3631 and below, with option 01, specify 521A-95A adapter kit.
- Option 13 includes, in itself, four distinct options for 562A 11-column operation; and though 1-2-2-4 column boards are indicated, other coded boards may be substituted, each print wheel having its own board. Input from two unsynchronized sources is possible.
- Dymec counters DY2500 and DY2503 must first be modified to operate into the Dual Input Couplers.
- The 560A and 561B Digital Recorders are adapted initially for 6-column print-out. The 562A Digital Recorder print-out is dependent upon the number of plug-in BCD boards or option number specified.
- Eleven column print-out capability is standard for all digital recorder models, but the ability of the different recorders to accept information is requisite on the number of BCD boards installed for the 562A; the number of input cables used for the 561B; the number of comparator boards installed for the 560A. (cf. Note 7)
- Analog output is standard from the 560A and 580A or 581A; however, the 562A requires option 41 (1-2-2-4) or option 42 (1-2-4-8).



	Digitizing Model	Cable Furnished (562A-16C)	Additional Cable Required DYMEC Optional Accessory	Digitizing Model Option 02	Analog Output 0-100 mv dc 0-1 ma dc (See Note 3)	Remote Indicator, K05-
						521D 521E 523C 524C 405
						&
						Remote Cable K07- (Note 2)
						521D 521E 523C 524C 405
580A/581A Operation With Companion Equipment:	H80-521A	•			•	
	H80-521C	•			•	
	H80-521D	•			•	
	H80-521E	•			•	
	H80-521G	•			•	
	H80-522B	•			•	
	H80-523C	•			•	
	H80-523D	•			•	
	H80-524C	•			•	
	H80-524D	•			•	
	5212A	•			•	
	5512A	•			•	
	5232A	•			•	
	5532A	•			•	
	5233L	•			•	
	5243L	•			•	
	5245L	•			•	
	5275A	•			•	
	H80-405CR	•			•	
	DY 2401	•			•	
DY 2500 (Note 1)			•			
DY 2503 (Note 1)			•			
Remote Indicator Operation With Companion Equipment:	521D			•		•
	521E			•		•
	523C			•		•
	524C			•		•
	405CR					•
Operation of DYMEC Instruments	H60-521A		•			
DY 2540	H60-521C		•			
DY 2530	H60-521D		•			
DY 2545A	H60-521E		•			
With Companion Equipment:	H60-521G		•			
	H60-522B		•			
	H60-523C		•			
	H60-523D		•			
	H60-524C		•			
	H60-524D		•			
	H60-405BR		•			
	H60-405CR		•			
	DY 2500		•			
	DY 2503 (Special)		•			
DY 2545 (Special) With Companion Equipment: (See Note 4)	5212A		•			
	5512A		•			
	5232A		•			
	5532A		•			
	5233L		•			
	5243L		•			
	5245L		•			
	5275A		•			
	DY 2401		•			

## NOTES

- (For DY2500 and DY2503) Requires Dymec option M21 and special cable furnished by Dymec.
- Remote Cable K07-524C (\$135.00 + \$2.25/ft) may be ordered in lieu of cable 561B-16A which otherwise is furnished with option 02. All other remote indicator cables are separately ordered: Cable 561B-16A, \$100.00 (6 ft); K07 Cables are \$90.00 + \$2.25/ft.
- Analog output is standard from the 560A and 580A or 581A; however, the 562A requires option 41 (1-2-2-4) or option 42 (1-2-4-8).
- Further information about DYMEC Equipment can be obtained by writing for "Digital Systems Brochure" -Dymec, 395 Page Mill Road, Palo Alto, California.


Digitizing Model	I 560A Output (Staircase)	II 561B or Remote Readout (ten line code) See Notes 1 and 2	III 562A, 580A/581A (+1 - 2 - 2 - 4 BCD and reference voltages)	IV DY Output BCD (1 - 2 - 2 - 4) See Note 4	Multiple Outputs Installed In One Instrument			
					Combination I and II See Note 8	Combination I and III or I and IV See Note 8	Combination II and III or II and IV See Note 8	Combination of three I, II and III or I, II and IV See Note 8
521A	●		●	●		●		
521C	●		●	●		●		
521D	●	●	●	●	●	●	●	●
521E	●	●	●	●	●	●	●	●
521G	●		●	●		●		
522B	●		●	●		●		
523C	●	●	●	●	●	●	●	●
523D	●		●	●		●		
524C	●	●	●	●	●	●	●	●
524D	●		●	●		●		
5212A			● <sup>5</sup>	● <sup>3</sup>				
5512A			● <sup>5</sup>	● <sup>3</sup>				
5232A			● <sup>5</sup>	● <sup>3</sup>				
5532A			● <sup>5</sup>	● <sup>3</sup>				
5275A			● <sup>5</sup>	● <sup>3</sup>				
5233L			● <sup>5</sup>	● <sup>3</sup>				
5243L			● <sup>5</sup>	● <sup>3</sup>				
405BR			● <sup>6</sup>	●				
405CR	●	● <sup>5</sup>	● <sup>7</sup>	●	●	●	●	
DY2401			● <sup>5</sup>	● <sup>3</sup>				
DY2500	● <sup>5</sup>		●	● <sup>5</sup>		●		
DY2503	● <sup>5</sup>		●	●				

- Notes: 1. One remote readout may be used at a time; limited by power supply.
2. Simultaneous use of 561B and Remote Readout is not recommended; limited by power supply.
3. Standard 562A output operates from modified DY equipment.
4. For installing both III and IV in one instrument contact Dymec; solution depends upon particular system.
5. Standard.
6. Including polarity and decimal.
7. No polarity or decimal.
8. Cost of combining options is sum of option costs, except for 523C. For the 523C combination of three outputs, add \$25 to sum of option prices. Note: combination of two or more printer outputs does not necessarily permit simultaneous printing to more than one printer. More than one printer heavily loads print command signal in some cases, and it may require amplification.

Speed Measurement Table

Speed measurements may be made with great accuracy by the use of digital tachometers and electronic counters. Accuracy depends upon the resolution obtained and the counter's time base stability. Resolution, generally the most important factor, is mainly a function of the tachometer characteristics and the driving system used.

Once a suitable tachometer is selected from the table below, the output frequency range may be used to determine the counter required. Remember that the frequency ranges listed below are based on tachometer shaft speed, not the sources'. If a step-up or step-down system is involved in driving the tachometer, the speed ratio must be considered.

Range	 Model	Description
600-300,000 rpm	506A	Photoelectric type; requires no mechanical connection. One pulse out for each light-dark section on shaft; virtually error free.
40-40,000 rpm	508A	Magnetic type; moderate torque require. Mechanical connection necessary; essentially error free; 60 pulses per revolution; counter with 1 second gate time reads directly in rpm.
30-30,000 rpm	508B	Same as 508A except 100 pulses per revolution
40-25,000 rpm	508C	Same as 508A except 120 pulses per revolution
50-5,000 rpm	508D	Same as 508A except 360 pulses per revolution

Notes: 1. One revolution feedback may be used at a limit limited by power supply.  
 2. Simultaneous use of 508B and 508C is not recommended; limited by power supply.  
 3. Standard 508A output operates from modified I/O equipment.  
 4. For tachometer both I and IV in one instrument contact system; solution depends upon particular system.  
 5. Standard.  
 6. Including polarity and detent.  
 7. No polarity or detent.  
 8. Cost of complex options is sum of option costs, except for 528C. For the 528C combination of three outputs, add \$25 to sum of option prices. Note: combination of two or more printer outputs does not necessarily require standard printer to more than one printer. More than one printer heavily loads print command signal in some cases, and it may require amplification.

SECTION I

DESIGN CONSIDERATIONS FOR 565A TRANSISTORIZED CONTROL CIRCUITS

Many circuit configurations may be used to control the  $\text{\textcircled{P}}$  Model 565A Digital Printer; however, a number of circuit considerations should be recognized when transistors are used (see figure 1):

- A. 1) Although maximum brush current is one milliampere, lower current is better for more reliable, positive action; a level of  $100 \mu\text{a}$  is frequently used.
- 2) Commutator and brush contact should have at least 6 volts between them when open.
- 3) Operating parameters for solenoids should not exceed 24 volts for high dependability. Ten volt solenoids are preferred. Since it is possible to damage transistors by an inductive kick when the circuit is opened, a diode clamping circuit is recommended for limiting any voltage surge to about four times the solenoid voltage. Lower surge voltages than this delay the pawl from locking the print wheel, because decay time of the magnetic field is increased. Driving transistors, therefore, should have a collector voltage rating in excess of four times solenoid voltage.
- 4) Biasing circuits for driving transistors should reduce solenoid current as close to zero as possible since residual currents also will retard pawl lock-in.

5) Many transistor types may be used as amplifiers or for driving solenoids, but one that is used successfully for driving 10 volt solenoids is the 2N1183B.

- B. 1) A clamping diode returned to a minus four times coil voltage can be used to protect the driving transistor from high voltage spikes without increasing drop-out time above the required 3 to 4 milliseconds; for a 10 volt pawl magnet, the diode is returned to a -35 volt supply. This allows a reverse voltage amplitude swing of about 45 volts when the +10 volt energizing voltage is removed.
- 2) The solenoid should not be loaded with additional circuitry in an attempt to reduce the inductive kick since this increases the time required to dissipate the stored energy, and, consequently, the wheel's lock-in time.
- C. 1) Paliney brushes are recommended for reducing brush noise that is contributed to the circuit when low voltages are used, as in transistor circuits, since noise will sometimes cause spurious pawl action: All  $\text{\textcircled{P}}$  Model 565A Printer Mechanism are supplied with Paliney brushes.

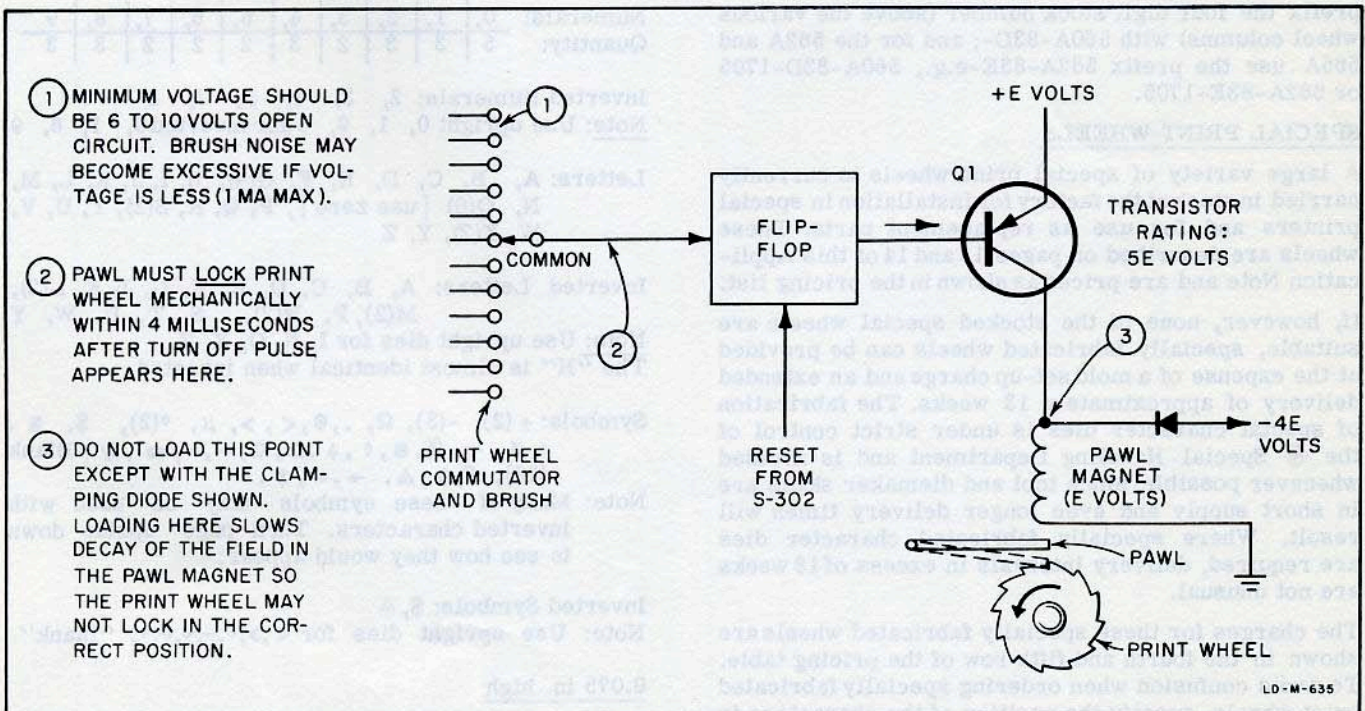


Figure 1. Representative  $\text{\textcircled{P}}$  565A Printer Circuitry

SECTION II

PRINT WHEELS

STANDARD PRINT WHEELS

Each standard printer mechanism comes equipped with 11 STANDARD print wheels, which are also available as replacement parts. Every wheel has the capacity for 12 characters (positions), and in the case of the STANDARD wheel is as follows, with an alternate format in the second column:

1	} stock no. —	1	} stock no. —		
3		For 560A or		3	For 560A or
5		561B:		5	561B:
7		560A-95T		7	560A-95P
9		For 562A or		9	For 562A or
-		565A:		*	565A:
8		562A-95B		8	562A-95P
6				6	
4				4	
2				2	
0				0	

ORDERING PRINT WHEELS

Two separate stock numbers are assigned to all print-wheel formats. Physically the wheels are the same, but those ordered for the 562A Digital Recorder and 565A Printer Mechanism have low noise brushes for working with solid-state circuits (see Section I, C-1); and though the low noise assemblies may be used in the 560A and 561B Digital Recorders, the converse is not true. Consequently, all the SPECIAL print-wheel stock numbers on page 12 will have two prefixes: For 560A and 561B SPECIAL print-wheels, prefix the four digit stock number (above the various wheel columns) with 560A-83D-; and for the 562A and 565A use the prefix 562A-83E-e.g., 560A-83D-1705 or 562A-83E-1705.

SPECIAL PRINT WHEELS

A large variety of special print wheels is currently carried in stock at the factory for installation in special printers and for use as replacement parts. These wheels are described on pages 13 and 14 of this Application Note and are priced as shown in the pricing list.

If, however, none of the stocked special wheels are suitable, specially fabricated wheels can be provided at the expense of a mold set-up charge and an extended delivery of approximately 13 weeks. The fabrication of special character dies is under strict control of the Special Handling Department and is avoided whenever possible, since tool and diemaker skills are in short supply and even longer delivery times will result. Where specially fabricated character dies are required, delivery intervals in excess of 18 weeks are not unusual.

The charges for these specially fabricated wheels are shown in the fourth and fifth row of the pricing table. To avoid confusion when ordering specially fabricated print wheels, specify the position of the characters in relation to the position of the characters in the standard 560A-95T print wheel (as shown above).

CHARACTER DIES

One character die is required for each of the twelve positions on a print wheel. Hence, if a print wheel repeats a character, more than one die for that character is required, and if additional dies must be made, the standard die charges apply.

Another general consideration to keep in mind is that a die cannot be inverted; a die intended to print upright characters (right reading viewed from the front of the printer) cannot be inverted (turned upside down). There are, however, some dies which can be used for printing either upright or inverted characters. For instance, the letter "O" can be used to print either way because it is the same whether printed with upright or inverted characters. Other dies can also be used for printing either upright or inverted characters even though their meaning changes. For instance, the upright character ">" (greater than) becomes "<" (less than) when used with inverted characters.

AVAILABLE CHARACTER DIES

Numerals in parentheses indicate the number of dies for a character, if there is more than one die.

SINGLE CHARACTERS

3/32 in. high

Numerals:	0	1	2	3	4	5	6	7	8	9
Quantity:	5	3	3	2	3	2	2	2	3	3

Inverted Numerals: 2, 3, 4, 5, 7, 8  
 Note: Use upright 0, 1, 9, 6 for inverted 0, 1, 6, 9

Letters: A, B, C, D, E, F, G(4), H, I, J, K, L, M, N, O(6) [use zero], P, Q, R, S(2), T, U, V, W, X(2), Y, Z

Inverted Letters: A, B, C, D, E, F, G, J, K, L(2), M(2), P, R(2), S, T, U, W, Y

Note: Use upright dies for I, N, O, X, Z  
 The "H" is almost identical when inverted.

Symbols: + (2), -(3), Ω, ., θ, <, >, μ, \*(2), \$, ⌘, ∴, ∅, =, %, ■, †, ‡, Δ, ∇, ~, ~, ■, √, Blank (14), ?, φ, Δ, →, ←, ✕.

Note: Many of these symbols may be used with inverted characters. Turn page upside down to see how they would appear.

Inverted Symbols: \$, Δ  
 Note: Use upright dies for <, >, +, -, ~, ~, \*, "blank".

0.075 in. high

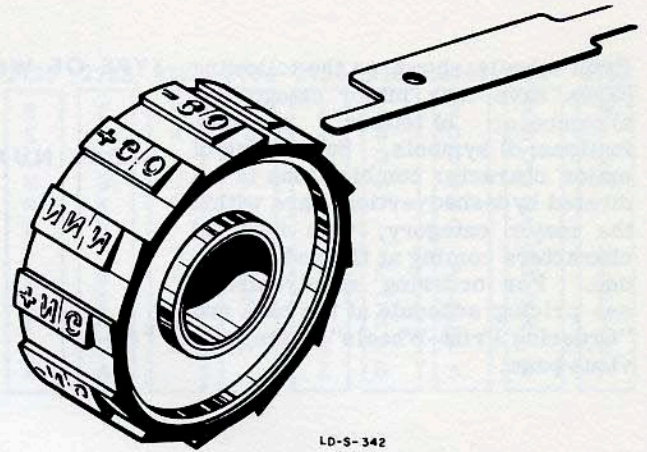
Numerals: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, -(2)  
 Letters: G, M, O(4), a, f(2), h, i, m, n, p, r, t, u

DOUBLE CHARACTERS

3/32 in. high: NN, ΔN, +N, ~N, -N, 1/, 2/, "blank" 1,  
"blank-blank," Mc, Kc, ms, sec, μs, ns

0.075 in. high: ΔG, GG, LI, ~G, +G, -G

Note: Double letters on a print wheel use up the entire width of a wheel including the portion of the wheel which is normally used to control the wheel's position. Hence, a double-letter print wheel can be controlled only by pinning it to an adjacent single-character wheel (see illustration). Thus, when you use a double-letter print wheel, you can obtain up to three characters in a two-column space, but must give up one independently controlled column.



LD-S-342

Figure 2. Double-Character Print Wheel  
(on left) Pinned to Single-Character Wheel

Print-wheels shown on the following pages have four major categories: a) numbers; b) letters; c) combinations; d) symbols. Sub-listing of major character combinations is indicated by dashed vertical bars within the major category, with inverted characters coming at the end of each one. For ordering requirements, see pricing schedule at the back and "Ordering Print-Wheels" on the previous page.

**TYPE OF WHEEL**

**STANDARD WHEELS**

**STOCK NUMBER**

560 & 561 | 562 & 565  
 560A 560A | 562A 562A  
 -95T -95P | -95B -95P

**FACE**

1 3 5 7 9 - 8 6 4 2 0	1 3 5 7 9 * 8 6 4 2 0	1 3 5 7 9 - 8 6 4 2 0	1 3 5 7 9 * 8 6 4 2 0
---	---	---	---

**SECTION A  
NUMERICAL**

2718	2730	2749
1 3 5 7 9 1/ 2/ 1	1 3 5 7 9 8 6 4 2 0	1 3 5 7 9 8 6 4 2 0

**NUMBERS PLUS SYMBOLS**

2753 2754

1 3 5 7 9 - 0 8 6 4 2 2	1 1 1
--	-------------

1713	1714	1746	1756	1787	1788	1792	2759	2760	2761	2776	2782
1 3 5 7 9 - + 8 6 4 2 0	1 3 5 7 9 . 8 6 4 2 0	1 3 5 7 9 █ 8 6 4 2 0	+ - + - -	1 * 0	0 2 4 6 8 - + 9 7 5 3 1	1 3 5 7 9 ? 8 6 4 2 0	1 3 5 7 9 < - 8 6 4 2 0	1 3 5 7 9 > - 8 6 4 2 0	1 3 5 7 9 : 8 6 4 2 0	1 3 5 7 - + 8 6 4 2 0	1 3 5 7 9 - 8 6 4 2 0

**INVERTED**

1708	1773	1791
1 3 5 7 6 8 9 4 2 0	1 3 5 7 6 \$ 8 9 4 2 0	1 3 5 7 6 - 8 9 4 2 0

**SECTION B  
LETTERS**

1707	1718	1719	1722	1726
A C E G I K L H F D B J	A C E G J L M H F D B K	N Q S U W Y Z V T R P X	o o o m g G G G N	N G A S T Y Z C B L H X

1729	1731	1739	1740	1750	1751	1752	1753	1754	1758	1765	1774	1775	1776	1777	1780	1782	1783	1786
B A E K L J D C F	M N R V T S I H O C	P R T V X Z Y W U S Q N	B D F H K M L J G E C A	I N C V W P M H A X	L R G I N S W U E M	H L S V R P A S C D E	D I M S V W T P K F	C F I P R S Q N H D T	B D F H M T J G E C A	H L N R T Y S O M K A	A C E G I L M H F D B K	N P R T V Y Z U S Q O X	H L S V R P A B C D E	B D F L P T N H E C A	B D F H J L K I G E C A	F A E T O D N S Y M H J	P I A O S E T C D N	A P E S T C I R B M F

1793	1794	1795	1798	1799	2700	2702	2708	2715	2716	2725	2726	2729	2734	2735	2736	2743	2747	2762
RYM XNC LBP GQ	EAL MTN FICO Z	SDIA OOL VNR HP	HLLB SNRT CAPD	MINI PUPU	TFV LP	BDSW TLEF	ABCD GHOP RSW	ADFM OSNJ EBR	AETI OTW PLHC U	BELM RSOI FDA	CISG KVW TPFA	EKLH DZCS VG	ACDF HLM PSTV	XY WZ	ASGL FCRP B	BDSG SWC TLEFA	ABCDE FGHJ XR	BFLR T V SPI EA

LETTERS PLUS SYMBOLS

2763	2767	2770	2771	2773	2774	2775	2777	2778	1705	1711	1712	1716	1723	1725
BDFW T V SM GE	DFLT WSGE B	APCY DLX OUEZ	JMSN CKDO AFH	BTUAL E HORCM	LFNR CE PDS TI	FUNSO PEAC IT	MPPH L TR WXYZ	BDFLT WSGE CA	MCTQ - + PA FR	+ATR K *> r P ~	ABCD - + E F G H	-BDF K M J E C A +	WRF ~ + - A T V N	SAGT - X + F M P E

1727	1738	1741	1744	1757	1759	1760	1761	1762	1766	1767	1768	1796	1797	2714	2724	2728	2731	2732
RΩ + ST YZ C ~ AX	VCTL ~ + HA Ω R	SAGT - Q + F M P R	+~ RTL DA θ F Ω - Z	ACEU - + T D B *	LTSN B C H R + - *	+ATR K * ~ N D - U	LHMC P T Ω F A N R	BFL O Z * T N H D A	CFL S Z * T O I E A	CEOT Δ * V S L D A	*TV G A	ALRS U T E Δ K G C	ABEF I * P Q θ V	ALRS U T E Δ B G C	NPI J Y * L X R O A	FLPT * - S N H C	UHΔ ■ Δ θ D	*~ - R C =

INVERTED

2741	2742	2744	2746	2750	2751	2752	2757	2758	2764	2765	2768	2769	2779	2780	1710	1769	1771
SPL ⊗ A E C V F T B	→ ↓ B =? - * C A ↑ D	UHΔ ■ ↑ ↓ =Δ θ D *	+FM < *~ + > K - O	+ATR Ω * I θ f - Z	MKΩ S M C R A	DNT f - p + P A F R	LTΔ Z C - K P D A N H	PLX K A - M V S B F T	ANR C θ E ↑ ↓ - V	RTS V P B I F G H O *	Dθ ▲ G F - ■ Δ H U	NR L P V * T G Y B C	m J P ° * A V R K D M	+~ θ ~ A C S W H F	MUR D I A C B L S E	G S T L ■	W G P D M S

**SECTION C  
COMBINATIONS**

1772	1770
I R R Y C P	I X X * J ■ S J

1706	1717	1720	1724	1728	1730	1732	1733	1734	1735	1736
G I 3 5 7 * 6 4 2 L H	G I 3 X Z * Y N 2 L H	I 3 S A X θ C ✓ 4 2 0	S T P D * 0 1 2 3 4 5	I 3 5 7 F K X P 6 4 2 0	I 3 5 F C G B 6 4 2 0	L H 5 7 9 * 8 6 4 P G	D T 5 7 9 * 8 6 η F A	P M L S O I D V E T A	- P * 6 C A +	M R * 6 4 L .

1737	1742	1743	1745	1747	1748	1749	1755	1763	1764	1778	1779	1781	1784	1785	1789	1790	2704	2705
I 3 5 7 9 T 8 6 4 2 0	L N 5 7 9 * 8 6 0 H G	K I W 7 9 * 8 6 V M U	S 3 5 7 9 * 8 6 4 2 P	K i u 7 9 * 8 6 m M U	+ p r t i D A h f η - a	I - ~ K > < μ M η ~ + 0	I 3 5 H M O L 6 4 2 R	I 3 E P S * R N 4 2 0	I 3 - I C ? U + 4 2 0	2 A C E L N H D B 3 I	I - K > < μ M η ~ + 0	I 3 5 7 9 B A 8 6 4 2 0	2 I N I D P C M G T	I 3 L S T C N B 4 2 H	0 2 4 6 8 C D 9 7 5 3 I	0 2 4 6 8 C 9 7 5 3 I	I 3 5 7 9 R 8 6 4 2 0	I 3 5 F L M P T 4 2 V

2706	2707	2709	2710	2711	2712	2713	2719	2720	2721	2722	2723	2727	2733	2737	2739	2740	2745	2748
G L M N R S W 1 0	A D F H I M R T V W 2	I 3 5 W * 6 4 2 T	I 3 B D F E C A 2	I 3 5 7 F G 8 6 4 2 0	- Z 5 7 9 * 8 6 L A +	I A 5 7 C * 8 6 E 2 0	0 1 2 3 4 B D 3 4 6 *	I 3 5 7 T * 8 6 4 2 0	I 3 5 W * 6 4 2 0 T	I 3 B D F E C A 2	I R A θ + * η S T X -	I 3 5 7 9 B 8 6 4 2 A	- T D A N 1 S E 2 W 3	I 3 5 7 9 D 8 6 4 2 0	I 3 X Y Z * C R O η	I 3 5 E W * + - 4 2 0	I 3 X Y Z * C R θ η	0 1 2 3 4 5 6 Z H M *

**INVERTED**

2756	2766	2772	2781	1709
I 3 5 7 9 - X 8 6 4 2 0	I 3 X Y Z * C R θ η 4 2	I 3 5 F - M P T 4 2 V	B S M F T R H L 1 2 3	I E θ W I H η N J 2 K

**SECTION D  
SYMBOLS**

2701	2703	2738
* ↑ -	■	-  + +

**DOUBLE  
WHEELS**

1721	2755
+G -G ~G ΔG LIGG ΔN ~N -N +N NN	Mc SEC μS    ns ms Kc

PRICING SCHEDULE

		560A	560AR	561B	561BR	565A
BASIC UNIT PRICES*	(1-9 units)	\$1400	\$1385	\$1150	\$1135	\$750
	(10-24 units)	1370	1355	1120	1105	725
	(25-up units)	1340	1325	1090	1075	700
Special Handling Charge per Instrument Use largest Charge Once for Any Combination →						
SOLENOIDS	(1-9 units)	Pawl	\$15			20
		Clutch				12
	(10-24 units)	Pawl	15			15
		Clutch				9
	(25-up)	Pawl	15			10
		Clutch				6
Pawls: 10v ±10% at 100-110 ma each 24v ±10% at 50- 65 ma each 30v ±10% at 45- 55 ma each Clutches: 10v ±10% at 695-850 ma each 24v ±10% at 300-370 ma each 30v ±10% at 375-460 ma each						
STOCKED WHEELS	(1-24)	15	5/wheel	5/wheel	5/wheel	5/wheel
	(25-49)	15	4/wheel	4/wheel	4/wheel	4/wheel
	(50-up)	15	3/wheel	3/wheel	3/wheel	3/wheel
SPECIAL MOLDING	Characters in Stock Use Stocked Wheel Price Above + Molding Charge	60	60	60	60	60
SPECIAL MOLDING AND DIES	Use Stocked Wheel Price Above					
	+ Molding Charge	60	60	60	60	60
	+ Character Die Charge	60/die	60/die	60/die	60/die	60/die
TWELVE COLUMNS	10	175	175	130	130	105
* NOTE: For 562A see Technical Data. Your Local Sales Representative Will be Glad to Help You.						

Enter a table with the appropriate instrument to establish a basic unit price. All numbers on the chart imply dollars.

As you work down the chart you add charges for various special options to this basic price, including a special handling charge.

You should add in only one special handling charge (largest) for any combination of special options.

The examples below will help you use the chart:

Example I. Required: Price for one 565A and two special stocked wheels (shown on list in Application Note 32).

565A	\$750.00
Wheels (2)	10.00
Special handling	15.00
	<u>\$775.00</u>

Example II. Required: Price for 30 565A's with 24v pawl and clutch solenoids and one special wheel that requires two new character dies.

565A (Quantity of 30)	\$700.00 each
24V Pawl Solenoids	10.00 each
24V Clutch Solenoids	6.00 each

Wheels:  
 2 character Dies  $\frac{2 \times 60}{30} = \$4.00/\text{unit}$   
 Molding Charge  $\frac{60}{30} = \$2.00/\text{unit}$   
 Wheel Charge = \$4.00/unit

Total wheel charge	\$10.00
Special handling charge	15.00
	<u>\$741.00 each</u>