Smart Choice for power

xantrex

ReFlex Power™

Modular Programmable Precision
AC/DC/Loads Power System

Modular Programmable Precision AC/DC/Loads Power System

ReFlex Power™ is a high density, modular programmable power system providing DC, AC and electronic load assets all under control of a single controller. It provides a reconfigurable, flexible platform ideal for ATE and production test environments where RFP™ can provide programmable stimulus and bias power as well as programmable loads for the device(s) under test.

The EIA 4U high RFP™ mainframe can hold up to 12 single-slot modules or combinations of single, dual and triple slot wide modules to configure (or reconfigure) the system for the particular requirements at hand. The mainframe can support up to 6 kW of output power.

Up to 8 mainframes, potentially up to 95 modules, can be controlled via a single controller. The controller communicates to the individual modules via a high speed proprietary bus protocol, providing very high data rates and a high degree of deterministic control. The RFP™ controller communicates to the host controller via an Ethernet LAN connection designed to be compliant with the LAN Extension for Instrumentation (LXI™) standard, assuring interoperability and ease of integration.

RFP™ system modules can be combined via the controller, permitting the creation of "virtual assets" with the voltage/current combinations required for a particular test regime. Creating "virtual assets" reduces the "logistical tail" and total cost of ownership.

Featuring AC, DC and Load Modules

- Single slot, 330 Watt programmable DC supplies
  - 16V, 20.6A
  - 65V, 5.1A
- Dual slot, 1kW programmable DC supplies
  - 33V, 30A
  - 450V, 2.3A
- Triple slot, 875 VA, single phase, programmable AC supply
  - Dual range: 280V(rms), 3.5A(rms) or 140V(rms), 7A(rms)
- Triple slot, 500V, programmable electronic DC loads
  - 15A, 375 Watt
  - 30A, 750 Watt

Xantrex Technology Inc.
Headquarters
8999 Nelson Way
Burnaby, British Columbia
Canada V5A 4B5
800 670 0707 Toll Free
604 420 1591 Fax

5916 195th Street NE
Arlington, Washington
USA 98223
800 446 6180 Toll Free
360 925 5144 Fax

Applications

Rackmount ATE Systems

The high power density, large number of output channels and 16-bit resolution, all under the control of a single Ethernet controller, makes RFP ideal for ATE system integration. The wide variety of voltage and current combinations and power density, created by up to 12 separately programmable DC channels in a compact 3U package, makes RFP the most compact ATE power package on the market. Combining this with the RFP AC and load channels in the same chassis and under the same controller, RFP can elegantly cover all of your ATE system power stimulus requirements.

Product Development

Testing and burn-in of aircraft flight hardware, DC-DC converters and automotives and semiconductor components are just a few of the items that are being tested with RFP. From simple DC voltage set points and AC sine waves to complex waveforms and triggers RFP keeps pace with your product development power stimulus requirements.

Aerospace Testing

Testing of flight hardware and aircraft auxiliary systems requires precision power stimulus hardware. RFP with its 3-phase AC capability at frequencies from DC to 5,000Hz and power to 2,625 VA with optional 1kW of 33V or 450V DC all in one 3U solution is ideally designed to meet your aerospace testing needs.

Process Control

Weather your are driving magnets for controlling ion beams for the manufacture of semiconductors or operation of an linear accelerator or driving a current through electrolyte for precise control of a plating process, RFP is your ideal process control choice. RFP's small footprint with flexible configuration of multiple channels of DC, AC and load modules can solve most companies' process control power.

Research

A research environment presents some of the most demanding requirements on your test instrumentation. RFP's flexible sequencing and triggering supports you research needs. All too often, equipment that meets the needs of your current project does not meet the needs of your next project. RFP with its modular design protects your capital assets. The RFP architecture allows you to change to different DC voltage and current combinations, add or subtract AC and load modules and parallel and phase-lock modules. This allows RFP to grow with your stimulus power needs.

ReFlex Power™ Modular Programmable Precision Power System

Key Features

- **Modular**
- **Control up to 95 assets**
- **Control multiple AC and DC power supplies and loads in one mainframe**
- **Sag surge resistant**
- **Simple series and parallel operation**
- **Web browser control**
- **User configurable**
- **Highest Power Density**
- **Simple integration**
- **PFC ≥0.95**
- **Universal AC/DC input**
- **Up to 6kW in one mainframe**
- **1kW DC modules**
- **Reduced space and logistics hassles**
  - **High power density**
  - **Handles DC and AC power and load modules**
  - **User configurable**
  - **Universal AC/DC input**
- **Ease of integration**
  - **Web browser control**
  - **Trigger bus**
  - **Configure modules to parallel or series operation "on the fly"**
  - **Precision 16-bit control**

Available from:

Measurably better value

Thurlby Thandar Instruments Ltd. Glebe Road, Huntingdon, Cambs. PE29 7DR U.K.
Tel: 01480 412451, Fax: 01480 450409**,** e-mail: e-mail: sales@tti.co.uk
Web: **www.tti.co.uk**

ReFlex Power™ DC Modules

The DC power supplies of the ReFlex Power™ (RFP™) system include models rated at 330W and 1kW. They are part of a modular family of power assets that integrate into the RFP™ Mainframe to provide a wide range of features, functionality, and extensive configurability and adaptability. The modules could be set up to operate as standalone assets, or in combinations of parallel, series, and series/parallel groups to extend their voltage, current, and power ratings.

The RFP™ system of DC power supplies brings modularity to DC power assets, and makes possible a high degree of reconfigurability and adaptability through a Mainframe-based architecture. It extends the modular configuration to high power DC assets, without compromising performance or the controls feature set. The mechanical design is ruggedized for harsh environments, including mobile applications, as well as general-purpose industrial and laboratory rack-mount ATE.

DC Modules Key Features

- **Near Linear Power Supply**
- **Modular**
- **≥0.95 PFC**
- **Digital control loop technology**
- **High Power Density (3.5 watts/cubic inch)**
- **"Virtual Assets" by:**
  - **Series operation**
  - **Parallel operation**
  - **Combined operation with loads**
- **Simple integration**

DC Modules General Specifications	
Line Regulation	+\- 10% line change
Steady State, Voltage Mode	0.01% of full-scale + 10mV (330W) and 0.03% of full-scale (1kW)
Steady State, Current Mode	0.05% of fullscale (330W) and 0.1% of full-scale (1kW)
Transient, Voltage Mode	Less than 1% of full-scale excursion returning to steady state within 500 micro-sec
Transient, Current Mode	Less than 0.05% of full-scale (330W) and less than 0.1% (1kW)
Remote Sense	Up to 3V load line drop. The drop in the load leads subtracts from the maximum voltage available for the load.
Parallel	Up to six like modules.
Series	Up to five like modules. Float not to exceed 200V (16V, 33V), 300V (65V). 450V (450V).
Sag/Surge/Hold Up	Sag to 65% of nominal for 450ms at full output power with AC input at ≥200VAC. Surge to 135% of nominal for 450ms at full output with AC input ≤230VAC. 10ms hold up at loss of input.
Remote programming connector	9-pin D-sub
Output connector	Combination signal/power contact subminiature D (Mating connector kit available)

Model Number	LP-DC16V20	LPD-C65V5.1	HP-DC33V30	HPD-C450VA2.3
Output Voltage	16V	65V	33V	450V
Output Current	20.6A	5.1A	30A	2.3A
Maximum Power	330W	330W	1000W	1000W
Mainframe Slots	1	1	2	2

Ripple / Noise				
RMS	5mV	6mV	15mV	40mV
Peak-Peak	25mV	18mV	60mV	200mV

Programming Accuracy				
Voltage 0.05%+	8mV	32.5mV	16.5mV	225mV
Current	20mA	5.1mA	30mA	2.3mA

Temperature Coefficient				
Voltage /°C	1.6mV	6.5mV	3.3mV	45mV
Current /°C	5mA	1mA	7.5mA	0.6mA
Output rise/fall time	20msec	20msec	20msec	20msec

ReFlex Power™ AC Module

The ReFlex Power™ (RFP™) system includes an AC power supply rated at 875VA with two output voltage ranges, 0-140VAC and 0-280VAC. This AC source is part of a modular family of power assets that integrate into the RFP™ Mainframe to provide a wide range of features, functionality, and extensive configurability and adaptability. The AC module can be set up to operate as a standalone asset, in combinations of parallel, and in multi-phase groups to extend their voltage, current, and power ratings.

The module utilizes high-frequency power conversion for high efficiency to maximize power density and realize lightweight and small size. The module is housed in a three-width enclosure, 4.2" W x 6.75" H x 15" D, and is only 11.4 lb. Mounting within the Mainframe is facilitated with chassis guides, back-plane guide pins, and front panel captive fasteners for securing the modules. The thermal design features integral, variable-speed fans so that the cooling performance scales with the complement of modules in the Mainframe, and their output loading, minimizing the audible noise and airflow requirements.

AC Modules Key Features

- **High Power Density (2 VA/cubic inch)**
- **Single or multi-phase output**
- **Parallel operation**
- **4.8 Crest factor**
- **Digital control loop technology**
- **≥0.95 PFC**
- **Brown-out simulation**
- **Up to 875 VA**
- **45 to 5000 Hz**
- **Universal AC/DC input via mainframe**
- **User configurable**
- **Simple integration**

AC Modules General Specifications	
Current, Maximum	140V Range 7A, not to exceed 875 VA, Overload 10A for 0.5 Seconds
Current, Maximum	280V Range 3.5A, not to exceed 875 VA, Overload 5A for 0.5 Seconds
Frequency	45-1200 Hz, up to 5 kHz optional
Crest Factor	4.8 X FS rms current
RMS Regulation	100% Resistive Load effect (<100 msec) Voltage Mode 0.5% of FS Current Mode 0.1% of FS
RMS Regulation	10% Line effect (< 100ms) Voltage Mode 0.1% of FS Current Mode 0.1% of FS
Programming Accuracy	Voltage 0.1% of FS + .02%/kHz Current 1% of FS Frequency 0.01% of setpoint
Programming Resolution	Voltage 0-140VAC 9mV, 0-280 18mV Current 2.2mA Frequency 0.1Hz thru 1kHz; 0.5Hz thru 5KHz
Temperature coefficient	Voltage .05% of FS per °C Current .05% of FS per °C
Distortion	<1% to 500Hz <2% to 2KHz <5% to 5KHz
Output DC Offset	±0.1Vdc maximum
Efficiency	72%
RMS Noise	55dB below full-scale Input (via RFP Mainframe) Inrush Current 8.8A at 115Vac; 17.6A at 230Vac 14.6A at 270Vdc
Power Factor	0.95 typical
Hold-up time	10ms
Remote Sense	0.75Vrms per line Input
Overvoltage Protection	Range: 1.4% to 110% Accuracy: 2% of setpoint
Overcurrent Protection	Range: 0.4% to 106% Accuracy: 3% of setpoint
Auxiliary AC Output	Isolated 0Vac to 31.6Vac, 2A max proportional to AC output
Cooling	Forced air convection, req. 40CFM airflow at altitude and ambient temperature
Multi phase & parallel	Up to 6 in a group
Phase Programming Range	0-360 degree; counterclockwise phasor rotation is assumed, therefore the phase angle offset is lagging the master reference.
Phase Programming Accuracy	1 degree plus 1°C/kHz for balanced resistive load measured with respect to A-phase, at 25 degree C, +/- 5 degree.
Remote programming connector	9-pin D-sub
Output connector	Combination signal/power contact subminiature D (Mating connector kit available)

ReFlex Power™ Load Modules

The High Power Active Load (HPAL) and the Low Power Active Load (LPAL) of the ReFlex Power™ (RFP™) system include models rated at 375 W and 750 W. They are part of a modular family of power assets that integrate into the RFP™ Mainframe to provide a wide range of features, functionality, and extensive configurability and adaptability. The modules could be set up to operate as standalone assets, or in combinations of parallel groups to extend their current, and power ratings.

The modules utilize FET active current sinks in modular form to get the flexibility of the two power ranges. The 375 W module is housed in a triple-width enclosure, and weighs 8.2 lb. The 750 W module is also triple-width, and weighs 12.9 lb. Mounting within the Mainframe is facilitated with chassis guides, back plane guide pins, and front panel captive fasteners for securing the modules. The thermal design features integral, variable-speed fans so that the cooling performance scales with the complement of modules in the Mainframe, and their output loading, minimizing the audible noise and the airflow requirements.

DC Electronic Load Modules Key Features

- **High Voltage (500V) Input**
- **Digital control loop technology**
- **Two models: 375W & 750W**
- **Up to 750W/500V/30A**
- **Parallel up to 6 automatically**
- **Modular**
- **High Power Density**
- **Simple integration**

Measurement

Digital Volt Meter	
Range	0-500V
Resolution	33mV
Accuracy	0.1% of FS

DC Loads Modules General Specifications	
Physical	Size: 3 RFP Slots Weight 8.2 lbs (375W); 12.9 lbs (750W)
Connectors	DC Input and Sense: MS3102R20-24P Remote Programming: 9 pin D-Sub (Mating connector available)
Stability	<0.1% of FS after 8 hrs
Temperature Stability	<0.05% of FS/°C
Protection	Overvoltage: 525V ± 3% Overcurrent: 20A ± 3% (375W) 40A ± 3% (750W) Overpower: 19-394W ± 5% (375W) 38 – 788W ± 5% (750W) Reverse Voltage: -15V ± 3%
Parallel Operation	Up to six modules. Must be adjacent.
Noise	30mA (pk-pk), 20 Hz to 20 MHz bandwidth
Programming Response Time	55ms
Input Trigger Response Time	≤5ms
Dynamic Response (10 to 90/90 to 10%)	50μs
Remote Sense	0.75V per source line
Max Float Voltage	500Vdc any input terminal to chassis
Cooling	Internal fans, require 110 CFM minimum airflow at altitude and ambient temperature

Model	375W	750W
Current Mode		
Range	0-15A	0-30A
Resolution	0.9mA	1.8mA
Accuracy	0.3% of FS	0.3% of FS
Resistance Mode		
Range 1, Resolution	1-99Ω, 1Ω	
Range 2, Resolution	100-1000Ω, 100Ω	
Range 3, Resolution	1000-5000Ω, 1000Ω	
Accuracy	5% of setpoint	
Analog Control		
Range	0 to 5V or 0 to 10V = FS	
Accuracy	0.3% of FS	
Bandwidth	8kHz @ -3dB	
DC Input Ratings	**375W**	**750W**
Voltage	500V	500V
Current	15A	30A
Power	375W	750W
Min Voltage, Full Load	3V	3V
Digital Amp Meter		
Range	0-15A	0-30A
Resolution	0.9mA	1.8mA
Accuracy	0.3% of FS	0.3% of FS

ReFlex Power™ System Controller

Ethernet Controller General Specifications	
Modules Controlled	Modules in RFP Mainframe(s)
Command Language	SCPI Standard 1997 command language via downloadable IVI Drivers
Control Interface	To host: Ethernet To Module: Proprietary high speed bus protocol
Front Panel Switch	Standby switch
Front Panel Connectors	Interface Connector: Subminiature D - Female LAN: Ruggedized RJ45
Input	Via RFP Chassis Hold-up time: 10ms
Physical	Size: 1 RFP slot, 1.4" (35.6mm) W x 6.75" (171.5mm) H x 15" (381 mm) D Weight: 2.4 lbs

The ReFlex Power™ (RFP™) System Controller (RFPC) provides a single command and status communication port for all power assets (power supplies and loads) within the RFP™ system. The RFP™ architecture is essentially a distributed processor system, and the role of the RFPC is command interpreter and redirector, plus manager of module status messages. The unique features of the RFP™ system of reconfigurablity and extensibility are made possible through the use of the latest in controls technology. An FPGAbased implementation uses VHDL, embedded processor cores for firmware based systems control, ARCnet™ inter-module communication and LAN system communications. The LAN network interface conforms to IEEE 802.3 standard. Network transmission rates up to 100 Mbps conforming to 10 BASE-T and 100 BASE-TX specifications are supported.

The RFP™ Controller (RFPC) module functions under remote control through a host controller. The RFPC module serves as a communications portal between the power supply modules and the remote host controller. All aspects of operation could be achieved through use of commands that comply with the requirements of the SCPI Standard 1999 command language. Additional discrete digital control signals are available for dedicated hardware interface. All connectors for control are accessible on the front panel.

ReFlex Power™ Mainframe

ReFlex Power™ is a high density, modular programmable power system providing DC, AC and electronic load assets all under control of a single controller. It provides a reconfigurable, flexible platform ideal for ATE and production test environments where RFP™ can provide programmable stimulus and bias power as well as programmable loads for the device(s) under test.

The EIA 4U high RFP™ mainframe can hold up to 12 single-slot modules or combinations of single, dual and triple slot wide modules to configure (or reconfigure) the system for the particular requirements at hand. The mainframe can support up to 6 kW of output power.

Up to 8 mainframes, potentially up to 95 modules, can be controlled via a single controller. The controller communicates to the individual modules via a high speed proprietary bus protocol, providing very high data rates and a high degree of deterministic control. The RFP™ controller communicates to the host controller via an Ethernet LAN connection designed to be compliant with the LAN Extension for Instrumentation (LXI™) standard, assuring interoperability and ease of integration.

RFP™ system modules can be combined via the controller, permitting the creation of "virtual assets" with the voltage/current combinations required for a particular test regime. Creating "virtual assets" reduces the "logistical tail" and total cost of ownership.

The mainframe provides internal power distribution, cabling, I/O and power connection and rack mounting for 12-asset slots. The mainframe also supplies the signal and control bus fabric supporting multi-module series/parallel operation, complex triggering, fault I/O and inter-mainframe control infrastructure.

RFP Key Features

- **Modular**
- **Control up to 95 assets**
- **Control multiple AC and DC power supplies and loads in one mainframe**
- **Create "virtual assets"**
- **Web browser control**
- **User configurable**
- **Highest Power Density**
- **Simple integration**
- **PFC**
- **Universal AC/DC input**
- **Up to 6kW in one mainframe**
- **1kW DC modules**
- **PFC ≥0.95**
- **Reduced space and logistics hassles**
  - **High power density**
  - **Handles DC and AC power and load modules**
  - **User configurable**
  - **Universal AC/DC input**
- **Ease of integration**
  - **Web browser control**
  - **Trigger bus**
  - **Configure modules to parallel or series operation "on the fly"**

Available power modules include

- **Single slot, 330 Watt programmable DC supplies**
  - **16V, 20.6A**
  - **65V, 5.1A**
- **Dual slot, 1kW programmable DC supplies**
  - **33V, 30A**
  - **450V, 2.3A**
- **Triple slot, 875 VA, single phase, programmable AC supply**
  - **Dual range: 280V(rms), 3.5A(rms) or 140V(rms), 7A(rms)**
- **Triple slot, 500V, programmable electronic DC loads**
  - **15A, 375 Watt**
  - **30A, 750 Watt**

Available from:

Measurably better value

Thurlby Thandar Instruments Ltd. Glebe Road, Huntingdon, Cambs. PE29 7DR U.K.
Tel: 01480 412451, Fax: 01480 450409**,** e-mail: e-mail: sales@tti.co.uk
Web: **www.tti.co.uk**

Product Specifications

Input	
Universal Input	AC 1 phase:115/120/200/208/230V ±10% AC 3 phase: 115/200 or 120/208V ±10% delta and wye AC 3 phase: 230/400V ±10% wye – neutral AC Voltage Range: 103.5V to 253V DC Voltage Range: 210V to 300V (314V for 2 sec.) Power Factor: ≥0.95
Frequency range	47Hz to 63Hz, DC
Input Connector	Amphenol, DL3102A24-10P or Phoneix style
Mating Connector	Amphenol, DL3106A24-10P

Common	
Module Interface Backplane	Slot Positions: 12 slots Multi-module control interface
Configuration Guidelines	Up to 8 Chassis may be interconnected. Paralleled AC, DC and Load modules must be in adjacent slots and be like modules. AC modules to be configured for multi-phase operation must be in adjacent slots.
Regulatory	Certified to UL 61010-1, CSA C22.2 No. 61010.1 and IEC/EN 61010-1. Compliance with EN61326 and FCC 21 CFR, Subpart J CE Mark is to EMC and LVD All specifications are subject to change

Environmental -Common	
Operating Temperature	-10° C to 50° C
Storage Temperature	-40° C to 70 °C
Operating Humidity Range	95%, non-condensating
Altitude	up to 2,000 M
Shock and vibration	Class 3 Mil-PRF-28800F

Physical	
Dimensions	EIA RS-310 rack mount : Wide 7" (177.8mm) (4U) : High 17"(432 mm) : Depth
Weight	11.4 lbs - Mainframe
Rack Mount	RETMA brackets
Cooling	Modules have integral fan cooling

Physical : Module Sizes	
Dimensions Single Slot	1.4" (35.6mm) W 6.75" (171.5mm) H 15" (381 mm) D
Dimensions Dual Slot	2.8" (71.1) W 6.75" (171.5mm) H 15" (381 mm) D
Dimensions Triple Slot	4.2" (106.7mm) W 6.75" (171.5mm) H 15" (381 mm) D