IDM

DATA ACQUISITION SYSTEM
The IDM – a compact and economical multifunction data acquisition system

**Unrivalled product profile**
- Advanced multifunctional distributed data acquisition system
- Fully multitasking operation system - VxWorks
- Supports multiple concurrent applications
- Flexible network communications - fibre and twisted pair Ethernet (TCP/IP) and RS232 with conventional modems (PPP)
- Replay Plus Master Station configuration and analysis software

**Rendering all other systems obsolete**

**State of the art technology**
- Powerful 16/32 bit micro-controller
- 16-bit analog resolution
- 16Mb of memory
- 10Mbit/s Ethernet network
- Integral DSP processor
- Surface mount technology throughout
- Internet communications

**High performance Replay Plus software**
- Full communications, configuration display and analysis
- Record viewer and printing
- Real time phasors
- Powerful analysis tools
- Interface to Microsoft Access database - user configurable record analysis
- Compatible with existing installed base of DFR IIs

**A true multifunction device**
- Fault location and fault recording
- Disturbance recording
- Transient and continuous slow scan
- Power quality recording
- Power system stability monitoring
- Sequence of events recording
- Quality of supply monitoring
- Measurement functions
- Circuit breaker monitoring

**Technical Overview**

**Introduction**
The IDM is a distributed multifunctional data acquisition system designed to address the data recording requirements of a modern distribution or transmission substation. The product, when coupled with Replay Plus, a Master Station software package, provides a powerful platform for the acquisition, analysis and reporting of data from power system substations. In addition to the fault and disturbance recording capabilities of the IDM, upgrades incorporate the following functions:
- Power system monitoring (triggered and continuous recording)
- Phasor measurement
- Event recording / power quality recording
- Equipment condition monitoring
- SCADA I/O

Each of these functions operates completely independently from any other function within the IDM and the use of an industry standard multitasking operating system provides added security. Individual Data Acquisition Units (DAUs) are networked on a twisted pair or fibre optic Ethernet LAN using TCP/IP protocol for communications. PC based local Storage Units can be added to the LAN to provide mass storage and Windows Master Stations can also be added to provide local analysis capabilities. This IDM 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 and the use of TCP/IP in the communications software allows direct connection to the Internet. The DAUs can be synchronised to 1µs using an internal or external GPS clock and this provides synchronous sampling in all DAUs with the ability to make system wide phasor measurements.

**DAU Installation**
Each IDM DAU is equipped with a powerful 16-bit processor, DSP processor, 16-bit A/D converter and 16Mb of memory. This provides sufficient processing power to carry out data acquisition on all analog inputs and to compute in real time watts, vars, sequence components and phasor quantities for up to three lines. These quantities are calculated on a cycle by cycle basis and the values are time-tagged to a resolution of 1µs.

DAUs are available in two formats:
- A 3U model with 10 analog channels and 16 or 32 events
- A 6U model with 16 analog channels and 32 events

All DAU signal conditioning is internal and the DAUs 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.
Fault and Disturbance 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 on under and/or over level, or rate of change of any primary or calculated quantity. Calculated quantities include negative and zero sequence voltages and currents, frequency, harmonics, watts and vars. In addition to the conventional fault record, which is typically one or two seconds long, each IDM DAU can simultaneously record up to eight channels of transient slow scan data around the time of the fault recorder trigger. This data can be sampled at 10/12Hz or 50/60Hz and up to thirty minutes of data can be recorded. This information can be used to analyze the response of the power system before, during and after real system faults.

Event Recording
The event recording function within the IDM will capture and time-tag all changes of state on the event inputs. This data can then be output to a local printer in a similar format to a conventional event recorder or transferred as a data file to a remote Master Station.

Power System Monitoring
More sophisticated triggering and longer duration recording of power system disturbances is provided by the power system monitoring function. For this application a Local Storage Unit or PC is attached to the IDM LAN to provide the mass storage required for storing the volume of data generated by this type of recording. Each IDM can calculate a number of power system quantities for each of the lines being monitored on a cycle by cycle basis.

Real Time Phasors
In addition to recording power system quantities, the IDM has the capability to provide real time phasor information to remote locations. The ability to transfer real time phasor information from a number of locations on a power network to a central point provides a source of data for developing an application to provide real time power system stability information.

Power Quality Recording
The IDM can be programmed to take measurements of the supply voltage at regular intervals. The quantities calculated and recorded include RMS voltage, harmonic content, frequency, sequence components, etc. The power quality function will also capture and record the magnitude and duration of voltage dips caused by faults and other system incidents. This data is stored in a database in the recorder and can be transferred automatically to a remote Master Station for subsequent analysis.

SCADA I/O
The SCADA I/O function can be used to eliminate the transducers and provide measurement information over a serial connection to an intelligent RTU using the Modbus protocol.

DRF Upgrades
An upgrade package for existing Hathaway DFR IIs, based on the IDM hardware, is available to provide the extra functionality of the IDM. This upgrade involves changing a number of boards, signal conditioning and isolation electronics, transforming it into a new fully integrated power system monitoring device.

Automated Analysis of Fault Records
It has long been appreciated that data from fault records has many applications in addition to the analysis of the performance of power system protection. However the extraction of data for applications such as equipment condition and power quality monitoring can be a time consuming task. Using the IDM with the Replay™ software automates this task and presents the resulting information in a usable format.

As each record is retrieved by the Replay™ software it is automatically analysed and the resulting summary parameters are stored in a database table. Analyses functions developed using Microsoft Access 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. The use of an Access database provides open access to the summary parameters and the analysis functions allowing third party support and enhancement.

Unequalled price and performance ... the future of data acquisition today
Unrivalled specification with Replay™ Plus... the Leading 32-bit Master Station

Technical Specification

Overview
- 10 or 16 analog, 16 or 32 event acquisition unit
- Relay outputs for alarms
- Scan rates at 7.68kHz
- Built-in self-checking functions
- Analog resolution: 16-bits
- 16Mb of DRAM

Enclosure
- 19” x 1U x 287mm - 10 channel model.
- 19” x 6U x 287mm - 16 channel model.
- 19” x 3U x 287mm - 10 channel model.

Front Panel
- 2 row x 16 character LCD display. Ten status LEDs.
- Membrane keypad.

Supply Voltage
- 80 - 300Vdc and 110V or 220Vac.
- 24Vdc and 48Vdc models available.

Relay Outputs
- Two alarm outputs with Form C contacts for failure alarm and operate signal.
- Additional 8 alarm outputs (optional).

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.

- Currents: 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 or 32 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).

Communications
- Ethernet network. TCP/IP protocol. Integral twisted pair and fibre interfaces.
- RS232 / RS485 port for relay communications and RS232 port for local configuration.

Memory
- Up to 16Mb of DRAM.

Real Time Clock
- Can be synchronised to 50/60Hz line voltage, internal or external 1ppm or GPS clock. Free running accuracy of one second per day.

Printout
- Local printout available using a serial printer on any serial port. (DAUs can be networked to one printer).

Fault Recording
- Record lengths:
  - Pre-fault time: 50ms - 5s.
  - Fault time: 100ms - 5s (controlled by op limiter).
  - Post-fault time: 100ms - 1s.
- Sample rate: 32, 64 or 128 cycles per cycle.
- 50 cycles: 1.6kHz, 3.2kHz or 6.4kHz.
- 60 cycles: 1.92kHz, 3.84kHz or 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.

Communications and configuration:
- Fully configurable using Replay™ Plus software.

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.

Profiles and Data Retrieval
- Retrieval of data is controlled by the Master Station and can be carried out manually or automatically by polling. Data can also be retrieved using one of a number of user defined templates or Profiles. These can be used to retrieve data around a specified time (e.g. a trigger time) with the data received coming from user selected channels on one or more IDMs. As a result of a trigger detected by one IDM, data can be automatically retrieved from both ends of a number of transmission lines and stored in one or more record files.

In this way, data from various parts of the power system can be automatically retrieved and made available for immediate display and analysis in a convenient manner.

Profiles can also be used to retrieve power system monitoring data from multiple sites creating a single record containing system wide information, including phasors.

Replay™ Plus is fully compatible with existing installed Hathaway DFRs (i.e. DFR 1200s and DFR 130s).

A demonstration copy of Replay™ Plus is available on 3.5” diskettes or on a CD-ROM. Contact Hathaway for details.

[Tightly integrated, powerful 32-bit Windows 95/98/NT application]
-Supports DFR, SER and slow scan functions
-Graphical manipulation of full record data
-Time and magnitude zoom
-Overlay multiple records
-Controlled editing, transmitting and archiving of configurable parameters
-Sequence components analysis
-Harmonic analysis
-Calculation of watts, vars, frequency, etc

Advanced Record Display, Analysis and Manipulation

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