

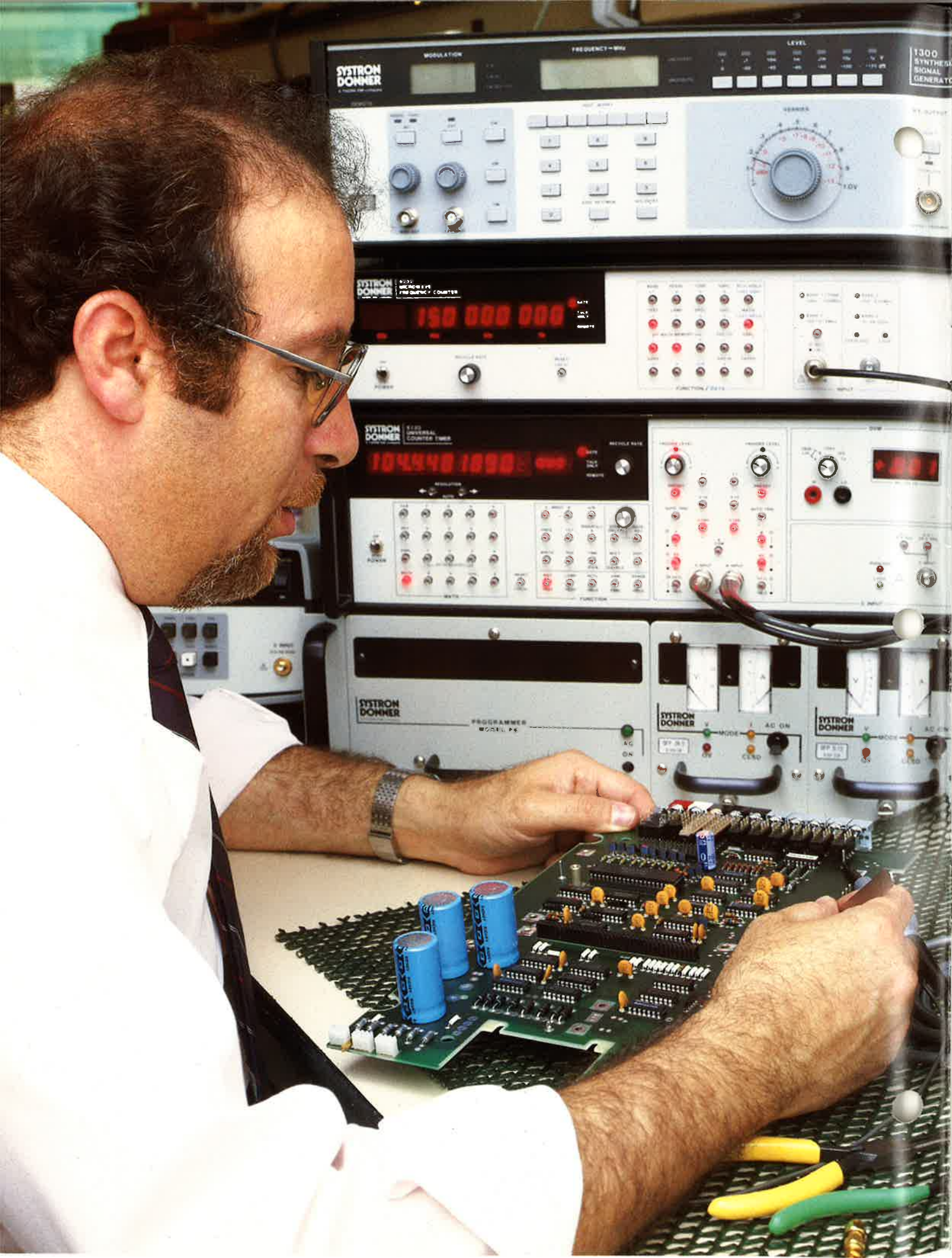
TEST & MEASUREMENT INSTRUMENTS



INSTRUMENT DIVISION

**SYSTRON
DONNER**

A THORN EMI company



SYSTRON DONNER INSTRUMENT PRODUCTS

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SYSTRON DONNER'S INSTRUMENT DIVISION

Over the past 25 years Systron Donner has become one of the world's leading manufacturers of electronic test and measurement instrumentation. We offer a broad selection of devices from analyzers to power supplies; for laboratory, bench, test, inspection, production and system uses with commercial and military/aerospace applications.

THE COMPANY BEHIND THE PRODUCTS

Systron Donner Corporation is comprised of seven divisions producing electronic-based devices and systems for the aerospace, computer and communications industries, among others.

In 1979 Systron Donner merged with the multi-billion dollar British company THORN EMI. THORN EMI is the largest manufacturer of TV and audio products in the UK and a major producer of electrical and electronic products. This new association not only strengthens Systron Donner's financial backing but also significantly extends the company's technological base and international scope.

QUALITY, PRICE, FLEXIBILITY

The aim of Instrument Division has been to provide a *useful* spectrum of electronic instrumentation—with unmatched quality.

Flexibility through options is a key ingredient in our design philosophy. Rather than include "all" conceivable capabilities in a single high-priced unit, we typically offer a choice of practical options that may be added to an instrument's basic capabilities. This gives users the specific capabilities they need—without compromising cost/performance, and without compromising quality.

CUSTOMER SERVICE

We view customer service as an integral part of the quality of our products. This means having a Customer Service Group that is large enough, skilled enough, and responsive enough to meet your needs.

Be assured that whenever you have a problem or a question our staff will respond with speed and knowledge.

ABOUT THIS CATALOG

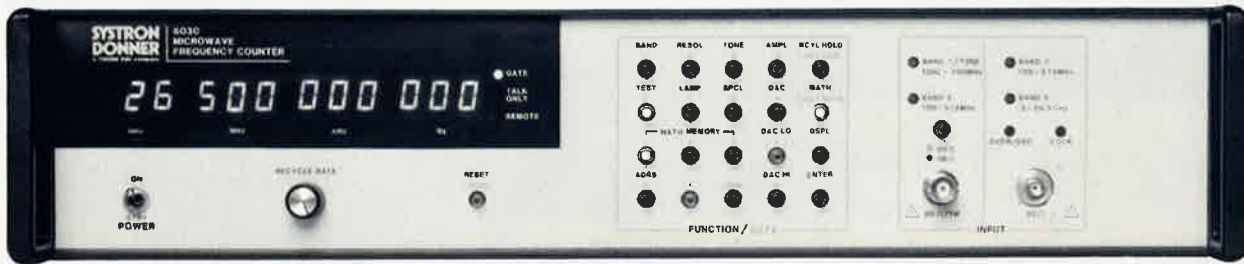
This is a guide to the many products offered by Systron Donner's Instrument Division. Of course, more detailed specifications, operations and applications information are available for individual products.

Your local Systron Donner representatives can help you select the appropriate instrument for your needs. They can also provide current price and delivery information, as well as details on parts and service assistance and ordering procedures.

If you like, you may call us in Concord, California, or simply send in the product inquiry card included with this guide.

All specifications published in this catalog are subject to change without notice.

6000 SERIES MICROWAVE COUNTERS



MODEL 6020 10 Hz to 20 GHz

MODEL 6030 10 Hz to 26.5 GHz (OPTIONAL TO 110 GHz)

Two models cover the frequency range from 10 Hz to 26.5 GHz, and optional extenders will take the range up to 110 GHz. Whichever one you choose, you'll get the essentials that you need:

- Microprocessor-based design for higher accuracy, simpler operation, and increased flexibility
- 1 Hertz per second resolution
- High AM and FM tolerance
- High-resolution tone mode
- Optional frequency extension to 110 GHz (on 6030)
- Optional power measurement from 100 MHz to 26.5 GHz with simultaneous readout of input frequency and amplitude
- Optional DAC output
- Standard IEEE-488 interface/MATE conversion
- 12-digit display
- Optional high-stability time base

WIDER DYNAMIC RANGE

The 6020/6030 Series gives you a dynamic range of 50 dB – a full 10 dB more than other counters. That means fewer worries about overloading the counter and less time spent attenuating signals.

GREATER SENSITIVITY

Sensitivity wasn't sacrificed to give you greater dynamic range. In fact, it's improved. Your 6020/6030 Series counter will measure it accurately to -30 dBm.

VERSATILE MATH PACKAGE

In addition to the standard add, subtract, multiply, and divide, the 6020/6030 math package has many unique features. You can store a math function in RAM and then execute it quickly and directly time after time by pushing a single button. You can also measure ΔF and ΔP from a stored value or from the last displayed value.

SHORTER ACQUISITION TIME

Through our improved technology, acquisition time of the 6020/6030 Series is less than 150 ms, at least 50 ms less than any other counter.

HIGH AND LOW DAC REGISTERS

In addition to the optional normal DAC output, the 6020/6030 Series has high and low DAC registers. This enables you to automatically apportion the 10 volt (0V to +10V) or 20 volt ($-10V$ to +10V) output over a range between set frequency limits.

MID-RANGE MEASUREMENT FLEXIBILITY

The 6020/6030 Series lets you make mid-range measurements (100 to 512 MHz) on either the high-frequency channel or the low frequency channel.

PLAIN ENGLISH DIAGNOSTIC MESSAGES

When the 6020/6030 Series unit is turned on, it initiates a thorough self-test routine. If the unit finds a problem, it displays an error message in plain English. There are no confusing codes to look up, so you can react faster to system problems. Also, the special function button lets you call up individual diagnostic routines to aid in locating the fault.

SIMPLE MAINTENANCE

In addition to its diagnostic features, the 6020/6030 Series has a modular design for fast troubleshooting and repair. You can replace most boards in minutes with only minor calibration.

LOW KICKBACK NOISE

The 6020/6030 Series units are designed to produce the lowest kickback noise in the industry (-65 dBm). You won't have to worry about counter noise interfering with the unit under test.

AUTOMATIC CONVERSION TO CIIIL

The IEEE 488 interface on the 6020/6030 Series unit is standard. When Option 03 is installed, the unit will automatically switch to CIIIL language upon receipt of the first command.

Specifications

FREQUENCY RANGES

6020:	10 Hz to 20 GHz
6030:	10 Hz to 26.5 GHz
Option 21:	26.5 GHz to 40 GHz
Option 22:	40 GHz to 60 GHz
Option 23:	60 GHz to 90 GHz
Option 24:	90 GHz to 110 GHz

LOW FREQUENCY INPUT CHARACTERISTICS (Band 1/Tone):

Range:	
Band 1	10 Hz – 100 MHz
Tone	10 Hz – 100 MHz (reciprocal)
Sensitivity:	25 mV rms at 50 ohm or 1M ohm
Impedance:	1M ohm, <50 pf or 50 ohm nominal
Coupling:	AC to instrument, DC to load
Input Connector:	BNC Type
Maximum Input:	
50 ohm:	5 V rms to 100 MHz
1M ohm:	DC to 500 kHz, 125 V rms; 500 kHz to 5 MHz, 50 V rms; 5 MHz to 100 MHz, 10 V rms.

PRESCALER, 512 MHz INPUT CHARACTERISTICS (Band 2 and/or 3)

Frequency Range:	100 MHz to 512 MHz
Sensitivity:	-25 dBm at 50 ohm (or 1 M ohm in band 2)
Input Impedance:	50 ohm nominal (or 1 M ohm in band 2)
Maximum Input:	5 V rms at 50 ohms

18/26.5 GHz INPUT CHARACTERISTICS (Band 4)

Frequency Range:	
Model 6020	500 MHz to 20 GHz
Model 6030	500 MHz to 26.5 GHz
Sensitivity:	
	-30 dBm to 12.4 GHz;
	-25 dBm to 20 GHz;
	-20 dBm to 26.5 GHz
Connector:	
Model 6020	Type N female
Model 6030	SMA-3mm
Maximum Input:	+20 dBm prior to acquisition; +30 dBm after acquisition
Acquisition Time:	<150 ms
AM Tolerance:	Any modulation index provided the minimum voltage of the signal is not less than the specified sensitivity.
FM Tolerance:	Frequency and rate dependent; typically >100 MHz (P-P) at rates to 10 kHz, decreasing to >10 MHz (P-P) at 10 MHz rate.

GENERAL SPECIFICATIONS

Display:	12-digit in-line, 0.4 inch LED
Resolution:	1 Hz to 1 MHz in decade steps, extended resolution by multiples to 0.001 Hz or via TONE mode (reciprocal) for low frequency signals.
Accuracy:	± 1 count \pm time base stability
Requirements:	100, 120, 220, 240 VAC ($\pm 10\%$) 48-66 Hz
Dimensions:	3 1/2" H x 16 3/4" W x 14" D
Weight:	Approximately 23 lbs. net, 30 lbs. shipping
Ext. Time Base Input:	Requires 1 MHz or 10 MHz, 500 mV minimum sine or square wave into 500 ohm via rear panel BNC. Switch selectable (INT/EXT) at rear panel.
Aging Rate after Warm-up:	
Standard	± 1 part in 10^6 /year, TCXO
Option 05	± 5 parts in 10^{10} /24 hrs., OVEN
Operating Temperature:	0 to +50°C

OPTIONS

Option 01:	DAC output
Option 02:	Amplitude measurement. Resolution of 0.1 dB and a dynamic range from the counter sensitivity to +20 dBm. Accuracy is better than ± 1.5 dB. Amplitude and frequency are displayed simultaneously.
Option 03:	CIIL interface provides MATE compatible interface in addition to the standard IEEE-488 GPIB.
Option 04:	Provides rear panel inputs in lieu of the standard front panel inputs.
Option 05:	Provides a high stability reference oscillator with an aging rate of $\pm 5 \times 10^{-10}$ /day.
Option 06:	Rack mount
Option 07:	Rack mount with slides
Option 20:	Frequency extension internal option to allow frequency measurement beyond 26.5 GHz. Includes all required interface between counter and selected optional external mixer.
Option 21*:	External mixer. Frequency range 26.5 to 40 GHz
Option 22*:	External mixer. Frequency range 40 to 60 GHz
Option 23*:	External mixer. Frequency range 60 to 90 GHz
Option 24*:	External mixer. Frequency range 90 to 110 GHz

* Requires Option 20

6245B/6246B SERIES MICROWAVE COUNTERS



PRACTICALITY AT ITS BEST

In a world of complicated test and measurement equipment, the 6245B/6246B series provides a refreshing return to human engineering and simplicity of operation. Built to MIL-T-28800, these microwave frequency counters offer complete coverage from 10 Hz to 26.5 GHz in a durable, portable, light weight package. The front panel design allows for minimum training and minimum set up time. The rugged aluminum "clam shell" case makes these counters the ideal choice for technicians on the move. All in all, we've made it simple, practical and affordable.

FREQUENCY MEASUREMENT

The 6245B and the 6246B are identical counters with frequency ranges to 20 GHz and 26.5 GHz respectively. The 10 Hz to 500 MHz range is accessible from a single BNC input. The "A" input switch allows for measurement to 100 MHz, while the "B" input switch allows for measurements to 500 MHz. The "C" input features an N type connector in the 6245B for frequencies from 500 MHz to 20 GHz and an SMA connector in the 6246B for frequencies to 26.5 GHz.

SENSITIVITY AND DYNAMIC RANGE

Utilizing the latest in thin film techniques, Systron Donner was able to combine the leveling circuit, the power divider and the dual sampler in a single module. This unique design makes it possible to achieve excellent sensitivity. For example, sensitivity is rated at -25 dBm from 500 MHz to 12.4 GHz and -20 dBm to 20 GHz. At low frequencies, sensitivity is rated at -25 dBm from 100 MHz to 500 MHz. The operative dynamic range (which is the difference between the sensitivity and the damage level) is extremely large. At 10 GHz for example, the operative dynamic range exceeds 55 dB.

OVERLOAD WARNING

Along with the extremely large "operative dynamic range" offered by the 6245B/6246B, a pending overload indication is provided. At approximately $+20$ dBm an overload warning circuit is activated and the display blinks. Of course, the reading continues to be correct and the instrument can be operated up to $+27$ dBm.

LOW KICKBACK NOISE

When utilizing the microwave counter to measure low level signals, the noise generated and radiated from the counter itself becomes very important. Because of the dual balanced sampler approach used in this counter, the noise level fed back to the source is typically less than -65 dBm. Isolators and directional devices are no longer needed to isolate the counter from the source.

HIGH FM TOLERANCE

High levels of frequency modulation pose no problem for this counter due to the frequency lock technique employed. The FM tolerance is frequency and rate dependent: typically >100 MHz (p-p) at rates to 10 KHz.

TEN DIGIT DISPLAY

The Model 6245B/6246B counters are supplied with a 10 digit LED display to allow utilization of the 1 Hz to 10 kHz resolution controls. The display features 0.4 inch, mercury-free, amber LED's for maximum visibility and reliability.

SYSTEM CAPABILITY

For systems requirements the 6245B/6246B may be purchased with the IEEE-STD-488 data interchange. Full "talk/listen" or "talk" only modes may be selected. Combine the technical performance of this counter with the system's capability for increased versatility.

Specifications

MICROWAVE INPUT

Range:	Model 6245B 500 MHz to 20 GHz Model 6246B 500 MHz to 26.5 GHz
Sensitivity:	-25 dBm to 12.4 GHz -20 dBm to 20 GHz -15 dBm to 26.5 GHz
Impedance:	50 ohm, nominal
Coupling:	AC
Connector:	Model 6245B Type N female Model 6246B Type SMA-3mm
Maximum Input:	+20 dBm prior to acquisition, +27 dBm after.
Operative Dynamic Range:	55 dB to 12.4 GHz 50 dB to 20 GHz 45 dB to 26.5 GHz
Acquisition Time:	60 ms + (1/r x N), N = Input freq. ÷ 100 MHz
Amplitude Discrimination of Two Frequencies:	20 dB amplitude separation (10 dB typical)
AM Tolerance:	Any modulation index provided the minimum voltage level is not less than the specified sensitivity.
FM Tolerance:	Frequency and rate dependent, typically >100 MHz (p-p) at rates to 10 kHz, decreasing to 10 MHz (p-p) at a 10 MHz rate.
VSWR:	<2:1 to 10 GHz, <2.5:1 to 18 GHz, <3:1 to 26.5 GHz.
Kick Back Noise:	-65 dBm typical.

MID RANGE INPUT

Range:	100 MHz to 512 MHz
Sensitivity:	-25 dBm
Impedance:	50 ohm nominal
Coupling:	AC
Connector:	BNC female
Maximum Input:	+27 dBm, fuse protected
Operative Dynamic Range:	52 dB

LOW RANGE INPUT

Range:	10 Hz to 100 MHz
Sensitivity:	25 mV rms
Impedance:	1M ohm/25 pf
Coupling:	AC
Connector:	BNC female
Maximum Input:	250V rms (10 Hz to 10 kHz), 50V rms (10 kHz to 2 MHz), 5V rms (2 MHz to 100 MHz).

TIME BASE

Time Base Output:	1 MHz, 1 volt p-p into 50 ohms
External Time Base Input:	1 MHz or 10 MHz, 1 volt rms into 500 ohms, automatic selection.

GENERAL

Display:	10 digit in-line, 0.4 inch LED, automatic leading zero suppression.
Test:	Measures 1 MHz
Resolution:	1 Hz to 10 kHz in decade steps
Reset:	Manual or automatic
Recycle Rate:	50 ms to 5 sec, plus hold
Dimensions:	4¾" H x 8¾" W x 13½" D
Weight:	Approximately 12 lbs. net; 20 lbs shipping
Accuracy:	±1 count ± time base error
Operating Temperature:	0 to 50°C
Power Requirements:	100/115 or 200/230 volts (±10%), 48 to 440 Hz, 35 watts
Accessories Furnished:	AC power cord, manual
Gate Indicator:	Front panel lamp to indicate when gate is open.

	STANDARD	OPTION 13
Aging Rate After Warm-Up	±1 part in 10 ⁶ /year	±5 parts in 10 ¹⁰ /24 hours 72 hours
Frequency Retrace for Off Periods to Approx. 24 Hours	±5 parts in 10 ⁷ within 15 minutes	1 hour typical to reach ±5 parts in 10 ⁹
Short-Term Aging Rate	±5 parts in 10 ⁶ /day average for 3 days	±5 parts in 10 ¹¹ rms for 1 second average
Temperature Variation	TCXO. 1 part in 10 ⁶ over 0 to +50°C	<±2 parts in 10 ¹⁰ /C°, typical
±10% Change in Line Voltage	±5 parts in 10 ⁶	±2 parts in 10 ¹⁰
Long-Term Aging Rate	±3 parts in 10 ⁷ for 30 days	±1.5 parts in 10 ⁸ for 30 days

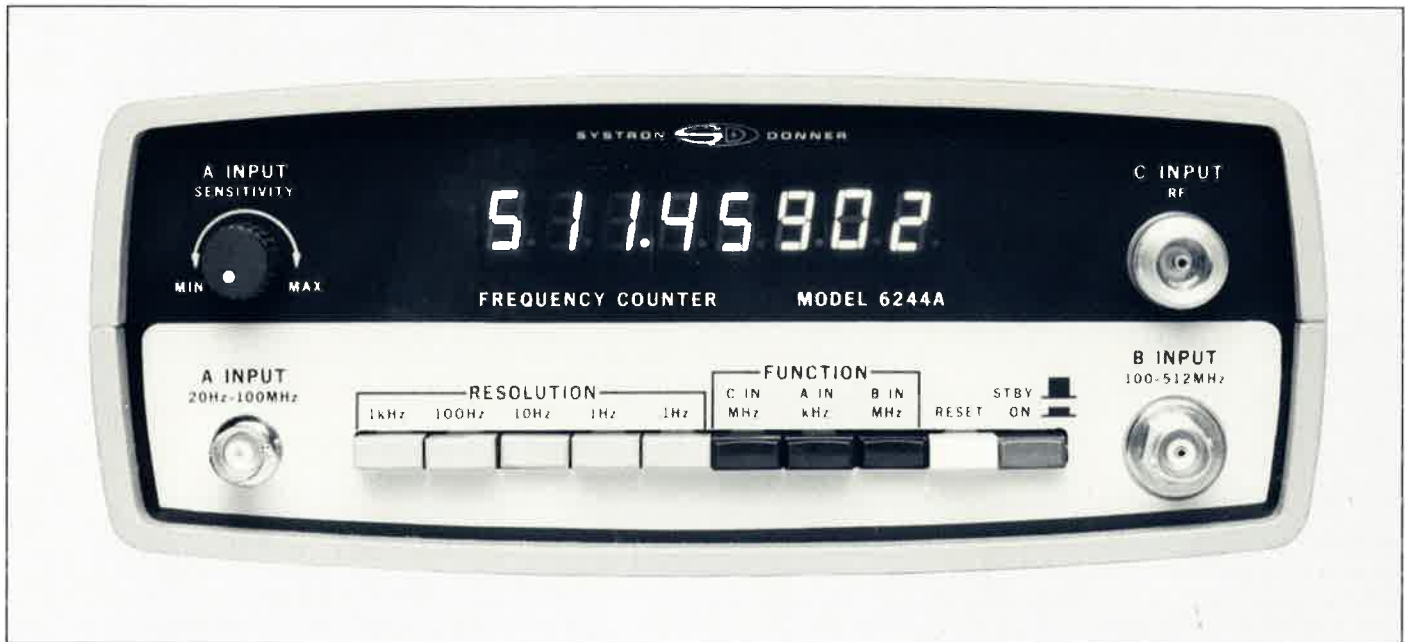
ORDERING INFORMATION

Models:	6245B 20 GHz Microwave Counter 6246B 26.5 GHz Microwave Counter
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Options:	Option 05 IEEE-STD-488 Option 13 Oscillator
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Accessories:	
<i>Part Number</i>	<i>Description</i>
06778701	10 position P.C. extender
06776601	22 position P.C. extender
06787402	Rack mount, single
06787502	Rack mount, dual
067876	Equipment carrying case
057245	Spare fuses, FR, 5 each

6240 SERIES COMMUNICATIONS COUNTERS



FEATURES

- Select from 100 MHz, 512 MHz, 1250 MHz, or 4500 MHz models
- 10 mV rms sensitivity for all models to 500 MHz; -13 dBm above 500 MHz
- Withstands high input signal levels without damage
- 8-digit LED readout, 0.1 Hz resolution
- Optional tone measurement capability. Example: 1020.01 Hz displayed automatically in one second
- Built-in battery pack, BCD output options

The 6240 series counters are rugged, light-weight, easy to carry and easy to use. The series consists of four counters covering 20 Hz to 4.5 GHz. Each counter can be equipped with a variety of options to satisfy the need of the individual users. Available options include low frequency tone measurement, built-in battery operation and digital outputs.

SENSITIVITY

All models feature 10 mV rms sensitivity from 20 Hz to 100 MHz and -27 dBm to 1250 MHz. The 6244A microwave input sensitivity is better than -13 dBm from 500 MHz to 4.5 GHz.

OVERLOAD

With excellent sensitivity and broad dynamic range these counters are also equipped with input overload protection. In the case of the 6242A (512 MHz) and the 6243A (1250 MHz) the 50 ohm RF channel is fuse protected. At an input level of 5V rms a front panel replaceable fuse will open to prevent damage. The 0.5 to 4.5 GHz input of Model 6244A incorporates a pin diode limiter to prevent damage with levels up to a full $+20$ dBm.

DISPLAY AND RESOLUTION

Systron Donner's communications series counters include an 8-digit readout using 0.4-inch amber LED indicators. The visibility is excellent

and the display meets all requirements for a mercury-free environment. The readout includes leading zero suppression and display storage. A rear panel lamp test pushbutton illuminates all segments of each digit.

Display resolution may be selected from 0.1 Hz to 1 kHz in decade steps from front panel pushbutton selectors. For higher resolution of low frequency inputs, Systron Donner's tone multiplier option may be ordered.

OPTIONAL TONE MULTIPLIER MODE

To make low frequency measurements with both high speed and high resolution, Systron Donner offers an optional tone multiplier mode. From 50 Hz to 3000 Hz, the tone mode will yield high-speed readings with resolution as high as 0.001 Hz. For example, 0.01 Hz resolution measurements may be made in just 1 second. This eliminates the need for 100 or 1000 second measuring times or the often-confusing period timing technique.

OPTIONAL BCD OUTPUT

All information displayed on the front panel is available in parallel 8-4-2-1 BCD format via a serial-to-BCD conversion cable. This includes all eight digits and decimal point. Logic levels are $+5$ volts (nominal), positive true, TTL compatible. A print command is provided for indications of end of count.

OPTIONAL BATTERY OPERATION

All models except the 6244A are designed to accommodate an internal battery pack. This option does not increase the size of the instrument. The battery's DC power is automatically implemented when AC power fails or is removed. During AC operation the battery is continually being charged. When fully charged, the instrument will operate continuously for approximately 3 hours.

Specifications

	MODEL 6241A	MODEL 6242A	MODEL 6243A	MODEL 6244A
FREQUENCY RANGE				
Direct (A) Input	20 Hz to 100MHz			
Prescaled (B) Input	N/A	100 MHz – 512 MHz	100 MHz – 1250 MHz	100 MHz – 512 MHz
ACTO (C) Input	N/A			0.5 GHz to 4.5 GHz
Tone Mode (optional)	50 Hz to 3000 Hz via "A" input			N/A
INPUT IMPEDANCE				
Direct (A) Input	1 M Ω / 25pF			
Prescaled (B) Input	N/A	50 ohms nominal		
ACTO (C) Input	N/A		50 ohms nominal	
SENSITIVITY				
Direct (A) Input	10 mV rms			
Prescaled (B) Input	N/A	10 mV rms/ – 27 dBm		
ACTO (C) Input	N/A			– 13 dBm
OVERLOAD				
Direct (A) Input	250V rms (20 Hz to 10 kHz); 50V rms (10 kHz to 2 MHz); 5V rms (2 MHz to 100 MHz)			
Prescaled (B) Input	N/A	5V rms		
ACTO (C) Input	N/A			+ 20 dBm
RESOLUTION				
A, B, and C Inputs	0.1 Hz to 1 kHz in decade steps			
Tone Mode (optional)	0.001, 0.01, 0.1 Hz if tone multiplier installed			N/A
GATE TIMES				
Direct (A) Input	10 sec to 1 ms in decade steps			
Prescaled (B) Input	N/A	4 ms to 40 sec	16 ms to 160 sec	4 ms to 40 sec
ACTO (C) Input	N/A			10 ms to 90 sec

OSCILLATORS	STANDARD	OPTION 08	OPTION 11	OPTION 13
Aging Rate after Warm-up	± 2 parts in 10^6 /year	± 1 part in 10^6 /year	$< \pm 3$ parts in 10^9 /24 hrs after 72 hours	± 5 parts in 10^9 /24 hr after 72 hours
Frequency Retrace for Off Periods to Approximately 24 Hours		± 5 parts in 10^7 within 15 minutes	1 hour typical to reach ± 6 parts in 10^9 max.	1 hour typical to reach ± 5 parts in 10^9
Short-Term Aging Rate	5 parts in 10^9 rms for 1 second average	± 5 parts in 10^9 /day average for 3 days	± 1 part in 10^{10} rms for 1 second average	± 5 parts in 10^{11} rms for 1 second average
Temperature Variation	5 parts in 10^6 from 0 to +50°C.	TCXO. 1 part in 10^6 over 0 to +50°C.	$< \pm 2$ parts in 10^{10} /°C typical. Maximum: ± 4 parts in 10^9 over a 20°C change within the range of –20°C to +55°C.	
$\pm 10\%$ Change in Line Voltage	± 1 part in 10^7	± 5 parts in 10^8	± 5 parts in 10^{10}	± 2 parts in 10^{10}
Long-Term Aging Rate	± 3 parts in 10^7 for 30 days	± 3 parts in 10^7 for 30 days	± 3 parts in 10^8 for 30 days	± 1.5 parts in 10^8 for 30 days

OPTIONS

Option 06	Internal battery pack. AC or DC operation. May not be installed with Option 45 or on 6244A Counter.
Option 35	Digital outputs. Converter cable for 8-4-2-1 BCD, 5 volts (nom.), TTL compatible.
Option 45	Tone multiplier. 0.01 Hz resolution in one second for 50 Hz to 3,000 Hz inputs. May not be installed on 6244A Counter.

ACCESSORIES

Part No.	Description
037724	Carry case, soft
067876	Carry case, hard
06787401	Rack mount, single
06787501	Rack mount, dual
057245	Spare input fuses, box of 5 (except model 6241A)

6100 SERIES UNIVERSAL/MICROWAVE COUNTERS



MULTI-FUNCTION COUNTERS FOR EVERY APPLICATION

	UNIVERSAL AND TIME MEASUREMENT	FREQUENCY MEASUREMENT		
		TO 1.3 GHz	TO 18 GHz	TO 26.5 GHz
6100	■			
6110	■	■		
6120	■	■	■	
6130	■	■	■	■

DESCRIPTION

The basic instrument is the Model 6100 Universal Counter Timer, which provides reciprocal or normal gate mode frequency measurement to 100 MHz and time measurement to 5 nsec. Pulse characterization by measurement of transition times and pulse duration is also provided. Advanced arming, choice of various trigger modes, a 1mV resolution 3½-digit DVM, matched A and B input amplifiers, IEEE-488 GPIB and a math package with three level operation make the 6100 the most advanced universal counter timer available.

The 6110 adds frequency measurement capability to 1.3 GHz. Frequency measurements beyond 100 MHz are achieved by utilizing a ÷16 prescaler circuit. The 6110 model is ideal for fast and accurate RF measurements in communication applications.

The Model 6120 Universal Counter Timer provides all the timing features of the basic Model 6100 along with frequency measurement extension to 18 GHz. A ÷4 prescaler is added for frequency counting between 100 MHz and 512 MHz. Microwave frequencies from 500 MHz to 18 GHz are measured by Systron Donner's FLACTO® technique (Frequency Locked Automatic Computing Transfer Oscillator).

The Model 6130 extends the microwave frequency measurement to 26.5 GHz utilizing the same prescaler and FLACTO® technique as the Model 6120.

EXTENDED RESOLUTION

In the frequency mode you are guaranteed a resolution of 1 Hz per second to 26.5 GHz. At frequencies below 100 MHz the 6100 series can be used in the "AUTO" reciprocal mode which displays 8 digits per second.

In the time measurement mode, extended resolution is obtained by employing the multiple sample key. You can choose up to 100,000 samples. This feature can be used to increase resolution in the period, pulse, width, time interval, ratio and rise/fall modes.

EXTERNAL ARMING FUNCTION

By using an external signal to arm the 6100 series, the counter is capable of measuring a portion of a waveform both in frequency and time. The arming signal can also be used as an electronic switch in the totalizing mode instead of the front panel switch.

VERSATILE TRIGGER CAPABILITY

The matched "A" and "B" input amplifiers are designed for optimum performance.

In the manual trigger mode, the trigger point is adjustable (+2V to -2V) and is conveniently monitored on the 3½ digit DVM. In the preset mode, the counter is triggered at the 0 volt crossing while in the auto trigger mode the counter is triggered at the center between peaks, or adjustable between the upper and lower peaks of the input signal.

In the time measurement modes a "Stop Delay" key can be used to delay the stop trigger from 100 μsec to 5 sec. This allows for time measurement of complicated wave forms that contain notches, spikes or ringing which could cause false readings.

STANDARD IEEE GPIB/OPTIONAL CIIIL

Except for the external DVM input and the power switch, every front panel key can be accessed over the IEEE BUS. When in remote, the counter is a listener and a talker unless the "Talk Only" switch is selected. In addition to the standard IEEE-488 GPIB, an optional software package is available for systems that require CIIIL interface.

Specifications

GENERAL SPECIFICATIONS

Frequency Resolution: At least 8 digits displayed per second of gate time in the AUTO (reciprocal) mode.

Accuracy: ± 1 count \pm time base error.

Period A or B Inputs:

Range 10 nsec to 10^7 sec
LSD Displayed 10 nsec \div MULT

Time Interval (TIM) A \rightarrow B:

Range 10 nsec to 10^7 sec (single event); 5 nsec to 10^7 sec (MULT mode)
LSD Displayed 10 nsec \div $\sqrt{\text{MULT}}$

Pulse Width A or B Input: Same as TIM A - B

Totalize A and B:

Range 0 to 100 MHz

Ratio A/B:

Range 0 to 100 MHz

Rise and Fall A Input:

Range 10 nsec to 10 msec
LSD Displayed 10 nsec \div $\sqrt{\text{MULT}}$
Measurement 10% to 90% of applied waveform

A/B INPUT CHARACTERISTICS

DC to 100 MHz - All Models

Frequency Range DC Coupled: 0 to 100 MHz
AC Coupled: 10 Hz to 100 MHz
AC 50 Ω : 200 kHz to 100 MHz

Sensitivity Sinewave: 25mV rms (Typ. 10mv at <50 MHz)
Pulse: 75 mV p-p, 5 nsec minimum pulse width

Coupling DC or AC

C INPUT CHARACTERISTICS

Prescaler 100 MHz to 1.30 GHz; Model 6110:

Frequency Range 100 MHz to 1.3 GHz
Sensitivity -25 dBm

Prescaler 100 MHz to 512 MHz; Models 6120 and 6130:

Frequency Range 100 MHz to 512 MHz
Sensitivity -25 dBm to 10 GHz
-20 dBm to 18 GHz
-15 dBm to 24 GHz
-10 dBm to 26.5 GHz

Impedance: 50 Ω , nominal

Coupling: AC

Connector: Type N female, Model 6120
SMA-3mm, Model 6130

Maximum Input: +20 dBm prior to acquisition, +27 dBm after

Amplitude

Discrimination of Two Frequencies: 20 dBm amplitude separation (10 dBm typical)

AM Tolerance: Any modulation index provided the minimum voltage of the signal is not less than the specified sensitivity

FM Tolerance: Frequency and rate dependent; typically >100 MHz (p-p) at rates to 10 kHz, decreasing to 10 MHz (p-p) at 10 MHz rate.

Overload Indication: Front panel LED. Flashes at approx. +20 dBm.

DVM INPUT CHARACTERISTICS

Range: ± 1.999 VDC, ± 19.99 VDC, ± 199.99 VDC
Resolution: ± 1 mV, ± 10 mV, ± 100 mV
External Time Base Input: 10 MHz, 500 mV rms minimum into 500 Ω ; rear panel BNC.

PHYSICAL SPECIFICATIONS

Dimensions: 133.3 mm x 419.1 mm x 508 mm (5.25" x 16.5" x 20")

Weight: Net: 32 lbs.
Shipping: 44 lbs.

Power: 100, 115, 215, 225, 230, 240 VAC ($\pm 10\%$)
48-66 Hz; 100 watts

Operating Temperature: 0 to +50 $^{\circ}$ C

OPTIONS AND ACCESSORIES

Option 03: Internal CIIL TMA

Option 06: Rack mount

Option 07: Rack mount with slides

Option 13: High stability oscillator

Option 32: Rear panel A & B inputs

Option 33: Rear panel C inputs

Option 34: Rear panel A, B & C

Extender Boards for Calibration: Consists of the following; 1 ea. 07713701, 2 ea. 07713801, 2 ea. 07713901 (sold as a set only).

	STANDARD	OPTION 13
Aging Rate After Warm-Up	± 1 part in 10^6 /year	± 5 parts in 10^{10} /24 hours after 72 hours
Frequency Retrace for Off Periods to Approx. 24 Hours	± 5 parts in 10^7 within 15 minutes	1 hour typical to reach ± 5 parts in 10^9
Short-Term Aging Rate	± 5 parts in 10^9 /day average for 3 days	± 5 parts in 10^{11} rms for 1 second average
Temperature Variation	TCXO. 1 part in 10^6 over 0 to +50 $^{\circ}$ C	$< \pm 2$ parts in 10^{10} / $^{\circ}$ C typ. Max.: ± 4 parts in 10^9 over a 20 $^{\circ}$ C change within the range -20 $^{\circ}$ C to +55 $^{\circ}$ C
$\pm 10\%$ Change in Line Voltage	± 5 parts in 10^9	± 5 parts in 10^{10}
Long-Term Aging Rate	± 3 parts in 10^7 for 30 days	± 1.5 parts in 10^8 for 30 days

5220 TRANSMISSION LINE ANALYZER



FEATURES

- 2 MHz to 18 GHz operation
- Single measurement identifies up to 50 faults
- Simple keyboard for operator control
- Printed record of results
- Measures location and VSWR of each fault
- Reflectometer for testing antennas and filters
- Operator prompted by display
- Built in self-test
- Portable and rugged design

DESCRIPTION

The Model 5220 Transline Analyzer is a diagnostic instrument that helps locate and characterize faults on an RF coaxial cable or waveguide transmission line in just a few minutes.

Frequency Domain Reflectometry techniques combined with a powerful microprocessor program permits rapid and accurate troubleshooting of RF transmission lines. The Transline Analyzer is NOT a complex piece of laboratory equipment that has been modified for field use. It IS a rugged instrument designed specifically for portable field use to aid the technician in rapid fault location without the need for complicated set-up or specialized training to interpret the results.

Utilizing digital signal processing and Frequency Domain Reflectometry techniques, Systron Donner's Model 5220 Transline Analyzer has the capability to identify, measure, and chart the true value of multiple faults in coax and waveguide transmission lines.

Within a few minutes, the Transline Analyzer provides an easy-to-understand log of the precise distance to each mismatch, along with the exact VSWR of each mismatch corrected for line attenuation and preceding mismatches. Best of all, the analyzer's reproducible hard-copy printout requires absolutely no subjective analysis by the operator.

CABLE DIRECTORY

The 5220 has a permanently stored library of data on the most commonly used types of transmission lines. The operator enters via the keyboard the type of cable being tested. The 5220 then uses the stored data for that cable type in performing calculations in the Transline mode. For cable types not included in the built-in directory, the velocity and cable attenuation factors must be entered via the keyboard during the test sequence.

INTERACTIVE PROMPT/RESPONSE SCHEME

The test setup and measurement operations are accomplished using an interactive prompt/response scheme. Prompt messages appear in the 40-character display on the mainframe front panel. The operator responds to these prompts via a keyboard, also located on the front panel. The hard-copy printer outputs information messages and measurement results in graph or tabular format. The operator can request a printout of complete operating instructions.

Specifications

Transline Mode: (Line Loss and Distance to Fault)

FREQUENCY

Range:	0.002 to 18 GHz
Accuracy:	
>500 MHz	±1% or 150 kHz, whichever is greater
<500 MHz	±5% or 5 MHz, whichever is greater

RF OUTPUT

Output Level:	0 dBm typ.
Harmonics:	< -20 dBc typ.
Nonharmonics:	< -40 dBc typ.
Output Impedance:	50Ω nom.
Dynamic Range:	80 dB nom.
VSWR Accuracy:	±5% of indicated VSWR from 1.1:1 to 1.99:1 for $f_0 \leq 14$ GHz, ±7% for $f_0 \geq 14$ GHz. ±10% of indicated VSWR from 2.0:1 or higher for $f_0 \leq 14$ GHz, ±17% for $f_0 \geq 14$ GHz.

Two Way Attenuation

Accuracy:	
0.002 to 2 GHz	±1.5 dB or 10%, whichever is greater
2 to 8 GHz	±2.0 dB or 10%, whichever is greater
8 to 18 GHz	±3.5 dB or 10%, whichever is greater

Fault Location Accuracy with Known Velocity of Propagation:

0.002 to 2 GHz	±1.5' or ±1%, whichever is greater
2 to 4 GHz	±1' or ±1%, whichever is greater
4 to 8 GHz	±6" or ±1%, whichever is greater
8 to 18 GHz	±5" or ±1%, whichever is greater

Reflectometer Mode: (Return Loss and SWR)

FREQUENCY

Range:	0.002 to 18 GHz
Accuracy:	±1% or 150 kHz, whichever is greater

RF OUTPUT

Output Level:	0 dBm typ.
Harmonics:	< -20 dBc typ.
Nonharmonics:	< -40 dBc typ.
Output Impedance:	50Ω nom.
Dynamic Range:	40 dB nom.
VSWR Accuracy:	Same as Transline Mode

REMOTE PROGRAMMING

Serial Interface:	RS232C
Parallel Interface:	IEEE 488-1978

GENERAL

Foreign Signal Reflection:	+17 dBm nominal, within 10% of operating frequency >500 MHz, and within ±30 MHz of operating frequency <500 MHz.
Overload Input:	+30 dBm without damage. Test operations halted and test inhibit indicator turns on when overload is greater than +17 dBm.
Data Entry:	16-key keypad
Data Display:	Two-line, 40-character LCD Alphanumeric display
Printer:	44-column thermal graphics printer.
Self-Test:	Built-in test (BIT) test of mainframe and RF head
Input Power:	100, 120, 220, 240 VAC ±10%, 46 to 440 Hz, 75 watts
Operating Temperature:	0° to 50°C
Dimensions:	
Mainframe	6½" H x 12½" W x 14½" D
RF Head	7⅛" H x 6¼" W x 10" D
Weight:	
Mainframe	30 lbs. net
RF Head	10 to 17 lbs. depending on model

MODELS AND ACCESSORIES

5220:	Transmission Line Analyzer Mainframe
5220-002-1:	RF Head, 2-1000 MHz
5220-1-2:	RF Head, 1-2 GHz
5220-2-4:	RF Head, 2-4 GHz
5220-4-8:	RF Head, 4-8 GHz
5220-8-18:	RF Head, 8-18 GHz
L118844*:	Interconnect Cable
123347*:	Printer Paper (6 rolls)
410153*:	Precision Open/Short
410154*:	Calibrated Termination
L118846*:	Technical Manual
L118979:	Mainframe Carrying Case
L118980:	RF Head Carrying Case
L118864*:	10 ft. Reference Cable

* Included with each mainframe

MODEL 1300 SYNTHESIZED SIGNAL GENERATOR



FREQUENCY COVERAGE AND RESOLUTION

The Model 1300 offers the full frequency spectrum from 100 Hz to 999.9999 MHz in 100 Hz steps. Complete frequency settings can be entered, or individual digits modified. Ten memories allow storage and recall of often-used values.

OUTPUT RANGE AND ACCURACY

From -127 dBm to $+13$ dBm the 1300 displays its output in both dBm and volts rms. The 120 dB step attenuator is typically better than ± 1 dB flat over the entire frequency range of the instrument, and guaranteed to better than ± 2 dB. Systron Donner has retained the all important vernier control which is easier to use than a keyboard.

SPECTRAL PURITY

The true measure of a signal source is what it doesn't put into the circuit. Harmonics are better than -25 dB, while non-harmonics are better than -50 dB. As for the all important figure of close in purity, single side band phase noise, the Model 1300 has better than -97 dBc 50 kHz away from the carrier!

VERSATILE MODULATION

No two applications are ever quite the same. The content of the signal is as important as the signal. Systron Donner has made another departure from the button-only sources by offering easily-set AM and FM modulation. AM from 0 to 90% from internal 1 kHz or 400 Hz synthesized signals, or from your own external source at any rate from DC to 10 kHz, all with a low distortion factor. FM range of 0 to 20 kHz, deviation at 1 kHz or 400 Hz from the internal sources, or externally at rates from DC to 15 kHz. Combination external and internal modulation gives the 1300 the capacity to generate complex signals, including pulses. A 4-digit LCD display lets you set the precise parameters.

OUTPUT PROTECTION

Reverse power protection comes standard in the 1300. The activation point is at 10 volts reverse input. This doesn't just protect the instrument, in many cases it protects the circuit under test.

LEAKAGE

Leakage is so low because the 1300 is really a box within a box. We keep the RF synthesizer in a shielded assembly and feed the signal through the attenuator to the front panel. This technique is the result of many generations of Systron Donner instruments operating up to 40 GHz.

CONSTRUCTION AND RELIABILITY

Solid design and attention to serviceability are the elements found in all Systron Donner instruments. That is why our instruments are found in so many major support systems for the military and embedded in the new cellular radio repeaters. The 1300 continues the tradition of quality workmanship that meets all military and Bell System requirements. But the proof of reliability can best be proven by use. When the Model 1300 arrives, it has gone through testing and aging procedures that have given Systron Donner an enviable warranty return record and will give you peace of mind.

VALUE

Offering a wide range of options to meet your exact needs at minimum cost, the Model 1300 has been designed to be the best VALUE Signal Generator in the market today. Uncompromised specifications, and capabilities carefully matched to requirements, means the 1300 is designed to give you the VALUE needed from a Signal Generator.

Specifications

FREQUENCY

Range:	100 Hz to 999.9999 MHz
Resolution:	100 Hz
Accuracy:	Equal to time base
Selection:	Ten memories, sequential digit entry, individual digit editing.
Time Base Specifications:	±1 part in 10 ⁶ /yr TCXO

RF OUTPUT (levelled into 50 ohms)

Dynamic Range:	-127 dBm to +13 dBm (0.1 μV to 1V rms)
Calibrated Range:	-127 dBm to -7 dBm (0.1 μV to 0.1V)
Attenuation:	120 dB push button attenuator in 20 dB steps, continuously adjustable 20 dB vernier

Flatness: (Vernier at +13 dBm position, 20 dB step attenuation.)

FREQUENCY	GUARANTEED	TYPICAL
100 kHz - 250 MHz	±1 dB	±0.5 dB
250 MHz - 550 MHz	±1.5 dB	±0.7 dB
550 MHz - 1000 MHz	±2 dB	±1 dB

Incremental Step Attenuator Accuracy:
(accuracy when changing attenuation ranges)

FREQUENCY/STEP	0 dB	≤80 dB	≥100 dB
100 kHz - 550 MHz	Uncal.	±1 dB	±1.5 dB
550 MHz - 1000 MHz	Uncal.	±1.5 dB	±2 dB

Impedance:	50 ohms
Connector:	Type N

SPECTRAL PURITY

(Vernier at +13 dBm position, 20 dB step attenuation.)

Harmonics:	≤ -25 dBc
Spurious	100 kHz - 110 MHz: ≤ -37 dBc
Nonharmonically	110 MHz - 950 MHz: ≤ -50 dBc
Related:	950 MHz - 1000 MHz: ≤ -46 dBc
Residual AM Noise:	(0.1 to 3 kHz BW) 0.1% at +13 dBm

Residual FM and SSB Phase Noise:

FREQUENCY RANGE	RESIDUAL FM 0.1-3 kHz POST DET. BW	SSB PHASE NOISE 1 Hz BW at 50 kHz OFFSET
100 kHz - 500 MHz	≤25 Hz rms	≤ -103 dBc
500 MHz - 1000 MHz	≤50 Hz rms	≤ -97 dBc

AMPLITUDE MODULATION (AM)

Modes:	Internal, external or both
Display:	3 digit, seven segment
Range:	0 to 90% (Vernier at +7 dBm position, 20 dB minimum step attenuation.)
Resolution:	0.1%
AM Rate:	Internal: 1 kHz or 400 Hz fixed External: DC to 10 kHz

Distortion, T.H.D. (at 1kHz rate):
 ≤30% AM: 0.6% typ., 1.5% max.
 ≤70% AM: 1% typ., 2.5% max.
 ≤90% AM: 3% typ., 5% max.

Indicator Accuracy: 5% of reading, ±5% full scale

Incidental FM (at 30% AM, 1kHz rate): ≤250 Hz, ≥500 MHz

External Pulse Response: ≤40 μs rise and fall

External Input: 2 volts peak for max. modulation, BNC connector

External Impedance: 600 ohms

FREQUENCY MODULATION (FM)

Modes: Internal, external or both

Display: 4 digit, seven segment

Range: 0 to 20 kHz peak

Resolution: 10 Hz

FM Rate: Internal: 1 kHz or 400 Hz fixed
External: DC to 15 kHz

Distortion, T.H.D.:
 At 20 kHz deviation, 1 kHz rate: ≤1.2%
 At 20 kHz deviation, 15 kHz rate: ≤3%
 At 10 kHz deviation, 15 kHz rate: ≤5%

Indicator Accuracy: ±6% of reading, ±100 Hz

Incidental AM (at 20 kHz deviation, 1kHz rate): ≤0.1%

External Pulse Response: ≤40 μs rise and fall

External Input: 2 volts peak for 20 kHz peak deviation, BNC connector/600 ohms, nominal.

GENERAL SPECIFICATIONS

External Reference Input: 1, 2, 5 and 10 MHz

Time Base Reference Output: 1 MHz

Internal 1kHz/400 Hz Output: Level: 0 to 2V peak into 600 ohms
Distortion: ≤1% Connector: BNC

Output Protection: Trip: Approx. 10V peak ±DC and AC component
Reset: Push button Overload indication: LED

OPTIONS AND ACCESSORIES

Option 01: Provide remote control of frequency, level and modes of operation via IEEE-488, talk and listen modes.

Option 02: Provide a rear panel RF output connector in lieu of the standard front panel configuration.

Option 03: High stability time base oscillator rated at ±5 x 10⁻¹⁰/day.

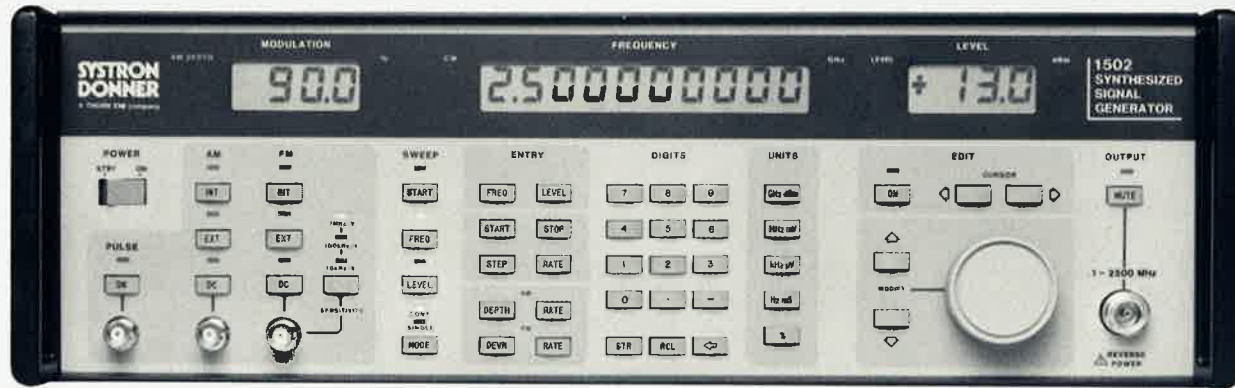
Option 04: An external frequency doubler extends the range of the 1300 to 2000 MHz. Conversion loss is <13 dB for a +13 dBm input signal.

Option 05: Rackmount configuration in lieu of the standard bench version.

Option 06: Rackmount with slides in lieu of the standard bench configuration.

06738301: Extender boards (2) dual 22 pin for calibration and repair.

1500 SERIES SYNTHESIZED SIGNAL GENERATORS



AHEAD BY DESIGN

For nearly three decades Systron Donner has been supplying the best price/performance Signal Generators to both the military and commercial markets. The 1500 Series Signal Generators continue this tradition. The 1500 Signal Generator provides all of the essential features required by industry and more. It is truly the best value in the marketplace when comparing features and specifications. All this, without sacrificing reliability and performance.

THE ESSENTIAL FEATURES

▪ Frequency Coverage and Resolution:

The 1500 Series Synthesized Signal Generator consists of two models. The Model 1501 covers the frequency range of 100 kHz to 1.5 GHz and provides 1 Hz resolution. The 1502 covers the frequency range of 100 kHz to 2.5 GHz and provides 2 Hz resolution.

▪ Output Range and Accuracy:

The 1500 Series output level may be entered in microvolts, millivolts, or dBm. The range is from -127 dBm ($0.1 \mu\text{V}$) to $+13$ dBm (1.0 V), with ± 1 dB accuracy across the range. Level flatness is better than ± 1 dB. Output level is displayed in 0.1 dB increments.

▪ Spectral Purity:

The 1500 Series provides a very clean output. Harmonics are better than -25 dBc with non-harmonics better than -60 dBc. The single sideband phase noise, which is a most important specification for receiver testing, is -115 dBc/Hz at an offset of 20 kHz from the carrier.

▪ Digital Step Sweep:

The 1500 Series provides digital step sweep of both frequency and level.

▪ Simplicity of Operation:

The dual microprocessor design provides both ease of function and data entry, along with comprehensive diagnostic and maintenance capability.

▪ Versatile Modulation – AM, FM, and Pulse:

The 1500 Series offers the most versatile modulation capability available. AM and FM modulators have individual internal generators that provide rates up to 100 kHz, and FM peak deviations up to 1 MHz. The modulated output is very low distortion and the programmed modulation parameters are displayed in a four-digit LCD display. The internal AM and FM modulation may be simultaneous. The external AM and FM inputs are DC coupled to provide for receiver and pager testing. External and internal modulation may also be simultaneous, thus providing complex output signals.

Pulse modulation is provided by an internal modulator that is driven from an external pulse input. This modulator will provide 100 ns rise times with 60 dB on/off ratio. Pulse modulation precludes the use of simultaneous AM, but may be used with FM modulation.

▪ Reliability

As with all Systron Donner instruments, the 1500 Series is designed to provide many years of troublefree service. Designed to meet MIL-T-28800 and MATE requirements, the 1500 Series is the perfect choice to fill your source requirements, whether for benchtop use or ATE system integration.

Specifications

FREQUENCY

Range:	
1501	100 kHz to 1500 MHz
1502	100 kHz to 2500 MHz
Resolution:	
1501	1 Hz
1502	2 Hz (1 Hz below 1500 MHz)
Accuracy and Stability:	Same as internal time base
Frequency Switching Speed:	<10 msec (typ.)

RF OUTPUT (leveled into 50 ohms)

Level Range (into 50 ohms):	+13 to -127 dBm
Resolution:	0.1 dB
Absolute Level Accuracy:	<±1 dB to >-120 dBm <±3 dB to <-120 dBm
Level Flatness:	<±1 dB
VSWR:	
<1 GHz	<1.5:1
>1 GHz	<2.5:1
Reverse Power Protection:	50W <1.5 GHz 25W >1.5 GHz

SPECTRAL PURITY

Harmonics:	<-25 dBc
Non-harmonic:	<-60 dBc <1.5 GHz <-54 dBc >1.5 GHz
Sub-harmonic:	
1501	None
1502	<-60 dBc
Line Related:	<-45 dBc
Residual FM:	<10 Hz rms to 1.5 GHz <20 Hz rms to 2.5 GHz
Residual AM (0.3 to 3 kHz post det. BW):	<-70 dBc
Typical SSB Phase Noise (20 kHz offset):	<-115 dBc/Hz

DIGITAL SWEEP

Start/Stop:	
Frequency	Any within frequency range.
Level	Any within level range.
Step Size:	
Frequency	1 Hz to maximum frequency range of unit
Level	0.1 dB to maximum level range of unit
Step Rate:	10 ms to 999 ms
Sweep Mode:	Single sweep or continuous

AMPLITUDE MODULATION (AM)

AM Depth:	0 to 99% to +7 dBm 0 to 30% to +10 dBm
Resolution:	0.1%

AM Rate:	
Internal	20 Hz to 99.9 kHz
External	DC to 100 kHz (3 dB)
AM Distortion (at 1kHz rate):	<2%, 0 to 30% AM <4%, 31 to 70% AM <6%, 71 to 90% AM
AM Depth Accuracy (Int.) (for depths <90%):	±6% of setting
Incidental Phase Mod. (at 30% AM):	<0.3 radians peak

FREQUENCY MODULATION (FM)

Peak Deviation:	
Internal	999 kHz
External	1 MHz
Deviation Resolution:	10 Hz for deviation <10 kHz 100 Hz for deviation <100 kHz 1 kHz for deviation <1 MHz
FM Rate:	
Internal	20 Hz to 99.9 kHz
External	DC to 200 kHz (3 dB)
FM Distortion:	<2% for deviations >25 kHz <1% for deviations >50 kHz
FM Deviation Accuracy:	±5% of setting
Incidental AM (1 kHz rate, 20 kHz deviation):	<0.3%, $f_0 > 1$ MHz

PULSE MODULATION: ($F_0 \geq 10$ MHz)*

Rise/Fall Time:	≤100 ns
Minimum Pulse Width:	6 μs
On/Off Ratio:	≥60 dB
Repetition Rate:	10 Hz to 400 kHz
Ext. Input Impedance:	50 ohm nominal, DC coupled
Input Level:	>2.7 V = On (±10V max) <0.5 V = Off

* Pulse output available below 10 MHz but not specified.

GENERAL

Memory Store/Recall:	10 registers in nonvolatile memory that save all front panel settings.
Remote Programming Interface:	IEEE-488 1978 in MATE/CIL format.
Operating Temperature:	0 to 50° Celsius
Power Requirements:	100, 120, 220 or 240V (+5%, -10%); 48 to 440 Hz; 125VA maximum
Weight:	<60 lbs
Size:	5.25 H x 16.75 W x 20.5 D (in inches)

OPTIONS AND ACCESSORIES

Option 01:	High stability time base oscillator rated at ±5 x 10 ⁻¹⁰ /day.
Option 02:	Provide a rear panel RF output connector in lieu of the standard front panel configuration.
Option 03:	Rack mount with slides in lieu of the standard bench configuration.

1618B SYNTHESIZED SIGNAL GENERATOR



DESCRIPTION

The Model 1618B Microwave Synthesizer provides precise signals between 2 GHz and 18 GHz from a single output connector. The frequency range can be extended down to 50 MHz for receiver applications. By employing advanced synthesis techniques the Model 1618B offers excellent stability, purity and programmability.

FLEXIBLE DYNAMIC OUTPUT RANGE

The 1618B incorporates automatic internal and external leveling control to provide extremely flat response over the full 2 to 18 GHz range for component characterization and receiver applications. The 110 dB precision step attenuator and level vernier provide accurate level control from -120 dBm to $+3$ dBm.

FREQUENCY CONTROL

Output frequency is selected remotely or manually from the front panel in 1 kHz increments over the full frequency range.

For applications requiring resolution increments less than 1 kHz, an external 1 to 2 MHz synthesizer input is provided to control the 1 kHz through 100 kHz digits. An external input with 1 Hz resolution will provide 1 Hz resolution at the 1618B output.

SPURIOUS AND HARMONICS

The 1618B optimizes frequency stability and spectral purity. Internal filtering obtains exceptionally low harmonics. Harmonics are better than 50 dB below carrier from 2 GHz to 18 GHz and 40 dB below the carrier from 50 MHz to 2 GHz. Non-harmonic spurious levels are better than 50 dB down from 50 MHz to 18 GHz.

SINGLE-SIDEBAND PHASE NOISE

Systron Donner's synthesis techniques offer the lowest possible fractional frequency deviation and optimum phase noise characteristics without overly complex circuitry.

MODULATION

The AM, FM, and optional high speed pulse modulation features provide additional versatility for testing receivers. The 1618B requires external modulation signal inputs. Combined modulation modes can be selected for complex output modulation in manual or remote operation. Phase lock is maintained in all modulation modes. Amplitude modulation depths to 90% at rates to 100 kHz are selected by front panel controls in manual mode. For FM applications, the RF output can be modulated at rates of 50 kHz to 1 MHz providing peak deviation greater than 1 MHz. Deviation is controlled from the front panel.

Optional pulse modulation permits high speed pulse amplitude modulation with 25 nanoseconds rise/fall time and on/off ratios that are typically 80 dB, 2 to 18 GHz. This option minimizes power losses at 18 GHz and provides a superior signal-to-noise ratio when low level, pulse-modulated outputs are required.

DIGITAL STEP SWEEP (OPTION 15)

A remotely programmable digital sweep function is capable of sweeping in discrete programmed increments across the entire output frequency range or any portion thereof. The synthesizer pauses automatically at each frequency long enough to insure signal stability or can be programmed for longer delays. An "RF Valid" and a "Step" signal are available for use in a "handshake" mode for multipoint measurements. These are TTL level control signals accessed from BNC's located on the rear panel. The sweep function is programmed only over the IEEE-488 bus and cannot be operated from the front panel controls.

Specifications

FREQUENCY

Range: 2 to 18 GHz with overrange ≥ 18.1 GHz, Option 04 extends low range to 50 MHz.
Resolution: 1 kHz (2 to 18 GHz)
Time Base: 10 MHz; aging rate $< \pm 5$ parts 10^{10} /day

RF OUTPUT

Leveled Output Power^{3, 4, 9:} $\geq +3$ dBm
Unleveled Output Power Typical^{5:} $> +5$ dBm
Calibrated Dynamic Range^{4:} -120 to +3 dBm
Attenuation:
 Level Vernier 13 dB
 Resolution 0.1 dB
 Overrange (typical) 25 dB
Step Attenuation: 110 dB
 Step Size 10 dB
Flatness and Accuracy^{3, 4, 6, 10:} ± 1.5 dB
Output Impedance: 50 ohms nominal

SPECTRAL PURITY^{5, 7, 11}

Harmonics and Subharmonics: ≥ -50 dBc (-40 dBc, Opt. 04)
Spurious (CW and FM modes) Nonharmonically Related: ≤ -50 dB excluding line related spurious.
Power Line Related:
 60 Hz specifications degrades by 5 dB at 50 Hz. (Readings in dBc)

FREQUENCY RANGE (GHz)	OFFSET FROM CARRIER		
	<300 Hz	0.3 to 1 kHz	>1 kHz
0.05 to 2	-35	-45	-55
2 to 8	-40	-50	-60
8 to 18	-35	-45	-55

Single Side Band Phase Noise:

Measured in a 1 Hz Noise BW, CW mode. (Readings in dBc.)

FREQUENCY RANGE (GHz)	OFFSET FROM CARRIER				
	30 Hz	100 Hz	1 kHz	10 kHz	100 kHz
0.05 - 2	-58	-64	-84	-78	-97
2 - 4	-64	-73	-88	-86	-104
4 - 8	-58	-67	-85	-83	-103
8 - 12	-54	-64	-84	-78	-97
12 - 18	-54	-60	-80	-77	-97

MODULATION⁴

Amplitude Modulation:
 Depth 0-90% at level vernier setting 6 dB below maximum specified leveled output (2 to 18 GHz)
 Rate 10 Hz to 100 kHz
 Frequency Response (100 Hz to 50 kHz) ± 3 dB relative to 10 kHz
 Sensitivity 1 volt peak for 100%, external input into 600 ohms
Frequency Modulation:
 Peak Deviation > 1 MHz (2 to 18 GHz)
 Rate 50 kHz to 1 MHz
 Frequency Response (50 kHz to 1 MHz) ± 3 dB
 Sensitivity 1 volt peak for maximum deviation, external input into 50 ohms

PULSE MODULATION (Option 03)

Reduces specified leveled output power 3 dB (2 to 18 GHz), and degrades level flatness and accuracy ± 0.5 dB.
Rise/Fall Time: 25 nanoseconds
Minimum Pulse Width: 100 nanoseconds
On/Off Ratio: ≥ 75 dB (2 to 18 GHz)
Input: TTL levels on rear panel BNC

DUAL MODULATOR (Option 05)⁸

Extends on/off ratio spec to ≥ 75 dB (2 to 18 GHz), ≥ 60 dB (0.1 to 2 GHz)

DIGITAL STEP SWEEP (Option 15)

(Remote Control Only)

Sweep Function: Start (F₁)/Stop (F₂)
Sweep Mode: Single sweep, auto, single step (Ext Trig)
Step Size: Minimum 1 kHz, maximum frequency range of unit
Programmable Delay: 0 to 999 msec per frequency change.
Fixed Delay: 10 to 50 msec
Ext. Trig. (single step): Programmable - Pos Edge Trig or neg edge trig.
Attenuator Incremental Accuracy (typ.): ≤ 1 dB to -30 step, ≤ 2 dB to -60 dB step, ≤ 3 dB to -90 step, ≤ 4 dB to -110 dB step.

REMOTE PROGRAMMING

IEEE-488 Programming of frequency, mode of operation (CW, AM, FM and ALC), output power and status of phase lock and leveled RF output.

NOTES

- Stability and spectral purity will be affected by characteristics of external reference oscillator.
- Stability and spectral purity will be affected by characteristics of external synthesizer.
- At 0 dB step where applicable into 50 ohms in leveled mode.
- 15 degrees C to 35 degrees C.
- Spurious content may degrade at power levels above specified leveled output power or when vernier overrange is selected.
- Accuracy and level relative to digital output display with internal leveling.
- Relative to carrier at specified leveled output including option configuration.
- Disables underrange detection and display.
- With Option 03 or 05 leveled output power is reduced 3 dB.
- With Option 03 or 05 accuracy and flatness degrades by 0.5 dB.
- ≤ 18 GHz.

SYSTEM 1001 POWER SUPPLY SERIES



SYSTRON DONNER MODEL P-6, P-12 PROGRAMMERS

Broad capability and simplicity make Systron Donner's System 1001 Programmable Power Supplies the choice for automatic test equipment applications. Choose one of our CIIIL-compatible programmers, and add individual supplies to meet your exact needs. Then, just let your Systron Donner system take care of itself, while you concentrate on the rest of your test program.

Systron Donner's P-6 and P-12 power supply programmers take instructions from your automatic test equipment controller, monitor the performance of the power supplies connected to them, and report problems that occur.

These new GPIB-commanded units will control up to fifteen independent, voltage-programmable DC power supplies, yet they require only a single bus address. The programmer controls voltage, current, and voltage limit of each supply.

FULL BUS COMMUNICATION

At the heart of the programmer is a microcomputer and firmware that can "listen" and "talk" on the GPIB bus and on an internal bus to all of the DAC cards.

PROGRAM LANGUAGE VERSATILITY

The microcomputer-based programmer replaces previously available power supply programmers, and the built-in test module adapter makes peripheral hardware unnecessary. Because a replaceable EPROM is used, the programmer can readily handle various input languages, including CIIIL. A RAM stores all transitory data for the power supply coming from the GPIB bus on a priority basis.

DIAGNOSTIC CAPABILITY

The programmer features two levels of testing to provide complete confidence in the operation of the power supply system. When initiated by software, the programmer automatically goes through a built-in test routine that verifies that all system components are operational.

Then, during operation, the programmer self-test function constantly monitors the status of each supply, comparing the actual output with the output requested by the ATE controller.

A fault can be handled in one of two ways, depending on its severity. If the fault is serious, a discrete "interrupt" signal can be sent to the controlling computer via a Discrete Fault Indicator (DFI) or IEEE-488 SRQ. The computer halts operation, determines the source of the fault, resets the power supply system, and sends a status (STA) command.

For less severe faults, a message describing the problem is stored in RAM in the programmer. At the next controller query, the programmer sends all fault messages that have been stored since the last query.

These messages can be evaluated so appropriate action can be taken. The system computer may ask for status at any time and the programmer micro-computer will respond with stored messages.

Another way to determine fault conditions is to initiate a self-test. When either of the CIIIL commands—CFN (confidence test) or IST (internal self-test)—is received, the programmer exercises the supplies and verifies performance by observing the status flag patterns. Messages are stored and transmitted following the next status command.

DAC OPERATION

The DAC card provides electrical isolation, digital storage and digital-to-analog conversion. Various digital status flags, which indicate control modes and the states of analog comparators, are provided for read-back to the microprocessor.

The standard DAC card has three analog output channels. The outputs are used to control supply voltage, current (limit), and voltage limit or the over-voltage protection level.

SYSTRON DONNER POWER SUPPLIES PROVIDE DEPENDABLE POWER

In the current mode, the voltage limit and current control define a safe operating area for the load. If the load impedance increases, the supply will automatically cross over into the voltage mode.

The System 1001 supplies can stabilize any voltage or current value within their power rating. In the voltage mode, the load voltage is stabilized while the current control sets a limit on the amount of current the load can draw.

Specifications

P-6 AND P-12 PROGRAMMERS

	P-6	P-12
Power:	103.5 to 129 or 207 to 258V, 47-420Hz; 0.75A maximum	103.5 to 129 or 207 to 258V, 47-420Hz; 0.75A maximum
Power Connector:	IEC with detachable line cord	IEC with detachable line cord
Dimensions:	8 1/4" wide x 5 1/4" high x 18" deep	19" wide x 5 1/4" high x 18" deep
Capacity:	Up to 6 DAC cards. Each DAC card controls one external programmable power supply. An optional expansion channel is available.	Up to 12 DAC cards. Each DAC card controls one external programmable power supply. Optional expansion of 3 channels is available.
Digital Input/Output Connector:	Standard IEEE-488-1978	Standard IEEE-488-1978
Language:	CIIL, SD Control Std. or other, consult factory	CIIL, SD Control Std. or other, consult factory
Local Control:	None, except for power switch	None, except for power switch
Panel Indicator:	Panel ON light	Panel ON light
Operating Temperature Range:	0° to 50°C	0° to 50°C
Storage Temperature:	-40° to +85°C	-40° to +85°C
Other:	Designed to meet requirements of MIL-T-28800C, Type III, Class 5, Style F	Designed to meet requirements of MIL-T-28800C, Type III, Class 5, Style F
Weight:	Less than 15 lbs.	Less than 30 lbs.
Mounting:	Fits Standard RA-5 5 1/4" x 19" Rack Tray	

DAC-4XX CARD

Connector to Power Supply:	D type subminiature. 25 contact socket. Mounts on rear panel of Systron Donner power supply programmers			
Analog Outputs:		V	I	L
Resolution & Accuracy:	DAC-401	0.025%	0.025%	0.4%
	DAC-402	0.006%	0.025%	0.4%
	DAC-403	0.025%	0.4%	0.4%
	DAC-404	0.006%	0.4%	0.4%
Voltage	All 0 to +10V DC.			
Current:	All +5 mA max. at 10V.			
Capacitive Loading:	<1 nF			
Step Response to Program Change:	<1 ms			
Temperature Coefficient, Output Voltage:	±0.002%/°C typical; ±0.005%/°C maximum			

OPTIONS AND ACCESSORIES

- Option 24:** RA-5 Rack Tray. Allows rack mounting of 1/4 and 1/2 rack power supplies and the P-6 programmer
- Option 30:** 1 set of voltage and current meters. 2% accuracy.
- Option 31:** Polarity change relay.
- Options 10, 12, 13, 14 – See NOTES**

119957	..... Rack Slides (1 set)	06592402	..... Interconnect Cable, 10 ft.
07900501	..... Filler Chassis, 1/4 Rack	06592403	..... Interconnect Cable, 11 ft.
07900401	..... Filler Chassis, 1/2 Rack	06592404	..... Interconnect Cable, 12 ft.
06592401	..... Interconnect Cable, 1.5 ft.		Other lengths available on request

NOTES: ¹ Whichever is largest
² Option 10, 100V ± 10% @ 50 Hz; Opt 12, 220V ± 10% @ 50 Hz;
³ Except HFP's <2 ms
 Er = Rated Voltage Ir = Rated Current

PROGRAMMABLE POWER SUPPLIES

QUARTER RACKS			HALF RACKS		
Model	Volts	Amps	Model	Volts	Amps
QFP6-12	0-6	0-12	HRP8-20	0-8	0-20
QFP16-7	0-16	0-7	HRP26-12	0-26	0-12
QFP26-5	0-26	0-5	HRP36-10	0-36	0-10
QFP36-4	0-36	0-4	HRP60-7	0-60	0-7
QFP60-2.5	0-60	0-2.5	HRP75-5	0-75	0-5
QFP75-2	0-75	0-2	HRP100-4	0-100	0-4
QFP100-1.5	0-100	0-1.5	HFP150-2	0-150	0-2
QFP200-0.8	0-200	0-0.8	HFP500-1	0-500	0-1

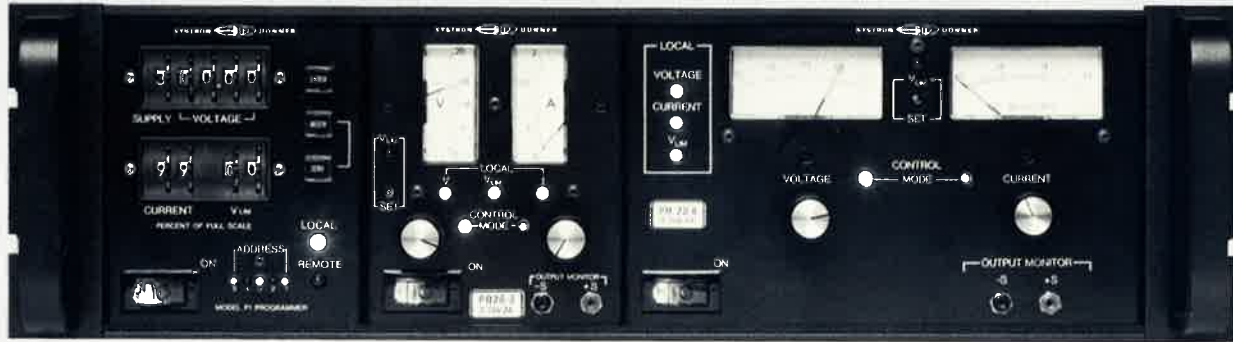
POWER SUPPLIES SPECIFICATIONS

Models	QFP	HRP/HFP
Pard Voltage Mode: (RMS) (P-P)	<.001% or 0.5mv ¹ <10 mv	<.002% or 1mv ¹ <.025% Typ
Pard Current Mode: (RMS) (P-P)	<0.01% Typ <.05% Typ	<.02% Typ <.05% Typ
Regulation Load:	<.002% Er <1 MA Max	<.002% Er <1 MA Max
Regulation Line:	<.001% Er <.005% Ir	<.001% Er <.005% Ir
Stability: (8 Hr.)	<.005% Er <.025% Ir	<.005% Er <.025% Ir
Temperature Effect:	<.005% Er <.02% Ir	<.005% Er <.02% Ir
Programming Response: 10% 100% Change Up Down	<0.5 ms <2.0 ms <2.0 ms	<0.5 ms <60 ms ³ <2 ms
Power In: Volts Amps Hertz	115V ± 10% Std ² 2.5 Typ 47-63 Std ²	115V ± 10% Std ² 9.0 Typ 47-63 Std ²
Temperature: Operating Storage	0 to 55°C -40 to +85°C	0 to 55°C -40 to +85°C
Weight: Net Ship	15 lb (7 kg) 21 lb (10 kg)	33 lb (15 kg) 40 lb (18 kg)

GENERAL

- Crowbar:** From 3V to 112% of E rated Trigger at nominal 2% above VLim within 100 μs typ. Can be reset by "RST:CHXX" command.
- Isolation:** 600V Either Terminal
- Front Panel Status Lights:** Voltage Mode – Green
Current Mode – Yellow
OV/Crowbar – Red
Output Relay Closed – Orange
- Status Flags (Built-in Test):** Voltage Mode
Current Mode
OV/Crowbar
Over Temperature
Output Relay Closed

P-SERIES PROGRAMMABLE POWER SUPPLIES



PRACTICAL USER FEATURES

The P-Series was designed to satisfy a multitude of requirements. The basic power supply is ideal for laboratory requirements where space is limited and performance is mandatory. Provided with the IEEE-488 programmer, this series is ideal for small systems ATE or production line testing. Modular construction allows selection for today's requirements and expansion capability for meeting future needs.

LOCAL CONTROL AND INDICATORS

Slide switches on the Power Supply rear panels allow any or all of three functions to be operated locally from the front panel or remotely by the programmer. These functions are voltage, current and voltage limit. Ten turn potentiometers allow precise settings of voltage and current from the front panel. Monitor jacks are provided on the front panel to allow use of a DVM to achieve precise settings or use the separate voltage and current meters to set the output to $\pm 2\%$ accuracy. Front panel indicators tell you immediately if you are: in the voltage mode, in the current mode, if the supply is in voltage limit, or if the programmer is in the remote or local mode. In addition, status lights on the programmer tell you what bus address is selected. Front panel controls on the P-1 or P-2 programmer allow local simulation of IEEE-488 bus control.

BUS CONTROL

P-Series Programmable Power Supplies are listen only devices. Two programmer models are provided for your convenience. Where space is a problem, the P-2 is the solution. In $1\frac{1}{4}$ inches of rack space, it controls up to 4 power supplies with one bus address. The P-1 controls 3 power supplies but can be extended with P-1E extenders to control up to 8 power supplies with one bus address. The DAC-2 cards are installed in the programmer modules. An internal bus allows bringing up or

setting to zero all power supplies simultaneously. The restore command allows reset of a crowbarred supply without turning the power off, then back on.

DAC-2 INTERFACE

DAC-2 cards mount in the programmer modules and control 3 independent functions of each power supply. They are voltage setting, current setting, and voltage limit. A slide switch on each DAC-2 allows connection to an internal bus such that a crowbar flag on one supply will shut down the other supplies with their DAC switch selected. This prevents damage to circuits where loss of one supply only would be catastrophic.

POWER SUPPLY SELECTION

P-Series Supplies can stabilize any voltage or current value within their power rating. In the voltage mode, the load voltage is stabilized while the current control sets a limit on the amount of current the load can draw. In addition, a voltage limit control protects the load from damage due to overvoltage conditions. In effect, the voltage limit and current control define a safe operating area for the load. If the load impedance decreases, the supply will automatically cross over into the current mode. When the supply is programmed to a lower level, an internal current sink discharges the output capacitor (and load capacitor, if any). Though load capacitors may not be discharged immediately because this sink current is limited, loads with moderate capacitance are generally stabilized in two milliseconds.

A variety of Power Supplies are available in power ranges to suit most system applications. A V-limit circuit allows you to set a soft limit to protect the device under test. A hard crowbar tracks the V-limit to protect the power supply.

Specifications

DAC-2 PERFORMANCE

IN-SYSTEM PERFORMANCE SPECIFICATIONS*	ANALOG CURRENT SIGNALS		
	VOLTAGE VALUE	CURRENT VALUE	V _{LIM} VALUE
Input Code	4-digit BCD	2-digit BCD	2-digit BCD
Output Resolution**	0.01%	1%	1%
Output Accuracy**	0.01%	<1%	<1%
Output Range**	0% to 100%	0% to 100%	0% to 100%
Step Response Time†	2ms	1ms	2ms
DAC Capacitance Loading	<1nF	N/A	<1nF
Isolation Potential	300V	300V	300V
Temperature Range	0° to 55°C	0° to 55°C	0° to 55°C
Temperature Coefficient			
Typical, per °C	0.002%	0.01%	0.01%
Maximum, per °C	0.005%	0.02%	0.02%

*These describe the instruments combined warranted performance

**Refers to the power supply's rated output

†Includes total time from transfer command to stabilization within 0.1% of step

POWER SUPPLY PERFORMANCE

PERFORMANCE SPECIFICATIONS*	STABILIZATION MODE	
	VOLTAGE	CURRENT
Load Effect: The change in stabilized output caused by a load change equal to the output rating.	0.002% E-rated	0.05% I-rated, or 1mA**, +3 mA
Source Effect: The change in stabilized output caused by any change in the AC line within the input rating.	0.001% E-rated	0.005% I-rated, or 200µA**
Pard: Periodic and random deviations from the stabilized output, measured from 20 Hz to 10 MHz.	300µV rms† 1mV rms†† 3mV p-p†	0.05% I-rated, or 1mA** rms 0.15% I-rated or 3mA**, ** p-p
Step Response: The time required to achieve 99.9% of the programmed change with a resistive load.	2ms	1ms† 2ms††

With a capacitive load, voltage stabilization may be delayed because rate of current discharge is limited. When the load capacitance is known, the step response time can be calculated using the equation below. C_i is the supply's internal capacitor (see output ratings) and I_s is the sink or source current limit. The units of measure are seconds, volts, farads, and amps.

$$\text{Time} = [\Delta E (C_i + C_x)]/I_s$$

* These describe the instruments warranted performance.

** Whichever is greater.

† PQ & PH models.

†† PHR models.

POWER SUPPLY SELECTION

P-SERIES MODEL	OUTPUT				SINK CURRENT LIMIT	INPUT	
	VOLTAGE MODE		CURRENT MODE			VOLTAGE	FREQUENCY
	RANGE	RESISTANCE	RANGE	IMPEDANCE			
PQ 10-3	0 to 10 VDC	20 µΩ	0 to 3 A	3.3 kΩ + 11µF	3.5 A	90 to 110 VAC 104 to 127 VAC 194 to 237 VAC 207 to 253 VAC	47 to 440 Hz
PQ 20-2	0 to 20 VDC	67 µΩ	0 to 2 A	6.7 kΩ + 5.7µF	2.3 A		
PQ 50-3	0 to 50 VDC	333 µΩ	0 to 1 A	16.6 kΩ + 2.2µF	1.0 A		
PQ 100-0.5	0 to 100 VDC	1.3 µΩ	0 to 0.5 A	33.3 kΩ + 1.0µF	.35 A		
PH 10-10	0 to 10 VDC	67 µΩ	0 to 10 A	3.3 kΩ + 16µF	3.5 A		
PH 20-6	0 to 20 VDC	200 µΩ	0 to 6 A	6.6 kΩ + 6.6µF	2.3 A		
PH 50-3	0 to 50 VDC	1000 µr	0 to 3 A	16.6 kΩ + 2.2µF	1.0 A	100 to 130 VAC 200 to 260 VAC	47 to 63 Hz
PH 100-1.5	0 to 100 VDC	4000 µr	0 to 1.5 A	33.3 kΩ + 1.0µF	.35 A		
PHR 20-12	0 to 20 VDC	16 µΩ	0 to 12 A	6.7 kΩ + 16µF	2.5 A		
PHR 50-8	0 to 50 VDC	63 µΩ	0 to 8 A	16.7 kΩ + 10µF	1.5 A		
PHR 100-4	0 to 100 VDC	250 µΩ	0 to 4 A	33.3 kΩ + 5µF	0.4 A		

SUPPLEMENTAL CHARACTERISTICS

SUPPLEMENTAL CHARACTERISTICS*	STABILIZATION MODE VOLTAGE	CURRENT
Drift: the output drift over 8 hours under constant line, load and temperature after a 30 minute warmup	0.01% E-rated in Local 0.005% E-rated in Remote	0.1% I-rated or 3mA** in Local 0.02% I-rated in Remote
Temperature Effect: The change in stabilized output per °C change in ambient temperature.	0.01% E-rated in Local 0.005% E-rated in Remote	0.02% I-rated in Local or Remote
Adjustment Range: The output range obtainable with front panel controls	0% to 100% E-rated	0% to 100% I-rated
Resolution: The resolution obtainable with front panel controls	0.03% E-rated	0.06% I-rated
Programming Scale: The external input that will change the output from minimum to maximum.	0 to +10V @ 1mA voltage and V _{LIM}	0 to -1mA @ -1V
Transient Recovery: Time required to recover within 0.1% E-rated following a step load change between 10% and 100% of I-rated	50µs	
Meter Accuracy: The maximum nonlinear error at 25°C.	2%	
V_{LIM} Adjustment Range:	5% to 109% E-rated	
V_{LIM} Margin: The recommended minimum margin of setting above output voltage.	5% E-rated	
Crowbar Tracking Range:	5V to 110% E-rated†	
Crowbar Threshold: The voltage above V _{LIM} at which the crowbar will trip.	1% E-rated 50 µs response	

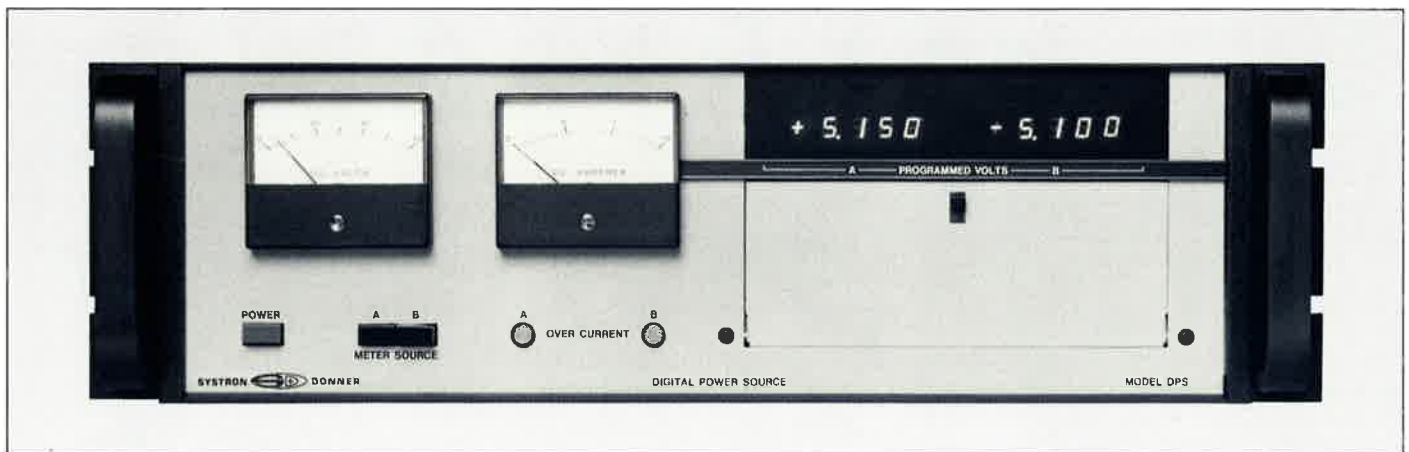
*These give typical, but non-warranted performance parameters.

**Whichever is greater. †50V and 100V models: 7V to 110%

WEIGHTS AND DIMENSIONS

ITEM	NET WT. (lbs/kg)	SHIP WT. (lbs/kg)	HEIGHT	WIDTH	DEPTH
P-1	9/4	14/6.4	5¼	4¾ ₃₂	16¼
P-1E	9/4	14/6.4	5¼	4¾ ₃₂	16¼
P-2	13/6	19/8.6	1¾	19	16¼
PQ	11/5	15/6.8	5¼	4¾ ₃₂	16¼
PH	23/10.5	28/12.7	5¼	8¾ ₁₆	16¼
PHR	33/15	40/18	5¼	8¾ ₁₆	16¼

DPSD-50 PROGRAMMABLE SUPPLY



FEATURES

- IEEE-488 Interface, for control of output voltage, polarity and range.
- Manual control of output voltages, polarity, range and current via the front panel.
- Two independent, programmable power sources.
- Four range/polarity combinations are available. After each change in range or polarity the output will return to zero and the voltage level reprogrammed. The range/polarity codes are:

0	10 to 50V/negative	2	0 to 9.9V/negative
1	10 to 50V/positive	3	0 to 9.9V/positive
- Internal interface board decodes all ASCII characters and connects to the bus via a rear panel connector.
- Only one address is used for the DPSD-50. This address is selected by using the "Channel A" 5-bit switch on the local control panel.
- ASCII strobe commands determine which channel will receive the interim register contents.
- The local control panel is in absolute command when the remote/local switch is in "local" position.
- Unit turn-on state is in local, unaddressed mode with all memory and interim registers set to zero.
- Alarm and ready flags are positive true and are accessed via a rear panel Molex socket.

Specifications

PROGRAM FORMAT:

The DPSD-50 is a listening device per IEEE-488-1978. The DPSD-50 is defined by these subsets:

AH-1	DC-0	DT-0	L-2	LE-0	PP-0
RL-2	SH-0	SR-0	T-0	TE-0	

OVERCURRENT & OVERVOLTAGE LEVELS:

Each channel of the DPSD-50 can be programmed with overvoltage and overcurrent limits to protect its load. The overcurrent and overvoltage codes are set into separate registers, providing great flexibility in the protection of the device under load.

GENERAL SPECIFICATIONS:

Output Voltage:

X0.1 range:	-9.999 to +9.999 VDC
X1 range:	-50.00 to +50.00 VDC

Current:

1 amp at 60°C, 1.5A at 40°C source or sink from each output channel.

Pard (Ripple & Noise):

X0.1 range:	500 μ Vrms, 2 mVpp
X1 range:	1.25 mVrms, 5 mVpp

Regulation:

Load effect:	<500 μ V
Line effect:	<200 μ V

Input Power:

115 or 230 VAC \pm 10%, 50-60 Hz \pm 5% isolation 300V; consumption 225W

Programming Format:

ASCII encoded data per IEEE-488 or parallel BCD bus

Resolution:

X0.1 range:	1 mV
X1 range:	10 mV

Basic Accuracy (90 days):

X0.1 range:	23°C \pm 3°C, no load, 30 min.
X1 range:	1 mV

Overvoltage:

Programmable crowbar 5 to 56 volts

Stability (30 min. warm up):

X0.1 range:	300 μ V
X1 range:	1.5 mV

Temperature Range:

Operating:	0 to +50°C
Storage:	-55° to +85°C

Temperature Coefficient:

X0.1 range:	150 μ V per °C
X1 range:	1.5 mV per °C

Programming Time:

Sign change:	(to within 0.1%)
Range change:	<10 ms
All others:	<5 ms
	<2 ms

Dimensions:

5/4" High retma rack

Configuration:

5/4" H x 19" W x 21" D
13.3 cm x 48.3 cm x 53.4 cm

Net Weight:

43 lbs. (19.5 Kg)

Shipping Weight:

55 lbs. (25 Kg)
The DPSD-50 is shipped with rack ears and rear panel bracket ready for systems console installation.

HR SERIES LABORATORY POWER SUPPLIES



FEATURES

The Systron Donner Half Rack Series units are designed for laboratory, bench, test, inspection, production and systems applications. Their unique design provides operating flexibility and high reliability at high power output levels.

Specifications

MODEL	VOLTS	40°C	MAX. AMPS AT AMBIENT OF		NOMINAL AC* LINE CURRENT RMS AMPS
			60°C	71°C	
HR20-12C 0V	0 to 20	12	10	7.5	6
HR40-10C 0V	0 to 40	10	7.5	5.5	8
HR60-8C 0V	0 to 60	8	5.7	4.4	7
HR160-3C	0 to 160	3	2.5	2	9

*At nominal 115 VAC line 40°C max. voltage and current output

CONSTANT VOLTAGE MODE WITH ADJUSTABLE CURRENT LIMITING

Input:	115 VAC \pm 10%, 60 Hz \pm 5%, Option available for other inputs.
Output:	Floating; isolated from ground, 300 VDC max.
Regulation:	
Line	0.01% or 2 mV*, for 105-125 VAC line change, at any output within specifications.
Load	0.01% or 3 mV*, no load to full load at any output within specifications.
Ripple:	Less than 0.5 mV rms, 15 mV p-p.
Stability:	0.05% or 18 mV* for 8 hours after warm-up. Measured at constant line voltage, load and ambient temperature.
Temperature Coefficient:	(0.02% + 400 μ V)/°C.
Temperature Range:	-20°C to +50°C.
Recovery Time:	Less than 50 microseconds to recover within 0.05% or 15 mV* of output voltage for 25% step change in rated load.
Output Impedance:	DC - 1 kHz; 10 milliohms, nominal.
Short Circuit Protection:	Automatic Adjustable Current Limiting (ACL) variable from 1% to 100% of rated current.
AC Power Input Protection:	Fuse
Remote Programming:	All units remotely programmable over output voltage range. Scale factor approx. 100 ohms/volt
Remote Sensing:	Maintains rated regulation directly at the load. Maximum line drop 0.5 volts per leg.
Voltage Adjustment Range:	Continuously adjustable concentric vernier controls.
Overvoltage Protection:	Automatic fast-acting overvoltage protection tracks the present output voltage

CONSTANT CURRENT MODE WITH ADJUSTABLE VOLTAGE LIMITING

Current Range:	1% to rated current output.
Regulation:	
Line	0.05% I_{rated} for 105-125 VAC line change, at any output within specifications.
Load	0.05% I_{rated} output current change for the maximum change in load resistance within the rated voltage compliance range.
Ripple:	0.25% or 5 mA*
Stability:	0.05% I_{rated} for 8 hours after warm-up. Measured at constant line voltage, load and ambient temperature.
Temperature Coefficient:	0.1% I_{rated} /°C.
Remote Programming:	$R_{pgm} = 250 (1 - I_{load}/I_{rated})$

GENERAL AND PHYSICAL SPECIFICATIONS

Design Principle:	Phase controlled pre-regulation with precision series pass regulation.
Operational Modes:	Constant voltage with adjustable current limiting; constant current with adjustable voltage limiting; automatic crossover
Mode Indicator:	Front panel mode indicator light indicates when supply is operating in the constant current or current limiting mode.
Controls:	
Voltage	Coarse and fine; 0 to rated output; front panel.
Current	Coarse and fine; 1% I_{rated} to rated output; front panel.
Input Power	Front panel switch and indicator.
Metering:	
Voltage	Front panel voltmeter.
Current	Front panel ammeter.
Terminals:	
Front Panel	Positive Output (+V); Negative Output (-V); Positive Sensing (+S); Negative Sensing (-S); Ground (G);
Rear Panel	1 - Negative Output (-V); 2 - Negative Sensing (-S); 2-3 - Remote Voltage Programming (RVP); 4 - Ground (G); 5 - Positive Sensing (+S); 6 - Positive Output (+V); 6-7 - Remote Current Programming (RIP); 8-11 - Spares.
Rack Mounting:	Rack adapters mount one or two units in a 5 1/4" rack height. (Detailed rack adapter data available).
Size:	7 3/4" W x 4 7/8" H x 14" D.
Weight:	31 lbs. (14 kg)

* Whichever is greater.

PRECISION AND MULTIPLE OUTPUT POWER SUPPLIES



PLS50-1 PRECISION LAB

- Calibrated voltage in 1mV steps
- Five decade dials and current vernier
- Remotely programmable by voltage or resistance
- Precision 50-watt supply in a half-rack case
- Load voltage regulated to 0.001%



DL40-1A DUAL LAB

- Dual outputs – independently adjustable
- Series or parallel operation
- Adjustable current limiting
- Two 40-watt supplies in a half-rack case
- Load voltage regulated to 0.1%



TL8-3 0V TRIPLE LAB

- Triple outputs – independently adjustable
- Overvoltage protected, 24-watt TTL supply
- Two 30-watt analog supplies (0 to 32V)
- Three metered supplies in a half-rack case
- Load voltage regulated to 0.02%

Specifications

MODEL	VOLTS, DC	OUTPUT AMPS
PLS50-1	0 to 50	0 to 1

Input: 115 VAC or 230 VAC \pm 10%, 50-400 Hz \pm 5%. Internal tap change is required.

Output: Floating, isolated from ground, 300 VDC max.

Regulation, Line: \pm (0.001% + 100 μ V) for 10 VAC rms change.

Regulation, Load: \pm (0.001% + 100 μ V) no load to full load or full load to no load, measured at remote sensing terminals.

Ripple and Noise: 250 μ V rms, 900 μ V p-p at 60 Hz \pm 5% (measured at 10 MHz bandwidth).

Stability: 0.002% + 100 μ V for 8 hours after warm-up, under constant line, load and ambient temperature.

Temperature Coefficient: (0.002% + 100 μ V)/ $^{\circ}$ C to +50 $^{\circ}$ C.

Temperature Range: +10 $^{\circ}$ C to +50 $^{\circ}$ C.

Recovery Time: 50 microseconds to within 0.05% or 15 mV of output voltage for a 75% step change in rated load.

Short Circuit Protection: Automatic Electronic Switching removes output current from load. Output current variable from 10% to 110% of rated amperage.

Operation Mode: Constant voltage with automatic electronic switching of output current.

Voltage Control: 5 decade rotary switches plus calibrated vernier.

Current Control: Calibrated control. Front panel overload indicator.

METER Control: 3 position rotary switch (voltage, current X1, current X.1)

Rack Mounting: Option 25 (single); Option 26 (mounts two PLS units)

Size: 7 $\frac{7}{8}$ " W x 4 $\frac{7}{8}$ " H x 12 $\frac{9}{16}$ " D (20.0 x 9.9 x 30.8 cm)

Weight: 15 lbs. (6.8 kg).

MODEL	VOLTS, DC	OUTPUT AMPS
DL40-1A	Dual 0 to 40 0 to 40 0 to 80	0 to 1 0 to 2 (parallel) 0 to 1 (series)

Input: 115 VAC or 230 VAC \pm 10%, 50-400 Hz \pm 5%. Internal tap change is required.

Output: Dual. Floating, isolated from ground, 300 VDC max.

Regulation, Line: 0.01% or 2mV, for 100-125/200-250 VAC line change, at any output within specifications.

Regulation, Load: 0.01% or 3mV, no load to full load, at any output within specifications.

Ripple: 250 μ V rms, 2mV p-p (10 MHz) (20mV p-p at 400Hz input).

Stability: 0.05% or 10mV for 8 hours after warm-up. Measured at constant line voltage, load and ambient temperature.

Temperature Coefficient: (0.02% + 400 μ V)/ $^{\circ}$ C.

Temperature Range: 0 to +50 $^{\circ}$ C.

Recovery Time: 25 microseconds to within 0.05% or 15 mV of output voltage for 100% step change in rated load.

Short Circuit Protection: Adjustable Automatic Current Limiting (ACL) from 3% to 100% of rated amperage.

Operation Mode: Constant voltage with automatic current limiting. Dual outputs may be paired in series or parallel.

Rack Mounting: Option 25 (single); Option 26 (mounts two DL40-1A units)

Size: 7 $\frac{3}{4}$ " W x 4 $\frac{1}{2}$ " H x 14 $\frac{1}{2}$ " D (19.7 x 38.0 x 36.9 cm)

Weight: 18 lbs. (8.2 kg).

MODEL	VOLTS, DC	OUTPUT AMPS
TL8-3 0V	0 to +8 0 to +32 0 to -32	0 to 3 0 to 1 0 to 1

Input: 115 VAC \pm 10%, 50-400 Hz \pm 5%. Option available for 230 VAC \pm 10% operation.

Output: Triple floating, isolated from ground, 300 VDC max.

(A) 0 to +8 VDC, 3 ampere; rating reduces to 2 ampere at 0 VDC.

(B) 0 to +32 VDC, 1 ampere; rating reduces to 0.5 ampere at 0 VDC.

(C) 0 to -32 VDC at 1 ampere; rating reduces to 0.5 ampere at 0 VDC.

All outputs are referenced to a common return electrically isolated from chassis ground.

Regulation, Line: 0.02% or 2mV, for 100-125 VAC line change, at any output within specifications.

Regulation, Load: 0.02% or 5mV, no load to full load, at any output within specifications.

Ripple: 500 μ V rms, 3mV p-p (10 MHz) (20mV p-p at 400Hz input).

Stability: 0.1% or 10mV for 8 hours after warm-up. Measured at constant line voltage, load and ambient temperature.

Temperature Coefficient: (0.02% + 400 μ V)/ $^{\circ}$ C.

Temperature Range: 0 to +40 $^{\circ}$ C.

Recovery Time: 50 microseconds to within 0.05% or 15 mV of output voltage for 80% step change in rated load. (0.2 load to full load.)

Short Circuit Protection: Output current is removed by Automatic Electronic Switching.

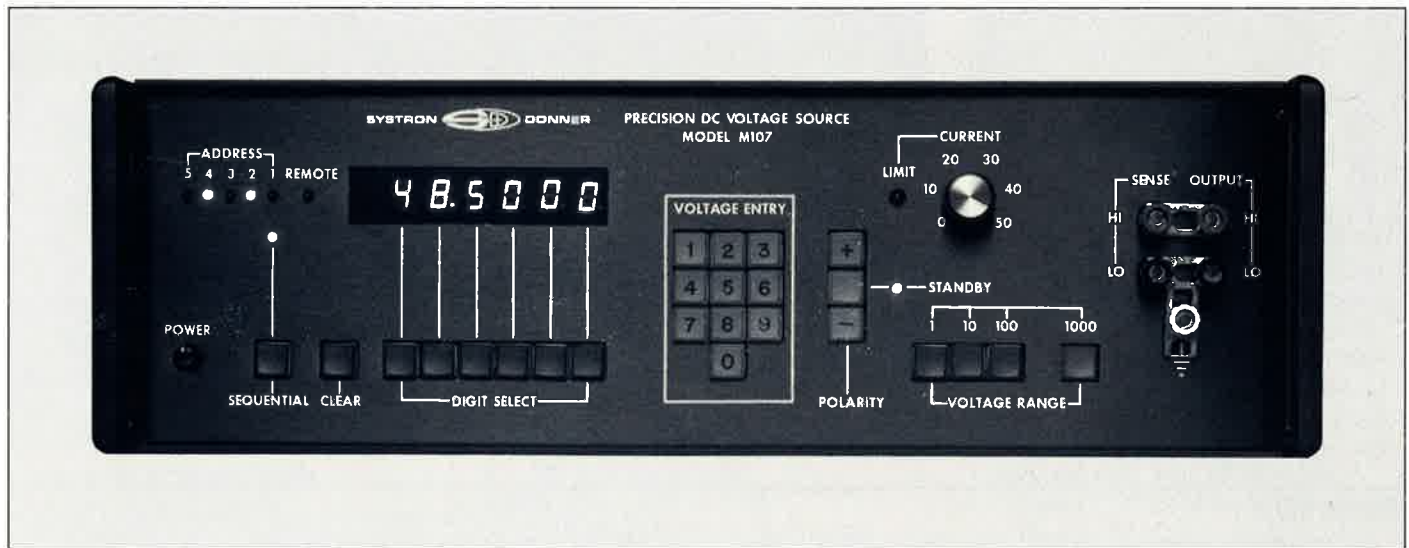
Overvoltage Protection: Adjustable overvoltage protection acts on output (0 to +8 VDC).

Rack Mounting: Option 25 (single); Option 26 (mounts two TL8-3 0V units)

Size: 7 $\frac{7}{8}$ " W x 4 $\frac{7}{8}$ " H x 12 $\frac{9}{16}$ " D (20.0 x 9.9 x 30.8 cm)

Weight: 17 lbs. (7.7 kg).

M107 PRECISION DC VOLTAGE SOURCE



FEATURES

- IEEE-488 Interface, for control of output voltage, polarity and range.
- Manual control of output voltages, polarity, range and current via the front panel.
- Six digits of resolution.
- $\pm 0.002\%$ accuracy all ranges (20 ppm).
- Voltage outputs from 1 microvolt to 1 kilovolt.
- $\pm 0.0001\%$ regulation, line or load.
- Optional parallel BCD programming in lieu of IEEE-488.
- Second generation improvements in reliability and operations.
- Traceable to N.B.S.
- Front and rear outputs.

Specifications

GENERAL SPECIFICATIONS

Current Limit:	Continuously variable from 0 to max. output with limit indicator lamp.
Isolation:	DC output can be floated up to ± 500 VDC from chassis.
Polarity Selection:	+, -, and standby (short circuit across output terminals.)
Output Terminals:	Five terminals on the front panel and a five pin connector on the rear panel: (2) DC output; (2) sense; (1) chassis ground.
Warm-up Time:	1 hour to full specifications, 20 minutes with some accuracy degradation.
Accuracy:	3 months $\pm 0.002\%$ of range, after warm-up and stabilization at $23^\circ\text{C} < 70\%$ R.H. constant line and load.
Operating Temperature:	0 to $+50^\circ\text{C}$.
Temperature Coefficient of Output:	$\pm (0.0002\%$ of setting $+ 0.0001\%$ of range) per $^\circ\text{C}$, between 0° and $+50^\circ\text{C}$. (32°F and 122°F).
Relative Humidity:	To 70%
Input Power:	115/230 VAC $\pm 10\%$ std.; 100/200 VAC $\pm 10\%$ optional; 48-440 Hz, 35 W.
Weight:	26 lbs.
Size:	$5\frac{1}{4}$ " H x 19" W (full rack) x 17" D

OPTIONS AND ACCESSORIES

Option 01:	Parallel interface in lieu of IEEE-488
Option 07:	Local control ONLY in lieu of IEEE-488
Option 25:	Rack mount
Option 26:	Rack mount/slides
117697:	Mate to rear output connection

PROGRAM SUBSETS

SH-0	AH-1	T-0	TE-0	L-2	LE-0
SR-0	RL-2	PP-0	DC-1	DT-0	C-0

OUTPUT RANGES	MAXIMUM OUTPUT VOLTAGE	INCREMENTS	MAXIMUM OUTPUT CURRENT	OUTPUT RESISTANCE	ACCURACY
1V	0.999999	1 microvolt	*	200 Ω	$\pm 0.002\%$
10V	9.99999	10 microvolts	50 ma	.0002 Ω	of range
100V	99.9999	100 microvolts	50 ma	.002 Ω	All Ranges
1000V	999.999	1 millivolt	50 ma to 120V 5 ma to 1000V	.02 Ω .2 Ω	

* Limited by 200 Ω impedance.

OUTPUT RANGE	COMMON MODE ** REJECTION RATIO (db)		NOISE (microvolts RMS max.)		SETTLING TIME (mSec) ***
	DC	AC (50 to 1kHz)	<150 Hz	Wideband	
+1V	160	100	15	25	<300
-1V	160	70	25	40	<300
± 10 V	150	70	20	100	<300
± 100 V	130	60	50	150	<400
± 1000 V	110	50	200	500	<500

** Maximum common mode voltage: 500 VDC or peak AC.
*** Time to complete voltage step to within 0.002% of step size, without changing range or polarity. Add 257 msec $\pm 20\%$ to setting time if range or polarity or both are changed.

MODEL 114A-100V PULSE GENERATOR



FEATURES

- 100V into 50 Ω
- 200W peak pulse power
- Fast rise and fall times
- 1MHz repetition rate
- Double pulse mode
- Gated operation
- Commercial version of SG-816/U

DESCRIPTION

As time domain testing requirements have grown within the electronics industry, so has the importance of pulse generating techniques. In the course of this growth, the controllable, repetitive pulse train has emerged as the most useful stimulus available for the design, development and production testing of electronics devices, instruments and systems. However, specific testing applications have always varied widely, ranging from the need for a simple repetitive clock source to requirements for highly complex waveforms at various rep rates, delays, widths, rise times and output powers. Systron Donner has developed a broad line of general purpose pulse generators, automatic pulse systems, and special pulse instruments to meet these requirements.

The Model 114A Pulse Generator brings real pulse-testing flexibility to just about every laboratory and production line application. All parameters on the 114A are variable, with the exception of the rise and fall time. Output amplitude is continuously variable from 80mV to 100V into 50 Ω in nine overlapping ranges. The unit is capable of delivering 200W of peak pulse power at 10% duty cycle into a 50 Ω load, with repetition rates up to 1MHz and rise and fall times of less than 17ns. Positive or negative output polarity, pulse delay or advance, double pulse and many more outstanding features make this instrument universally useful — particularly for testing current-driven devices such as power semiconductors and diodes, power amplifiers, high-powered modulators, and power dissipation tests.

Specifications

GENERAL SPECIFICATIONS

Repetition Rate:

Internal 10Hz to 1MHz in five ranges.
 External DC to 1MHz positive or negative slope. Sensitivity is adjustable from $\pm 0.5V$ to $\pm 40V$. Input impedance is approximately 1M Ω .

Manual One pulse is generated at the output each time the single cycle pushbutton is depressed.

Gated Operation Input gate must be $\geq 8V$ to 40V to obtain gated pulse at main and sync outputs. Input impedance is $\geq 250k\Omega$.

Delay/Advance:

0 to 10ms in five ranges. Minimum pulse spacing (delay) in the double-pulse mode is 1 μs or 25% of the upper limit of the width range setting, whichever is greater.

Width:

50ns to 10ms in five ranges. Maximum duty cycle is 50% for amplitudes up to 10V, 25% for amplitudes from 10 to 20V and 10% for amplitudes from 20 to 100V.

Rise and Fall Time:

(measured from 10% to 90% points) 13ns for amplitude ranges up to 50V. 17ns on the 100V range.

Aberrations:

Overshoot $\leq 5\%$; Preshoot $\leq 2\%$; Droop $\leq 6\%$.

Jitter:

Repetition Rate $< 0.5\%$ of rep rate + 1ns.
 Delay/Advance $< 0.05\%$ of delay/advance setting + 1ns.
 Width $< 0.05\%$ of width setting + 1ns.

Amplitude:

80mV to 100V (into 50 Ω) in nine ranges.

Polarity:

Positive or negative output selectable by a front panel switch

Output Impedance:

50 Ω for amplitudes up to 50V and approximately 1500 Ω for amplitudes from 50 to 100V.

Output Protection:

Protected against short and open circuits. An overload light illuminates if the duty cycle is exceeded.

Sync Output:

Amplitude 25V into 2k Ω , polarity selectable.
 Width Approximately 400ns.
 Rise Time $\leq 50ns$.
 Fall Time $\leq 300ns$.

Modes of Operation:

Internal Oscillator 10Hz to 1MHz.
 External Trigger May be triggered by a positive or negative pulse at rep rates up to 1MHz.

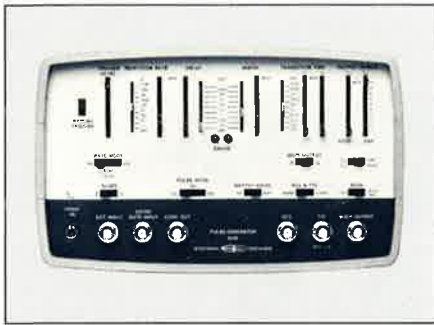
Double Pulse Two pulses per rep period rate are generated at the output.
 Single Cycle One pulse is generated at the output each time the single cycle pushbutton is depressed.

Gated Output pulses occur only for the time interval of an externally applied gate pulse.

General:

Power 115/230 ($\pm 10\%$), 50 to 60Hz at approx. 250W. Voltage is selectable from a back panel mounted switch.
 Operation Temperature 10° to 50°C.
 Dimensions 5 $\frac{1}{4}$ " H x 16 $\frac{3}{4}$ " W x 17" D (13.3 cm x 42.5 cm x 43.2 cm)
 Weight Approx. 25 lbs. (11.3 kg) net; 28 lbs. (12.7 kg) shipping
 Accessories Furnished 8' power cord; operation and maintenance handbook.
 Optional Accessories Standard rack mount P/N 1011
 Rack mount with slides P/N 1012

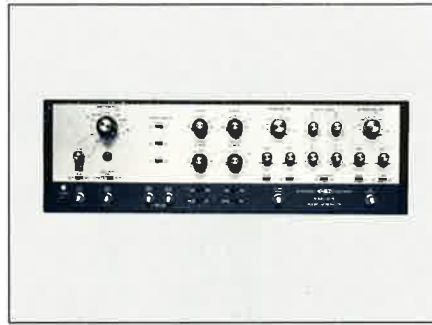
GENERAL PURPOSE PULSE GENERATORS



100 SERIES

- Main output to 20VA from 50 ohm source
- Simultaneous TTL and ECL outputs
- State-of-the-art output circuitry
- 3 modes of output control
- Variable transition times from 10ns to 500ms
- Automatic delay and width error indicators

The Model 101D, the latest of the 100 Series, utilizes state-of-the-art technology and provides maximum functional pulse versatility. Repetition rates to 30 MHz and output capability to $\pm 20V$ make it ideal for circuit design, signal processing, radar, RF switching, lasers, nuclear research and testing and stimulation of most digital logic families. The Model 101D allows convenient control of parameters. An upper/lower level control allows independent setting of pulse levels for digital logic applications. The amplitude/baseline offset control allows independent setting of pulse amplitude and DC offset. The output control capability, and variable transition times make the Model 101D the industry standard general purpose pulse generator.

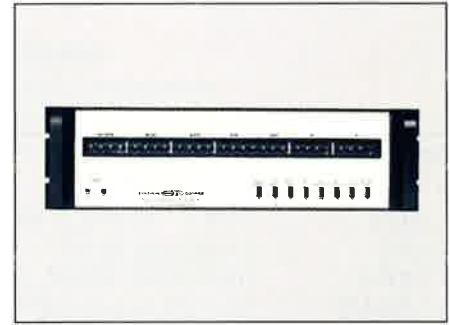


110 SERIES

- Repetition rates from 0.5 Hz to 50 MHz
- Single, double pulse output
- $-18V$ to $+18V$ variable
- Offset from $-18V$ to $+18V$
- Simultaneous positive/negative output
- 10ns to 1s pulse widths

The 110 Series combines all the controls of a general purpose, high performance 50 MHz pulse generator. With outputs to test TTL, DTL, RTL, CMOS, MOS, HTL and ECL logic families, it fills needs for logic testing and other pulse requirements in circuit design, signal processing, radar, RF switching, laser and nuclear research.

The 110s feature rise and fall time controls that set values which remain practically unaffected as amplitude is changed. The upper and lower level controls allow the user to independently change any pulse shape setting. The 110s generate cleaner, more reliable pulses than conventional models because of a state-of-the-art output amplifier and circuit design using digital range control. This eliminates the need for switch-mounted timing capacitors, which reduces stray capacitance and crosstalk, thus improving period, delay and width jitter.



154-4

- IEEE-488 programmable
- Rates from 10 Hz to 50 MHz
- Delay and width from 10ns to 10ms
- T+ and T- (rise and fall times) from 5ns to 10 μs
- $V_{UL} - V_{LL}$ (amplitude) from 1 to 10 volts
- Synchronous and asynchronous gate modes
- Programming through front panel push-buttons and thumbwheel switches

The 154-4 programmable pulse generator is designed for maximum versatility in automatic testing applications. The Model 154-4 offers GPIB programming (IEEE-488 bus compatible). This automatic pulse generator has its roots in the distinguished Datapulse line which has become part of the expanding instruments product group of Systron Donner. The 154-4 is completely programmable with 14 12-bit characters. It contains storage for each parameter and circuitry for decoding address information and steering program information to the proper storage register.

MODEL	REP. RATE	PULSE DELAY	PULSE WIDTH	TRANSITION TIMES	MAIN OUTPUT	SPECIAL FEATURES
100C	10 MHz	35ns to 10 sec	35ns to 10 sec	5ns fixed	Variable to 10V	Double pulse, advance trigger, advance sync,
101	10 MHz	40ns to 10ms	35ns to 10ms	5ns fixed	Variable to 10V	complement output mode.
101D	30 MHz	30ns to 1sec	15ns to 1sec	10ns variable	$-20V$ to $+20V$	Separate level control
110B	50 MHz	15ns to 50ms	10ns to 5ms	5ns variable	Variable to 10V	Twin pulse mode, adjustable baseline
110D	50 MHz	35ns to 1sec	35ns to 1sec	5ns variable	$-18V$ to $+18V$	Dual output, multigating
154-4	50 MHz	10ns to 10ms	10ns to 10ms	5ns variable	$-10V$ to $+10V$	IEEE-488 programming

5000A PORTABLE SWEEP GENERATOR

MODELS

- 5000A Mainframe
- 5005B 100 kHz – 32 MHz, 25 mW
- 5007 10-100 MHz, 30 mW
- 5008-1 100-500 MHz, 30 mW
- 5010-M2 500-1000 MHz, 25 mW
- 5030 1-4 GHz, 13 mW
- 5014 4-8 GHz, 10 mW
- 5031 8-18 GHz, 2.5 mW
- 5018 18-26.5 GHz, 1 mW



Specifications

PLUG IN SPECIFICATIONS

- Frequency Linearity:** Typically at $\pm 1.0\%$
- RF Power Leveling:** Leveled with internal DC amplifier driving PIN modulator where indicated
- RF Level Control:** Attenuates RF output ≥ 30 dB. Panel control varies internal PIN diode attenuator. (Calibrated in mW when leveled.)
- 1 kHz Modulation:** AM modulates RF output with adjustable square-wave (950 Hz to 1050 Hz). Stability ± 1 Hz per degree C. Rise and fall times $< 10\mu\text{s}$ at maximum leveled output, on-off ratio > 40 dB (unleveled).
- External Leveling:** BNC connector accepts external directional detector. Sensitivity is approximately 10 mV/mW of output power. Input impedance is 5 k Ω , negative polarity.
- RF Output Connector:** Precision Type N connector.
- External AM:** Control input 0-10 V unleveled. Control sensitivity to 100 mV/mW leveled. Rise and fall time typically 2 μs , leveled or unleveled, above 10 MHz.
- Fast FM and Phase-Lock Control:** 0-60 V (non-linear) control range. Response typically 10 MHz, depending on plug-in and frequency setting. Option M6 provides linear sensitivity phase-lock input with slower response.
- Frequency Markers:** Adjustable panel switch disables markers when desired.

MAINFRAME SPECIFICATIONS

Modulation Modes

1 kHz: Rear panel BNC connector provides +2V square-wave. Output impedance is 1k Ω .

- External AM:** Positive going increases RF output from level setting. Control range from 30 to 40 dB unleveled. Rear panel BNC unleveled.
- Fast FM and Phase Lock Control:** Rear panel connector couples directly to RF oscillator. Model 9106 phase-lock plug supplied.
- Frequency Control:** F1-F2, Marker 1, Marker 2-F_C, and Marker 3 controls operate corresponding color-coded pointers on slide rule dial.
- Frequency Markers:** Three markers reduce RF output > 0.2 dB. Marker width $< 1\%$ of maximum range on wide sweep. Video markers available, with -1V pulse at rear panel BNC connector. Output impedance is 3 k Ω .
- Frequency Vernier:** Provides $\pm 10\%$ control of band in all sweep modes. Calibrated in MHz.

Sweep Modes

- Wide:** (F-1, F-2) up or down sweep, anywhere in band, set by F1 and F2 controls.
- Narrow (ΔF):** Maximum width $\pm 5\%$ of band set by $\Delta F \times 11$, $\Delta F \times 0.1$, or $\Delta F \times 0.01$ decade switch. Calibration accuracy $\pm 10\%$ of selected ΔF range. center frequency set by F_C control.
- CW:** Full band tuning set by marker 2-F_C control.
- External:** Rear panel switch disables internal sweeps, permitting 0 to 10V external signal to program frequency over complete band. Response DC-10 kHz. Input impedance 25 k Ω . Rear panel BNC connector. +20V reference provided for remote control of frequency with potentiometer or switched voltage divider connected to external sweep input. Rear panel connector.
- Internal Recurrent:** Sweep start is automatic. Front panel selector.
- Line Synchronized:** Sweep start synchronized with primary power. Front panel selector.
- External/Manual Trigger:** Single sweep actuated by front panel push-button or by external +2V signal $\geq 1\mu\text{s}$. Input impedance 10 k Ω . Rear panel BNC connector.
- Sweep Speeds:** 10 ms to 100 s, by decade selector. Vernier provides 10:1 range in each decade. Flyback time 10% of decade selector setting.
- Manual Sweep:** Frequency controlled by sweep speed vernier. Variable between limits set by F1/F2 and ΔF controls.
- Sweep Output:** 0 to +10V fixed amplitude during wide or narrow sweep, varies proportional to frequency on manual scan. Output impedance < 100 ohms, load current ≤ 10 mA. Front and rear panel BNC connectors.

General

- Retrace Blanking:** RF may be left on or turned off during sweep retrace. Front panel switch.
- Blanking Output:** +18V during retrace -0.6V during sweep. Output impedance is 1k Ω . Rear panel BNC connector. See Option M1.
- Frequency Reference Output:** 0 to -10V/band full scale proportional to frequency (0.1V minimum and -9.9V maximum, usable frequency). Accuracy and linearity are one-half the the values specified for RF plug-ins. Output impedance 1k Ω . Positive reference voltage optionally available.
- Dimensions:** 5 1/4" H x 8 1/2" W x 3 1/2" D (13.3 x 21.6 x 34.3 cm).

MICROWAVE COMPONENTS

Systron Donner has been a leader in RF and microwave instrumentation for over twenty-five years. A combination of experienced technical staff, modern facilities and a commitment to the development of high-technology thin-film componentry has resulted in products which offer state-of-the-art performance.

The modules illustrated here are just a sampling of the many unique designs used in the instruments described in this catalog. Following is a partial list of the advantages offered by thin-film componentry integration.

FREQUENCY COUNTERS

- Automatic measurement to 110 GHz
- Simultaneous measurement of frequency and power
- 60 dB dynamic range
- -65 dBm kickback noise
- +30 dBm input protection

SIGNAL SOURCES

- Complete coverage to 26.5 GHz
- Excellent spectral purity
- Output dynamic range to 140 dB
- Full modulation capability

TRANSMISSION LINE ANALYSIS

- 2 MHz to 18 GHz operation
- 80 dB dynamic range
- Coaxial or wave guide applications



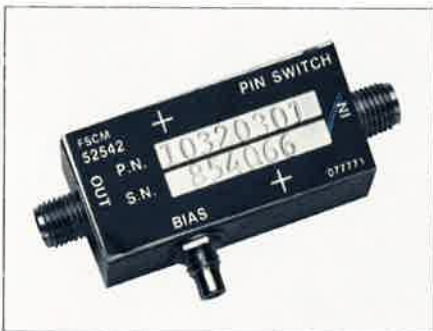
SAMPLER/MIXER

- 450 MHz-26.5 GHz
- Very High Sensitivity
- Low L.O. Pwr. Requirement
- High L.O. to R.F. Isolation
- Unique Design



LEVELER/MODULATOR

- 12 GHz-18 GHz
- Very High Dynamic Range
- Fast Rise/Fall Time
- Low Pulse Overshoot
- Low Control Current
- Compact Design



LEVELER

- 100 MHz-26.5 GHz
- Very High Dynamic Range
- Low Control Current
- Low Insertion Loss
- Small Size



DETECTOR/PWR DIVIDER

- 100 MHz-26.5 GHz
- Flat Response
- Low Insertion Loss
- Small Size
- Simple Construction



PIN DIODE SWITCH, SP-3T

- 100 KHz-3 GHz
- Low Frequency Channel
- Low Harmonic Distortion
- Fast Switching
- Unique Design



DUAL VCO

- 400-600 & 600-1000 MHz
- Low Control Voltage
- Low Distortion
- Flat Output Power
- Compact Design

INSTRUMENT DIVISION

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