DOBLE PROTECTION TESTING

F6150e

Power System Simulator

VERSATILE SOLUTION FOR TESTING PROTECTION DEVICES AND SCHEMES

The Doble F6150e is your versatile solution for testing protection relays and schemes. This power system simulator performs the simplest through the most complex tests. Meeting all your testing needs, the F6150e is available in four of different models. Whether you need to test an individual component or test an entire scheme, the F6150e is the proven solution to assess protection system performance.

FEATURES

- Performs standard relay calibration and verification testing of high burden and microprocessor relays
- Analog testing of 1A and 5A protection devices
- Performs state simulation and transient testing
- Tests 0.2-class metering CTs and transducers
- Implements end-to-end testing of communications-based schemes with GPS time syncing
- Maximum of 12 Sources (six voltage, six current) configurable for bench testing and proof-of-concept testing for complicated relaying schemes
- Delivers full VA power with resistive, inductive and capacitive loads at maximum current rating (6x35, 3x70, 1x210 amps)
- Wi-Fi capable (optional)
- Control all sources from a tablet device for basic, manual protection testing

BENEFITS

- Select from a number of instrument models that feature varying power levels and complexity. Choose the best solution according to your testing and budgetary requirements.
- Rugged construction and proven state-of-the art design provide laboratory accuracy with uncompromising field performance
- Convenient front-panel display indicates active voltage/current amplitudes and phase values during testing
- High-precision measurements for energy meter and transducer testing

DOBLE F6150e CUSTOMIZED MODELS

NAME	F6150e	F6150e-D	F6150e-SP	F6150e-IRC
DESCRIPTION	PREMIER MODEL	DISTRIBUTION MODEL	SINGLE PHASE MODEL	IRC MODEL
Applications	Test traditional electromechanical, electronic and microprocessor relays and devices Maximum power to test high-burden relays Test complex schemes	Test digital three-phase systems Test single phase & low-burden, three phase relays	Test single phase relays	Test IntelliRupter® PulseCloser® Fault Interrupter and other devices using low-level sources
Technical Highlights	Maximum of 12 high-level analog sources are available at any time Maximum of 12 low-level analog sources are available at any time	Maximum of 8 high-level analog sources are available at any time Maximum of 8 low-level analog sources are available at any time	Maximum of 4 high-level analog sources are available at any time Maximum of 4 low-level analog sources are available at any time	Maximum of 12 low-level analog sources are available at any time
Technical Details	6 AC/DC Amplifiers: 3 x 150 VA Voltages & 3 x 150/225 VA currents AC volts: (1 x 600 V), (3 x 300 V), (6 x 150 V) AC amps: (1 x 180 A), (3 x 60 A), (6 x 30 A) Each 150 VA Voltage/Current amplifier can be split into 2 x 75 VA sources; total 12 sources	4 AC/DC Amplifiers: 2 x 150 VA Voltages, 2 x 175/262.5 VA currents AC volts: (1 x 600 V), (2 x 300 V), (4 x 150 V) AC amps: (1 x 120 A), (2 x 60 A), (4 x 30 A) Each 150 VA Voltage/Current amplifier can be split into 2 x 75 VA sources; total 8 sources	2 AC/DC Amplifiers: 1 x 150 VA Voltages, 1 x 175/262.5 VA currents AC volts: (1 x 300 V), (2 x 150 V) AC amps: (1 x 60 A), (2 x 30 A) Each 150 VA Voltage/Current amplifier can be split into 2 x 75 VA sources; total 4 sources	
	WITH OPTIONAL F6005 INCLUDED	WITH F6005 OPTION INCLUDED	WITH F6005 OPTION INCLUDED	
	Each 175/262.5 VA Current amplifier can be split into 2 x 87.5/131.25 VA sources; total 6 sources AC amps: (1 x 210 A), (3 x 70 A), (6 x 35 A) Each 175/262.5 VA Current source can be combined into 1 x 525/787.5 VA source or 1 x 175/262.5 VA & 1 x 350/525 VA sources	Each 175/262.5 VA Current amplifier can be split into 2 x 87.5/131.25 VA sources; total 4 sources AC amps: (1 x 140 A), (2 x 70 A), (4 x 35 A) Each 175/262.5 VA Current source can be combined into 1 x 350/525 VA source	The 175/262.5 VA Current amplifier can be split into 2 x 87.5/131.25 VA sources; total 2 sources AC amps: (1 x 70 A), (2 x 30 A)	

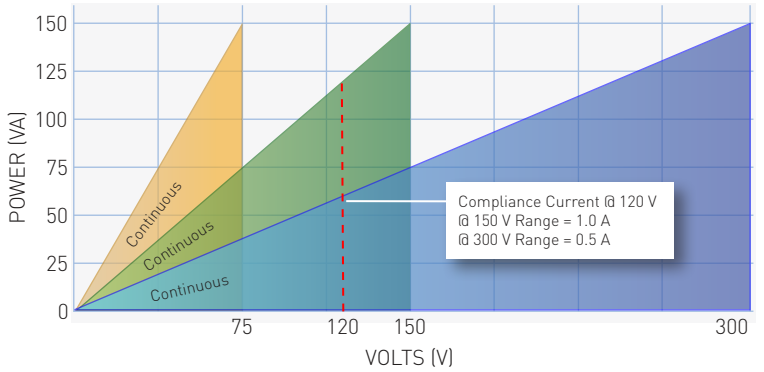
Doble Engineering Company
Worldwide Headquarters
123 Felton Street, Marlborough, MA 01752 USA
tel +1 617 926 4900 | fax +1 617 926 0528
www.doble.com

MKT_SL_MKT_SL_F6150e_1/21

DOBLE F6150e POWER SYSTEM SIMULATOR TECHNICAL SPECIFICATIONS

VOLTAGE SOURCES (6 TOTAL)	
Source Configuration	**Power**
6-phase AC (L-N)	6 x 150 V @ 75 VA
3-phase AC (L-N)	3 x 300 V @ 150 VA
1-phase AC (LL-LN)	1 x 600 V @ 300 VA
DC (LL-LN)	3 x 424 V @ 150 W
Available Range	75 V, 150 V, 300 V

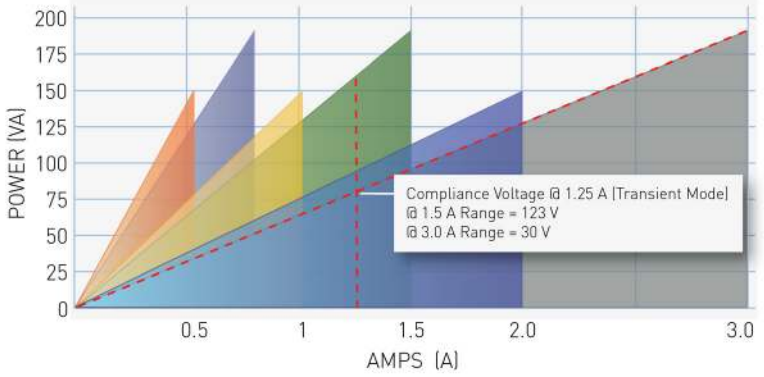
VOLTAGE SOURCES OUTPUT VOLTAGE



CONVERTIBLE V/I SOURCES	
Source Configuration	**Power**
6-phase AC (L-N)	6 x 1.5 A @ 97.5 VA* 6 x 1 A @ 75 VA
3-phase AC (L-N)	3 x 3 A @ 195 VA* 3 x 2 A @ 150 VA
1-phase AC (LL-LN)	1 x 9 A @ 585 VA* 1 x 6 A @ 450 VA
DC (LL-LN)	1 x 6.36 A @ 585 W* 1 x 4.24 A @ 450 W
Available Range	0.5 A, 1 A, 1.5 A, 3 A, 9 A

**In Transient Mode which provides up to 1.5 seconds duration.*

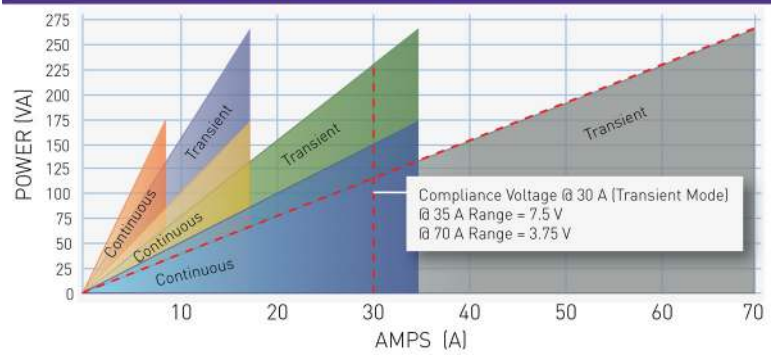
CONVERTIBLE V/I SOURCES OUTPUT CURRENT



CURRENT SOURCES	
Source Configuration	**Power**
6-phase AC (L-N)	6 x 35 A @ 131.25 VA** 6 x 17.5 A @ 87.5 VA
3-phase AC (L-N)	3 x 70 A @ 262.5 VA** 3 x 35 A @ 175 VA
1-phase AC (LL-LN)	1 x 210 A @ 787.5 VA** 1 x 105 A @ 625 VA
DC (LL-LN)	1 x 140 A @ 787.5W** 1 x 70 A @ 625W
Available Range	8.75 A, 17.5 A, 35 A, 70 A, 210 A

***With the F6005 option which provides up to 45 seconds duration.*

CURRENT SOURCES OUTPUT CURRENT



LOW LEVEL SOURCES			
Range	**Voltage Power**	**Current Power**	**Transient Mode**
Convertible Amplifier Sources	6.7 VRMS	4.5 VRMS	6.7 VRMS
Current Amplifier Sources	N/A	3.399 VRMS (Non-Enhanced) 3.5 VRMS (Enhanced)	6.798 VRMS (Non-Enhanced) 7 VRMS (Enhanced)
Number	12		
Accuracy	± 0.25% of reading		
Resolution	331 µV/bit		

DOBLE F6150e POWER SYSTEM SIMULATOR TECHNICAL SPECIFICATIONS

LOGIC INPUTS (VOLTAGE OR CONTACT SENSE)		
Description	**Isolated Inputs**	**Paired Inputs**
Inputs	2 (First Strike)	3 Pairs (6)
Voltage Sense	250 V RMS AC / 300 V DC	250 V RMS AC / 300 V DC
Open Circuit Test Voltage	12 V DC	4 V DC
Short Circuit Test Current	20 mA DC	>50 mA DC
Response Time	0.1 msec max pickup /dropout	0.1 msec max pickup /dropout
Input Impedance	150 kΩ	150 kΩ
Isolation	±500 V peak	±500 V peak

LOGIC OUTPUTS		
Description	**FET (High Speed Electronic)**	**Relay**
Number	4	4
Isolation Voltage	±500 V peak	±500 V peak
Response Time	0.1 ms pick up / dropout	<10 ms pick up / dropout
Maximum (Make/ Break Current)	0.5 A	(Breaking cap AC: 2000 VA with Vmax 250 V, Imax 8 A) (Breaking cap DC: 50 W with Vmax 300 V, Imax 8 A)
Input Voltage	250 V RMS	250 V RMS

METERING FUNCTIONS	
DC Meter Inputs	
Input Range	0 - ±10 V DC / 0 - ±20 mA DC
Typical	<0.003%
Guaranteed	<0.05%
AC Sources	
Typical	<0.02% of metering loads
Logic Input As Counters	
Frequency	10 kHz
Pulse width	>175 µs

ANALOG INPUT MEASUREMENT AIM	
Recording	8 external Analog or Digital Signals
Internal Source recording	12 Sources
Ranges	250 mV, 2.5 V, 25 V, 250 V RMS
Bandwidth	DC, 0-5kHz
Input Impedance	150 kΩ
Max Input Voltage	250 V RMS AC / 300 V DC
Isolation	±500 V peak channel to channel
Accuracy	
Typical	±0.06%
Maximum	±0.15%

VARIABLE OUTPUT BATTERY SIMULATOR	
Range	6 - 300 V DC
Resolution	0.3 V
Power	90 W, 1.5 A max
50/60 Hz Ripple	<0.2% of Range
Accuracy	<±5%

TIMING ACCURACY	
With F6895 (Antenna and Receiver)	± 50 ns
With F6051 (Irig-b Converter)	+ 6 ms (un-modulated) +9 ms (modulated)
With F6053 PTP (1588) Power and Power Utility Profile	200 ns

POWER CONSUMPTION	
F6150e/sv at Full Power	2600 W
F6150e/sv at Idle	140 W

DOBLE F6150e POWER SYSTEM SIMULATOR TECHNICAL SPECIFICATIONS

AC AMPLITUDE ACCURACY @ 50-60 HZ @ 20° - 30° C	
Typical	0.02% of reading + .01% of range
Guaranteed	0.09% of reading + .04% of range
Playback Rate for Transient Test	10 kHz

CONVERTIBLE SOURCE IN CURRENT MODE @ 20° - 30° C	
Guaranteed	<0.5%

TIMERS AND TRIGGERS	
Timers Number	8
Max Recording Time	<24 h
Accuracy	±0.0005% of reading, ±50 µs
Resolution	100 µs

FREQUENCY	
Bandwidth	DC - 3 kHz at Full Power
Range	DC, 0.1 Hz - 2.0 kHz Continuous Full Load
Resolution	0.001 Hz

PHASE ANGLE @ 50/60 HZ	
Range	±360° - 0°
Accuracy	± 0.25°
Resolution	± 0.1°

DISTORTION @ 50 /60HZ V & I SOURCES TOTAL HARMONIC DISTORTION (THD)	
Typical	<0.02%
Guaranteed	<0.1%
Accuracy	
Typical	0.5 ppm
@ 20° - 30° C	1.5 ppm
@ 0° - 50° C	10 ppm

GENERAL SPECIFICATIONS	
Enclosure	High-impact, molded, flame-retardant ABS-meets National Safe Transit Association testing specification No.1A for immunity to severe shock and vibration
Mechanical	IEC 60068-2-27 Shock (15g/11ms, half sine) IEC 60068-2-6 Vibration (10-150 Hz, 20m/s^2) IEC 60068-2-6 Drop Test
Weight	42lb,19.05kg (front cover and strap included)
Dimensions	15 X 9.5 X 18 in 38 X 24 X 45.7 cm
Calibration	Certification traceable to N.I.S.T. standards
Environmental	IEC 60068-2-2 Dry Heat (+85°C storage; + 50°C Rating Operating), IEC 60068-2-1 Cold (-50°C storage; 0°C operating), IEC 60068-2-30 Damp Heat (+55°C, 6 cycles, 95% humidity), NEMA Enclose Rating Type 1IEC Enclosure IP20
EMC Emissions	FCC 47 CFR Part 15 Class A (USA), EN55011:1998/A1:1999/A2:2002 Group 1 Class A ISM(EU), AS/NZS CISPR 11:2004 Class A ISM (Australia), ICES-001 Issue 3 ISM (Canada)
EMC Immunity	EN 61000-6-2:2005; IEC 61000-4-2/3/4/5/6/11
Quality Assurance Management System	Third Party certification to ISO 9001:2000
Humidity	Up to 95% relative humidity, non-condensing
Electrostatic Discharge Immunity	IEC 801-2 I.E.C. performance level 1 @ 10kV: normal performance within specifications. I.E.C. performance level 2 @ 20kV: no permanent damage
Surge Withstand Capability	ANSI/IEEE c37.90. The simulator functions as a source during surge withstand capability tests, when the ANSI/IEEE specified isolating circuit is interposed between the simulator and the test relay
Line Power Supply	105-264 V, 47-63 Hz
Safety	EN 61010-1 third edition; UL 61010-1; CSA 27.2 # 61010-1 third edition
Communication Interfaces	Ethernet or USB control to PC, Wi-Fi (802.11 B+G bands, 30 - 80ft, 9 - 24m)

Doble Engineering Company
Worldwide Headquarters
123 Felton Street, Marlborough, MA 01752 USA
tel +1 617 926 4900 | fax +1 617 926 0528
www.doble.com

PUBLISHED: NOVEMBER, 2023