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PRODUCT OVERVIEW

To produce the output voltages and frequencies required to drive the company's broad line of AC power sources, Elgar designed a family of oscillators and plug-in programmers.

Elgar Plug-In Programmers (PIPs) are microprocessor-based, multi-function system components that can be programmed to control amplitude, frequency, phase angle, current limits and a variety of special built-in functions.

The PIP 704 is a Plug-In Programmable Transient Generator that includes all the critical test parameters of MIL-STD-704 for "Aircraft Electrical Power Characteristics" pre-programmed and ready to use at the touch of a button or over the IEEE-488 bus.

Elgar's family of plug-in oscillators provides users with maximum flexibility and optimum price performance for both manually adjustable and fixed frequency applications.

Elgar offers a two year warranty on the manual oscillators, PIPs and the SL, SX and B Series power supplies.



PIP 704, PIP 9023 and PIP 9012A

The table below cross-references application needs with the Elgar plug-in programmers and manual oscillators designed to meet them. Just turn to the indicated page number for product details.

Selection Guide

Elgar Series	CE	Fixed Frequency Output	Variable Frequency Output	Manual Front Panel	IEEE-488 Programmable Operation Control	Resistance or Voltage Programming	Resistance or Voltage Programming Output Freq	Transient Testing Dropout Output Volts	Independent Voltage and Phase Output Capability	Test Readback Option Control
PIP 9012A			■	■	■			■		■
PIP 9023			■	■	■				■	■
PIP 704			■	■	■			■	■	■
400		■								
400 SP		■					■			
400 SD			■	■			■			
PIP 9012AE	■		■	■	■			■		■

CE

Elgar ▪ 1.800.733.5427 ▪ 858.450.0085 ▪ Fax 858.458.0267 ▪ 9250 Brown Deer Road, San Diego, CA 92121 ▪ ww.elgar.com ▪ email: sales@elgar.com

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PRODUCT OVERVIEW

Elgar PIPs are ready to plug in to any of our full line of AC linear power sources. They are programmable via the IEEE-488 GPIB bus, or locally from the front panel keypad.

Whether controlled power is needed for automated test equipment (ATE), aircraft ground support, production lines or laboratories, PIPs provide reliable programming that is easy to use. Elgar programmers are used in aerospace, military, commercial and telecommunications electronic applications around the world.

All Elgar PIPs have a two-year limited warranty.

STANDARD ON ALL PIPS

BUILT-IN TEST DIAGNOSTICS

Built-In Test (BIT) provides continuous self-testing for overvoltage, open sense leads and overcurrent. It shuts down the output voltage when any discrepancies occur between actual and programmed values.

DISCONNECT RELAY

The output voltage is automatically pro-grammed to zero during relay transfer time with off and on executed at zero crossings. This feature requires the "D" option on the AC power source.

REMOTE SENSING

This feature provides full programming accuracy without sacrificing response time. Programming from zero volts to full scale takes less than 1 ms to within ±1% of full ms scale or to within ±0.2% of full scale in less than 50 ms.

OPTIONS

TEST OPTION (BITE)

Optional Built-In Test Equipment (BITE) limits the need for extra test equipment by monitoring output frequency, RMS voltage, RMS current and true watts. It requires the test option on the AC power source. It includes current limit programming, which protects units under test (UUT's) by limiting current to each UUT's specific maximum requirements.

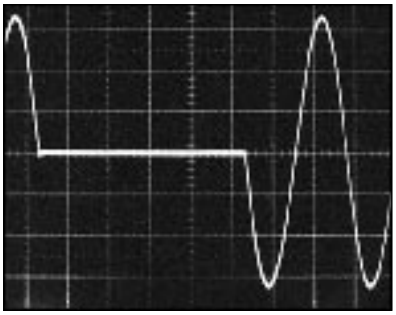
The chart below details the standard functions of each PIP and the options available. If you have special power applications, please call your local representative or a member of our service team to discuss how custom functions can be added.

PIP Comparison

	9012A/AE	9023	704
AC transient generation			■
Amplitude modulation input capability			■
Auto-ranging frequency		■	
Built-In Test (BIT) diagnostics	■	■	■
Local control/display	■	■	■
Multi-system phase lock		■	■
Preprogrammed MIL-STD-704D testing			■
Programmable flat top distortion			■
Programmable frequency range	■	Auto	Auto
Remote sensing	■	■	■
Synchronization pulse output	■		■
Voltage drop-outs	■		■
Voltage range programming	■	■	■[2]
Zero, peak, or random command	■		
Optional functions			
Built-In Test Equipment (BITE)	■	■	■
Current limit programming	■	■	■
Output disconnect relay[1]	■	■	■

[1] The AC source must have a disconnect option
[2] Switch selectable from internal range switch

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PIP 9012A Line Drop-out



PIP 9023



PIP 704

PIP 9012A/PIP 9012AE (CE)

The PIP 9012A/AE features remote programming or local control via a 12-pad keyboard with display and function enunciators. The 9012A/AE provides full GPIB control of simultaneous voltage and frequency and has a 1 to 9 full or half cycle dropout capability. With the test option, the front panel display becomes a digital meter to read the RMS volts, amps, watts and frequency.

The PIP 9012A/AE is well suited for applications such as pass/fail incoming inspection testing.

The oscilloscope picture, above (left), is a two cycle voltage drop-out from a "DROP 2" command to a PIP 9012A.

PIP 9023

The PIP 9023 is designed for complicated, variable phase angle applications. It has three programmable voltage ranges with independent control of voltage and phase angle. The independent phase angles are programmable in 0.5 degree steps through 360 degrees. The PIP 9023 also features auto ranging frequency.

The PIP 9023 is the product of choice for complicated, variable phase applications such as gyro testing.

The oscilloscope picture above (center) is of a three phase output programmed for unbalanced voltages and special phase angles from a PIP 9023-3.

PIP 704

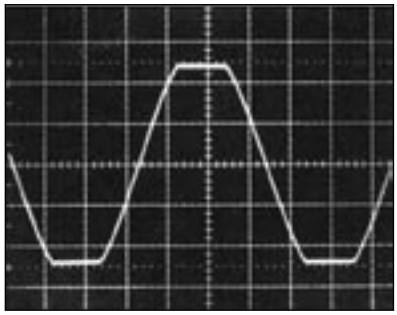
The PIP 704 Plug-In Programmable Transient Generator is designed to meet the MIL-STD-704 "Aircraft Electrical Power Characteristics" test requirements for 400 Hz power.

It can also perform various voltage and frequency aberrations, such as simultaneous or independent transients (including 704D ramps), voltage surges/sags, frequency deviation, voltage phase differentiation, and waveform distortion in any single phase or in all three phases.

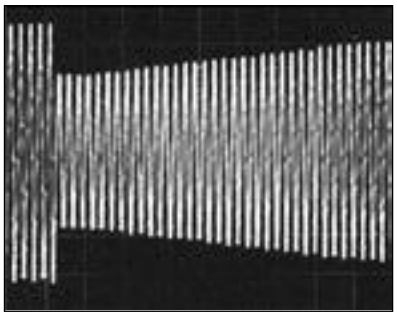
The PIP 704 is designed for testing aircraft avionics, shipboard electronics and jet and rocket engine controllers.

The scope pictures, above, show 8% Total Harmonic Distortion (THD) simulating sudden overload of a generator and a ramp per Table 5 of MIL-STD-704.

PIP 9023 Programmable Phases



PIP 704 Flat Top Distortion



PIP 704 Voltage Ramp



PIP 9012A

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Specifications

	9012A/AE	9023	704
FREQUENCY			
Range	Programmable 45-99.99 Hz 45-999.9 Hz 45-5000 Hz	Auto-Ranging 45-999.9 Hz 1000-5000 Hz	Single Range 45-999.9 Hz
Resolution	0.01/0.1/1.0 Hz	0.1/1.0 Hz	0.1 Hz
Accuracy	0.001% of Set Value	0.001% of Set Value	0.001% of Set Value
External Frequency/ Phase Synchronization	No	Yes-to another 9023 or a 704	Yes-to another 704 or a 9023
VOLTAGE			
Mode	Programmable Simultaneously	Programmable Independently or Simultaneously	Programmable Independently or Simultaneously
Range	0-135VAC 0-270VAC	0-67.5 VAC 0-135VAC 0-270VAC	0-135VAC Switch Selectable 0-270 VAC Switch Selectable
Resolution	0.1 VAC	0.1 VAC	0.1 VAC
Programming Accuracy	±0.2% of Full Scale	±0.2% of Full Scale	±0.2% of Full Scale
Load Regulation	±0.015%; No Load to Full Load	±0.015%; No Load to Full Load	±0.015%; No Load to Full Load
Line Regulation	±0.015%; for a 10% Line Change	±0.015%; for a 10% Line Change	±0.015%; for a 10% Line Change
CURRENT LIMIT (Requires test option)	Programmable Simultaneously (All Phases)	Programmable Independently by Phase	Programmable Independently by Phase
Range	5%-100%	5%-100%	5%-100%
PHASE ANGLE PROGRAMMING	Single ø, Two ø Fixed 90˚ 3ø , Fixed 120˚	Three ø Programmable	Three ø Programmable
Range	N/A	0-360˚	0-360˚
Resolution	N/A	0.5˚ Increments	0.5˚ Increments
Accuracy	±1˚; 45-2 kHz Add 1˚ Per kHz above 2 kHz	±1˚; 45-2 kHz Add 0.5˚ Per kHz above 2 kHz	±1˚, 45-999.9 Hz

Specifications

	9012A/AE	9023	704
Fault Shutdown	Over/Under Voltage Overload Over Current*	Over/Under Voltage Overload Over Current*	Over/Under Voltage Overload Over Current*
Programmable Amplitude Execution	Random/Zero Crossing Peak	N/A	Zero Crossing
Line Cycle Drop-Out	Programmable 1-9 Cycles	N/A	Programmable 1-9999 Cycles
Flat Top distortion	N/A	N/A	8% THD
MEASUREMENT READBACK FREQUENCY			
Range	45 Hz-5 kHz	45 Hz-5 kHz	45 Hz-1 kHz
Resolution	2 Hz	1 Hz	1 Hz
Accuracy	0.12% ±0.8% Reading	± LSD	± LSD
TRUE RMS VOLTAGE			
Range	0-300 VAC	0-300 VAC	0-300 VAC
Resolution	0.1 VRMS	0.1 VRMS	0.1 VRMS
Accuracy	0.1% FS ±0.1% Reading	0.1% FS ±0.1% Reading	0.1% FS ±0.1% Reading
CURRENT			
Range**	0-5A, 10A, 20A, 40 ARMS	0-5A, 10A, 20A, 40 ARMS	0-5A, 10A, 20A, 40 ARMS
Resolution	0.01 ARMS	0.01 ARMS	0.01 ARMS
Accuracy	1% FS ±1% Reading	1% FS ±1% Reading	1% FS ±1% Reading
POWER			
Range**	0-500W, 1 kW 2 kW, 4 kW	0-500W, 1 kW 2 kW, 4 kW	0-500W, 1 kW 2 kW, 4 kW
Resolution	1W	1W	1W
Accuracy	1% FS ±1% Reading	0.5% FS ±1% Reading	0.5% FS ±1% Reading
PHASE ANGLE			
Range	N/A	0-359˚	0-399˚
Resolution	N/A	0.5 ˚	0.5˚

* With Programmable Current

**Depends on Power Amplifier Selection in the Power Source

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PRODUCT OVERVIEW

Elgar's plug-in oscillator product line is designed to provide the required output frequency for Elgar AC power sources. Plug-in oscillators also give users maxi-mum flexibility and optimum price/performance for their specific application. The plug-in oscillators are an integral part of Elgar Linear AC power sources.

Both the RC phase shift oscillators and crystal controlled precision oscillators provide users with variable or fixed frequency capabilities and a low distortion sine wave output to meet a variety of application needs. All are available in single, dual, or three-phase configurations.

FEATURES AND BENEFITS

RC PHASE SHIFT OSCILLATORS (FIXED OR VARIABLE)

These oscillators provide a lower cost alternative when the application doesn't require the frequency accuracy of crystal control. They're the best selection when continuous sweep frequency is required.

CRYSTAL CONTROLLED PRECISION OSCILLATORS (FIXED OR VARIABLE)

These oscillators provide variable frequency capability via front panel decade switches. They offer frequency selection capability via internal DIP switches in fixed frequency models. In addition, they feature precision frequency resolution of 0.01 Hz, calibration accuracy of ±0.001%, and optional programmable amplitude via external resistor or external DC programming.

400 SERIES

CE 400 Series fixed frequency RC phase shift oscillators operate at 50, 60, or 400 Hz. All are available in single, dual or three-phase configurations. They are the low cost alternative for applications which require ±0.1% accuracy. Single phase versions include a 1/8" phone jack for Ext. input.



400 SD

400 SD/400 SDE SERIES

CE 400 SD and 400 SDE (CE) Series allows manual selection of output frequency with decade dials and range switches. The frequency range is 45 Hz to 5 kHz. Optionally, output voltage can be externally programmed with resistance of 0-13 kOhms for a 0-full scale output voltage or with DC voltage of 0-10 VDC for a 0-full scale output voltage. They offer precision frequency resolution of .01/.1/1 Hz and calibration accuracy of ±0.001% of set value.

400 SP/400 SPE SERIES

CE 400 SP and 400 SPE (CE) Series allows selection of any fixed frequency from 45 Hz to 5 kHz with DIP switches located behind the blank front panel. Optionally, output voltage can be externally programmed in the same manner as the 400 SD.

400 SR

400 SR signal routing plug-ins are used for multiple power source applications to route the proper signal from the master oscillator to the proper slave power source(s).

400A

400A plug-ins are used to allow an external source, such as an arbitrary waveform generator, to provide the waveform input to the power source.

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RC Phase Shift Oscillators

Type	Model	Phase	Frequency Range (Hz)	Calibration Accuracy	Phase Angle	Freq. Temp. Coefficient
*Fixed Frequency	451-.1T*	1	50	±0.1%	—	±0.015%/°C
	452-.1	2	50	±0.1%	90±1°	±0.015%/°C
	453-.1	3	50	±0.1%	120±1°	±0.015%/°C
	461-.1T*	1	60	±0.1%	—	±0.015%/°C
	462-.1	2	60	±0.1%	90±1°	±0.015%/°C
	463-.1	3	60	±0.1%	120±1°	±0.015%/°C
	441-.1T*	1	400	±0.1%	—	±0.015%/°C
	442-.1	2	400	±0.1%	90±1°	±0.015%/°C
	443-.1	3	400	±0.1%	120±1°	±0.015%/°C

* All single phase Oscillators have mini phone jack for external signal source

Crystal Controlled Precision Oscillators

Model	Programming	Sensing	Voltage/Frequency
Variable Frequency 45-5000 Hz 400 SD Series: 401 SD Single-Phase 402 SD Dual-Phase 403 SD Three-Phase Fixed Frequency 45 Hz to 5 kHz* 400 SP Series: 401 SP Single-Phase 402 SP Dual-Phase 403 SP Three-Phase	(0) No external programming (1) External resistance prog. 0 to 13 kOhm for 0 to FS (2) External voltage prog. 0 to 10 VDC for 0 to FS (3) External voltage prog. 0 to 13 VDC for 0 to 130V output (4) External voltage prog. 0 to 26 VDC for 0 to 260V output	(0) No remote sense with servo control (1) 1ø remote sense with servo control (2) 2ø remote sense with servo control (3) 3ø remote sense with servo control (4) 3ø open DELTA (5) 3ø open DELTA remote sense with servo control	(1) 0 to 130V output of power source (2) 0 to 260V output of power source (3) 0 to 32V output of power source (4) 0 to 65V output of power source (5) Frequency range of 400 SD extended to 15 Hz to 10 kHz (6) Frequency range of 400 SD extended to 15 Hz to 5 kHz (7) Frequency range of 400 SD extended to 45 Hz to 10 kHz

*SP Series fixed frequency preset by internal Dip switches
Freq. Temp. Coefficient 3 PPM/C°
Frequency Calibration Accuracy ±0.001% ±1° 45 Hz to 2 kHz add ±1° per kHz above 2 kHz

Signal Routing Modules

400 SR Ext. Source Input 400 A	Signal routing plug-in. Used in multiple power source applications (e.g.,1500 SL-3 consisting of three units, three-phase) Plug-in contains a mini-phone jack to allow a drive signal connection from an external source.

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