Using the Microsoft Windows (7, 8) operating system, the E-MAX DII DFR features complete Transient and Long-Term Phasor Data Recording, Analysis, and Transmission. E-MAX DII has a maximum capacity of 128 Analog and 256 Digital directly connected channels.

The networking capabilities of DII and the Windows (7, 8) operating system provide the power and capacity to monitor and collect data from other substation equipment. The TCP/IP addressing and data handling also allow pass-through of communications from a Master Station to other devices. The Director and DII system includes complete remote control of the Director, DII, and any connected E-MAX DFRs.
GENERAL DESCRIPTION

Using the Microsoft Windows (7®, 8®) operating system, Director features complete Transient and Long-Term Phasor Data Recording, Analysis, and Transmission. E-MAX Director has a maximum capacity of 128 Analog and 256 Digital directly connected channels.

The networking capabilities of Director combined with Windows (7®, 8®) provide the power and capacity to monitor and collect data from other substation equipment. The TCP/IP addressing and data handling also allow pass-through of communications from a Master Station to other devices. The Director system includes complete remote control of both the Director and any connected E-MAX DFRs.

INPUT CHARACTERISTICS

Analog Channel Capacity
- Director: 8 to 128 inputs
- Faxtrax DFR: 8 to 64 inputs

Analog Input Range
- Voltage Channels: 0 to 500 Vac rms
- Current Channels: 0 to 200 Amps

Analog Isolation
- 2500 Volts rms, Channel-to-channel and Channel-to-ground

Frequency Response
- Standard 12 or 16 bit Inputs
- DC to 1600 Hz standard (Other response ranges available)
- DC-coupled w/6th order anti-aliasing filter
- Sigma Delta
  - DC - 3000 Hz (Other Ranges Available)

Sampling Method
- Simultaneous Sample and Hold
- 16 or 12-bit A/D Converter Resolution

Sampling Rate
- Standard Base Sample Rate: 5760 samples/channel/second with 2880, 1440, 720 samples/channel/second software selectable
- 11520 & 23040 samples/channel/second available.

Digital Channel Capacity
- Director: 16 to 512 inputs

Input Configuration
- Normally Open or Normally Closed (Software Selectable)

Input Voltage
- 60-185 Vdc (standard). Other supply voltage ranges available

Isolation
- 2500 Volts rms, Channel-to-channel and Channel-to-ground

SENSORS

Software triggers (sensors) are standard for E-MAX Director DFRs. Each Director locally stores the trigger information. All trigger information is user-settable — locally or remotely.

Analog Sensors: Over-, Under- limit and rate software sensors on each channel
Symmetrical component, harmonic, frequency, swing and power sensors.
Operation Limiters Individual Channel: Software Settable up to 15 minutes per fault

Event Sensors: Trigger on ALARM (operate) and/or RTN (return-to-normal) for each channel.
**PROCESSING OF DATA**

Director continuously monitors all channels. If triggered, Director will record data to memory and process according to user settings. Director automatically identifies fault type, and calculates distance to fault. Director can print, display, fax, transmit and e-mail recorded and calculated data automatically or upon operator request. Director can convert record data to COMTRADE and PQDIF formats automatically or upon operator request.

**COMMUNICATIONS**

Director includes ethernet, and serial (RS-232 or RS-485) ports. Director can also be equipped with a high speed modem and 10/100 Base-FL fiber-optic ethernet ports.

Director can be controlled remotely using communication software from any PC connected to it by any of the above ports.

**DFR AND POWER QUALITY SENSORS**

**Single Phase - One Per Channel**

- Under Limit Sensors - rms setting \(10 - 100\) percent
  - with Hysteresis up to 5 %
  - Rate of Change up to 10 %
- Over Limit Sensors - rms setting \(95 - 300\)
  - with Hysteresis up to 5%
  - with Time Delay (selectable) 30 msecs
  - Rate of Change up to 50% per cycle
  - Frequency 56 - 64 Hz
  - Rate of Frequency Change (selectable) 0.5 - 4 Hz

**Single Or Three-phase Triggers**

- Power Scalable Number
  - Rate of Change of Power 10 - 50% /second
- Directional Power Relay Reverse Power Flow
- Reactive Power Scalable Number
- Apparent Power Scalable Number
- Phase Angle - Rate of Change settable -90 to +90 degrees/sec

**Three Phase Triggers**

- Positive Sequence 50 - 150%
- Negative Sequence 0 - 30%
- Zero Sequence 0 - 30 %

**Power Quality Triggers**

- Total Harmonic Distortion 5 - 50%
- Individual Harmonic 3 - 50%
- Voltage Sag / Surge 1 - 50 V/second
- Flicker 3 - 15 %

**Swing Triggers** specified by crest to valley percentage

- 5 - 30 % setting and time swing of 0.5 to 4 cycles /second

**Hardware Triggers**

- Frequency and Rate of Frequency 56 - 64 Hz
- Ground Detector \(R< 5 \) k
- Quad (Under/Over Limit Sensor) 10 - 100% or 100 - 300 %
### Analog Inputs:
- 8 to 128 inputs local

### Analog Input Range:
- Voltage: 0 to 500 Vac rms or Current: 0 to 200 Amp.
- Accuracy: 1 %, calibrated to .5%
- Analog Isolation: 2500 Volts rms

### Sampling Rate:
- Standard Base Sample Rate — 5760 samples/channel/second with 2880, 1440, 720 Hz, samples/channel/second software programmable.
- 11520 and 23040 samples/channel/second available.

### Digital/Event Inputs:
- 16 to 512 inputs local

#### 1. Input Configuration
- N.O. or N.C. (Software Selected)

#### 2. Input Voltage
- 125 Vdc Nominal standard —24, 48, 250 Vdc available

#### 3. Isolation
- 2500 VDC (To Ground) and between inputs

### Sensors:
- Auto-resetting standard

#### 1. Analog Sensors
- Over-, Under- limits and rate software sensors on each channels
- Symmetrical component, harmonic, frequency swing sensors

#### 2. Operation Limiters
- Individual Channel: Software Settable up to 15 minutes per fault

#### 3. Event Sensors
- Individual Programmable (N.O., N.C., Trigger on ALARM and/or RETURN)

#### 4. External Sensors
- Contact or voltage input

### Continuous Recording

### Long term Recording
- Phasor recording - simultaneous with Transient recording.
- Sample rate is software selectable: 1 sample/cycle, 1/2 sample/cycle, 1/4 sample/cycle, 1/8 sample/cycle
- Programmable Record Length
- 90 days maximum length
- Logs of signals, power, and frequency (optional)

### High Speed Fault Recording:
- Prefault Period: Up to 10 seconds. Default setting: 10 cycles.
- Postfault Period: Minimum Record Length can be set with System Parameter file (0.5 sec default).
- Maximum Postfault Time - Can be set for continuous data streaming to disk capacity. *(Longest Postfault captured to date: 31 minutes)*

### Record Storage:
- Nonvolatile data storage on local IDE drive. Optional solid state drive up to 140 Mb. Capacity determined by disk size and scan frequency.

### Resolution:
- 16 bit

### Power Supply:

### Controller:
- Atom N270 CPU. 2 Gb RAM standard
- 2 USB 2.0 Ports, 1 Parallel Port, PCI Hard Disk Controller.

### Graphic Output:
- Supports color inkjet, laser or dot matrix printers
- Graphics display on optional monitor.

### Data Storage:
- Minimum 160 Gb Hard Disk. Solid State Disk to 1 Gb(optional)

### Clock Options:
- GPS Timing - GPS Receiver or IRIG B Decoder Internal (1 kHz or TTL), External GPS Clock, or Internal GPS Clock Decoder
- Accuracy: Better than 20 µs.

### Communications Capability:
- Data/Fax Modem and Network cards available.
  1. To Master Stations
     - Auto-dial, auto transmission of data files.
     - Functions with multiple-Master system.
     - Complete Remote Control
  2. To Fax Machines
     - Up to 24 locations. (Up to 8 Fax numbers in each of three outputs.)
  3. LAN and WAN
     - Software supports communication via TCP/IP

### Software Supplied:
  1. Operating System
     - For Digital Transient Recorder, operating with setting, recording, communications and display capabilities.
     - Microsoft Windows (7", 8")
  2. Master Station & Recorder
     - 2000/XP/Vista compatible data display and analysis software.
     - Complete remote control, test and data retrieval, display and screen manipulation.
     - Remote setting of program and system parameters.
     - Full data analysis program at recorder and Master Station
  3. Communications
     - Remote Control Computing Program - Communication Software
     - Network control and data transmission (Ethernet)

### Environmental Characteristics:
- Operating Temperature: 0 To 60-Centigrade
- Storage: -20 to 65-Centigrade
- Relative Humidity: 0 to 95% R.H. non-condensing
- Surge Withstand Capability: ANSI C37.90.1 2002

### INTERNATIONAL STANDARDS COMPLIANCE

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