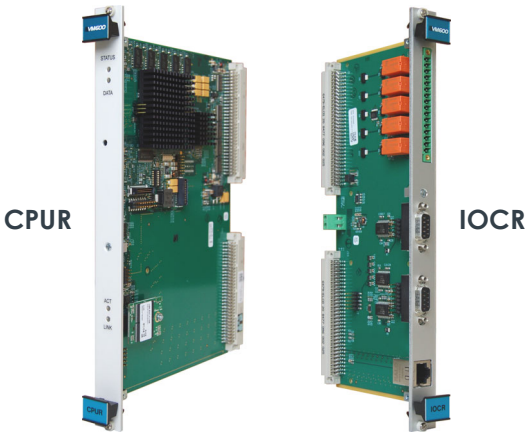
MEGGITT

DATA SHEET

Vibro-Meter®

VM600 CPUR and IOCR rack controller and communications interface card pair



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KEY FEATURES AND BENEFITS

- VibroSight® compatible hardware from the Vibro-Meter® product line
- VM600 CPUR/IOCR rack controller and communications interface card pair with support for Modbus RTU/TCP and card pair redundancy
- "One-Shot" configuration management of protection cards (MPC4 and AMC8) in a VM600 rack using an Ethernet connection to a computer running the VM600 MPSx and VibroSight® software
- Rack controller and communications redundancy with two CPUR/IOCR card pairs: Master (active) and Inactive (redundant)
- Industry standard fieldbus communications interfaces: Modbus RTU and Modbus TCP
- One Ethernet connection and one serial connection (RS-485, RS-422 or RS-232) can run simultaneously
- Communications redundancy with two fieldbuses: Ethernet and serial or serial and serial
- Five output relays to signal system statuses and alarms

KEY BENEFITS AND FEATURES *(continued)*

- VM600 system event and measurement event logs available via VibroSight® software
- Supports live insertion and removal of protection cards ("hot-swapping") with automatic configuration
- CPUR and IOCR are hot-swappable
- Gigabit (1 Gbps) Ethernet communication
- Front-panel status indicators (LEDs)
- Compatible with later VM600 (ABE04x) system racks with I^2C interface (VME utility bus)

APPLICATIONS

- Rack controller for a VM600 system
- Redundant rack controller for VM600 systems where the cost of failure is high
- Communications gateway between VM600 and third-party systems, such as a DCS or PLC
- Enables sharing of measurement data from VM600 monitoring cards in machinery protection, condition monitoring and/or combustion monitoring applications

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DESCRIPTION

Introduction

The VM600 CPUR and IOCR rack controller and communications interface card pair is a central processing unit (CPU) card pair that acts as a system controller and data communications gateway for a VM600 rack-based machinery protection system (MPS) and/or condition monitoring system (CMS) from Meggitt's Vibro-Meter® product line.

In critical applications where the cost of failure is high, two CPUR/IOCR card pairs can be installed in a VM600 rack in order to obtain true rack controller and communications redundancy. This is a cost-effective solution where increased system reliability and availability are required.

Different versions of CPUx/IOCx card pair

Different versions of CPUx/IOCx rack controller and communications interface card pair are available, as follows:

- The CPUM/IOCN is the original version with a front-panel display and support for Modbus RTU/TCP or PROFINET (PNR 200-595-VVV-VVV).
- The CPUR/IOCR is a version with rack controller redundancy and support for Modbus RTU/TCP (PNR 600-007-VVV-VVV).
- The CPUR2/IOCR2 is a version with mathematical processing of fieldbus data and support for Modbus TCP and PROFIBUS DP (PNR 600-026-000-VVV).

VM600 rack-based monitoring systems

The Vibro-Meter® VM600 rack-based monitoring system is part of Meggitt's solution for the protection and monitoring of rotating machinery used in the power generation and oil & gas industries. The VM600 is recommended when a centralised monitoring system with a medium to large number of measurement points (channels) is required. It is typically used for the monitoring and/or protection of larger machinery such as gas, steam and hydro turbines, and generators, smaller machines such as compressors, fans, motors, pumps and propellers, as well as balance-of-plant (BOP) equipment.

A VM600 system consists of a 19" rack, a rack power supply and one or more monitoring card pairs. Optionally, relay cards and rack controller and communications interface cards can also be included.

Two types of VM600 rack are available: a VM600 system rack (ABE04x, 6U) that can house up to 12 monitoring card pairs, and a VM600 slimline rack (ABE056, 1U) that can house 1 monitoring card pair. VM600 racks are typically mounted in standard 19" rack cabinets or enclosures installed in an equipment room.

Different VM600 monitoring cards are available for machinery protection, condition monitoring and/or combustion monitoring applications. For example, machinery protection cards such as the MPC4/IOC4T machinery protection card pair and AMC8/IOC8T analogue monitoring card pair, and condition monitoring cards such as the XMV16/XIO16T monitoring card pair for vibration and XMC16/XIO16T monitoring card pair for combustion.

The RLC16 relay card is an optional card used to provide additional relays when the four relays per MPC4/IOC4T or AMC8/IOC8T card pair are not enough.

The CPUx/IOCx rack controller and communications interface card pairs (CPUM/IOCN, CPUR/IOCR or CPUR2/IOCR2) are optional cards used to provide additional VM600 system functionality such as configuration management, "hot-swapping" with automatic reconfiguration, front-panel display, CPUx/IOCx card pair redundancy, fieldbus data processing, front-panel alarm reset (AR) button, MPS rack (CPUx) security, system event and measurement event logging, fieldbus communications (Modbus, PROFIBUS and/or PROFINET) and/or communications redundancy.

Note: Different versions of CPUx/IOCx rack controller and communications interface card pair support different combinations of VM600 system functionality.

VM600 rack-based monitoring systems complement the VibroSmart® module-based distributed monitoring systems that are also available from Meggitt's Vibro-Meter® product line.

DESCRIPTION *(continued)*

CPUR/IOCR card pair and VM600 racks

The CPUR/IOCR card pair is used with a VM600 system rack (ABE04x) and a CPUR card is always used with an associated IOCR card as a card pair.

Both the CPUR and the IOCR are single-width cards that occupy a single VM600 rack slot (card position). The CPUR is installed in the front of the rack and the associated IOCR is installed in the rear of the rack in the slot directly behind the CPUR. Each card connects directly to the rack's backplane using two connectors.

When one CPUR/IOCR card pair is installed in a VM600 rack as a standard (non-redundant) rack controller and communications interface, the CPUR/IOCR are typically installed in slots 0.

When two CPUR/IOCR card pairs are installed in a VM600 rack as a redundant rack controller and communications interface, the Master CPUR/IOCR is typically installed in slots 0 and the Inactive CPUR/IOCR is typically installed in slots 1.

Note: The CPUR/IOCR card pair is compatible with later VM600 (ABE04x) system racks with I2C interface (VME utility bus).

CPUR rack controller and communications interface functionality

The CPUR card contains a PowerPC® based processor and an FPGA that work together to act as a system controller for a VM600 series rack. It runs the software for configuring, controlling, monitoring and diagnosing all of the processing cards in the rack.

As a fieldbus communications interface for a VM600 monitoring system, the CPUR communicates with MPC4 and AMC8 cards via the VME bus in order to obtain measurement data and then share this information with third-party systems such as a DCS or PLC.

Redundant operation is obtained by using two functionally equivalent CPURs in the same VM600 rack. During normal operation, the left-most CPUR in the rack is considered the Master CPUR (active) and the other is the Inactive CPUR (redundant) card.

The functions implemented to support redundant behaviour consist of:

- Data mirroring – external communication links carry the same content.
- Dedicated supervision bus – the Master CPUR and the Inactive CPUR constantly monitor each other's status.
- Mutual detection mechanism – the Inactive CPUR automatically takes control if the Master CPUR fails.
- Status communication – the status of every card in the rack is available externally.

During normal operation, the Master CPUR is the active card. It acts as the system controller and processes all external communications and ensures that the Inactive CPUR remains synchronised with it, in case of a failure.

At the same time, the Inactive CPUR (redundant card) constantly monitors the status of the Master CPUR. If the Master CPUR fails, the Inactive CPUR will detect this and automatically take control of the system, becoming the system controller (Master CPUR). In this way, there is minimal impact on the system functionality and the availability of the entire system is increased.

Third party devices, such as a distributed control system (DCS) can question either CPUR, at any time, to check the status of the cards.

IOCR card

The IOCR card acts as a signal and communications interface for the CPUR card. It also protects all inputs against electromagnetic interference (EMI) and signal surges to meet electromagnetic compatibility (EMC) standards.

To signal system status and alarms, the IOCR card's relay (J1) connector provides access to the output relay connections.

For communications, the IOCR includes a pair of 9-pin D-sub connectors (J2 and J3) for configuring multi-drop RS-485 networks of VM600 racks. It also includes an 8P8C (RJ45) connector (J4) for the Ethernet connection.

Act(ivity) and Link LEDs on the front panel of the CPUR indicate the communication status of the Ethernet port on the IOCR card.

DESCRIPTION *(continued)*

VM600 event logging

The CPUR card automatically logs VM600 system events and measurement events to non-volatile memory in order to provide valuable information on the operating history of a system. Up to 1000 of the most recent events are stored on the card for download as user-readable event log files using the VibroSight® software.

Relays

The CPUR/IOCR card pair includes five output relays to remotely indicate system status and alarm information. Each of the relays can be mapped to any Modbus bit variable. In a typical application, they are used to signal a fault or a problem detected by a common alarm, such as communication status or rack status.

Software

The CPUR/IOCR is software configurable using the VibroSight® software. However, jumpers are required to configure the default signal levels on the RS-485 serial communications bus.

The VM600 MPSx software supports the configuration and operation of MPC4/IOC4T and AMC8/IOC8T card pairs for machinery protection applications, including the processing and presentation of measurement data for analysis.

The VibroSight® software supports the configuration and management of CPUR/IOCR card pairs.

Note: The VM600 MPSx software and VibroSight® software are from the Vibro-Meter® product line.

Applications information

The VM600 CPUR/IOCR rack controller and communications interface card pair is recommended for applications using multiple monitoring cards in a VM600 rack.

The rack controller functionality makes it easier to work with a VM600 machinery monitoring system – for installation, configuration, management and general operation. The CPUR/IOCR can manage the configuration of MPC4/IOC4T and AMC8/IOC8T card pairs, including hot-swapping.

The communications interface functionality makes it easy to further process and share data from the monitoring cards (MPC4 and AMC8) in a VM600 machinery protection, condition monitoring and/or combustion monitoring system with third-party systems such as a DCS or PLC using industry standard fieldbuses.

A single CPUR/IOCR card pair can be used to replace a CPUM/IOCN card pair in standard applications. Two CPUR/IOCR card pairs are recommended for rack controller redundancy in applications where the cost of failure is high and increased system reliability and availability are required.

The CPUR/IOCR card pair is described in more detail in the *VM600 CPUR and IOCR rack controller and communications interface card pair manual*.

For further information, contact your local Meggitt representative.

SPECIFICATIONS

Processing functions

Rack controller

- *VM600 monitoring card configuration management* : Acts as a rack controller that manages the configuration of MPC4/IOC4T and AMC8/IOC8T card pairs, including support for "hot-swapping" with automatic configuration.
- *VM600 rack controller and communications interface card pair redundancy* : Implements true rack controller and communications redundancy using two functionally equivalent CPUR/IOCR card pairs in the same VM600 rack.
  The Master CPUR (active) and the Inactive CPUR (redundant) mirror and supervise one another so that should the Master CPUR fail, the Inactive CPUR will detect this and automatically take control of the system.
- *Fieldbus data processing (mathematical processing)* : Further processing of system data (measurement data and status information) before being shared by fieldbus.
  The further processing supported includes basic mathematical functions such as arithmetic and logical operations, data selection, comparison, min/max and scaling functions, bit manipulation and packing/unpacking functions, and many supporting functions.
  There is also a data freeze detection function that can be used to help detect if a data value has stopped being updated.
- *Event logging* : VM600 system event and measurement event logging with up to 1000 of the most recent events stored on the CPUR (in non-volatile memory).
  Note: System event logs and measurement event logs are downloaded from a CPUR using the VibroSight® software (VibroSight System Manager).
- *Status indication* : CPUR front-panel LEDs (front of VM600 rack) indicate the mode of operation and status of the CPUR card, and the status of the Ethernet communications
- *Status monitoring* : Diagnostic log files record status (health) information for a CPUR/IOCR card pair.
  Note: Diagnostic logs are downloaded from a CPUR using VibroSight System Manager.
- *Relays* : Five user-configurable relays for the remote indication of system statuses and alarms.
  Note: Relays can be mapped to any Modbus bit variable.

Communications interface

- *VM600 rack (system) communications* : Uses a VME communications link for communications with MPC4/IOC4T and AMC8/IOC8T card pairs (via the VME bus on the VM600 rack's backplane).
  Uses a system Ethernet connection for communications with a computer running software such as VM600 MPSx and VibroSight®.
- *Fieldbus communications (data gateway)* : Acts as a fieldbus server (slave) device that obtains data from the cards in the VM600 rack (that is, from MPC4/IOC4T and AMC8/IOC8T card pairs, and XMx16/XIO16T card pairs) to share with fieldbus client (master) devices such as a DCS or PLC:
  • The CPUR can act as a Modbus server and use the Ethernet interface to share data via Modbus RTU and/or Modbus TCP.
  Note: The configuration of the fieldbus interfaces and the definition of the data to be shared via fieldbus is defined by a CPUR card fieldbus configuration file that is uploaded to the CPUR card using the VibroSight® software (VibroSight Configurator).

SPECIFICATIONS *(continued)*

Fieldbus interfaces

Number of channels	: Up to 2 fieldbus interfaces (ports). Ethernet and serial or serial and serial: Modbus TCP and/or Modbus RTU.
Data transfer	
• *Modbus*	: Up to 131072 registers/words and 131072 coils/bits total. That is, up to 2 × 65536 registers/words and 2 × 65536 coils/bits (holding and discrete).

Communication interfaces

Communication interfaces – Ethernet

Number	: 1
Network interface	: 10/100/1000BASE-T(X) – Ethernet / Fast Ethernet / Gigabit Ethernet
Data transfer rate	: Up to 1000 Mbps (1 Gbps)
Distance between devices	: Up to 60 m at 1000 Mbps. For distances greater than the specified maximum (60 m), the interface will operate at reduced data transfer rates.
Protocols	: Meggitt TCP/IP proprietary protocol for communication with the VM600 MPSx software, VibroSight® software and Modbus TCP
Function	: VM600 rack configuration and communications using the VM600 MPSx software, CPUR card configuration using the VibroSight®software and/or fieldbus Modbus TCP communications
Connector	: J4 on IOCR card (see **Connectors on page 9**)
• *VM600 MPSx software*	: Used for the configuration and operation of MPC4 cards (using the CPUR as a communications gateway)
• *VibroSight® software*	: Used for the configuration of CPUR cards. Used for the configuration of XMx16 cards (using the CPUR as a communications gateway).

Communication interfaces – serial

Number	: 2
Network interface	: RS-232 or RS-422 or RS-485 (half-duplex (2-wire) or full-duplex (4-wire))
Data transfer rate	: Up to 115.2 kBaud
Distance between devices	: According to the relevant standard
Network topologies	: Point-to-point for RS-232 links. Point-to-point or linear (daisy-chained) for RS-422/ RS-485 networks.
Protocols	: Meggitt TCP/IP proprietary protocol for communication with the VM600 MPSx software and Modbus RTU
Function	: VM600 rack configuration and communications using the VM600 MPSx software and/or fieldbus Modbus RTU communications
Connectors	: J2 and J3 on IOCR card (see **Connectors on page 9**)
RS-485 (fieldbus) isolation	: 500 V_{DC}

Notes
Jumpers on the IOCR card are used to configure the required operation of serial interfaces and connectors. Refer to the *VM600 CPUR and IOCR rack controller and communications interface card pair manual* for further information.

SPECIFICATIONS *(continued)*

System communications

Internal : VME bus interface (A24 / D16 master mode) for communication with protection cards (MPC4 and AMC8) via VM600 rack backplane

External : System communication interfaces (Ethernet and serial) for communication with VM600 MPSx software and VibroSight® software running on an external computer(s).
See **Communication interfaces – Ethernet on page 6** and **Communication interfaces – serial on page 6**.

External communication links/connections

- *Connection to a computer/network* : An Ethernet communication interface (J4 on IOCR card) can be used for connections/communications between a CPUR/IOCR card pair and a computer/network, using standard Ethernet cabling.
See **Communication interfaces – Ethernet on page 6** and **Connectors on page 9**.

  A serial communication interface (J2 on IOCR card) can be used for connections/communications between a CPUR/IOCR card pair and a computer/network, using a standard serial cable.
See **Communication interfaces – serial on page 6** and **Connectors on page 9**.

- *Connection to a fieldbus (third-party system)* : An Ethernet fieldbus communication interface (J4 on IOCR card) can be used for connections/communications between a CPUR/IOCR card pair and Ethernet-based fieldbuses (Modbus TCP).
See **Communication interfaces – Ethernet on page 6** and **Connectors on page 9**.

  A serial fieldbus communication interface (J2 or J3 on IOCR card) can be used for connections/communications between a CPUR/IOCR card pair and serial-based fieldbuses (Modbus RTU).
See **Communication interfaces – serial on page 6** and **Connectors on page 9**.

- *VM600 MPSx software* : Used for the configuration and operation of MPC4/IOC4T and AMC8/IOC8T card pairs (using the CPUR/IOCR card pair as a communications gateway)
- *VibroSight® software* : Used for the configuration of CPUR/IOCR card pairs.
  Used for the configuration of XMx16 cards (using the CPUR/IOCR card pair as a communications gateway).

Configuration

CPUR/IOCR card pair : Software configurable via Ethernet, using a computer running the VibroSight® software.
Note: Serial (RS-485) line configuration is determined by jumpers on the IOCR card.

SPECIFICATIONS *(continued)*

Time synchronisation

Time reference for CPUR	: Network time protocol (NTP) server or local clock on computer running the VibroSight® software or CPUR's internal real-time clock (RTC) with battery backup
Protocol used between VM600 cards and host computer	: Network time protocol (NTP)

Note: When VM600 system event and/or measurement event logging is used, the time and date must be configured for the CPUR in order for the timestamps in the event log files to be correct.

Environmental

Operating	
• *Temperature*	: 0 to 65°C (32 to 149°F)
• *Humidity*	: 0 to 90%, non-condensing
Storage	
• *Temperature*	: −40 to 85°C (−40 to 185°F)
• *Humidity*	: 0 to 95%, non-condensing

Approvals

Conformity	: CE marking, European Union (EU) declaration of conformity
Environmental management	: RoHS compliant

Power supply (to CPUR/IOCR)

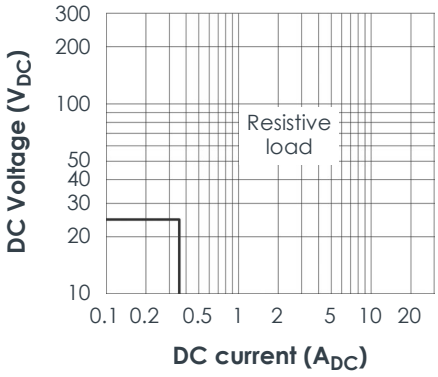
Source	: VM600 rack power supply
Voltage	: 5 V_{DC}
Total power consumption (CPUR/IOCR card pair)	: ≤19 W

Relay characteristics

Number	: 5 (RL1 to RL5)
Type	: PE014005 or equivalent
Contact arrangement	: 1× COM, 1× NC and 1× NO contact per relay (see **Connectors on page 9**)
Nominal voltage	: 24 V_{AC} / 24 V_{DC}
Nominal current	: 5 A_{AC} / 0.35 A_{DC}
Maximum breaking capacity (without contact protection)	: 120 VA

SPECIFICATIONS *(continued)*

Maximum DC load breaking capacity curve:



Operate / release / bounce time	: 8 / 8 / 6 ms typical
Dielectric strength test voltages	
• *Between open contacts*	: 1000 V_{AC}
• *Between contact and coil*	: 4000 V_{AC}
Mechanical life	: 15 x 10^6 operations
Electrical life	: >10^5 operations
Connector	: J1 on IOCR card (see **Connectors on page 9**).

Status indicators (LEDs)

CPUR

• *STATUS and LED*	: Indicate the status and mode of operation of the CPUR card
• *ACT and LINK*	: Indicate the status of the Ethernet port (see **Communication interfaces – Ethernet on page 6**)

Connectors

IOCR

• *J1*	: 16-contact screw-terminal strip connector. J1 is used for relay outputs.
• *J2*	: 9-pin D-sub connector (DCE), female, RS-485 (full duplex), RS-422 and RS-232. J2 is the main serial communications interface, which is used for all serial communications links, notably Modbus RTU.
• *J3*	: 9-pin D-sub connector (DCE), female, RS-485 (half duplex). J3 is a secondary serial communications interface, which is used for multidrop (daisy-chained) serial communication networks of CPUR/IOCR card pairs.
• *J4*	: 8P8C (RJ45) modular jack, female, Ethernet. J4 is the network communications interface, which is used for all Ethernet communications links, such as with computers running software such as VibroSight® and VM600 MPSx, and Modbus TCP.

SPECIFICATIONS *(continued)*

Physical

CPUR

- *Height* : 6U (262 mm, 10.3 in)
- *Width* : 40 mm (1.6 in)
- *Depth* : 187 mm (7.4 in)
- *Weight* : 0.40 kg (0.88 lb) approx.

IOCR

- *Height* : 6U (262 mm, 10.3 in)
- *Width* : 20 mm (0.8 in)
- *Depth* : 125 mm (4.9 in)
- *Weight* : 0.25 kg (0.55lb) approx.

ORDERING INFORMATION

To order please specify

Type	Designation	Ordering number (PNR)
CPUR	VM600 rack controller and communications interface card	600-007-VVV-VVV
IOCR	Input/output card for the CPUR	601-002-000-VVV

Note: "VVV" represents the different firmware (embedded software) versions and hardware versions that can be used by a finished product.

RELATED PRODUCTS

ABE040 and ABE042	VM600 system racks	: Refer to corresponding data sheet
CPUM and IOCN	VM600 modular CPU card and input/output card Note: With a front-panel display and support for Modbus RTU/TCP or PROFINET	: Refer to corresponding data sheet
CPUR2 and IOCR2	VM600 rack controller and communications interface card pair Note: With mathematical processing of fieldbus data and support for Modbus TCP and PROFIBUS	: Refer to corresponding data sheet
AMC8 and IOC8T	VM600 analog monitoring card pair	: Refer to corresponding data sheet
MPC4 and IOC4T	VM600 machinery protection card pair	: Refer to corresponding data sheets
RLC16	VM600 relay card	: Refer to corresponding data sheet

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The Energy & Equipment division includes the Energy Sensing and Controls product group that specialises in sensing and monitoring solutions for a broad range of energy infrastructure, and control valves for industrial gas turbines, primarily for the Power Generation, Oil & Gas and Services markets. Energy & Equipment is headquartered in Switzerland (Meggitt SA) and incorporates the Vibro-Meter® product line, which has over 65 years of sensor and systems expertise and is trusted by original equipment manufacturers (OEMs) globally.

In this publication, a dot (.) is used as the decimal separator and thousands are separated by thin spaces. Example: 12345.67890.

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