



Brüel & Kjær Vibro

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Product specifications and ordering information

VC-8000

System Access Module - SAM

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Product specifications and ordering information **VC-8000 System Access Module**,
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Overview

The System Access Module (SAM) provides robust, comprehensive communications capabilities between the SETPOINT® rack and connected systems/devices such as plant and machinery control systems, configuration software, condition monitoring software, and an optional touchscreen display. It also features on-board data storage capabilities, allowing an embedded solid-state hard drive and/or removable SD card to store the same data that in the past would require an external condition monitoring server. The on-board storage thus eliminates the need for an external network/software/server infrastructure as a data repository. However, it can also be used concurrently with an external condition monitoring server. In this mode, it ensures data is not lost if network or server interruptions occur. Embedded storage is available in various capacities, allowing anywhere from one month to one year of full static and dynamic (waveform) data to be retained, depending on number of rack channels, data complexity, and data variability.

For connection to plant and machinery control systems, both serial (Modbus® RTU) and Ethernet (Modbus® TCP) communications are supported as standard. In addition to the basic measurements and alarm statuses within a rack, Modbus allows a rich data set of numerous other parameters and statuses to be accessed for enhanced operator data.

When used with the optional rack touchscreen, real time display of monitored values, alarm statuses, and other information is available for all channels concurrently on a single screen for “at a glance” convenience. The display interface can also be adapted for use with any external panel mount PC.

When a touchscreen display, embedded data storage, Modbus communications, and/or streaming to a condition monitoring server are not required, a SAM is not strictly necessary, but it is still strongly recommended to facilitate ease of configuration and enhanced rack diagnostics.



The SAM is not in the critical machinery protection path; therefore, its inclusion enhances basic rack functionality without affecting machinery protection, even in the unlikely event of a SAM failure. The SAM resides in rack slot #2 and uses 24 V_{DC} instrument power as supplied by the SETPOINT Rack Connection Module (RCM). An additional SAM can be installed in rack slot #3 when Modbus redundancy is required. System Access Modules are available in both basic and enhanced versions to support a variety of communications requirements:

- **Basic (bSAM)**

- Provides Modbus RTU and Modbus TCP communications with the SETPOINT rack for integration with plant and machinery control systems.
- Permits other installed monitoring modules in the rack to communicate with one another during configuration via backplane network communications.
- Allows clock synchronization of all installed modules to an external time reference using Network Time Protocol (NTP).

- **Enhanced (eSAM)**

The eSAM augments the basic functionality of the bSAM by adding another processor to handle the following enhanced capabilities:

- Streaming of high-speed waveforms and data to an external condition monitoring server (refer to CMS datasheet S1157533 for more information).

- Streaming of the same data as above, but to an embedded solid-state hard drive and/or removable SD card. Streaming to an external server and the eSAM's embedded storage are not mutually exclusive and can thus operate concurrently.
- Support for an optional 8.4" backlit touchscreen display (refer to System Overview datasheet S1077785 for more information). The Ethernet port can also be used to display MPS data on a panel mount PC, allowing an external PC of any size to be used in lieu of the rack's integral touchscreen display. An external pointing device may also be used. This is particularly important when the rack and screen will be inside an enclosure that cannot be easily opened, such as outdoors or in certain hazardous areas.
- Configuration changes may be performed remotely via the CMS port (available as a separate ordering option).

Both the bSAM and eSAM have identical faceplates and connectors. However, the display connector, CMS connector, and SD Card slot are inactive on bSAMs.



Features and Benefits

- **Embedded “flight recorder” data storage**
SETPOINT is the world’s only system that can provide *months or years* (not minutes or hours) of high-definition data storage right in the rack. This capability means that a persistent connection to an external condition monitoring server is no longer required to obtain the benefits of condition monitoring. Users can simply extract saved data from the rack’s SD Card or embedded hard drive at regular intervals and/or following a machinery event. This is exactly the same data that would be streamed to an external condition monitoring server, so users are not penalized for choosing on-board storage versus streaming data to a server.
- **Ultra-fast data acquisition**
SETPOINT captures static data at 80ms update rates and waveforms from all channels at adaptive rates that reflect changing machinery conditions – continuous waveforms during fast transient conditions such as startups and shutdowns – and slower rates when waveforms aren’t changing and thus do not need to be stored. Each and every waveform is examined from each and every channel continuously and compared against the last stored baseline waveform. If it changes, we save it. If it doesn’t, there’s no need to save it. These patented capabilities allow SETPOINT to store data more efficiently than any other system – but without losing any vital data when machinery conditions change.
- **Condition Monitoring Software (CMS) connectivity**
The SETPOINT® system can stream data directly to a condition monitoring server without any additional data acquisition hardware required. This data can be stored in an OSIsoft® PI System server, where it can be easily combined with process data for ease of data correlation, or in a special .cms file format on an external computer. The file format is identical to that used by our embedded flight recorder (internal hard drive and/or SD Card). CMS Display software can then be used to visualize the collected data, whether it resides on a PI Server, an SD Card, the rack’s internal hard drive, an external computer’s hard drive, or cloud-based storage. Our CMS Display software is available for download at no charge from our website, making it extremely easy to open, view, and share data collaboratively regardless of where it is stored.
- **Out-of-the-box integration with OSIsoft’s PI® System**
SETPOINT® is the world’s only vibration monitoring system that can store *all* data – waveforms included – in a PI System server. Once in the PI System, it can be viewed using standard PI client applications such as Coresight and ProcessBook. Our CMS Display software augments the basic visualization capabilities of these clients by providing the specialized plot types needed by vibration analysts, such as orbit, spectrum, polar, bode, cascade, waterfall, and numerous others. Also, because this data resides in the PI System, it is available for use by other applications that use PI System data, such as automated analytics and expert systems, maintenance management systems, and others.

- **Flexible display options**

The optional 8.4" touchscreen can be mounted on the front of the rack without consuming extra panel space. It can also be detached from the rack and mounted up to 3m (10 ft) away via a special ribbon cable. This is particularly useful when the display will be mounted in a cabinet door, and allows the rack to reside in the back of the cabinet while only the display needs to be mounted on the door, reducing swing weight and eliminating movement of transducer wiring each time the cabinet door is opened or closed. SETPOINT® can also be used with virtually any third-party PC (panel mounted), allowing larger screen sizes where required and wired or wireless mice or trackballs.

- **Modbus TCP and RTU digital communications**

SETPOINT® provides a standard feature set that allows highly flexible integration capabilities with legacy and new control systems. For older systems, analog 4-20 mA and relay outputs are available for each monitored channel. For newer control systems that support digital interfaces, both Modbus TCP and Modbus RTU are provided as standard and deliver a dataset that is much richer than that of analog outputs. Modbus RTU is particularly useful in retrofit situations where the outgoing monitoring system used serial communications. It also allows re-use of the installed RS-232, RS-422, or RS-485 serial cabling and PLC/DCS gateway devices. Users can easily customize SETPOINT's Modbus map to match that of the system being replaced, eliminating the need for reprogramming the DCS or PLC gateway.

- **IEC 62443 eSTS Cyber Security Certification**

The SETPOINT® SAM module has attained IEC 62443 Part 4-1, Section 9 eSTS Level 1 certification providing assurance that critical protection functionality will be intact no matter what traffic is bombarding your network.

- **Optional Modbus redundancy**

Up to two SAM cards can reside in a single SETPOINT rack for redundant Modbus communication links with plant and machinery control systems.

- **Powerful onboard processors**

Deliver ultra-reliable, ultra-fast communications with multiple devices and systems simultaneously.

- **No separate I/O module required**

Module functions and I/O are contained on the same card.

- **Clear, intuitive labeling**

Easily identify status LEDs and connections.

- **No jumpers or DIP switches**

Every option in the SETPOINT system is configured via software. Cards do not have to be removed from the rack.

- **Hot swappable**

Modules can be inserted and removed without powering down the rack.

- **Innovative front-loading wiring**

Every module in the SETPOINT rack places all wiring connections on the front, providing the flexibility of 19" rack, panel cutout, and bulkhead mounting without different rack chassis, backplanes, or I/O modules. Reduces costs, saves valuable space, and makes installation and maintenance easier as everything is accessible from the same side of the rack.

- **Simple, reliable, self-contained design**

Reduces likelihood of failures from inter-module dependencies.

- **Remote network access**

Optionally ordered with remote network access to data and configuration via secure, encrypted, and password protected protocols.

- **Spreadsheet-like configuration environment**

SETPOINT software provides unparalleled ease of configuration – easily cut and paste data to/from Microsoft® Excel® and most other programs. No manual reentry of data from project documents is required, reducing the likelihood of transcription errors and eliminating tedious re-typing.



Specification

All specifications are at +25 °C (+77 °F) unless otherwise noted.

Inputs	
Channels	Supports all installed channels in quarter (4-slot), half (8-slot), and full (16-slot) rack sizes.
Input Power Voltage	Continuous: + 22 to +30 V _{DC} Transient: +18 to + 36 V _{DC}
Power Consumption	bSAM: ≤ 7W* eSAM w/o display: ≤ 13 W* eSAM w/ display: ≤ 19 W* * When input excitation voltage is 22 to 26 V _{DC} .
Outputs	
Touchscreen Display Port	Interface Type: LVDS Maximum cable length between SAM port and display: 3 m (10 ft)
LEDs	OK LED
	On – SAM module is operating correctly Off – SAM module has a fault or has lost power
	OK LED – SD Enabled
	Solid Green – SD OK and safe to eject Blinking Green – Overwriting data safe to eject Blinking Green/Amber – data is being written and should not be ejected Solid Amber – No SD card present Blinking Red – SD card not operational
	TM (Trip Multiply) LED
	On – Rack is in Trip Multiply mode (one or more setpoints elevated by user-defined multiplier) Off – Rack is in normal mode

	DSP (Display) LED
	On – Optional touchscreen display is connected Off – No display detected
SD (Secure Digital) Memory Card	Media Compatibility: SDHC (High Capacity) only* Maximum Storage Capacity: 32 GB NOTE: SDHC is also known as SD 2.0. SDSC (Standard Capacity) media is also supported, but storage is limited to 2GB. SDXC (eXtended Capacity) media (2048 GB max) is not currently supported.
Internal Hard Drive	Capacity: 32 GB or 256 GB NOTE: Capacity specified at time of ordering. For usable storage space for CMS data, subtract approximately 6 GB to allow for overhead of embedded operating system.
DCS Comm Port	Protocol
	Modbus® TCP
	Available Data Types
	Channel <i>BYPASS</i> status Channel <i>ALERT</i> status Channel <i>DANGER</i> status Channel <i>FAULT</i> status Channel <i>TRIP MULTIPLY</i> status • Channel measurement values (can be multiple per channel) • Channel gap or bias voltage (where applicable) • Measurement setpoints (read) Measurement statuses (<i>VALID</i> , <i>ALERT</i> , <i>DANGER</i>) • System date/time (read) • System date/time (set) • System <i>Trip Multiply</i> status (read/invoke) • System <i>Alarm Inhibit</i> status (read/invoke) • System status reset/acknowledge (invoke)

	• SD card status (card present, locked, failed, busy, full) • CMS link status • Internal Hard Drive status • DCS link status • Touchscreen link status • HW and SW diagnostics
	Modbus Mapping
	Can use default mapping or can customize to match that of an existing rack being replaced.
	Connector Type
	RJ45
	Ethernet Speeds
	10/100 BASE-T
	Cable Type
	CAT 5 (twisted pairs)
	Maximum Cable Length
	100 m (328 ft)
	Default IP address
	192.168.0.1
	Default Subnet Mask
	255.255.255.0
	Default Gateway
	192.168.0.1
	Ethernet Link LED
	On – The port has established an Ethernet connection. Off – The port has not established an Ethernet connection.
	Ethernet Activity LED
	On – The port is sending or receiving Ethernet frames. Flashes with each send/receive action. Off – The port is not sending or receiving Ethernet frames.
DCS SER Comm Port	Protocol
	Modbus® RTU
	Available Data Types

	Same as for Modbus TCP port (both ports use same Modbus Map)	
	Supported Standards	
	- RS-232 (point-to-point) - RS-422 (point-to-point only) - RS-485 (pt-pt and multi-drop)	
	Connector Type	
	RJ45 (refer to manual for pinout details)	
CMS Comm Port	Protocol / TCP Port	
	All Protocols are unidirectional to the rack	
	*VC8000/SAM-07, or -73 must be ordered to remotely access configuration	
	Data Collection	8001
	HD	8003
	MPS Access*	8004
	Available Data Types	
	- Static values - Statuses - Dynamic (synchronous and asynchronous waveform) - Trends - Configuration (read only) - Events	
	Connector Type	
	RJ45	
	Ethernet Types	
	10/100/1000 BASE-T (Gigabit)	
	Cable Type	
	CAT 6 (twisted pairs)	
	Maximum Cable Length	
	100 m (328 ft)	
	Default IP address	
	192.168.0.1	
	Default Subnet Mask	
	255.255.255.0	
	Default Gateway	
	192.168.0.1	



	Ethernet Link LED
	On – The port has established an Ethernet connection. Off – The port has not established an Ethernet connection.
	Ethernet Activity LED
	On – The port is sending or receiving Ethernet frames. Off – The port is not receiving or sending data.
Configuration	
Method	PC-based SETPOINT® configuration software
Connection Type	Local: Mini-B USB “on-the-go” receptacle on any installed UMM or TMM* * With a System Access Module (SAM) installed in the rack, the USB receptacle on any TMM or UMM can be used to configure every module in the rack.
Memory Location	Each installed module stores its own configuration data in non-volatile RAM where it is retained until changed. SAM stores its own configuration and also serves as a back-up repository for configuration data of all other modules in the rack. Batteries or other power sources are not required to maintain any module’s configuration data.
Environmental	
Operating Temperature	-20 °C to +65 °C
Storage Temperature	-40 °C to +85 °C
Operating Temperature Ramp	Do not exceed 0.5C/minute
Storage Temperature Ramp	Do not exceed 10C/minute
Humidity	5 % to 95 %, non-condensing

CE Mark Directive	
ESD	Contact: 6 kV, Criteria B Air: 8 kV, Criteria B
Radiated EMI Susceptibility	80 – 1000 MHz: 20 V/m* 1.4 – 2 GHz: 6 V/m* 2 – 2.7 GHz: 3 V/m* * Criteria A
Magnetic Field	30 A/m, Criteria A
EFT Burst	2 kV, Criteria B
EFT Surge (Signal Lines, Power Line)	2 kV line to ground, Criteria B
Conducted RFI (Signal Lines, Power Lines)	150 kHz to 80 MHz, Criteria A
Conducted RF Common Mode Immunity (Signal Lines, Power Lines)	15 Hz – 150 Hz: 10 V* 150 Hz – 1.5 kHz: 1V* 1.5 kHz – 150 kHz: 10 V* * Criteria A
Radiated EMI Emissions	30 dB µV/m @ 30 m, 30 MHz – 1000 MHz, Class A
Conducted Emission	60 dB µV/m @ 30 m, 0.5 MHz – 30 MHz, Class A
AC Power Voltage Dip Immunity	One-half period, 30 % reduction, Criteria B
AC Power Voltage Dip Interruption	250 periods, 95 % reduction, Criteria B
DC Power Voltage Dip Immunity	10 ms, 60% reduction, Criteria B
DC Power Voltage Dip Interruption	30 ms, 100% reduction, Criteria B
Low Voltage Directive	Council Directive 2014/35/EU Low voltage using B & K Vibro-supplied power supply (rack ordering option –CC) or other Low Voltage Directive approved supply.

Hazardous Area Approvals



PART NUMBER:
VC-8000/RCK

Physical

Size	9.1" H x 9.0" D x 1.0" W (231 mm x 229 mm x 25 mm)
Weight	16.1 oz (456 g)
Rack Slots Required	One or two* * When a single SAM is used, it must be installed in slot 2. When dual SAMs are used for redundant Modbus communications, the second SAM resides in slot 3.

Safety Integrity Level (SIL) Capability*

SETPOINT® is suitable for use as part of a SIS, to implement safety instrumented functions up to SIL 2 when configured, installed and commissioned properly as per instructions provided within the Operations and Maintenance Manual (doc S1079330) and safety manuals:

- VC-8000 Backplane and Rack Safety Manual (C107579)
- RCM Safety Manual (C107578)
- TMM Safety Manual (C107576)
- UMM Safety Manual (C107577)

*Hardware availability in Q4 2019.



CAUTION

SAM cards are shipped with default factory configuration settings, which are not necessarily suitable for any particular application. Before use, each SAM must be configured properly for its application via SETPOINT® configuration software.

This software is included with each system or UMM ordered and is also available for download at www.setpoint.bkvibro.com



Ordering Information

Spare SAM Cards

C106791.001
VC-8000 bSAM-01-05
Basic SAM (bSAM), MODBUS

C106792.001
VC-8000 eSAM-02-05
Enhanced SAM (eSAM), MODBUS,
Flight Recorder

C107224.001
VC-8000 eSAM-07-05
Enhanced SAM (eSAM), MODBUS,
Flight Recorder, Remote Access

C107392.001
VC-8000 eSAM-02-09
Enhanced SAM (eSAM), MODBUS, Flight Recorder,
eSTS

C107393.001
VC-8000 eSAM-07-09
Enhanced SAM (eSAM), MODBUS, Flight Recorder,
Remote Access, eSTS

C106796.001
VC-8000 eSAM-33-05
Enhanced SAM (eSAM), MODBUS, Flight Recorder+



C107227.001
VC-8000 eSAM-73-05
Enhanced SAM (eSAM), MODBUS, Flight Recorder+,
Remote Access

C107394.001
VC-8000 eSAM-33-09
Enhanced SAM (eSAM), MODBUS, Flight Recorder+,
eSTS

C107395.001
VC-8000 eSAM-73-09
Enhanced SAM (eSAM), MODBUS, Flight Recorder+,
Remote Access, eSTS

C107738.001
eSAM Remote Configuration License

NOTES:

1. Touchscreen display / external monitor purchased separately. CMS data capabilities require CM-Enabled UMMs and TMMs, purchased separately. Refer to SETPOINT System Overview datasheet S1077785 for ordering information, specifications, and additional details.
2. eSAM includes Flight Recorder to store 1 month of data internally or on an SD card.
3. Flight Recorder+ typically stores 1 year or more of static, and dynamic data

Accessories

SAM-to-Display Cable

This cable connects a rack's touchscreen display to its associated eSAM. When the display is mounted on the face of the rack, a 11" cable length is used. When the remote display (VC-8000/RDP) is used, cable lengths of up to 10 feet are supported. Identical male connectors are preinstalled at each end, compatible with the female connectors at the SAM and the touchscreen. The connectors snap securely into place using integral locking mechanisms.



C106491.002

SAM-to-Display Cable 11-inch cable

C106558.001

SAM-to-Display Cable 36-inch cable

C106642.001

SAM-to-Display Cable 60-inch cable

C106643.001

SAM-to-Display Cable 84-inch cable

C106644.001

SAM-to-Display Cable 120-inch cable



CAUTION!

To prevent display damage, do not connect cable when SAM is energized.

Manuals and Software

A complete set of VC-8000 manuals and configuration software on USB memory stick is supplied at no extra charge with each order, but must be specified at time of ordering. If you need the instructions in other languages than available on the website please contact us.

NOTE: Manuals are published electronically in Adobe® PDF* format and may be printed and freely distributed. Adobe Reader is required and can be downloaded free-of-charge from www.adobe.com.

C106547.001

VC-8000 Manual and Configuration Software

USB Cable

This cable is used to connect a computer running VC-8000 Configuration Software to the USB port on UMM and TMM modules. The cable is included with part number VC-8000/CSW and does not need to be ordered separately. Order the item below only when replacing a lost or damaged cable.



C106613.001

2m (6') USB 2.0 A / Mini-B Cable



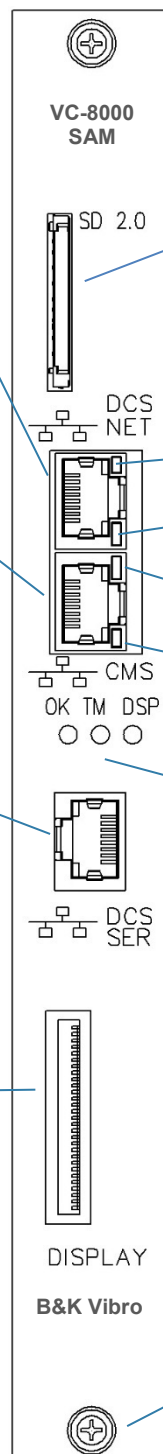
Outline / Connection Diagrams

Industry-standard Modbus TCP (10/100 BASE-T Ethernet) communications for integration with plant and machinery control systems, SCADA systems, and other control and automation platforms. Supports NTP for clock synchronization.

10/100/1000 BASE-T Gigabit communications using an industry-first open protocol for connection to SETPOINT CMS condition monitoring software or process historians, such as the OSIsoft® PI System.

Industry-standard Modbus RTU serial communications (RS-232, -422, -485 pt-pt and multi-drop) also provided for use with older control systems that do not support Ethernet.

Display interface. Allows optional 8.4" color touchscreen to be located integral to rack faceplate or externally within 3 meters (10 feet). Can also be adapted for use with standard DVI and USB cables, allowing an external monitor of any size and corresponding pointing device to be used in lieu of the rack's integral touchscreen.



Captive thumbscrew for securing SAM in SETPOINT rack slot.

Optional embedded "flight recorder" supports up to 256 GB of storage for all condition monitoring data on internal solid-state hard drive and/or 32 GB of system data on removable SD card. Can be used in addition to or in lieu of an external condition monitoring server.

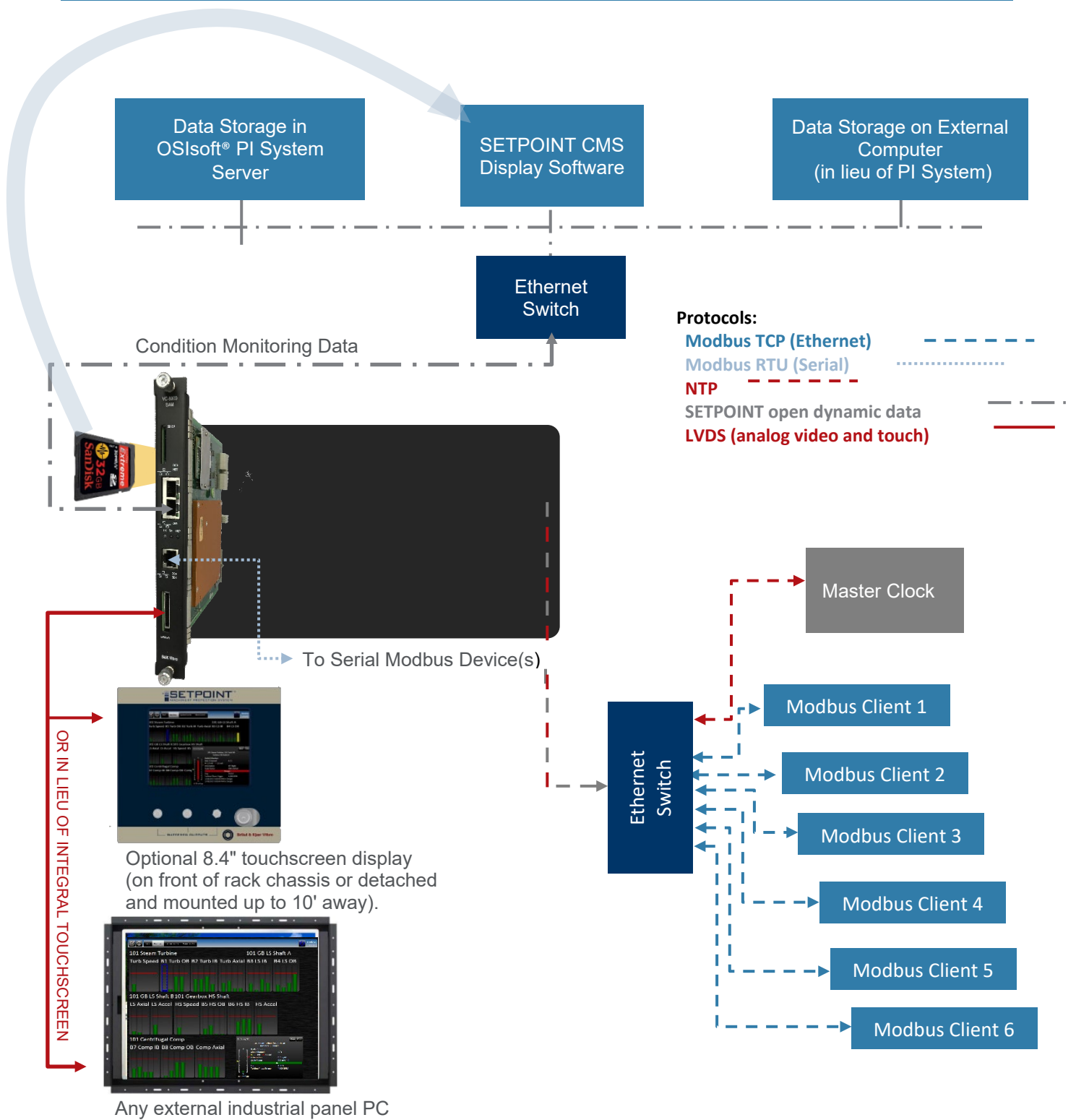
Modbus TCP Link Present LED

Modbus TCP Link Activity LED

CMS Link Activity LED

Status LEDs for MODULE OK, TRIP MULTIPLY, and DISPLAY COMMUNICATIONS OK conditions.

Captive thumbscrew for securing SAM in SETPOINT rack slot.



Contact