

IDM

Digital fault recorder



The world's #1 installed and most preferred fault recorder

- **Comprehensive.** Meets or exceeds all power monitoring requirements
- **Flexible.** Expandable architecture and adaptable acquisition for wide ranging customer needs
- **Updatable.** Cost effective, quick and easy upgrade for legacy versions to most up-to-date platform
- **Compatible.** Master station software works with all legacy devices

Product Summary

Description Digital fault recorder and dynamic monitoring system with multi functional capabilities all contained in one device.

Application Used primarily in power transmission and large distribution as digital fault recorder, disturbance system monitor, continuous fault recorder, synchrophasor measurement unit, impedance fault locator and power quality monitor



QUALITROL[®]
Defining Reliability

IDM Digital fault recorder

The world's #1 installed and most preferred fault recorder

- More IDM fault recorders are installed throughout the world than any other fault recorder
 - IDM is the most preferred fault recorder due to many factors:
 - System design
 - Meets long list of broad customer requirements
 - Flexibility in installation configurations
 - Backwards compatibility of master station software with legacy products
 - Ease of operation and service support
 - Reputation and historic experience as leader in the field of fault recording (since 1946)- overall value for the money
 - Systems installed and operational in every continent of the world
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Comprehensive. Meets or exceeds all power monitoring requirements

- One flexible, upgradeable device for multiple uses:
 - Digital fault recorder (DFR)
 - Dynamic system monitor (DSM)
 - Power quality monitor (PQ)
 - Phasor measurement unit (PMU)
 - Fault locator (impedance based) (FL)
 - Circuit breaker monitor (CBM)
 - Sequence of events type display (SOE)
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Flexible. Expandable architecture and adaptable acquisition for wide ranging customer needs

- Simultaneous data recording modes include:
 - Fault recording triggered function at sample rates of up to 6.4kHz (7.68kHz on 60Hz systems) for records in the region of 2 seconds
 - Transient slow scan (TSS) triggered at sample rates of 10/12Hz or 50/60Hz - with up to 30 minutes of data per record
 - Continuous recording or dynamic system monitoring mode the IDM continuously records data at 10/12Hz or 50/60Hz with up to 45 days of data
 - Advanced multi functional distributed data acquisition system, configurable to meet any system architecture requirements
 - Flexible network communications - fiber and twisted pair Ethernet (TCP/IP) and RS232 with conventional modems (PPP)
 - Fibre-optic ethernet cables allow devices to be connected up to 0.7m (1km) apart
 - Fully multi-tasking operating system to support multiple concurrent applications
 - Human Machine Interface (HMI) for in situ reporting in parallel to central master station reporting
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Updatable. Cost effective, quick and easy upgrade for legacy versions to most up to date platform

- An upgrade package for legacy Hathaway digital fault recorders is available to provide the most up to date functionality of the IDM digital fault recorder
- This upgrade involves changing a number of cards within the data acquisition unit
- The original signal conditioning and isolation electronics are retained
- Existing wiring is not disturbed which minimises cost and time of installation



- Upgrade kits are available for:
 - DFR 0, I, II and II(B)
 - IMS-8A
 - IMS-12
- Chassis replacement kits are available for:
 - IMS-8
 - DFR 1200

Compatible. Master station software works with all legacy devices

- Compatible with existing installed base of legacy Hathaway fault recorders (i.e., DFR and IMS ranges)
- Compatible with the QUALITROL breaker conditioning monitor (BCM) device
- Windows based master station software
- Full communications and remote device configuration
- Real time phasors
- Powerful analysis tools
- Manual or automatic polling of devices

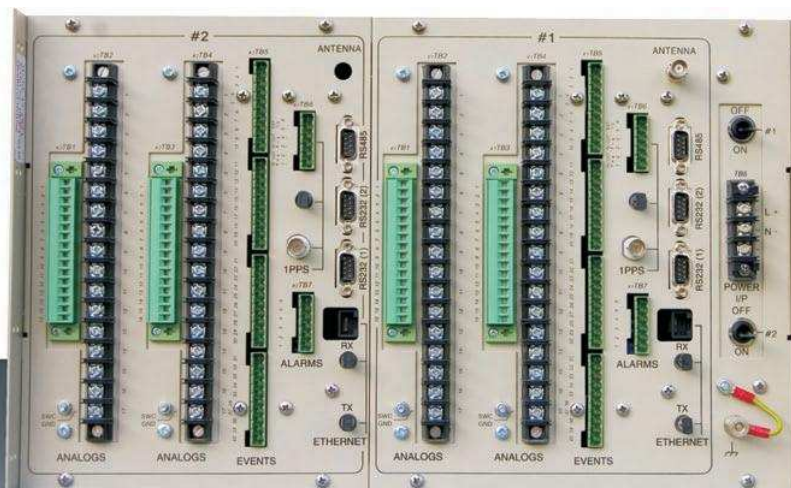
Local storage unit (LSU) for mass storage of data

- An industrial PC is used for storage of data from the IDM
- Local storage unit (LSU) specification - industrial PC, 80 Gbyte hard disk, Linux operating system, integral modem, Ethernet port
- One LSU can support up to 4 data acquisition units (DAUs)

Optimized monitoring and recording

- 16/32 bit micro-controller
- Acquisition sample rate up to 128 samples/cycle (6.4kHz @ 50Hz)
- 16-bit analog resolution
- 16Mb of memory
- 10Mbit/s ethernet network
- Integral DSP processor
- Surface mount technology throughout
- Internet communications

*IDM T5 DAU
32 analog channels
64 event channels*



IDM Digital fault recorder

IDM - technical overview

Introduction

- The IDM digital fault recorder is a distributed multi functional data acquisition system designed to address the data recording requirements of a modern distribution or transmission substation. When coupled with the master station software package, the IDM digital fault recorder provides a powerful platform for the acquisition, analysis and reporting of data from power system substations.

IDM multi functional platform

- An industry standard multitasking operating system provides added security, high reliability and facilitates the multi function nature of the device i.e., digital fault recording, dynamic monitoring, synchronized phasor measurement, power quality monitoring, event recording and impedance based fault location. Each of these functions operates completely independently of any other function without compromising individual performance.

IDM system installation

- Individual data acquisition units (DAUs) are networked on a twisted pair or fiber optic ethernet LAN using TCP/IP protocol for communications. Industrial PC based local storage units (LSU) can be added to the LAN to provide mass storage. Windows master stations can also be added to provide local analytical capabilities.
- Each IDM data acquisition unit is equipped with a powerful 16-bit processor, a DSP processor, a 16-bit A/D converter and 16Mb of memory. This provides sufficient processing power to carry out data acquisition on all analog inputs. The DAU computes watts, VArS, sequence components and phasor quantities for up to three lines in real time. Quantities are calculated on a cycle-by-cycle basis and values are time-tagged to a resolution of 1 μ s.
- IDM data acquisition units are available in three formats:
 - A 3U model with 10 analog channels and 16 or 32 events (IDM T1)
 - A 6U model with 16 analog channels and 32 events (IDM T3)
 - A 6U model with 32 analog channels and 64 events (IDM T5)

- All DAU signal conditioning is internal. Data acquisition units are designed to be installed in the relay panels associated with the circuits being monitored. The 3U DAU can be used to monitor up to two circuits if a common set of voltages is available. Each DAU can calculate the neutral current from the phase currents, eliminating the need to dedicate a channel to recording neutral current.
- An IDM digital fault recorder network can be connected directly to wide area networks or can be accessed directly using industry standard dial-up networking. The architecture of the IDM digital fault recorder and the use of TCP/IP in the communications software enables direct connection to the internet. DAUs can be synchronized to 1 μ s using an internal or external GPS clock. This provides synchronous sampling in all DAUs along with the ability to make system wide phasor measurements.
- The LSU, which uses the Linux multi tasking operating system, provides storage for all DFR, TSS and CSS records. It also provides the communications for the system; e.g. modem, local or wide area networking, local printing, etc.
- Up to 4 DAUs can be connected to an LSU within a sub system.

Fault and event recording

- The fault recording function records all primary analog quantities at sample rates of up to 6.4kHz (7.68kHz on 60Hz systems) and can be triggered at under and/or over level or at the rate of change of any primary or calculated quantity. Calculated quantities include negative and zero sequence voltages and currents, frequency, harmonics, watts and vars.
- The event recording function within the IDM captures and time-tags all changes of state on the event inputs. This data can be output to a local printer in a similar format and on to a conventional event recorder or transferred as a data file to the remote master station.

Dynamic system monitoring (DME / DSM)

- The IDM dynamic system monitor is equipped with two dynamic monitoring recording modes: triggered recording (TSS) and continuous recording (CSS). These modes operate at sample rates of 10/12Hz or 50/60Hz and can be used to meet all the recording requirements for model validation or incident analysis.



- The triggered recording mode can be used to capture data associated with power system incidents by triggering on excursions of frequency, voltage, current or power flow. A comprehensive range of user settable triggers are possible. Record length and pre-trigger time are fully user configurable and can last up to 30 minutes in duration.
- For continuous monitoring of power system quantities (or in the event that user triggers are not configured to capture a specific incident of interest), the continuous recording mode can be used (concurrently with the triggered recording mode) to capture the required data.
- When used in this mode, up to 45 days of power system quantities is available for user analysis and archiving (note, 30 days minimum).

SCADA I/O*

- The SCADA I/O function can be used to eliminate transducers and provide measurement information over a serial connection to an intelligent RTU using the modbus protocol.
- The internal DSP in the IDM can calculate RMS voltage, current and, single and three phase power (real and reactive).

- In addition, this SCADA port can be used to report the status of all event inputs to the RTU. This RTU port can also be used to control secure SBO (select before operate) relay outputs fitted in the distributed DAUs.

* The SCADA I/O feature will require detailed discussion with users to identify specific requirements.

Automated analysis of fault records

- Data from fault records has many applications. However, the extraction of data for applications such as equipment condition or power quality monitoring can be a time consuming task. The IDM digital fault recorder, with its modern master station software, can automate this task and present the resulting information in a usable format.
- As each record is retrieved by the master station it is automatically analyzed. The resulting summary parameters are stored in a database table. Analytical functions developed using high level queries are provided for a number of applications including protection performance, equipment condition monitoring and power quality. These functions automatically process the summary information, compare calculated quantities against user specified limits and generate reports summarizing the results. Alarm messages are used where immediate action is required in response to calculated results.
- Use of a Microsoft Access database provides open accessibility to summary parameters and analysis functions, enabling third party support and enhancement.

Portable IDM digital fault recorders

- The IDM is available in portable formats:
 - 10 analog and 16 digital channel portable high resolution digital fault recorder (IDM T4)
 - 16 analog and 32 digital channel portable high resolution digital fault recorder. (IDM T6)
- The T4 and T6 devices are designed to maximize the portability, being housed in a carrying case, yet make no compromise on the features.



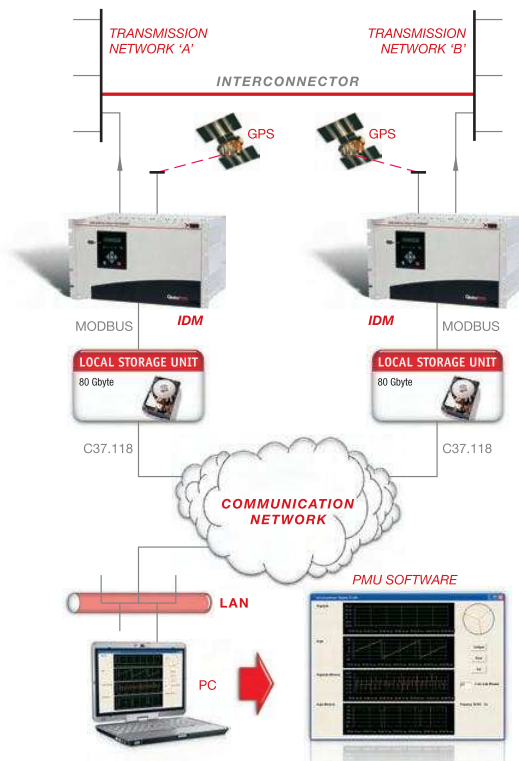
*IDM T6 portable
16 analog channels
32 event channels*

IDM Digital fault recorder

IDM - PMU and power quality functions

Synchronized phasor measurement

- Most transmission substations selected for synchrophasor data collection are already equipped with digital fault recorders. Utilizing the existing digital fault recorder offers several advantages to the utility:
 - Less expensive to upgrade the DFR than to purchase new PMU equipment.
 - Less expensive installation when existing field wiring and PT/CT circuits are used.
- The IDM records three phase voltages and currents from the substation PTs and CTs. The data acquisition front end is synchronized to a time reference signal - the one second pulse (1 PPS) from an internal GPS clock. From these direct inputs the IDM fault recorder calculates values for positive phase sequence magnitude and phase angle on a cycle-by-cycle basis. These values are streamed back to a central gathering point where the difference between a number of locations (nodes) on the transmission network can be monitored without any time skew among any channels on any of the acquisition systems. The IDM also provides precise system wide phase angle measurements to an accuracy of up to 0.1degrees.



- A local storage unit (LSU) can be used to concentrate the data streams from a number of IDM fault recorders at the same location and also perform the conversion of the calculated phase values into the C37.118 protocol. Utilities already using Hathaway DFR models 0, I, II and II(B) have a simple and cost effective path to upgrade these models to the IEEE C37.188 certified PMU - the IDM digital fault recorder.

Power quality

- The IDM provides a comprehensive range of power quality metrics for analysis and presentation. The power quality recording feature will in most cases eliminate the need for a separate substation power quality recording device. Since the input quantities required for fault recording are identical to those required for power quality recording, it is a natural evolution to provide these power quality measurements with a multi function fault recorder. Power quality measurements available include:
 - **Harmonics recording** - Compliant to IEC 61000-4-7, the harmonic recording is available on up to 2 three-phase groups of analog channels (ie. 2 groups of voltage or 1 group of voltage and 1 of current). Up to 40 user selectable harmonic quantities can be selected for each three-phase group to be recorded at intervals of 1 or 10 mins. Data can be stored for up to 365 days and can be retrieved for analysis by the master station software.
 - **Sags and Swells** - Compliant to IEC 61000-4-30 the power quality sensor can detect voltage sags (dips) and swells. The last 1000 incidents are retained in memory and can be retrieved for analysis.
 - **Flicker recording** - Compliant to IEC 61000-4-15 flicker is calculated on a group of three-phase voltage inputs. Data is stored in memory for up to 512 days and can be retrieved for analysis.
 - **Power quality data logging** - Provides the ability to record calculated quantities at sample intervals of 10sec or 10min as well as the maximum and minimum values over the sample interval. Data is stored in memory up to 60 days (at 10s sample rate) or 365 days (at 10min sample rate). All of these power quality functions are provided concurrently with the other IDM recording functions including fault recording, triggered slow scan recording and continuous slow scan recording. Any power quality incident can trigger a standard fault or transient record.



TECHNICAL SPECIFICATIONS

General	Overview	10, 16 or 32 analog, 16, 32 or 64 event acquisition unit. Relay outputs for alarms. Scan rates to 7.68kHz. Built in self-checking functions. Analog resolution 16-bits. 16Mb of DRAM.
Power supply	Supply voltage	80 - 300 VDC and 110 or 220 VAC. 24 and 48 VDC models available.
Inputs / outputs	Analog channels	The 10 channel DAU is equipped with 9 AC channels and 1 DC channel. The 16 channel DAU has 16 AC channels with optional DC response available on all channels. The 32 channel system DAU has 32 AC channels with optional DC response available on all channels. Current: 1A or 5A (nominal). Voltage: 80V or 150V. Accuracy: Better than 0.5%, CMRR >85db, phase angle error 0.5 degrees, frequency response 3db @3000Hz.
	Event channels	16, 32 or 64 event channels. Input rating: 24/48V, 125V or 250V. Event circuits isolated in groups of eight (dry or wet contacts). Bipolar common (i.e. common +ve or -ve). Relay outputs: two alarm outputs with Form C contacts for failure alarm and operate signal. Additional 8 alarm outputs (optional). SER output: data associated with changes in event inputs or operation of analog triggers is recorded and output locally or remotely in conventional SER format.
Fault recording	Record lengths	Pre-fault time: 50ms - 10s. Fault time: 100ms - 5s (controlled by op limiter). Post-fault time: 100ms - 30s.
	Sample rate	128 samples per cycle. 50 cycles: 6.4kHz. 60 cycles: 7.68kHz.
	Triggering	Level (over and/or under) and rate triggers on all analog channels. Settings from 5% to 95% of channel full scale. Each analog trigger has an individual operation limiter that can be set from 100ms to 5s. Analog triggering accuracy shall in all cases be better than 0.5% of channel full scale. Level triggers are equipped with hysteresis to prevent unwanted triggering. Event triggers on open, close, both or none. A user selectable event debounce (0 - 10ms) is provided. Negative sequence triggering, zero sequence triggering, frequency level and rate of change triggering are also provided. Frequency level triggering is under and over (i.e. Window). Settings in steps of 0.1Hz up to ± 2 Hz. Level triggers will also be provided on calculated quantities such as MW, Mvar, etc.
	Data analysis	Record summaries, including record priority information, are stored in a separate database so that they can be retained even if records are overwritten. This database has a capacity for up to 128 summaries.
	Comms / config.	Fully configurable using <i>Replay Plus</i> software.
Communication	Ethernet network	TCP/IP protocol. Integral twisted pair and fibre interfaces. RS232 / RS485 port for remote communications and RS232 port for local configuration.
	Memory	Up to 16Mb of DRAM.
	Printout	Local printout available using a serial printer on any serial port. (DAUs can be networked to one printer).
	Real time clock	Can be synchronized to 50/60Hz line voltage, internal or external 1pps or GPS clock. Free running accuracy of one second per day.
Compliance	Immunity	IEC 61000-4-4, 4-5, 4-6, 4-12 compliant.
Environmental		Operating temp: 5 to 55°C without disk; 5 to 45°C with disk; 5 to 40°C with battery option. Storage: -10 to 65°C. Humidity: 10 to 90% non-condensing. Vibration (IEC 68-2-6): 4.9m/s ² . Electrostatic discharge (IEC 61000-4-2): class 4. Radiated electromagnetic field (IEC 61000-4-3): class 3.
MMI	Front panel	2 row x 16 character LCD display. Ten status LEDs. Membrane keypad.
Mechanical	Dimensions	10 channel model: 19 inch x 3U x 11.3 inch (483 mm x 3U x 287 mm). 16 and 32 channel model: 19 inch x 6U x 11.3 inch (483 mm x 6U x 287 mm).



Top 5 features of the IDM

- 1. World's most popular fault recorder - market leader**
- 2. Full multi functional device - DFR, DME, FL, SOE, PMU, PQ**
- 3. Highly flexible system architecture - highly customizable**
- 4. Full upgrade path - unique, cost effective upgrade path for any legacy device**
- 5. Master station compatibility with all legacy devices**

**Comprehensive, flexible,
updatable and compatible.
More than just another
fault recorder!**



QUALITROL® Field Services

QUALITROL® provides on-site commissioning/start-up and comprehensive maintenance contracts to all customers worldwide. To further improve reliability, an extended warranty is available on selected products commissioned by QUALITROL®.

QUALITROL® Educational Services

QUALITROL® professional training (designed to achieve hands-on performance based objectives) prepares operations, maintenance, and engineering personnel to install, test, configure, operate and maintain QUALITROL® products.

QUALITROL® Accelerated Delivery

QUALITROL® provides accelerated delivery on many products and services including replacements, spare parts and repairs.

About QUALITROL®

QUALITROL® manufactures substation and transformer monitoring and protection devices used by electric utilities and manufacturing companies. It is the global leader in sales and installations of transformer asset protection equipment, fault recorders and fault locators. Established in 1945, QUALITROL® produces thousands of different types of products on demand, each customized to customers' unique requirements.

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