User Guide
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CSI 2600 Machinery Health™ Expert

User Guide

EMERSON
Process Management

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1 CSI 2600 Machinery Health Expert

Topics covered in this chapter:

- *CSI 2600 overview*
- *User Guide overview*
- *User Guide conventions*
- *Technical support*

1.1 CSI 2600 overview

The CSI 2600 Machinery Health™ Expert is a portable, online analyzer that simultaneously and continuously monitors and records up to 24 vibration or process channels and up to 4 speed inputs.

The CSI 2600 is available with one or two 6510 signal input modules. Each 6510 module has 12 analog channels, 2 tachometer channels, and 2 relay channels. Emerson sells the CSI 2600 as a 12/2/2 channel or a 24/4/4 channel analyzer.

The CSI 2600 comes in non-Transient and Transient configurations. A non-Transient unit is designated by an "M", such as A2600M, and a Transient unit is designated by "T", such as A2600T. The analog channel count is also part of the name; a 12 channel unit is designated by the number "7", and a 24 channel unit is designated by the number "8". Available models are:

- A2600M7—non-Transient, 12 channel
- A2600M8—non-Transient, 24 channel
- A2600T7—Transient, 12 channel
- A2600T8—Transient, 24 channel

This manual will assume that the CSI 2600 is an A2600T8—a Transient, 24 channel system.

Use Emerson's AMS Suite: Machinery Health™ Manager software to view orbits, shaft center lines, Bode, polar, cascade, waveform, and spectrum plots live and simultaneously, or to archive for future reference.

1.2 User Guide overview

The CSI 2600 Machinery Health Expert User Guide is written for Vibration Analysts, Reliability Data Collection Technicians, and Reliability Engineers who monitor rotating machines in a process plant environment. This user guide describes how to set up the unit, collect data, and transfer the data to AMS Machinery Manager for storage and analysis.

1.3 User Guide conventions

The following conventions are used throughout this User Guide.

Note

A note paragraph contains special comments or instructions.

⚠ CAUTION!

A caution paragraph alerts you to actions that may have a major impact on the equipment or stored data.

⚠ WARNING!

A warning paragraph alerts you to actions that may have extremely serious consequences for equipment and/or personnel.

1.4 Technical support

When you contact Technical Support, be ready with a screen capture of the error message and details such as when and how the error occurred.

Hardware Technical Help

Have the number of the current version of your firmware ready when you call.

Software Technical Help

Provide the software version numbers of both your Microsoft® Windows operating system and AMS Suite: Machinery Health Manager, and your AMS Machinery Manager serial number. To find AMS Machinery Manager version and serial numbers, select Help > About.

Be at your computer when you call. We can serve you better when we can work through the problem together.

Software Technical Support

Emerson provides technical support through the following for those with an active support agreement:

- Telephone assistance and communication via the Internet.
- Mass updates that are released during that time.
- Interim updates upon request. Please contact Emerson Technical Support for more information.

Contact us

For Emerson Technical Support and Customer Service Toll Free numbers, email addresses, and hours of operation, please visit http://www.sureservice.com and select Technical Support and Customer Service.

2 Introduction to the CSI 2600

Topics covered in this chapter:

- *CSI 2600 out of the box*
- *Optional services*
- *CSI 2600 monitoring requirements*
- *Precautions*
- *Safety notes*

2.1 CSI 2600 out of the box

Figure 2-1: CSI 2600 front view

Figure 2-2: CSI 2600 back view

Figure 2-3: CSI 2600 accessories

- *CSI 4500/6500/2600 Machinery Health Monitor firmware DVD*
- *AMS Suite Operating Manuals & Extras DVD*
- *1 Ethernet cable*
- *1 serial cable*
- *1 package of replacement filters*
- *1 standard IEC 320 C13 to NEMA 5-15P power cord*
- *1 3-pin screw mount connector plug*
- *3-piece international AC adapter kit*

Optional accessories

- Sensors

- Mounting pads
- BNC connectors
- Extension cords

Optional firmware

- PeakVue
- Modbus

Optional software

- Object Linking and Embedding for Process Control (OPC)

2.2 Optional services

- Training in the Online Prediction Operation and Maintenance course and rolling element bearing vibration.
- Remote analysis.
- Turbomachinery diagnostic training and AMS Machinery Manager transient analysis training.

2.3 CSI 2600 monitoring requirements

The CSI 2600 portable transient monitoring requires:

- Field wiring to installed sensors
- AC line power wiring
- Connection points (usually a buffered output panel) for cabling to the CSI 2600 monitoring unit
- Computer
- CSI 2600 firmware (loaded on Online Server, downloaded into CSI 2600 monitoring unit)
- Machinery Health Manager online software
- Online Database
- Ethernet cable

2.4 Precautions

Cleaning

The CSI 2600 is dust resistant. Use a damp, clean cloth for cleaning. Do not use cleaning fluids, abrasives, or aerosols, as they could enter the device, causing damage, fire or electrical shock.

Avoid water

Avoid direct contact with water, wet surfaces, or condensing humidity. Keep away from wet locations such as sinks, laundry, wet basements, swimming pools, and so on. If the device is subjected to these conditions, adverse operation may result. If the surface of the device becomes wet, allow it to dry thoroughly before operation.

Avoid damage or injury

Follow these guidelines to avoid costly damage or injury:

- Place the device on a solid, stable surface when not in use and do not place any heavy objects on it.
- Use only accessories recommended by Emerson Process Management.
- Keep liquids and foreign objects away from your CSI 2600.
- Never operate your CSI 2600 if any liquid or foreign object has entered it.
- The enclosure should never be subjected to direct sunlight for long periods of time.

2.5 Safety notes

This document is intended as a guide only. No instructions given here are intended to supersede any locally issued directions or safety instructions.

⚠ WARNING!

Do not operate the CSI 2600 in a hazardous area.

3 Getting started

Topics covered in this chapter:

- *Remove the CSI 2600 from the case*
- *Turn on the CSI 2600*
- *Turn off the CSI 2600*
- *CSI 2600 fuse access*
- *Data collection overview*
- *Data recorder modes*
- *Store data on a NAS hard drive*
- *Network configuration*
- *System architecture*
- *Access the termination board*
- *Connectivity*

3.1 Remove the CSI 2600 from the case

⚠ CAUTION!

The CSI 2600 should be placed on a dry, level, cool surface where the vents and fans are not blocked. Avoid hot, wet surfaces and do not block the vents or fans.

Note

The CSI 2600 cannot be used while in the case.

Procedure

Reach down along the top and bottom of the CSI 2600 and extract the device straight up from its case.

Figure 3-1: Remove the CSI 2600 from the case

3.2 Turn on the CSI 2600

The CSI 2600 has two toggle switches, and both must be toggled in order to turn the unit on and off.

Prerequisites

⚠ WARNING!

Ensure that physical contact with unbuffered sensor signals will not interfere with other monitoring or protection systems.

Procedure

1. Plug the power cord into a standard 120 - 240 VAC input. Attach one of the provided adapters if necessary.

   The unit automatically senses the correct voltage.
2. Press the toggle switch located at the rear of the case to On.
3. Press the toggle switch located at the front of the case to On.

3.3 Turn off the CSI 2600

Prerequisites

Make sure that the computer has been connected long enough to allow all of the desired data to be transferred to the computer for storage. Check the time stamps of the data being reported in Online Watch. Once the times have progressed past the time range needed, data collection can be stopped and the CSI 2600 can be powered off.

Procedure

1. Turn the toggle switch located on the front of the unit to the Off position.

   After a couple seconds, the light will turn off. Wait for the light to turn off before continuing with the next step.

2. Turn the toggle switch located on the back of the unit to the Off position.
3. Unplug the power cord.

3.4 CSI 2600 fuse access

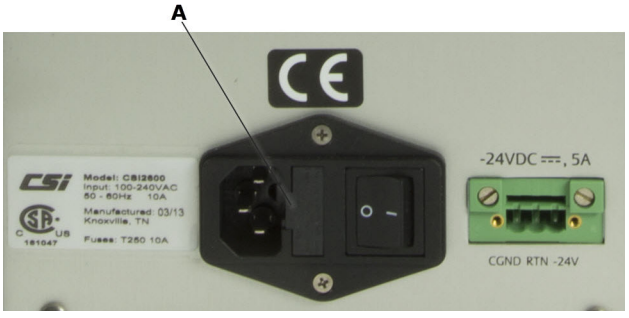
⚠ CAUTION!

Turn off the power to the CSI 2600 and unplug the unit before accessing the fuses.

Two 10 A fuses for the power input are accessible through a small access panel between the receptacle and the power switch. The access panel can be opened with a flathead screwdriver.

Figure 3-2: Fuse access

The AC power input is located on the unit's faceplate.



A. Fuse access panel

3.5 Data collection overview

The CSI 2600 is a continuously monitoring online system. Once configured, it will collect both periodic predictive data (Trend, Spectra, and Waveform snapshots, multiplexed two channels at a time) and Transient measurements (continuous unbroken waveforms for extended periods on up to all 24 channels). Predictive data can be stored in an AMS Machinery Manager database. Sections of the transient waveforms can also be extracted into archives either on-demand or based on alarm events.

For the Transient channels, the CSI 2600 continuously stores waveform measurements on a Hard Disk Drive (HDD). This can be either the internal 80 GB HDD or an external NAS drive (up to 250 GB). When the drive fills up, the system will begin overwriting the oldest measurements in a First In First Out (FIFO) manner.

Data is stored at a rate of approximately 40 MB per hour per channel. The following method can be used for estimating the amount of time that data can be streamed to the HDD before it begins to FIFO. First determine the number of channels that will be commissioned for Transient operation; then use this equation:

Storage Time (in hours) = HDD size / (number of Transient channels x 40 MB/hr).

For example, consider a pump monitoring system which has a total of 14 sensors. This could include 4 pairs of radial shaft vibration probes, 2 thrust probes, 1 case expansion sensor, 1 eccentricity sensor, and 2 horizontal accelerometers. In addition to collecting periodic prediction data, the 8 shaft vibration probes are also commissioned for Transient data collection.

80,000 MB / (8 channels x 40 MB/hr) = 250 hours (approximately 10 days)

So, the internal HDD will store data for approximately ten days before starting to FIFO.

The CSI 2600 is both a continuous monitoring system and a portable monitoring system. It can be moved from one piece of equipment to another, with data from each piece stored in separate databases. See *Section 6.10* for more information.

⚠ CAUTION!

Changing databases will reinitialize the Transient HDD, which eliminates all stored data. Extract any data before changing databases.

3.6 Data recorder modes

Data collection to CSI 2600 internal memory

When the CSI 2600 is running and the computer is disconnected, the unit runs in DAT recorder mode, optimized for turbomachinery transient data. Waveforms from up to 24 channels, including tach striping, are recorded continuously and simultaneously. If all 24 channels are streaming transient data, the internal 80 GB HDD will store approximately 90 hours of data before it begins to FIFO.

With the computer disconnected, the periodic predictive data is also buffered in the CSI 2600's internal RAM. The amount of time it will take to fill up the CSI 2600's internal RAM depends on how periodic predictive data storage settings are configured in the database. This data will also begin to FIFO when the memory buffer is full.

Data extraction from the CSI 2600

If the computer is reconnected while the CSI 2600 is in DAT recorder mode, any buffered periodic predictive data that has not been deleted by the FIFO process will automatically be transferred from internal memory to the database. Transient data will only be written to the database if a transient alarm event has occurred and the associated data has not been deleted by the FIFO process. Each transient channel can transfer a configurable amount of data (up to 30 minutes before and after) when a predefined transient alarm event has occurred.

When the computer is reconnected, portions of recorded data can be extracted on demand with AMS Machinery Manager Vibration Analysis. Field-based processing of multiplexed predictive data continues as usual while Vibration Analysis extracts data.

⚠ CAUTION!

If the computer is not connected, data may be lost or overwritten.

3.7 Store data on a NAS hard drive

The default streaming location is the internal hard drive. However, an external NAS drive can be used as an alternative transient streaming location. The CSI 2600 supports NAS drives up to 250 GB in size. You can use a NAS hard drive as the primary drive for transient storage or as a failover drive.

Prerequisites

Connect the NAS drive to the same port that is used to connect to the computer. The NAS drive must be capable of continuous write speeds of >20 MB/s, 100 Base-T minimum, and rated for a 100% duty cycle.

Procedure

1. In the AMS Machinery Manager Online Configuration tree structure, click one of the units to display the Unit Properties dialog.
2. Configure values in the External Network Folder Specifications field.

Figure 3-3: Online Configuration—External Network Folder Specifications

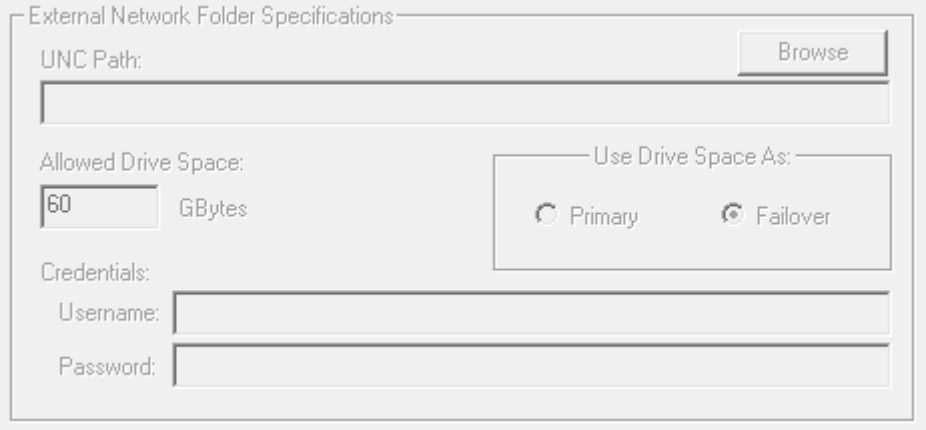


Table 3-1: External Network Folder Specifications dialog fields

Field	Values	Explanation
UNC Path	(variable)	Specifies the to the NAS drive folder where the unit should stream transient data.
Allowed Drive Space	1–250 GB	Specifies the limit for transient data on the NAS drive. The data will begin to FIFO when it reaches this limit.
Use Drive Space As	Primary	Indicates that the NAS drive is to be used as the primary streaming location (replacing the internal hard drive.
	Failover	Indicates that the NAS drive is to be used as a fail-safe location in the event that the internal hard drive fails.
Credentials	Username and Password	Specifies the username and password that will access the NAS drive folder named in UNC Path.

Example: Storage

If a 250 GB NAS drive is storing data from 24 transient channels, then it can store approximately 260 hours of data before it begins to overwrite the oldest measurements. If only 12 channels are streaming data, about 520 hours can be stored.

3.8 Network configuration

IP addresses are unique addresses that systems on a network use to communicate with each other.

Table 3-2: Example CSI 2600 system IP addresses

CSI 2600 Main Processor IP	192.168.0.10
CSI 2600 Transient Processor IP	192.168.0.11
Computer IP	192.168.0.1

Notes

- The IP addresses shown are defaults. If two or more systems will be used, each should be given a unique IP address.
- IP addresses should be given subnet masks. Transient extraction may fail without them. See *Section 5.7.6* for information on specifying subnet masks.

The computer's Ethernet port is connected to the CSI 2600. The port has an address. The CSI 2600 has two processing boards, both of which communicate using the same physical Ethernet connection on the CSI 2600 front panel. These boards have IP addresses that are stored in non-volatile memory (memory that does not get cleared when you turn the unit off). For a CSI 2600 system to communicate:

- the IP address of the computer must match a value stored in non-volatile memory in each CSI 2600 processing board.
- the IP address of the CSI 2600 Main Processor board must match a value listed in AMS Machinery Manager software, which is associated with the database in use.

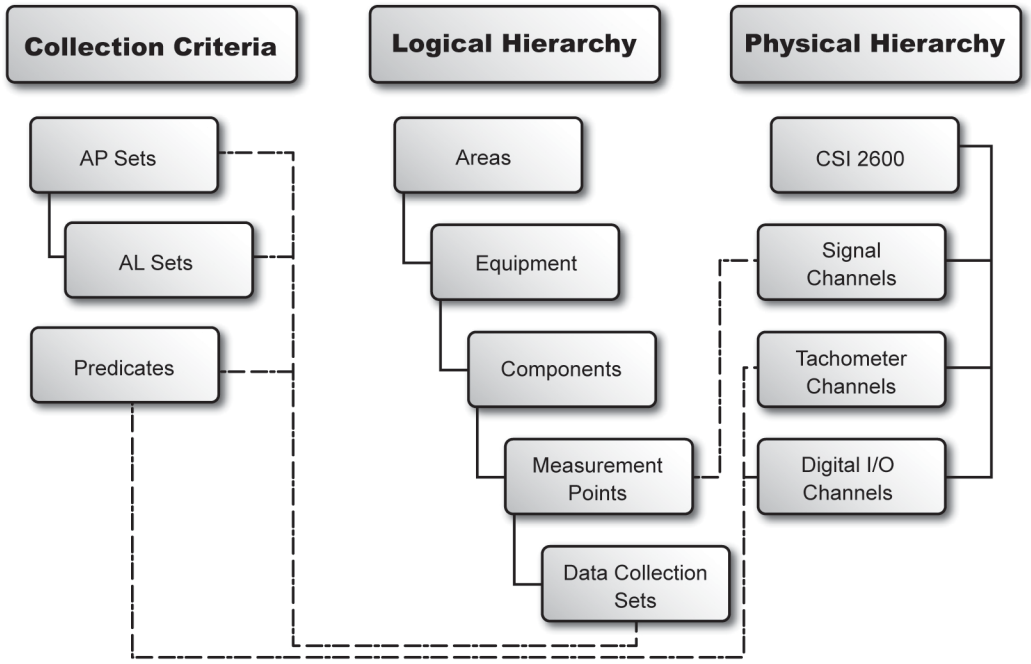
In short, the CSI 2600 must “know” its server address, and the computer must “know” the IP address of any CSI 2600.

3.9 System architecture

3.9.1 CSI 2600 online database diagram

The structure of an online database is designed to mirror the structure of the equipment being monitored. The database structure for prediction processing diagram shows the relationships of the various elements of an online database.

Figure 3-4: Online database diagram



Collection criteria

- Analysis Parameter (AP) Set—Defines a particular way to collect spectral data, and specifies:
  - the number of lines of resolution.
  - any averaging modes and windowing.
  - whether to be order-based.
  - what FMax to use.
  - what parameters are to be collected.
- Alarm Limits (AL) Set—Each AL Set is associated with a specific AP Set. There may be multiple AL Sets defined for any given AP Set to accommodate changing monitoring conditions. The alarm limit definition determines when alarms occur, data is stored, and output relays are set.
- Predicate—A collection predicate is an expression that compares the conditions of vibration levels, input relay states, and/or machine speeds to determine when data is collected and transient auto-archives are extracted.

Online storage logical hierarchy

- Area—A user-defined grouping of equipment. An area often corresponds to a building or section of a process line within a plant.
- Equipment—A group of coupled devices that logically should be monitored together. Most often a machine train is made up of a driver component (such as a motor) and one or more driven components (such as a pump or fan).
- Components—A specific, single asset to be monitored, possibly with multiple sensors. Usually a driver or driven piece of machinery. Motors, engines, turbines, pumps, and fans are examples of components.
- Measurement Points—Corresponds to a single physical sensor. A Measurement Point groups together all the data from all the collections that have been defined for a particular sensor. Any Gross Scan data collected on the sensor and reported for storage is logically associated with the Measurement Point in the database.
- Data Collection Sets (DCS)—The DCS is a single collection of data on a single Measurement Point. Multiple DCSs allow multiple collections on a single Measurement Point. The DCS combines a particular predicate (when to collect), with a particular AP Set (what and how to collect, including parameter bands), and a specific AL Set (alarm set points).

Physical hierarchy

- CSI 2600—The physical monitoring unit.
- Signal Channels—An AC vibration or DC process input.
- Tachometer Channels—A speed measurement input.
- Digital I/O Channels—A discrete relay, Input or Output.

CSI 2600 field wiring

In addition to predictive monitoring, the CSI 2600 is also a portable transient monitoring system, which means in most applications it is being connected to already installed sensors. Portable transient monitoring is different from a fixed, permanently connected system. For example:

- The portable application includes actions of connecting and disconnecting cables between the CSI 2600 monitoring unit and installed modules or even junction boxes. It is critical to ensure that these actions do not interfere with signals in such a manner that any permanently installed monitoring systems interpret temporary signal fluctuations as trip conditions. This is not a concern when connecting to module buffered outputs.
- Modules may condition the input signal and present a modified version to their own output connections (which are the input connections to the CSI 2600). For instance, some modules connect to an eddy current sensor which provides a DC output equivalent to gap voltage (usually about -10 V) and an AC voltage equivalent to vibration (millivolt signal). These modules are configured or programmed to provide a version of the input signal, at an output connection. The output signal could be a 0 – 10 V version of the input.

An analyst must know the sensitivity and offset of signals connected to the CSI 2600, which may be the same (or different) as signals connected to existing modules. An analyst must also know if the CSI 2600 connections are to buffered or unbuffered field wiring or module outputs.

3.10 Access the termination board

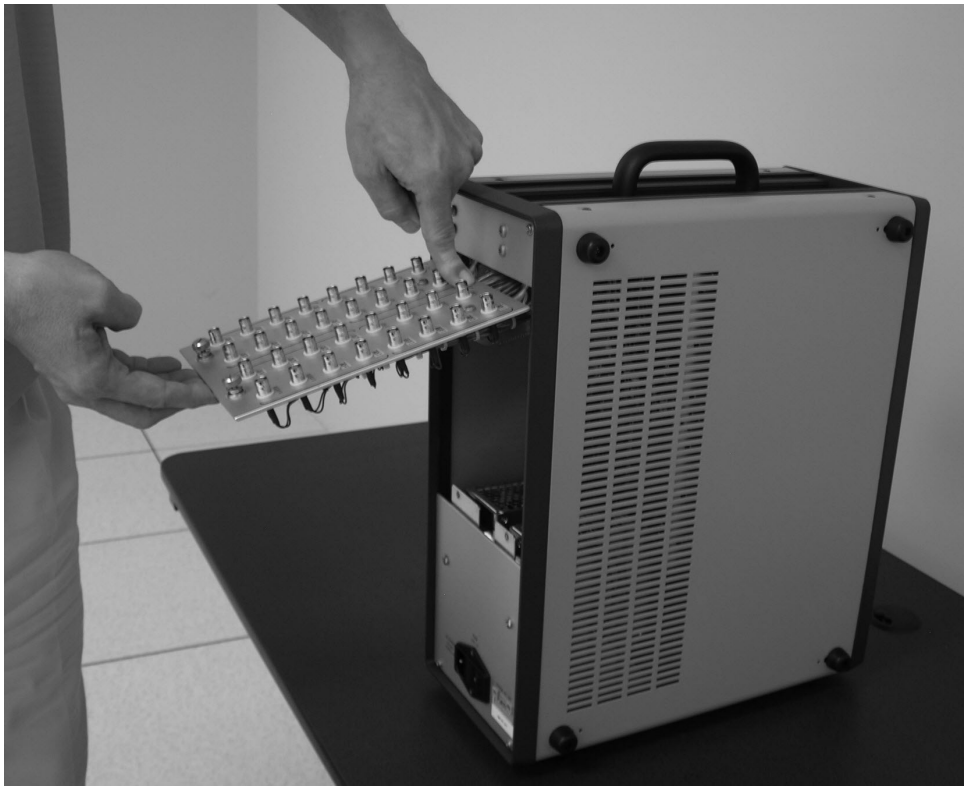
1. At the bottom of the rear panel, loosen the thumbscrews by hand.

⚠ WARNING!

Close the rear panel before powering the CSI 2600.

2. To lock the rear panel in the open position, lift the panel to an almost horizontal position and gently push down near the top center of the panel (as shown).

Figure 3-5: Termination board



3. Toggle the DIP switch to the left to turn off sensor power, or to the right to turn it on.

   The set of four DIP switches on SW1 controls sensor power for channels 1–4. Sensor power for the subsequent channels is controlled by the DIP switches on SW2, SW3, SW5, SW6, and SW7.

3.11 Connectivity

The CSI 2600 monitoring unit consists of:

- An AC power connection (110–220 V, 50/60 Hz)
- An Ethernet connection
- Signal connections for 1–24 sensors
- Tachometer connections for 1–4 sensors
- Digital I/O relay connections for 1–4 relays
- System power status LEDs
- An attached cooling fan

3.11.1 Power supply

Power input: 120–240 VAC, 50–60 Hz input, auto-sensing.

- AC power connection has an IEC 320 C13 receptacle
- North American 3-prong plug (NEMA 5-15P) is provided
- Unit may be powered with either 110 V / 60 Hz or 220 V / 50 Hz input power
- No internal switches need to be adjusted to select power type
- 80 W consumption

Note

A 500 W UPS is recommended. The quality of the power provided to the CSI 2600 is very important. Although the CSI 2600 contains input protection and some degree of line conditioning, it is important to provide the unit with clean power when ground isolated from the production equipment.

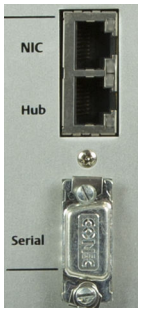
3.11.2 Ethernet ports

Use the NIC port to connect the CSI 2600 to the LAN.

Use the Hub port to connect the CSI 2600 directly to the computer.

Figure 3-6: Ethernet ports

The NIC and Hub ports are located on the unit's faceplate.



3.11.3 Channel connections

The CSI 2600 offers up to 24 sensor channels. The connections are made through the BNC connectors on the rear of the CSI 2600.

In addition, the CSI 2600 offers up to 4 tach channel connections, up to 4 digital relay channel connections, and 1 Ethernet HUB and 1 NIC.

The CSI 2600 can accept any sensor type with AC component 10V pk-pk and DC component < +/-24 V, AC+DC not to exceed +/-24 V. Accelerometers can be powered by the CSI 2600 system's power supply when sensor power is enabled via the DIP switches on the termination panel, accessible through the rear panel. Displacement probes can be powered by the auxiliary -24 VDC power supply. The output for this -24 VDC power supply is on the rear of the CSI 2600.

Tachometers should provide 1/rev pulses of >0.5V pk-pk with tach pulse 2x noise.

⚠ WARNING!

Make sure that the sensor power is disabled when connecting to a protection system with unbuffered BNC outputs.

3.11.4 4-channel relay inputs and outputs

The CSI 2600 includes up to 4 I/O relay connections that provide optically isolated digital inputs or dry contact outputs. Inputs can be between 5 V and 24 VDC. Outputs are limited to 24 VDC @ 0.5 A.

The 6510 Signal Input module is a component that connects to the unit's faceplate, and allows a combination of sensor and relay types in one module. Each I/O relay channel on the 6510 Signal Input module contains both input and output hardware. The relays are configurable as either input or output relays, with a DIP switch (SW1) on the circuit board. A relay channel that is configured in software cannot be utilized unless the corresponding DIP switch is set to the correct position. The firmware will detect the DIP switch state at startup and generates a flag in the HyperTerminal(1) session if the software configuration does not match the DIP switch setting.

(1) See Section 5.7 for more information on terminal emulators like Hyper Terminal.

The DIP switches are used to protect a user input device from inadvertently being shorted by a relay output configuration. Set the corresponding DIP switch to the On position for output relays, and to the Off position for input relays. The factory default state of the DIP switches is Off (Input). DIP switch 1 is for the first relay channel and DIP switch 2 is for the second relay channel.

The shelf-state of the output relays is normally open, meaning that when the power to the unit is disconnected, the relays are open. During operation of the unit, the relays are typically closed until activated by an alarm, but they can be configured either way.

The following are usage examples for an online monitoring system:

- (input) Transient event indicator, perhaps from a switch, DCS, external module
- (output) Bad/failed sensor indication
- (output) Alarm level indication
- (output) Speed level indication
- (output) Radial Trip Predicate state
- (output) Axial Thrust Predicate state

In most applications, the CSI 2600 will connect to buffered outputs of a protection system. These modules normally have relay outputs which indicate alarm levels, or bad/failed sensors. However, the CSI 2600 relays are different in that:

- A CSI 2600 alarm relay state may be based upon either overall vibration value (i.e., the attached module) or Analysis parameter signal level (i.e., energy at 1x turning speed, energy at 2x turning speed).
- All, some, or one of the alarm indicators may be mapped to the same CSI 2600 alarm relay output. In other words, all of the “Bad/Failed sensor” signal levels may be internally connected to a single relay. All of the “High alarm” signal levels may be internally connected to a single relay.

Radial Trip and Axial Thrust predicates are special methods of configuring voting logic for relay closures, and are explained in Emerson Machinery Health Manager manuals such as the Online Software guide (MHM-97460). These are innovations provided by the CSI 2600 system, which have value in turbo machinery applications.

4 Hardware configuration: overview

Topics covered in this chapter:

- *Gross Scan monitoring*
- *Spectral Scan*
- *Transient data capture*
- *Install a module*
- *Remove a module*
- *6560 Processor module*
- *CSI 2600 signal inputs*
- *6510 Signal Input module*
- *Mounting accelerometers*
- *Mounting tachometers*
- *Eddy current sensors*

The 6560 Processor Module, in combination with the 6510 Signal Input Module, is a multi-channel, multi-tasking, multi-processor data acquisition system primarily intended for monitoring heavy industrial rotating machinery. Typical signal inputs are dynamic AC machine vibration signatures from accelerometers, velocity probes, or eddy current sensors. These signals include two components: the dynamic AC component, which represents machine vibration, and a DC component, which represents the sensor bias level. In the case of an eddy current sensor, the DC component represents the gap, or average distance between the probe tip and the machine shaft. Other signal inputs include process signals; these are DC parameters such as temperature or pressure.

Tachometer inputs are used to determine machine speed. These tachometer signals are typically generated from an eddy current sensor or passive magnetic sensor positioned at a machine shaft keyway or gear, producing a pulse train (not necessarily 1x machine speed) representing the machine phase and running speed.

Discrete inputs represent machine states such as running, off, and starting. These inputs are used to control or modify the data acquisition based on machine state. Common state control inputs are relay closures or machine RPM. AC or DC signal levels can also be used for state control.

4.1 Gross Scan monitoring

Gross Scan monitoring includes:

- the acquisition of the overall level of the dynamic AC vibration signal, typically the RMS value of the signal.
- the DC sensor bias level.
- the measurement of a DC process signal.

All these signal inputs are DC values (the RMS value is a DC value proportional to the overall energy content of the AC signal). The Gross Scan inputs are multiplexed into a fast successive approximation ADC controlled by the 6560 Processor module. Gross Scan monitoring measures all input channels AC+DC twice per second. When the Transient option is included, true waveform peak-to-peak may be included in Gross Scan monitoring.

4.2 Spectral Scan

Spectral Scan is defined as the acquisition and analysis of dynamic AC signals only. The signals are acquired, two channels at a time (referred to as CHX and CHY), with a dual channel delta-sigma ADC controlled by the system DSP. The DSP performs analysis of the acquired time waveforms and transmits the results to the CPU host processor. Preprogrammed groups of Spectral Scan measurement parameters (AP Sets) may be assigned to specific machine state conditions to tailor data acquisition to specific machine operational states.

4.3 Transient data capture

Transient data capture is the acquisition of continuous time waveforms of dynamic AC signals. Transient data is captured in parallel for all channels. Other data stored along with the Transient data include Gross Scan data captured once per second, tach pulse records, and acquisition timestamps. The Transient data is stored on hard disk, and is available for real-time analysis via Ethernet.

4.4 Install a module

1. Line up the guide rails and push the module into the slot until fully seated.
2. Tighten the mounting screws.

4.5 Remove a module

1. Loosen the mounting screws.
2. Push outward on the handles to eject the module from the backplane connectors.
3. Pull the module from the slot by the handle.

Figure 4-1: Remove a module

Use the handles to remove modules.

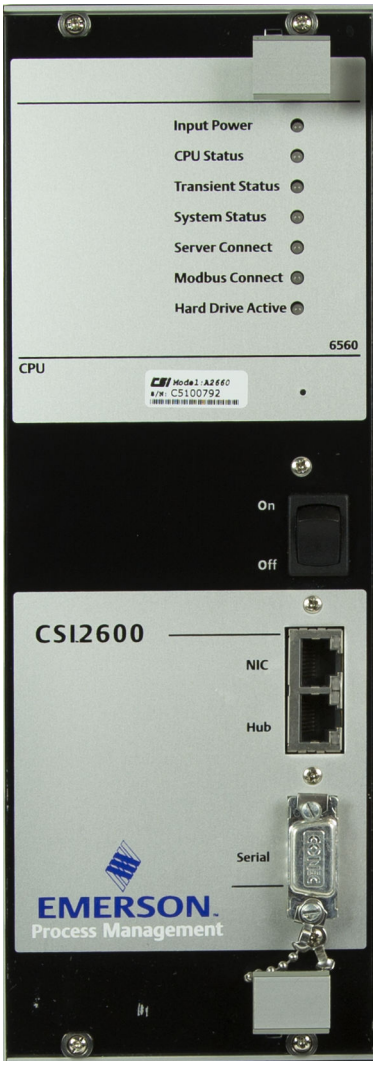
4.6 6560 Processor module

The 6560 Processor module provides all data acquisition, data storage, and data communications functions for the CSI 2600. The 6560 is capable of up to 24 simultaneous, continuous waveform measurements for detailed Spectral analysis, up to 24 RMS and DC values for Gross Scan measurements, up to 4 tachometers for machine speed measurement, and up to 4 discrete state inputs.

Gross Scan values, tachometer values, and digital input states may be combined logically to determine machine operating state, which may be used to define specific data acquisition states. The system can be configured to transmit and store data on either time interval or based on the amount of change of the data values.

The processor module provides 2 100Base-T Ethernet ports and one RS-232 serial port for system communications and diagnostics. Additional connections are available for the calibration signal and a dry contact SPDT SysFail relay. This relay is energized when the Processor CPU successfully boots. On a CPU failure or power loss, the relay will de-energize.

Figure 4-2: 6560 Processor module



4.6.1 Transient Daughterboard

The Transient Daughterboard adds the capability for parallel, continuous time waveform acquisition on all channels. All collected time waveform data, along with Gross Scan data and up to four tachometer pulse records is stored on an internal hard drive, which provides approximately 80 minutes per GB of storage.

The Transient Daughterboard can also stream data via Ethernet to analysis applications in near real time, without affecting data collection or on-board data storage.

While collecting time waveforms and tachometer pulses, the Transient Daughterboard continuously calculates the peak-to-peak value of each channel's waveform. When configured, this value may be sent to the 6560 Processor module for use as the Gross Scan instead of the RMS value produced by the 6510 Signal Input module.

The hard drive used on the Transient Daughterboard is specially rated for continuous operation. This drive should be replaced annually. In emergencies, any 2.5 in. parallel IDE drive may be used temporarily, but these drives are not generally rated for continuous operation.

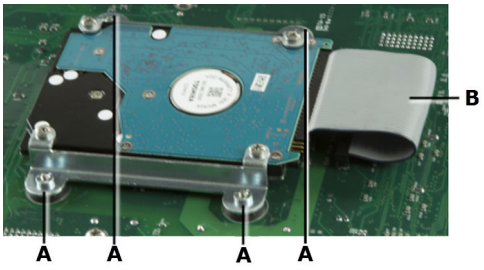
When installing the Transient Daughterboard on the 6560 Processor module, make sure all five mating connectors are fully engaged, and then install all six mounting screws.

Figure 4-3: Transient Daughterboard PCB mounted on Processor module

A. Mounting screw positions
B. Transient Daughterboard hard drive

Replace the Transient Daughterboard hard drive

Figure 4-4: Transient Daughterboard hard drive inset



A. Hard drive mounting screws
B. Ribbon cable

Procedure

1. Remove the four hard drive mounting screws.
2. Gently remove the hard drive ribbon cable from the hard drive, and then remove the old hard drive.
3. Install the new hard drive in the bracket.

⚠ CAUTION!

Do not over tighten the screws.

4. Replace the ribbon cable. Take care to line it up correctly.

Format the hard drive for the Transient Daughterboard

Before the new hard drive can be used, it must first be formatted by the Transient Daughterboard.

Prerequisites

- Power on the system.
- Ignore any hard drive error messages produced by the Transient Daughterboard on the HyperTerminal monitor.
- When the system has booted, use the DHM_III program (located in the C:\inetpub \ftproot\bin\Tools directory) to format the hard drive.

Procedure

1. Launch DHM_III.exe.
2. Select the Transient menu.
3. Click Format Hard Drive.

Postrequisites

When the drive has been formatted, reboot the unit. Ignore any hard drive error messages produced by the Transient Daughterboard on the HyperTerminal monitor.

When the POST process is complete, the firmware will automatically prepare the hard drive with the Transient File System. This process may take up to an hour.

Reboot the unit. The boot process should now complete normally with no hard drive error messages. If configured, Transient data collection should begin, indicated by a flashing hard drive indicator on the Processor front panel.

4.7 CSI 2600 signal inputs

The CSI 2600 is designed to receive voltage signals directly from sensors or from sensor support modules. The online database will store the collected sensor signal in the appropriate engineering unit, such as acceleration, velocity, displacement, and pressure.

Signals from 4-20 mA devices, RTDs, thermocouples, and other specialized sensors require external conditioning electronics that convert the sensor signal into a voltage signal the CSI 2600 can accept on its BNC input panel. The CSI 2600 can supply power to piezoelectric sensors from the BNC connection.

The CSI 2600 has 4 BNCs for tachometer inputs on the rear panel. The tachometer BNC inputs accept voltage signals only and do not furnish tachometer power.

When the CSI 2600 is in transient data collection mode, not all signals connected to a CSI 2600 need to be designated as transient. But since the Transient system is used to detect unexpected events using its continuous monitoring capability, it's best to designate every channel to be transient to make sure a special event is not missed.

4.8 6510 Signal Input module

The 6510 Signal Input module combines the features of Signal Input, Tachometer Input, and I/O Relays to allow a combination of sensor and relay types in one module.

The 6510 provides 12 channels of vibration or process sensor inputs, 2 channels of tachometer sensor inputs, and 2 optically-isolated I/O relay channels.

See *Section A.2.2* for specific calibration information.

Figure 4-5: 6510 Signal Input module

4.8.1 Vibration signal inputs

The vibration sensor types include accelerometer, passive velocity, active velocity, and displacement. The Signal Input module will also accept non-specific AC or DC inputs from any source that conforms to the input range limits.

The vibration inputs provide the following programmable functions for each channel: Input Attenuator /1, /2, Gain x1, x10, integrator on/off. In *Table 4-1*, the combination of input attenuator and gain setting provide four input range combinations.

Table 4-1: Signal input module input ranges

Attenuator	Gain	Input Range +/-
/2	x1	10.0 V, 100 g, 100 ips, 50 mil

Table 4-1: Signal input module input ranges *(continued)*

Attenuator	Gain	Input Range +/-
/1	x1	5.0 V, 50 g, 50 ips, 25 mil
/2	x10	1.0 V, 10 g, 50 ips, 5 mil
/1	x10	0.5 V, 5 g, 5 ips, 2.5 mil

The integrator allows acceleration signals to be converted to velocity.

The 6510 Signal Input module selects 2 of the 12 vibration channels at a time and routes them to the Processor module for spectral analysis. RMS-to-DC conversion is performed on all 12 channels. The RMS and DC signals are routed to the Processor module for Gross Scan collection.

The Transient Filter Board is required for Transient data acquisition.

To measure 4-20 mA signals, add a resistor across the channel input. A typical value is 250 ohms, which converts 4-20 mA to 1-5 V. Maximum series resistor value is 1000 ohms.

4.8.2 Tachometer inputs

The Tachometer inputs allow measurement of two pulse tachometer sources per module. Tachometer sensor types may include, but are not limited to: eddy current sensor, Hall effect sensor, or TTL pulse type from various sources.

The Tachometer Input module features either fixed voltage trigger or “adaptive” automatic triggering. Triggering parameters may be set independently for each tachometer sensor input.

An input gain selection of x1 or x5 may be selected for each channel. A gain of x5 is recommended for tachometer inputs smaller than 1 V pk-pk. If the x5 input gain is used, care should be taken to make sure that the input signal remains within +/-24 V, including any sensor bias or gap voltage.

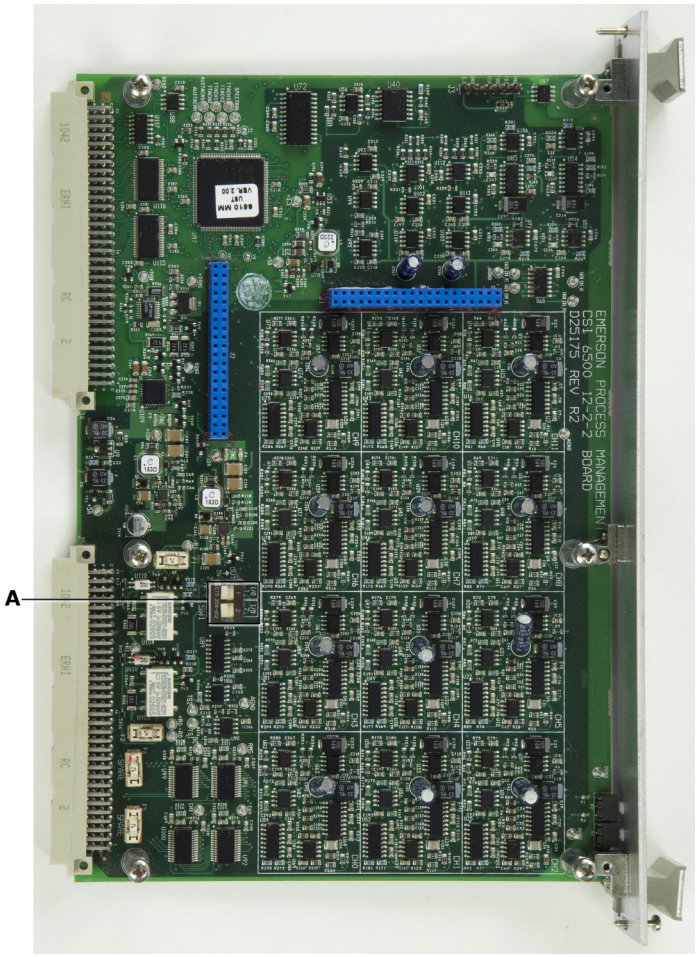
4.8.3 I/O relay channels

Each 6510 Signal Input module has two I/O relay channels that provide optically isolated discrete inputs or dry contact outputs. Inputs can be between 5 V and 24 VDC. Outputs are limited to 24 VDC @ 0.5 A.

Note

AC relays are not provided.

Figure 4-6: Signal Input module PCB



A. I/O relay DIP switches

Each I/O Relay channel on the 6510 Signal Input module contains both input and output hardware. The relays are configurable as either input or output relays, with a DIP switch (SW) on the circuit board. A relay channel that is configured in software cannot be used unless the corresponding DIP switch is set to the correct position. The firmware will detect the DIP switch state at startup and generates a flag in the HyperTerminal session if the software configuration does not match the DIP switch setting. The DIP switches are used to protect a user input device from inadvertently being shorted by a relay output configuration.

Set the corresponding DIP switch to the ON position for output relays, and to the OFF position for input relays. The factory default state of the DIP switches is OFF (Input). DIP switch 1 is for the first relay channel and DIP switch 2 is for the second relay channel.

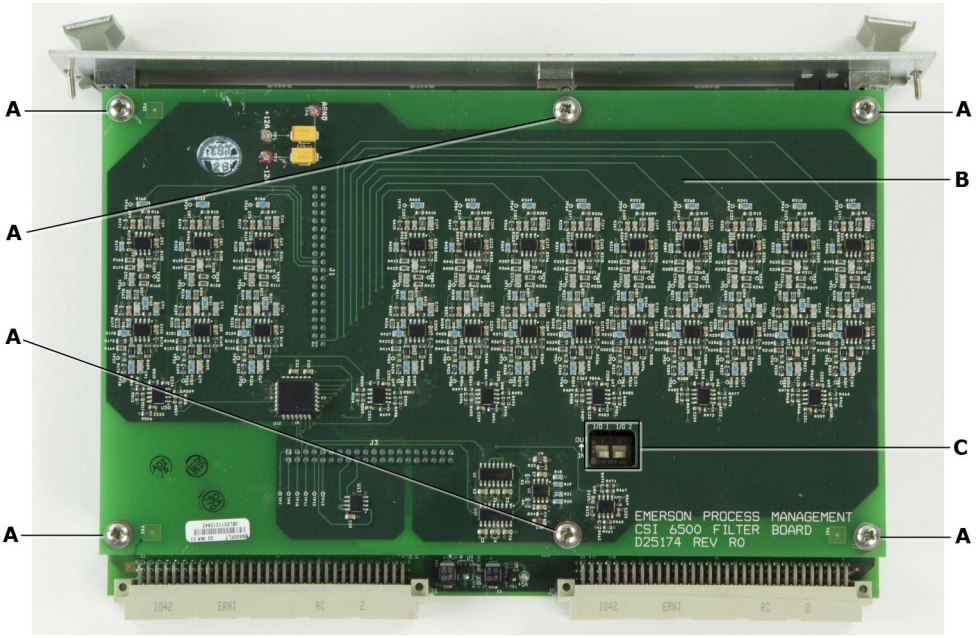
The shelf-state of the output relays is normally open, meaning that when the power to the unit is disconnected, the relays are open. While operating the unit, the relays are typically closed until activated by an alarm, but they can be configured either way.

4.8.4 Transient Filter Board

The Transient Filter Board provides parallel anti-aliasing filters for the signal channels on the Signal Input module. Either one or two Transient Filter Boards may be used to configure either a 12- or 24-channel Transient System.

When installing the Transient Filter Board on the Signal Input module, make sure both mating connectors are fully engaged, then install all six mounting screws.

Figure 4-7: Transient Filter Board PCB mounted on a Signal Input module



A. Mounting screw positions
B. Transient Filter Board
C. I/O relay DIP switches

4.9 Mounting accelerometers

4.9.1 Handling accelerometers

General purpose accelerometers are susceptible to mechanical shock. Take precaution when handling sensors. When magnetically mounting sensors, it is possible to generate shock loads that will damage sensors and void the manufacturer's warranty. To prevent damage, gently rock magnetic sensors into place.

⚠ WARNING!

Do not drop, hammer, or impact the sensor housing before, during, or after installation.

⚠ CAUTION!

Do not exceed specified torque when tightening stud-mounted accelerometers. Over-tightening accelerometers will damage sensing elements and void the manufacturer's warranty.

Although the integral cable has built-in strain relief, avoid excessive pulling force during cable pulls. Secure cable to the machine near the point of sensor installation.

⚠ CAUTION!

Do not exert more than 5 lbs pull force directly on sensor/cable connection during wire pulls.

If sensor mounting occurs before cable is pulled in conduit or raceway to junction box, leave cable bundled and secured to the machine. Sensor cable cannot be stepped on or severely kinked, or permanent signal degradation will occur. Cable bundle should also not be placed in such a manner that it will cause undo strain at the sensor/cable connection.

4.9.2 Tools and supplies

Mounting tools

- Drill
- Spot face or end mill tool

The spot face tool attaches to a standard electric drill and provides a machined surface at least 1.1 times greater than the diameter of the sensor. At the same time, the spot face tool also drills a pilot hole that can then be tapped for the stud mounted sensor.

The spot face tool can be purchased from Emerson or a spot face tool with similar characteristics may be substituted as required. Contact your local sales representative for assistance.

Figure 4-8: Spot face or end mill tool

For epoxy mounting, the following are also necessary:

- 2-part epoxy (e.g. Loctite Depend [Emerson P/N A92106] or comparable)
- A212 Mounting Pads

- (Optional) Grinder – to create a sufficiently flat mounting surface

Accelerometer attachment tools and supplies

- 40-200 in. lb torque wrench with 1/8 in. hex bit

  Suggested vendor: Grainger

  Part number: 4JW57

  Description: 3/8-in. drive in. lb torque wrench. Any torque wrench with a range of 40 to 70 in. lb and less than 5 in. lb increments can be substituted.
- 1/4 in. 28 taps and tap handle
- 9/16 in. open-end wrench
- 1/8 in. hex Allen key
- Wire brush
- Plant-approved cleaner/degreaser
- Plant-approved semi-permanent thread locker (e.g. Loctite)

4.9.3 Surface preparation: stud mount

Note
The mounting location must provide a flat surface, 1 in. in diameter. If this is not possible, an alternative mounting procedure must be used. Do not proceed; contact the project manager.

Note
The mounting location must provide a case thickness exceeding 0.4 in. If this is not possible, an alternative mounting procedure must be used. Do not proceed; contact the project manager.

Stud mount

1. Prepare the spot face or end mill tool by setting the drill bit depth to a minimum of 0.325 in. (325 mils).
2. Using a wire brush and plant-approved cleaner, clean and degrease the surface area.
3. Keeping the spot face/end mill tool perpendicular to the machine surface, drill into the mounting location until the surface is smooth to the touch with no noticeable irregularities. This may require the spot face tool to remove as much as 0.04 in. (40 mils) or more from the surface.

   Note
   If the spot face is not uniform on all sides, this is an indication that the spot face tool is not perpendicular to the mounting surface and the resulting surface will not allow the sensor to be mounted properly.

4. Using 1/4 in.-28 tap set, tap a pilot hole to a minimum depth of 0.25 in. (250 mils).

Refer to Figures *Figure 4-9* through *Figure 4-11* for illustrations on the stud mount method.

Figure 4-9: Correct (left) and incorrect (right) milling processes

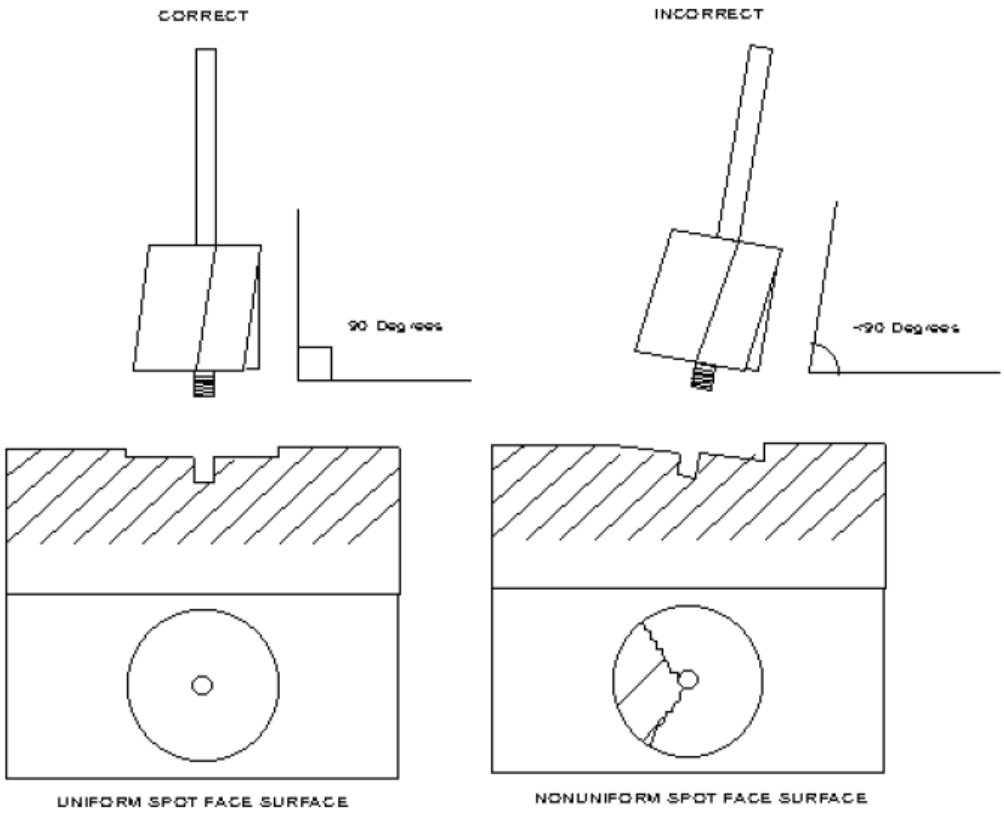


Figure 4-10: Milling process for sensor mounting

This spot facing should result in a uniform seat being created.

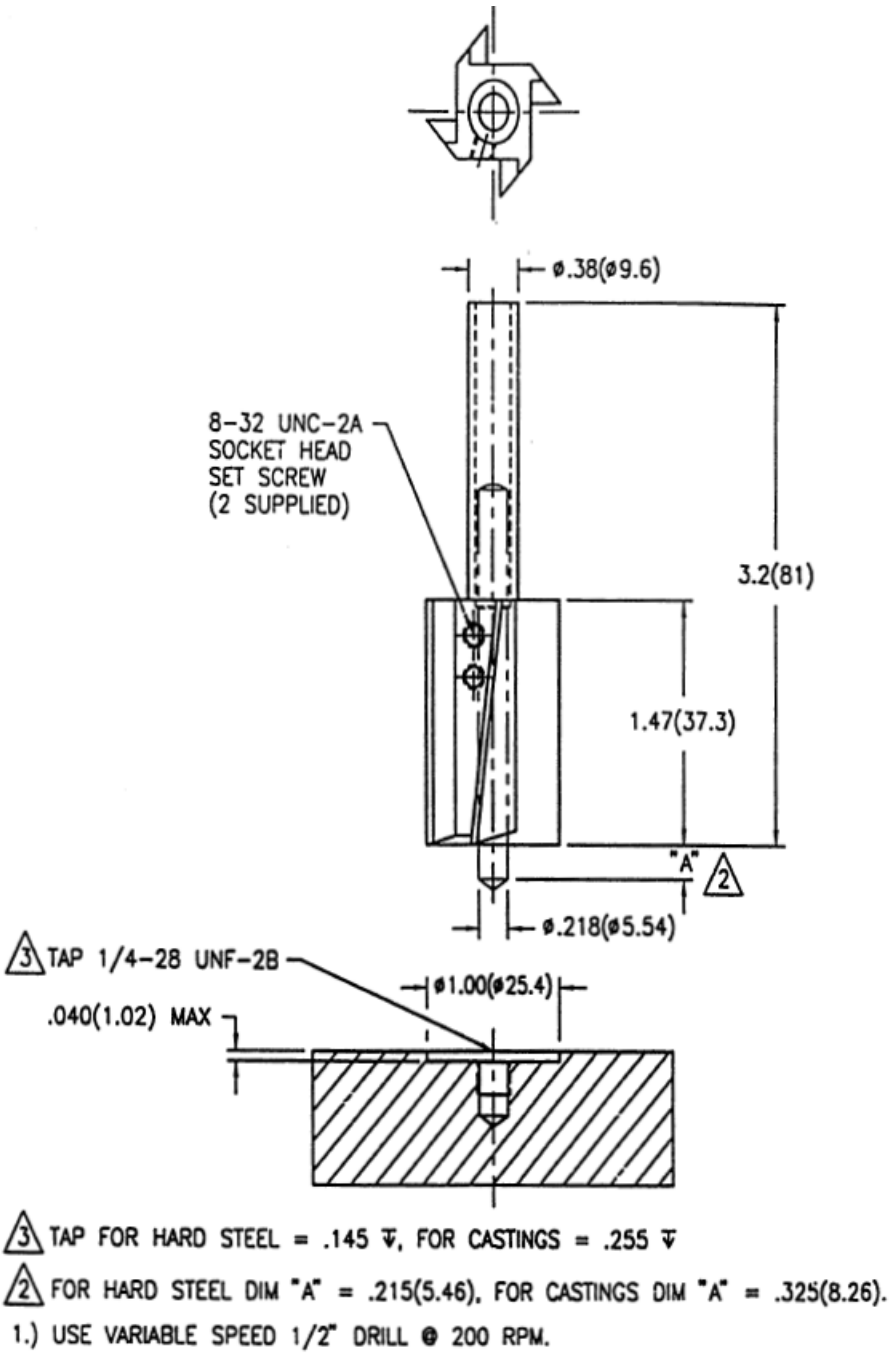
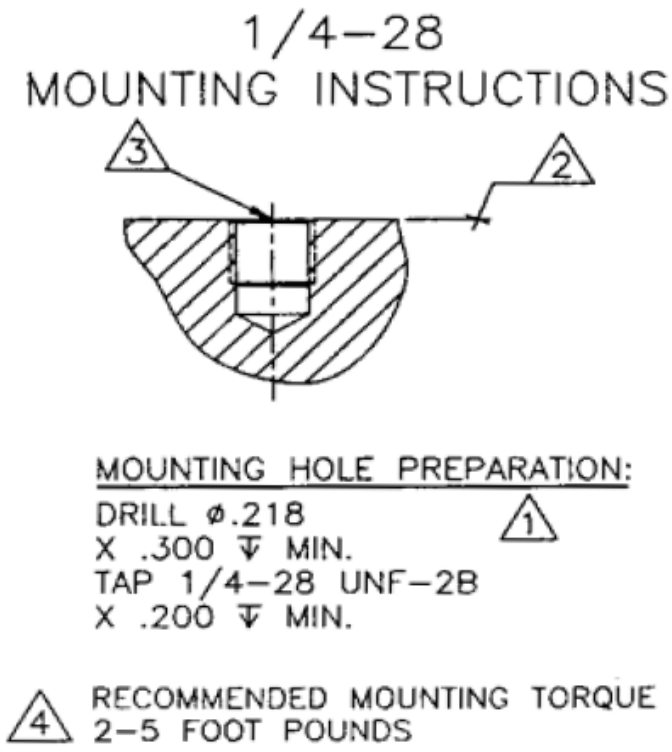


Figure 4-11: Tapping a pilot hole



4.9.4 Surface preparation: epoxy mount

Note

The mounting location must provide a flat surface, 1 in. in diameter. If this is not possible, an alternative mounting procedure must be used. Do not proceed; contact the project manager.

Epoxy mount

1. If the equipment surface has a radius of curvature that is less than 4 in., grind a flat surface approximately 1/2 in. diameter.
2. Using the wire brush and plant-approved cleaner, clean and degrease the surface area.
3. Using a 2-part epoxy (such as Emerson P/N A92016), spray the activator onto the mounting surface.
4. Place a light coat of epoxy on the surface of the mounting pad (such as Emerson P/N A212) and hold firmly against the machine spot face surface for 1 minute.

   If the adhesive does not set within 1 minute, it is an indication that too much epoxy is applied or that the mounting surface is not prepared properly. Repeat steps 2 through 4.

4.9.5 Install mounting studs

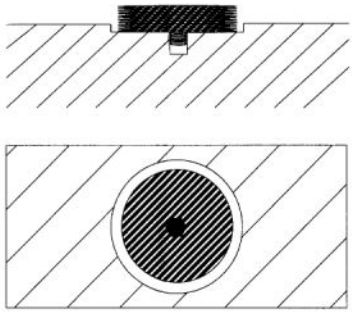
For use when installing A911 mounting stud or A0322 Quick-Connect base.

Procedure

1. Using a plant-approved degreaser, remove any lubricating fluid used during the tapping process.
2. Using a plant-approved epoxy, rub a small amount of epoxy onto spot face.
3. Using a 0.25 in. allen wrench, loosely screw a mounting base into the mounting location.
4. Using a torque wrench with a 0.25 in. hex bit, torque to 7-8 ft-lbs.

   If the mounting base is not seated against the spot face after torquing, the tap was not deep enough.
5. If the sensor will not be mounted immediately, cover exposed quick-connect threads to prevent contamination. Industrial tape is recommended.

Figure 4-12: A911 Quick-Connect



4.9.6 Mount accelerometers

Prerequisites

Note

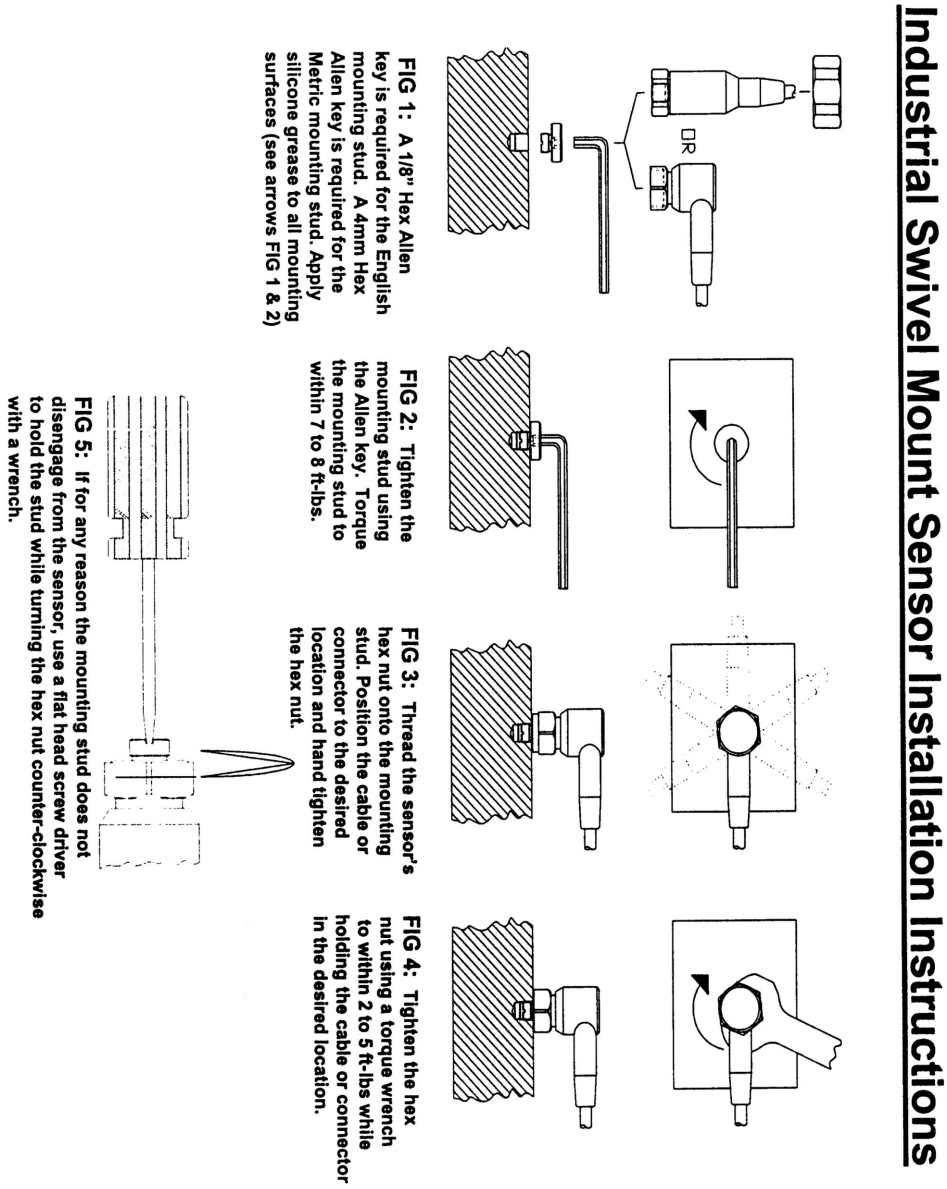
If you are not ready to pull cables, do not mount sensors on the machine. If it is necessary to mount a sensor, the bundled cable must be secured to the machine and protected from damage.

Procedure

1. Using a plant-approved cleaner/degreaser, remove any lubricating fluid used during the tapping process and clean the mounting stud threads.
2. Rub a small amount of semi-permanent thread locker onto the mounting location.

3. Place the sensor onto the mounting stud and hold it to create the least amount of cable strain and cable exposure. While holding the sensor, hand-tighten the 9/16 in. captive nut and use a torque wrench with the 9/16 in. open end to finish tightening to 50–60 in-lbs.
4. Secure sensor cable to the machine approximately 4–5 in. from the mounting location using an appropriately sized cable clamp. Do not exceed bending radius of 2.8 in.

Figure 4-13: Sensor installation for industrial swivel mounts



4.9.7 Mount accelerometers without Quick-Connect

Prerequisites

Note

If you are not ready to pull cables, do not mount sensors on the machine. If it is necessary to mount a sensor, the bundled cable must be secured to the machine and protected from damage.

Procedure

1. Using a plant-approved cleaner/degreaser, remove any lubricating fluid used during the tapping process and clean the mounting stud threads.
2. Rub a small amount of semi-permanent thread locker onto the mounting location.
3. Hand-tighten the mounting stud into the sensor housing, and use a 9/16 in. torque wrench to tighten the sensor and mounting stud into mounting location to 5 ft-lbs.
4. Secure sensor cable to the machine approximately 4–5 in. from the mounting location using an appropriately sized cable clamp. Do not exceed bending radius of 2.8 in.

⚠ CAUTION!

Mount the sensor to the machine before terminating or securing cable to the machine.

4.10 Mounting tachometers

4.10.1 Handling passive magnetic tachometers

The passive magnetic tachometer is installed near moving machinery—typically a rotating shaft. Observe clearances between the sensor and the target, and observe cable clearances.

⚠ CAUTION!

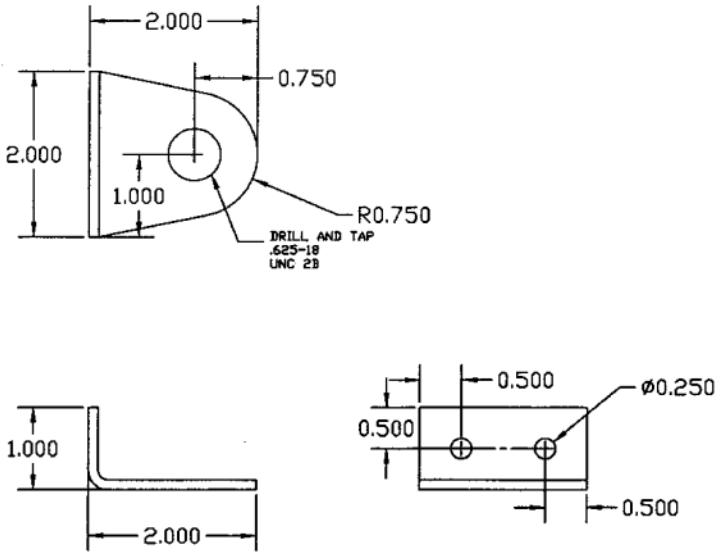
The tachometer can be damaged if proper clearance is not maintained between the sensor and the actuator. Follow installation procedures to set proper clearance.

4.10.2 Tools and supplies

The included mounting bracket and locking nut are required to install passive magnetic tachometers.

The universal mounting bracket will fit a variety of applications. If the included bracket will not work, then the contractor will have to fabricate a custom bracket.

Figure 4-14: Mounting bracket for a passive magnetic tachometer



4.10.3 Actuator choice: guidelines

Actuator dimensions

Some passive magnetic tachometers are designed to be used with a key meeting the following minimum specifications:

Figure 4-15: Key dimensions

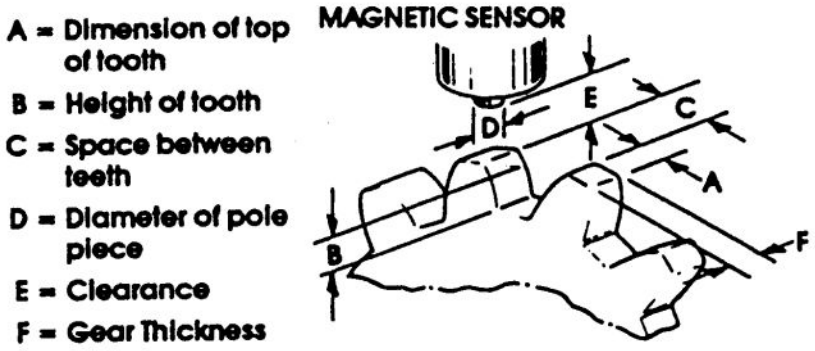


Table 4-2: Key dimensions

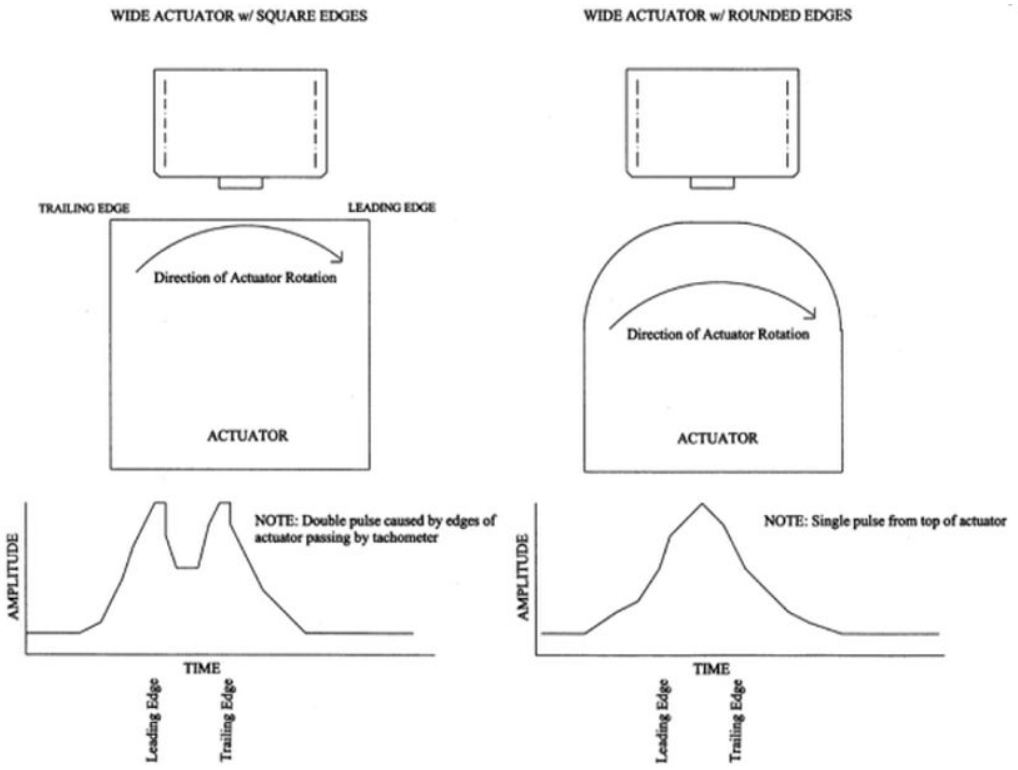
A	Dimension of top of tooth	>0.15 in.
B	Height of tooth	>0.5 in.

Table 4-2: Key dimensions *(continued)*

F	Gear thickness	>0.3 in.

If the chosen actuator has a dimension that must be greater than 0.5 in., round the edges of the actuator to allow the sensor to be as close as possible to actuator.

Figure 4-16: Modifying large actuators



Actuator material

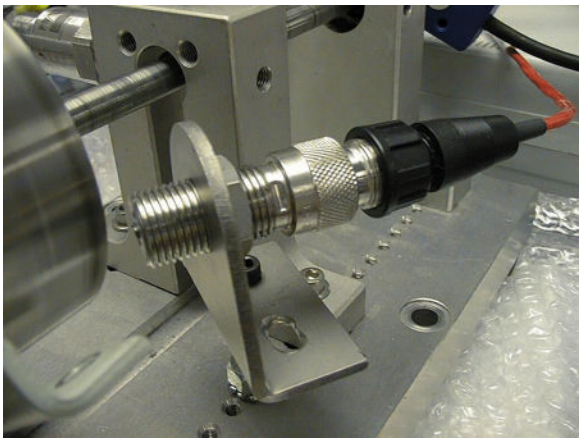
The actuator must be made of a metallic material with a high permeability. Ideal actuators are soft iron, cold-rolled steel, and #400 stainless steel.

4.10.4 Mount the sensor bracket

1. Turn the machinery shaft so that the actuator is at the mounting location.
2. Place the sensor in the mounting bracket and screw the sensor into the bracket, exposing an equal amount of thread on the back and front of the mounting bracket.
3. Place the sensor/bracket assembly into the mounting location and center the sensor pole piece over the actuator so the pole piece touches the actuator. Mark the hole locations on the bracket.

4. Drill and tap hole locations for an appropriately sized bolt to fit a 0.25 in. opening on the mounting bracket.
5. Secure the bracket to the mounting location and torque to bolt specifications.

Figure 4-17: Mounted passive magnetic tachometer



4.10.5 Mount tachometers

1. Screw the locking nut onto the sensor and thread completely onto the sensor.
2. Screw the sensor into the mounting bracket until the sensor pole piece contacts the actuator.
3. Back off the sensor 1 full turn.
4. While holding the sensor in place, thread the locking nut against the mounting bracket. Torque to 15 ft-lbs.
5. Slowly turn the shaft and confirm that the actuator does not contact the sensor.

   If sensor is contacting the shaft, loosen the lock nut and repeat steps 3 and 4.
6. Run the machinery at full speed and confirm that the sensor does not contact the actuator. Let the machine reach normal operating temperature and run through all operational speeds.
7. Observe the machinery during coastdown, and confirm that the sensor does not contact the actuator.
8. Cover exposed connector threads with the included protective cap to prevent contamination.

4.11 Eddy current sensors

Eddy current sensors are also supported.

Installation instructions for eddy current sensors PR6422–PR6426 and probe drivers CON011–CON041 are part of the manuals packaged with your sensors.

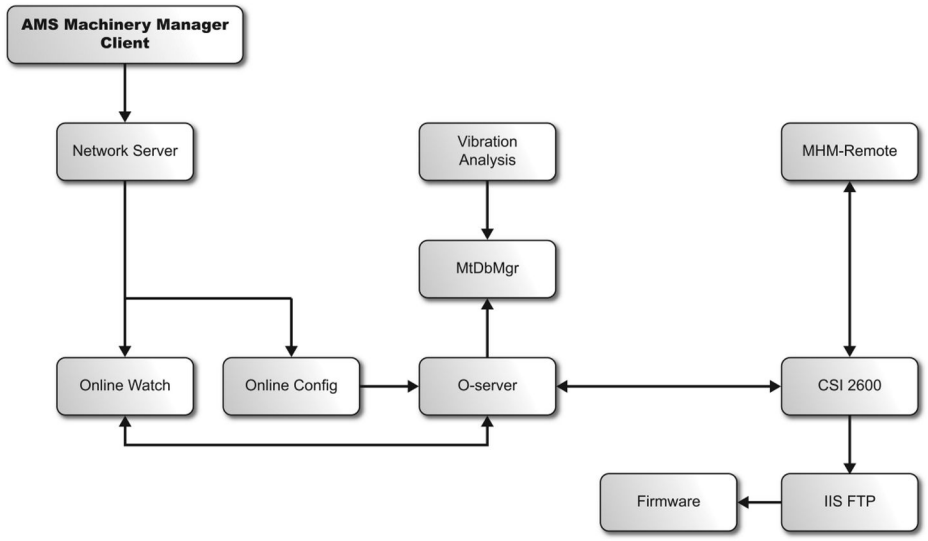
5 Software configuration

Topics covered in this chapter:

- *System overview diagram*
- *Connect the CSI 2600 to the network server*
- *Configuration overview*
- *Install AMS Machinery Manager*
- *Configure the computer's IP address*
- *Configure the FTP server to download firmware*
- *Configure boot parameters with a terminal emulator*
- *Add an Online Server to RBM Network Administration*

5.1 System overview diagram

Figure 5-1: System overview diagram



- Network Server—Service responsible for handling the user's access to the various programs within the AMS Machinery Manager software.
- Online Watch (O_watch)—Graphic interface that allows:
  - viewing of data sent to the server by the CSI 2600
  - management of transient acquisition and auto-extraction

  - adjustment of alarm levels
  - on-demand data acquisition
- Online Configuration (O_config)—Program that allows the creation and modifying of databases for use with the online system, along with system commissioning.
- Vibration Analysis (Diagnostics)—Application that allows the user to request and save transient data and view live streaming data. It provides a variety of analysis functions necessary for analyzing the data generated by the CSI 2600.
- CSIMtDbMgr Service—Handles most of the reading and writing operations performed on databases stored on the server. It also indexes and verifies the integrity of databases.
- Online Server (O_server)—The central process service which handles all predictive activity on the online system. It is responsible for processing requests from the client, sending configuration information to the CSI 2600, and receiving data from the CSI 2600.
- MHM Remote—Service that handles transient data generated by the CSI 2600, and database access required by the Vibration Analysis program.
- CSI 2600—Hardware portion of the monitoring system; a portable unit that is connected to the server through Ethernet.
- IIS FTP—Microsoft's IIS includes an FTP server which needs to be installed to allow the CSI 2600 to load firmware from the server.
- Firmware—The firmware consists of two files which are loaded from the computer during the boot up of the CSI 2600. This allows most system updates to be installed on the computer like any other program update without the requirement of any special interaction with the CSI 2600 beyond rebooting it to allow the new version to load.

5.2 Connect the CSI 2600 to the network server

After configuring the CSI 2600 with an IP address on the same network as the Network Server, connect to the network server through the Ethernet cable.

Procedure

1. If you are using a computer, connect a standard Ethernet cable (included) to connect the unit's Hub port to the computer.
2. If you need to connect to a Local Area Network to connect to the network server, connect a standard Ethernet cable (included) to the unit's NIC port.

5.3 Configuration overview

The CSI 2600 is a network-based system. The monitoring unit communicates with a server through an Ethernet connection. In order for the unit and the server to successfully communicate, both must have addresses known to each other. The addresses can be

changed, but AMS Machinery Manager must contain the correct IP address for the CSI 2600, and the CSI 2600 must contain the IP address of the FTP server from which to download its firmware.

Complete the following steps (each detailed later in this chapter) to configure the computer you use to connect to the unit:

1. Install AMS Machinery Manager on the computer.
2. Configure the computer's IP address.
3. Configure the FTP server to download firmware.
4. Configure boot parameters with a terminal emulator.
5. Add an online server to RBM Network Administration.

Note

If a computer is purchased from Emerson, this configuration is already complete.

5.4 Install AMS Machinery Manager

Install AMS Machinery Manager on your computer with the following options checked:

- Network Server
- Online Server
- AMS Machinery Manager Client

Refer to your software user guide for these details.

5.5 Configure the computer's IP address

Follow your operating system's instructions for changing the computer's IP address.

Procedure

1. Make a note of your computer's current settings.
2. Change the IP address assigned to the computer Ethernet port to the address expected by a CSI 2600.

Table 5-1: Example CSI 2600 system IP addresses

CSI 2600 Main Processor IP	192.168.0.10
CSI 2600 Transient Processor IP	192.168.0.11
Computer IP	192.168.0.1

5.6 Configure the FTP server to download firmware

Firmware is installed in directory C:\Inetpub\ftproot\bin\ in a folder with a name for the product model: 2600 or 2600T.

Each time a CSI 2600 powers up, it scans its network connection looking for the address that matches an address stored in internal CSI 2600 memory, and then for firmware at this directory location. If firmware is found, its version is read and compared to a copy of firmware stored in internal CSI 2600 memory. If the firmware is the same revision, then the CSI 2600 boots from its internal copy. If it has a different revision, then the CSI 2600 downloads newer firmware, boots using it, and stores a copy of this newer firmware in internal memory.

Unless otherwise specified, CSI Machinery Health Monitor systems are pre-configured and set up during commissioning.

The FTP service must be configured on a computer on the network so that a CSI Machinery Health Monitor can obtain firmware updates. If an FTP site is not available, the CSI Machinery Health Monitor boots from the firmware stored in memory. The FTP service is a Windows Feature that is available but not enabled by default on Microsoft Windows. Refer to your Microsoft Windows Operating System instructions to enable the FTP Server and set up an FTP site. These instructions are an overview of the steps to configure an FTP server for the CSI 6500 on Windows 7 and Windows 2008 R2.

Procedure

1. Go to Control Panel > Programs > Programs and Features and selectTurn Windows Features on or off.
2. Expand Internet Information Services (IIS) and select the following features: FTP Server, FTP Service, and IIS Management Service.

   Microsoft Windows configures the services.
3. Launch Internet Information Services Manager.

   To find the program, go to Start, type IIS in the search box, and select Internet Information Services (IIS) Manager.

   Internet Information Services (IIS) Manager opens.
4. In the Connections pane, expand the computer node, right-click Sites and select Add FTP Site.

   The Add FTP Site dialog appears.
5. Complete the steps in the wizard and configure the settings to match the FTP settings on the CSI Machinery Health Monitor according to the following example.

Table 5-2: CSI Machinery Health Monitor FTP configuration

Setting	Description
Site name	The FTP site name to display in IIS Manager. This is for your reference.
Physical path	The path to the bin directory where the firmware will be installed on the FTP server (do not include the bin directory). C:\Inetpub\ftproot, for example.
Binding	Set Binding to All Unassigned or the IP address or a range of IP addresses assigned to this computer. Do NOT enable virtual host names.
Start FTP site automatically	Allow the site to start automatically. Check Start FTP site automatically.
Security	Choose Allow SSL and do not select a certificate.
Authentication	Choose Anonymous if the CSI Machinery Health Monitor's user (u) and password (pw) boot parameters are set to anonymous.
Authorization	Choose Anonymous users if the CSI Machinery Health Monitor's user (u) and password (pw) boot parameters are set to anonymous.
Permissions	Read

The FTP site name appears in the Connections pane and the site is started.

Postrequisites

Install the firmware on this computer. You can store the firmware for different hardware models on the same FTP server.

Table 5-3: CSI Machinery Health Monitor FTP settings

Boot parameter	Definition	Default settings
host inet (h)	The IP address of the FTP server	192.168.0.1
user (u)	The username for the FTP account	anonymous
ftp password (pw)	The password for the FTP user	anonymous

5.6.1 CSI Machinery Health Monitor firmware update

Emerson Process Management periodically releases updates to firmware. When you update your AMS Machinery Manager software, it is a good practice to update the firmware if a new version is available. Refer to the Readme file (Readme.rtf) on the Software Installation DVD for information about the current firmware version. These instructions apply to the following CSI Machinery Health Monitor systems:

- CSI 6500 Machinery Health Monitor
- CSI 2600 Machinery Health Expert
- CSI 4500 Machinery Health Monitor

Install the firmware on the FTP server

Prerequisites

You need the AMS Machinery Manager Software Installation DVD.

Procedure

1. Log on to the computer that hosts the FTP Server for your CSI Machinery Health Monitor.
2. Insert the AMS Machinery Manager Software Installation DVD.
3. Open the DVD in Windows Explorer and browse to Install/Online Firmware.
4. Double-click setup.exe and continue through the installation.

Important
On Windows 7 and Windows Server 2008, right click setup.exe and select Run as administrator.

5. Accept the license agreement.
6. Select the type of installation.
   - Select Typical to install the firmware and tools.
   - Select Custom to choose to install either the firmware or the tools.
7. Follow instructions presented by the installation program.

The online firmware is installed in C:\Inetpub\ftproot\bin\.

Postrequisites

Cycle the power on each CSI Machinery Health Monitor that uses this FTP server.

Reboot the CSI Machinery Health Monitor

Cycle power on the CSI Machinery Health Monitor and verify the system is in good status after it boots.

Procedure

1. Cycle the power on each CSI Machinery Health Monitor that needs to get the new firmware update from the FTP server.
2. Wait approximately 5 minutes for the system to complete the boot process.
3. Verify the system is powered on and in good status.

   Refer to the Installation Manual for your specific hardware model for more information.

Check the firmware version in AMS Machinery Manager

1. Log on to AMS Machinery Manager Client with the Administrator user account or a user that has permission to use online technology.

2. Go to Tools > Setup/Communications > Online Configuration.

   The Online Config window appears.

3. Go to File > Online Server > Open.

   The Select Online Server Host Computer dialog appears.

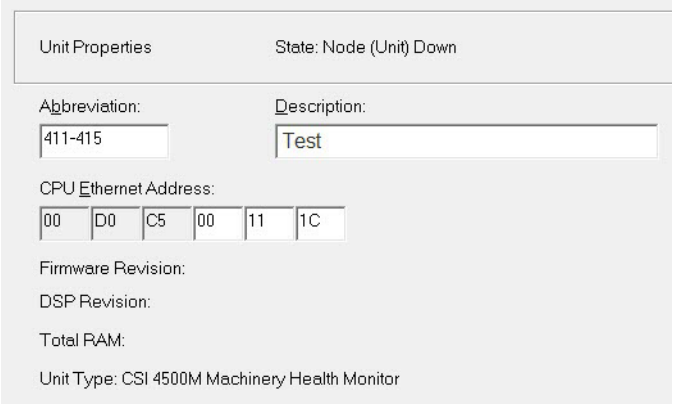
4. Choose a server name from the menu and click OK.

   The Online Server opens and a tree structure appears in the left pane of the Online Config window.

5. In the tree structure, expand Units folder, and right-click the icon next to the CSI Machinery Health Monitor you want to check and select Properties.

   The Unit Properties screen appears in the right pane and displays the State, Firmware Revision, DSP Revision, Total RAM, and Unit Type.

Figure 5-2: Unit properties



6. In the Unit Properties pane, verify State is Node(Unit)UP and Firmware Revision matches the version you installed.

   Contact Product Support for help if the firmware version does NOT match.

5.7 Configure boot parameters with a terminal emulator

During normal usage, it is unlikely that you will need to change the initial boot parameters. However, two situations may require changes to boot parameters:

- The CPU or Transient board is being replaced, and the replacement board has different boot settings.
- The CSI 2600 is added to an existing Ethernet network that is not directly connected to the online server through a dedicated cable.

Note

Do not add a CSI 2600 to an existing ethernet network until its IP addresses (CPU board, Transient board) have been verified and changed, if necessary, to be compatible with addresses already in use on the existing network.

Procedure

1. Turn on the CSI 2600 and start a terminal session.

   A screen similar to the following will appear during the boot process:

Figure 5-3: HyperTerminal System Boot screen

```
VxWorks System Boot
Copyright 1984-2002 Wind River Systems, Inc.
CPU: CSI 6500
Version: 5.5
BSP version: 1.2/4.00f
Creation date: May 5, 2008, 10:38:03
Image: bootrom
Press any key to stop auto-boot...
```

2. When the boot process has completed, type bootChange and press Enter to configure the unit. This command is case-sensitive.

   A list of boot parameters appears one line at a time. When configuring the Main Processor, the screen will look similar to this:

Figure 5-4: Main Processor boot parameters

```
boot device                          :shend0
processor number                     :0
host name                            :
file name                            :bin/6500
inet on ethernet (e)                 :192.168.0.10:ffffff00
inet on backplane (b)                :
host inet (h)                        :192.168.0.1
gateway inet (g)*                    :
user (u)                             :anonymous
ftp password (pw) (blank = use rsh)  :anonymous
flags (f)                            :0x1009
target name (tn)                     :
startup script (s)                   :
other (o)                            :
* If a gateway is used, the address must be specified as a boot parameter.
```

   When configuring a Transient Processor, the screen will look similar to this (note the difference in the file name value, which includes a "t" for Transient, and the different boot flags:

Figure 5-5: Transient Processor boot parameters

```
boot device                          :shend0
processor number                     :0
host name                            :
file name                            :bin/6500t
inet on ethernet (e)                 :192.168.0.11ffffff00
inet on backplane (b)                :
host inet (h)                        :192.168.0.1
gateway inet (g)                     :
user (u)                             :anonymous
ftp password (pw) (blank = use rsh)  :anonymous
flags (f)                            :0x1409
target name (tn)                     :
startup script (s)                   :
other (o)                            :(IP Address of WINS server, if configured)
```

Note

Only change boot flags under the direction of Emerson Product Support.

If allowed to complete without interruption, the boot process should finish with a screen similar to this:

Figure 5-6: HyperTerminal Boot Complete screen

```
Cfg Table Last "Put" (GUID: 0x774059b0-e72b-4e09-a690fc0c10ab007d)
(GUID time: 2008-08-13 19:09:29)
Component          Last Calibrated
---------------    -----------------------------------
DIO                2008-08-13 19:09:25
GS                 2008-08-13 19:09:25
TACH               2008-08-13 19:09:25
SCHED              2008-08-13 19:09:26
PRED               2008-08-13 19:09:25
LIMIT              2008-08-13 19:09:26
TRANS              2008-08-13 19:09:29
EGU_FAC            Default Table
EGU_ASN            Default Table

BRS_initRamdisk_i32f: No browser disk image found in FLASH
Initializing empty browser RAM disk /browser...Succeeded.

/browser/ - Volume is OK
Base Modbus register table size (excluding DCS info): 0xcf8a (53130)
This unit will begin announcing its availability in 84 seconds

0x7942148 (t startup): HLTMON sysCheck i32f: All expected modules were successfully registered.
```

5.7.1 HyperTerminal navigation after boot complete

After typing bootChange in a HyperTerminal session, use the following commands to navigate:

Note

When modifying an entry, type the new setting. Do not attempt to backspace over an existing entry.

Table 5-4: HyperTerminal navigation commands

Key sequence	Description
Enter	Accept the value.
. (period)	Clear the value when you press the period key followed by Enter.
– (dash)	Go back to the previous parameter when you press dash followed by Enter.
Ctrl + B	Toggle between Main Processor and Transient Processor.
Ctrl + T	Display/hide label that identifies the processor producing output to the screen.
reboot (case sensitive)	Reboot the board with new boot settings.

5.7.2 HyperTerminal navigation after boot interrupt

You may interrupt the boot process by immediately pressing Space after the VxWorks copyright is displayed. If you interrupt the boot process, use the following commands to navigate the boot configuration console.

The most commonly used commands are ?, @, P, and C.

Note

When modifying an entry, type the new setting. Do not attempt to backspace over an existing entry.

⚠ CAUTION!

Use only the first four commands (?, @, P, C) in *Table 5-5*. Contact Emerson Product Support before using the other commands.

Table 5-5: Boot interrupt navigation commands

Command	Description
?	Print this list
@	Continue boot (load and go)
P	Print boot parameters
C	Change boot parameters
g adrs	Go to adrs
d adrs[,n]	Display memory
z adrs	Modify memory
f adrs, nbytes, value	Fill memory
t adrs, adrs, nbytes	Copy memory
e	Print fatal exception
n netif	Network interface device address and other important information

5.7.3 Configure access to a CSI Machinery Health Monitor from a computer

Use a terminal emulator such as Telnet or HyperTerminal to connect to the CSI Machinery Health Monitor using a serial cable or an ethernet cable.(1) Configure the settings in *Table 5-6* in the terminal emulator's connection settings.

Prerequisites

You need a username and password to log on to a CSI Machinery Health Monitor with Telnet.

Table 5-6: Serial connection setup

Setting	Value
serial port	COM1
baud rate	9600
data bits	8
stop bit	1
parity	none
flow control	none

5.7.4 Boot parameters

Table 5-7: Boot parameters

Boot parameter	Description
boot device	The device name of the system. • shend0 (CSI 6500 and DCMII systems) • cs (DCMI systems)
processor number	0
host name	The username for the FTP user.
file name	The path and filename of the firmware installed in the FTP site root directory (C:\inetpub\ftproot, by default). bin/6500 is the firmware for a CSI 6500. bin/6500T is the firmware for a CSI 6500T.
inet on ethernet (e)	IP Address and Subnet in Hex: 192.168.0.10:ffffff00
inet on backplane (b)	Intentionally blank.
host inet (h)	The IP address of the FTP server. Example: 192.168.0.1

(1) Telnet and HyperTerminal are Windows Features that are available but are not enabled by default. You can use other terminal emulator programs.

Table 5-7: Boot parameters *(continued)*

Boot parameter	Description
gateway inet (g)	The IP address of the gateway.
user (u)	The username for the FTP account. If the field is set to anonymous the system issues commands with no user. The FTP Server must be set up to allow connections from anonymous users.
ftp password (pw)	The password for the FTP user. If the field is set to anonymous the system issues commands with no user. The FTP Server must be set up to allow connections from anonymous users.
flags (f)	Boot flags. Refer to *Section 5.7.5* for a description of boot flag values. Add the boot parameters together to specify more than one boot parameter.
target name (tn)	(Optional) When you connect to an online system using a terminal session, the prompt (>) will be preceded by the target name, if set. If you have several terminal sessions open to different online systems, specify a unique target name on each unit to help you identify them.
startup script (s)	Intentionally blank. Contact Technical Support for information on using a startup script.
other (o)	(CSI 6500T only) IP Address of WINS server, if configured.

5.7.5 Boot flags

Notes

- This table covers DCMII, DCMIII, and Transient units.
  - DCMIII units include the CSI 6500 and CSI 6500T.
  - DCMII units include the CSI 4500 and CSI 4500T with blue faceplate (with or without display screens).
- Boot flags below are expressed in hexadecimal. To activate more than one boot flag at the same time, add them together using the Windows Calculator. Select View > Programmer, and fill the circle for Hex math.

Table 5-8: Complete list of boot flags

Boot Flag	Description
0x0001	Skip SDRAM testing on cold boot (for testing).
0x0002	Load local system symbols (for debug).
0x0004	Don't autoboot (for testing).
0x0008	Quick autoboot (no countdown).
0x0010	Disable input from shell.
0x0020	Disable login security.

Table 5-8: Complete list of boot flags *(continued)*

Boot Flag	Description
0x0040	Use BOOTP to get boot parameters (network boot only).
0x0080	Use TFTP to get boot image (network boot only).
0x0100	Use Proxy ARP (network boot only).
0x0200	Ignore BOOTROM update image in FLASH (for testing).
0X0400	Change Ethernet speed from 100 Mbps to 10 Mbps (Main Processor only).
0x0400	Redirect the console I/O to COM1 (Transient only).
0x0800	Disable boot file update in FLASH (for development).
0x0800	Boot over a WAN, requiring extended FTP timeouts. This flag applies only if one of three flags is set: 0x1000, 0x2000, 0x4000.
0x1000	Attempt network, fallback on FLASH boot (legacy 4500 mode).
0x2000	Boot ALWAYS from network, never fallback on FLASH.
0x4000	Boot ONCE from network. This flag clears itself after one boot.

5.7.6 Subnet masks

A subnet mask is normally represented in Windows as a series of four decimal numbers, each of which can have a value from 0 to 255, separated by periods (255.255.248.0).

In the 6560 Processor module, the subnet mask is represented as a series of four hexadecimal pairs with no separators (that is, 255.255.248.0 is represented as fffff800). A hexadecimal conversion table can be used to convert the subnet mask numbers from decimal to hexadecimal. The calculator in the Windows Accessories folder will also perform this conversion when it is set to Programmer Mode.

5.7.7 Specify a subnet mask

The subnet mask on a 6560 Processor module defaults to 255.255.255.0 (ffffff00).

Procedure

1. The subnet mask should be set to match the subnet mask used on the server PC.

   If they do not match, network communication failure is possible.

2. On the configuration labeled inet on ethernet, enter the IP address of the unit followed by a colon and then the subnet mask in the hexadecimal format.

5.8 Add an Online Server to RBM Network Administration

After you install AMS Machinery Manager Online Server, add the Online Server in RBM Network Administration.

Prerequisites

Install and set up an AMS Machinery Manager Online Server.

Procedure

1. In RBM Network Administration, select Online Server > Add Online Server.

   The Add Online Server dialog appears.

2. Click Browse.
3. In the Browse for Computer dialog, select a computer where AMS Machinery Manager Online Server has been installed and click OK.

   The computer name appears in the Add Online Server dialog.

   Note
   You can type the computer name in Online Server Name instead of browsing.

4. Click OK.

   The computer name appears in the Online Server pane.

5.8.1 Add a unit's IP address to the Online Server in RBM Network Administration

Prerequisites

Add an online server in RBM Network Administration.

The unit must have an IP address in the same network as that of the online server.

Procedure

1. In RBM Network Administration, select Online Server > Online Server Setup.

   The Online Server Setup window appears.

2. Select a server name from the Online Server menu.

   The Online Server box displays the AMS Machinery Manager database assigned to the selected Online Server. Active Units lists the CSI Machinery Health Monitors monitored by the selected Online Server.

3. If data is being collected, click Stop Data Collection.

Data collection must be stopped to make changes.

The Edit buttons become active.

4. Click Edit beside the Active Units box.

   A New Unit field appears.

5. Type in the IP address in New Unit and click Add New.

   The unit appears in the Active Units list.

6 Data collection and analysis

Topics covered in this chapter:

- *View or edit IP addresses with the unit*
- *Verify or assign IP addresses to the database*
- *Database configuration: overview*
- *Online Watch overview*
- *Archive management*
- *Create archives manually*
- *Disable archive predicates*
- *Stop transient acquisition*
- *Remove an archive from the Transient Archive Status tab*
- *Change databases when moving the unit to a new machine*

6.1 View or edit IP addresses with the unit

Verify the network addresses of the computer, the unit, and the database.

Procedure

1. Start a terminal session on the CSI Machinery Health Monitor.

   If you use a serial connection with PuTTy or HyperTerminal, you do not need a username and password.

   If you use a Telnet connection, log in with the following credentials. Both are case-sensitive:

   - username:csi
   - password: csiSupport

2. At the prompt, type bootChange and press Enter. This command is case-sensitive.

   A list of boot parameters appears one line at a time.

3. Press Enter to advance down the list of parameters.
4. Note the IP addresses in the following fields:

   The value in inet on ethernet is the IP address of the CSI 2600's Main Processor or Transient Processor.

   The value in host inet is the IP address of the computer where the FTP server is installed.

5. On your computer, view the IP address of the FTP server by following Windows' instructions for viewing IP addresses. Verify that this address matches the one shown in host inet.

6.2 Verify or assign IP addresses to the database

The online database must be configured with the IP addresses of assigned monitoring units.

Procedure

1. Log in to AMS Machinery Manager and click on RBM Network Administration.
2. In the RBMadmin window, double-click the server listed under the Online Server panel.
3. In the Online Server Setup window, the Active Units panel lists the IP addresses of units available for the online server.

   If the system is configured to store data in a database, a database will be displayed in the Machinery Health Manager Database frame, the two Edit buttons will be inactive, and the Stop Data Collection button will be inactive.

4. If necessary, assign the IP address of a CSI 2600 to Active Units.

   a. In the Online Server Setup window, click Stop Data Collection.
   b. Beside the Active Units panel, click Edit.
   c. In the Edit Online Server's Active Unit List window, type the IP address of a new CSI 2600 in the New Unit field.
   d. Click Add New.

      The IP address appears in the Active Units panel.

   e. Click OK.

      The Edit Online Server's Active Unit List window will close.

   f. In the Online Server Setup window, click Start Data Collection.

Once a CSI 2600 IP address is listed in RBM Network Administration, that address may be used for any existing or future database built with the online server. This task does not need to be performed each time a new database is built.

6.3 Database configuration: overview

Configuring a database is different for a CSI 2600 than for other online monitoring applications. In most cases, the CSI 2600 is not connected directly to sensors. Rather, it is connected through coax cable with BNC connectors to a panel of monitoring modules. These modules are connected to field wiring. Therefore, when building a database, it is important to have a diagram that shows what sensors are connected to which monitoring modules. In addition, an analyst who builds a CSI 2600 database needs to know if the monitoring modules perform any signal conditioning on the input signals before passing them through to their output connectors.

The CSI 2600 has the capability to provide bias voltage and current (+24 V / 4 mA) for accelerometers and must be in this configuration if connecting directly to accelerometers. However, if connecting to a module, it is likely that the module powers/biases the accelerometers and sensor power should not be turned on at each CSI 2600 signal connection.

6.3.1 Database configuration pre-requisites

Have the following information available before you begin to build a database:

- Sensors connected to each CSI 2600 signal channel; sensitivity, offset (eddy current sensors, thrust probes), signal range.
- Source of sensor power for accelerometers.
- Definition of the transient event (speed drops below 3585 RPM, input relay from external control system changes state, etc.)
- Sensors for which transient measurements are desired.
- IP address of a CSI 2600.
- Bearing clearances (radial eddy current sensors).
- Resting DC voltage measurements for radially mounted eddy current sensors.

6.3.2 Collection predicates

Predicates are conditions that have a value of True or False, and are used to guide measurement operations.

A Collection Predicate tells the system when to perform a routine data collection based upon the definition created in the database. Inputs into this type of predicate include:

- speed
- Gross Scan AC amplitude
- Gross Scan DC amplitude
- discreet input signal
- another predicate

An example of a Collection Predicate for a CSI 2600 transient operation would be "Speed below 3585 RPM". This predicate will have a value of False if speed is above 3585 RPM. It would have a value of True if speed is below 3585 RPM.

6.3.3 Configure a collection predicate

Use Online Configuration to create a collection predicate.

Procedure

1. In the tree structure in the left panel, expand Units, expand the CSI 2600 that will collect data, right-click the Predicates folder, and select Add Collection Predicate.
2. Enter a name for the predicate. Do not include spaces.

3. Click the Tach drop-down menu and select the tachometer to be used for acquisition.

   This will be a tachometer connected to CSI 2600 tach location 1, 2, 3, or 4.

   The Tach Clause dialog opens.

4. Click the Comparison drop-down menu and select an equation for the predicate.
5. Enter an RPM value in the Speed1 field.
6. Click OK.
7. Click Apply to finish.

6.3.4 Configure a database for transient operation

The CSI 2600 system may be used to simultaneously monitor machinery under normal operating conditions and to create a large archive of information for those signals designated (while building the database) as transient. All sensor connections to the CSI 2600 are configured for predictive operation. Some (or all) of these are also designated as transient and are configured for transient operation.

Procedure

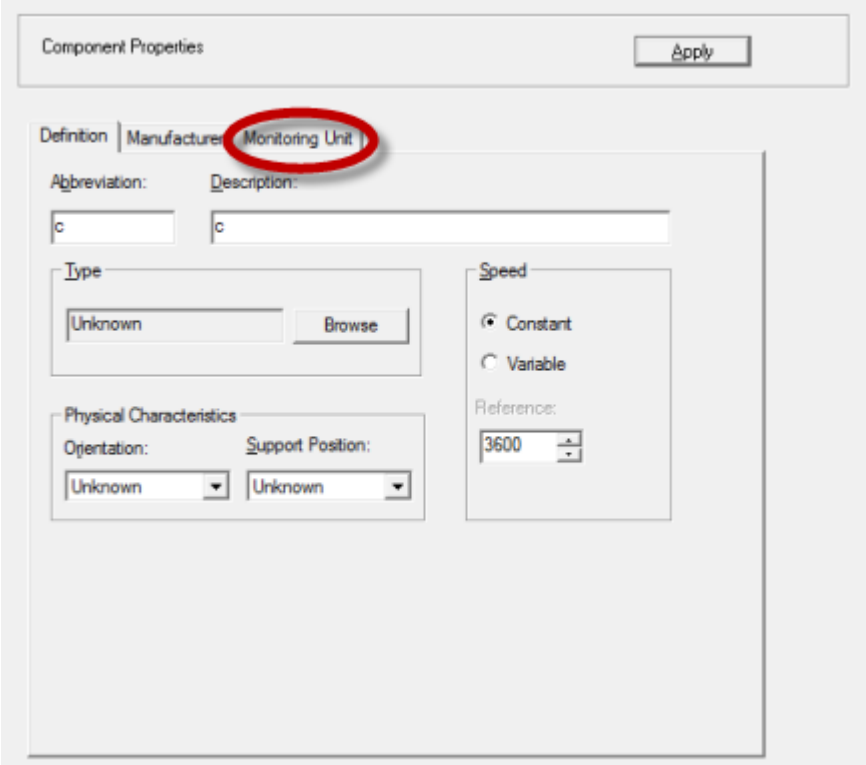
1. Create collection predicate for transient auto-archive operation.

   When you create an auto-archive definition, this collection predicate will cause the CSI 2600 to automatically transfer an archive of transient measurements to the online server, where they can be viewed by an analyst. Archives stored on the transient hard drive will eventually be written over by new measurements.

2. Configure the Measurement Points to associate tach channels with vibration channels.

   a. In Online Configuration, right-click Areas, select Add Area.
   b. Enter an Abbreviation and Description, and click Apply.
   c. Right-click the newly created Area and select Add Equipment.
   d. Enter an Abbreviation and Description, and click Apply.
   e. Right-click the newly created Equipment and select Add Component.
   f. Enter an Abbreviation and Description, and click Apply.
   g. Right-click the newly created Component and select Add Measurement Pt.
   h. Enter an Abbreviation and Description, and click Apply.
   i. With Component Properties still open, click the Monitoring Unit tab.

Figure 6-1: Online Configuration—Component Properties



j. In the CSI Online Monitoring Unit field, click Attach.

k. Select the unit and click Okay.

l. In the Component Properties field, click Apply.

3. Commission transient channels.

Transient channels may be commissioned all at once, unlike prediction channels. An analyst may designate some or all of the already commissioned predictive channels for transient operation. Some signals, such as case expansion may not include valuable transient information. In this case, they do not need to be commissioned as transient—only as predictive signals.

a. In the Online Configuration tree structure, right-click on the unit and select Commission Transient Channels.

The Commission Transient Channels dialog appears, showing signals already commissioned for predictive operation.

b. Select the desired tach channel, and click the check box for each signal input you want to associate with the tach channel.

c. Click the Acquire button.

Measurements for the entire set of signals are shown.

d. Click Commission to commission the channels for transient operation.

Data collection starts when you save the configuration to the O_server, which also downloads it to the unit.

4. Create an Auto-Archive definition.

   This tells the CSI 2600 when to automatically send an archive of measurements to the online server.

   a. Right-click the Transient Tachometer and select Transient Auto-Archive Properties.

      The Auto-Archive Properties dialog appears.

   b. Set the Pre-trigger time (in minutes) and Post-trigger time (in minutes).

      Pre-trigger time indicates how long the auto-archive will take measurements before the collection predicate changes to TRUE. Post-trigger time indicates how long the auto-archive will take measurements after the collection predicate changes to TRUE.

      After all measurements have been collected, the archive will be sent from the CSI 2600 to the online server.

6.3.5 Review and save a transient database

After creating a database, create a report to review your database configuration. The report includes:

- firmware revision used by the unit
- calibration information for the unit
- predicates and their definitions
- signal connections, transient or predictive
- tachometer definitions
- relay definitions

Procedure

1. In the Online Configuration tree structure, right-click on the unit and select Report.
2. Select File > Online Server > Save.

   The database configuration is downloaded to the unit.

6.4 Online Watch overview

AMS Machinery Manager Online Watch monitors system status and views the latest measurements.

To open Online Watch, log in to AMS Machinery Manager, click the Tools tab, and in the left panel, click Analysis.

Online Watch can perform four specific transient operations:

- Create archives manually.
- Disable archive predicates.
- Stop transient streaming to the CSI 2600.
- Remove archives from the Transient Archive Status tab.

Transient system status includes:

- Streaming/not streaming to HDD
- Time of oldest recorded information
- Progress of archive creation

The Online Watch screen displays CSI 2600 status, and the status of any archives. This display has two tabs, Transient Status and Transient Archive Status.

Transient archives are stored under the server folder ...\CustData. Two items will be created in this folder. One is the actual CSI 2600 database file, with an .rbm extension. The other is a sub-folder with the same name as the CSI 2600 database. Inside this sub-folder is a collection of other folders, including one named archives. Transient archives are stored under this archives folder, with a separate folder for each archive.

6.4.1 Online Watch—Transient Status tab

Figure 6-2: Online Watch—Transient Status

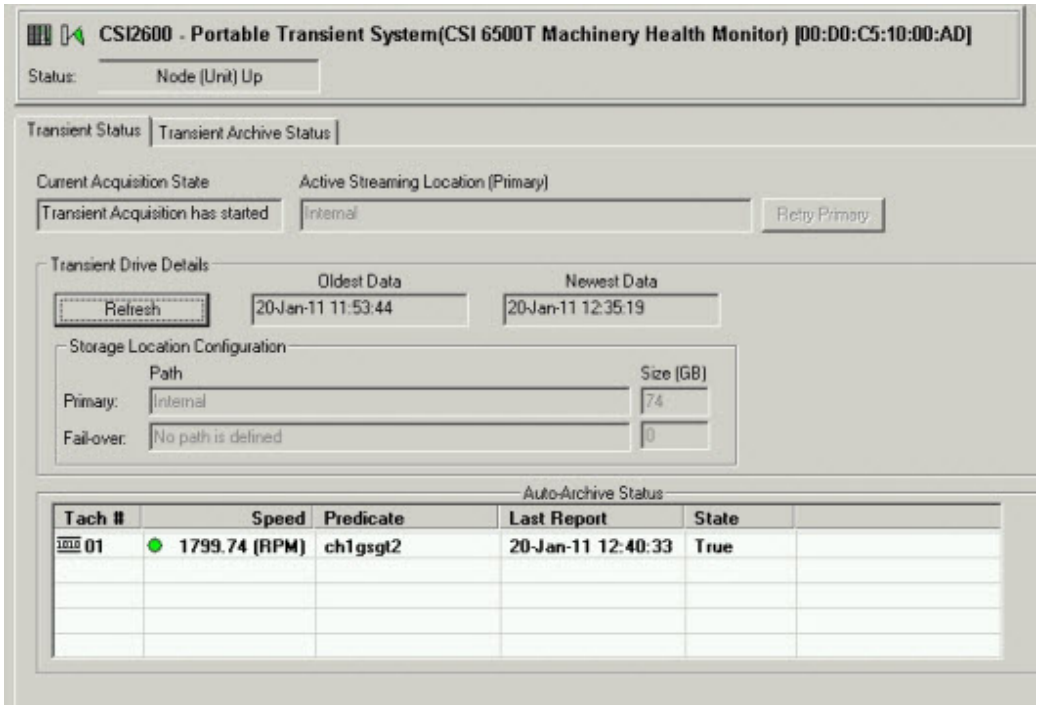


Table 6-1: Transient Status tab fields

Field	Message	Description
Status	Node(Unit)Up	Unit is ready to monitor using the database definition.
	Acknowledged	Unit is reorganizing internal software and schedules to conform to the database definition.
Current Acquisition State	Transient Acquisition has started	Transient measurement is proceeding normally.
	Transient Acquisition has stopped	Transient measurement was manually stopped.
	Unknown	Temporary message after a database is downloaded.
Active Streaming Location(1)	Primary	Transient system is recording to the primary drive, as specified in Online Configuration > Unit Properties.
	Failover	Transient system has detected a problem with the primary drive and is recording to a Failover drive, as specified in Online Configuration > Unit Properties.
Transient Drive Details	Oldest Data	Date and time of the oldest measurements currently stored in the unit. Update this field by clicking Refresh.
	Newest Data	Date and time of the newest measurements currently stored in the unit. Update this field by clicking Refresh.
Storage Location Configuration	Primary	Path displays which drive—Internal, External, No Path—has been specified as the primary streaming location. Size displays how much memory is available.
	Failover	Path displays which drive—Internal, External, No Path—has been specified as the secondary streaming location. Size displays how much memory is available.
Auto-Archive Status	Tach #	Tachometer input associated with a group of transient vibration channels.
	Speed	Current speed measured by the Tach input.
	Predicate	Name of the predicate used for triggering the auto-archive .
	Last Report	Date and time of the most recent archive.
	State	True means the parameters of the auto-archive predicate are being met and data is being recorded to the drive. An analyst can select the Transient Archive Status tab to monitor the progress of archive creation. False means the parameters of the auto-archive predicate are not being met and data is not being recorded. Disabled means the automatic archive predicate has been disabled.

(1) The Active Streaming Location is where transient data is recorded during normal/constant CSI 2600 operation. Measurements from this drive are extracted when an archive is created, and sent as a folder (archive to the online server).

6.4.2 Online Watch—Transient Archive Status tab

The Transient Archive Status tab shows archives that are currently being created.

Figure 6-3: Online Watch—Transient Archive Status

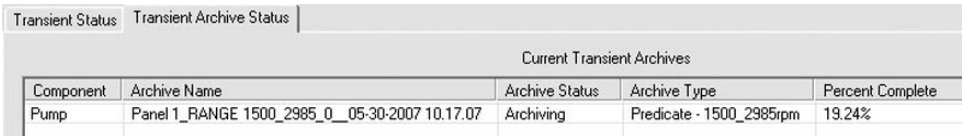


Table 6-2: Transient Archive Status fields

Field	Message	Description
Component	(variable)	Displays the machine component associated with the transient archive group.
Archive Name	(variable)	Displays the name of the archive that was specified in Online Configuration. Range 1500_2985 indicates that the collection predicate is TRUE for speeds between 1500 and 2985 RPM. The number in _0__ is reserved to ensure the filename is always unique. 05-30-2007 indicates the date the archive was created, in mm-dd-yyy format. 10.17.07 indicates the time the archive was created, in hh.mm.ss format.
Archive Status	Pending	The system is waiting for post-trigger data to be collected, before sending that data to the database.
	Archiving	The system is sending a complete set of measurements to the online server.
	Complete	All measurements have been sent to the online server.
Archive Type	Predicate + parameters	The archive was initiated by a predicate.
	Manual	The archive was initiated on-demand by a user.
Percent Complete	00.00%–100.00%	Displays progress while the system sends measurements to the online server.

6.5 Archive management

Archives are stored in folders in C:\RBMnet\RBMsuite\CustData\.

Computers have a finite amount of video display memory that may limit the amount of graphic data viewed in an archive. To achieve efficient CSI 2600 system operation, an analyst should regularly review extracted archives and keep only those of interest or only the portions of interest in each archive. An analyst can extract smaller archives from large ones using the program Vibration Analysis. To extract and view large amounts of information from the CSI 2600, an analyst should sequentially extract individual archives of 1 - 2 hours of measurements.

6.6 Create archives manually

There are three major differences between manually created archives and automatically created archives:

- Manual archives only include information already in the CSI 2600. Automatically-generated archives can include information which is received after the transient collection predicate = TRUE.
- Manual archives do not automatically have a date-time stamp appended to them. Ensure that unique names are assigned.
- Manual archives may have more than one hour of measurements in them. Automatically generated archives have a maximum of 60 minutes of measurements.

Procedure

1. In Online Watch, select a component that has transient signals.
2. Right-click and select Start Transient Archive.
3. Define the manual archive characteristics.

Postrequisites

Observe the progress of manual archives in the Transient Archive Status tab.

6.7 Disable archive predicates

An analyst can disable the creation of automatic archives during startup or when the machine is being cycled and multiple archives are not desired.

Procedure

1. In the Transient Status tab, right-click on the archive predicate and select Disable Archive Predicate.

   A caution window appears.

2. Click Okay to confirm disabling.

The predicate State on the Transient Status tab reads Disabled.

To re-enable the archive, right-click on the archive predicate and select Enable Archive Predicate.

Example: Archive creation

When an archive predicate changes from DISABLED to TRUE, no archive is created. Consider the following sequence:

1. Archive predicate is false.
2. Archive predicate is disabled prior to machinery start-up.

3. Machine starts up and increases to a speed of 1800 RPM.
4. Archive predicate is re-enabled.
5. Archive predicate immediately changes to value of TRUE.
6. No archive is created.
7. Machine speed continues to rise and reaches a speed of 3000 RPM.
8. Archive predicate changes to value of FALSE.
9. Machine trips and speed drops below 2985 RPM.
10. Archive predicate changes to value of TRUE.
11. Archive is automatically created and sent to online server.

Disabling or re-enabling archive predicates only determine whether or not the CSI 2600 will send an archive to the online server. This does not stop the CSI 2600 from recording measurements. In the above sequence, an analyst could extract a manual archive starting at the time when the archive predicate was initially false and ending at the time that the machine was at 3000 RPM.

6.8 Stop transient acquisition

An analyst can command the CSI 2600 to stop recording transient data.

Procedure

1. In the Online Watch tree structure, right-click on the CSI 2600 and select Stop Transient Acquisition.

   A caution window appears.

2. Click Okay to confirm.

In the Transient Status tab, Current Acquisition State displays the message Transient Acquisition has stopped, and the CSI 2600 is no longer streaming data to the designated drive.

6.9 Remove an archive from the Transient Archive Status tab

In the Transient Archive Status tab, right-click on the archive and select Acknowledge Transient Archive.

Note

Removing archives does not delete archives from the online server; it only removes them from the list in the Transient Archive Status tab.

6.10 Change databases when moving the unit to a new machine

Because the CSI 2600 is a portable system, analysts must ensure that measurements from one machine are not stored in a database or archive folder for a different one.

⚠ CAUTION!

Ensure that the following sequence is observed whenever moving the CSI 2600 from one monitoring rack or machine to another. Data from one machine could be stored in the database of another machine if this sequence is performed incorrectly.

⚠ CAUTION!

Changing databases will reinitialize the Transient HDD, which eliminates all stored data. Extract any data before changing databases.

Prerequisites

Before disconnecting from the first machine, log in to AMS Machinery Manager.

From the Tools tab, click Setup/Communication and open RBM Network Administration.

Procedure

1. In the bottom center panel labeled Online Servers, double-click the server.

   The Online Server Setup dialog opens.

2. Click Stop Data Collection.
3. Disconnect the unit from the first machine.
4. Connect the unit to the second machine.
5. In Online Server Setup, click the Edit button next to Machinery Health Manager Database—not next to Active Units.
6. Select the second machine's database when prompted.
7. In Online Server Setup, click Start Data Collection.

The system will now store any measurements or archives in the second database.

Appendix A
Specifications

Topics covered in this appendix:

- *CSI 2600 product specifications*
- *Module specifications*

A.1 CSI 2600 product specifications

The CSI 2600 Machinery Health Expert comes in a case with a retractable handle and two wheels for roll around transport.

Table A-1: Physical dimensions—case

Height	13.75 in.
Width	19.5 in.
Depth	24.5 in.
Weight (with case and unit)	53 lb.

Table A-2: Physical dimensions—unit

Height	20.5 in.
Width	8.25 in.
Depth	16 in.
Weight (unit alone)	30 lb.

Table A-3: Operational conditions

Relative humidity	Temperature range
0–95% R.H. non-condensing	-17–55°C
0–50% R.H. non-condensing	-17–65°C

A.2 Module specifications

A.2.1 6560 Processor module

6560 Processor module specifications at 25°C

Table A-4: 6560 Processor module specifications at 25°C

Memory Capacity	32 MB SDRAM, 32 MB Flash
Network Communication	10/100Base-T Ethernet dual RJ45 jacks wired for NIC and HUB, with two additional jacks on backplane
Local Communication	RS232 (up to 38.4 Kbs)
Onboard Test Generator	All sensor channels, tachometer channels, AC, DC amplitude, phase (0 V - 3 V pk, 0.25 Hz - 50 kHz sine +/- 7.2 VDC, GND +/- 1 mV)
Rack Health Relay	SPDT 24
Sensor Channel Scan	RMS + DC, rate equivalent to16 ch per 500 ms
Overall Vibration Units	RMS, RMS or peak-to-peak with Transient Option
DC Scan	Simultaneously scanned with overall vibration scan (includes DC Gap, temperature, and accelerometer bias)
Gross Scan and DC Accuracy	1% at input channel range full scale amplitude @ 1 kHz
Gross Scan ADC Resolution	16 bit
Data Acquisition Event Basis	Relay input, RPM, DC, AC or software controlled
Data Collection	Event-based adaptive
Data Collection Interval	Event-based and/or time-based
Data Storage Interval	Exception-based and/or time-based
Spectral ADC Resolution	24 bit, 2 channel simultaneous
Dynamic Range	100 dB, all frequency ranges
Spectral Resolution	100 to 6400 lines
Analysis Bandwidth	10 Hz to 40 kHz, discrete steps
Spectral Scan Rate	Depends on analysis configuration (1 second per two channels @ 400 lines, 400 Hz 1 avg)
Spectral Amplitude Accuracy	5% 0.2 Hz - 0.5 Hz 2% 0.5 Hz - 25 kHz 4% 25 kHz - 40 kHz
Frequency Accuracy	0.01%, crystal based
Total Harmonic Distortion	<-90 dB, all ranges
1X Synchronous Peak Accuracy	3% 0.5 Hz - 3 Hz 2% 3 Hz - 1 kHz 5% 1 kHz - 5 kHz
1X Synchronous Phase Accuracy	4 ^{0} 1 Hz - 1 kHz (not calibrated below 1 Hz) 5 ^{0} >1 kHz
Analysis and Trend Types	Configurable, with user-defined parameter names, multiple analysis types per machine and per sensor. (Total Energy, Energy in a range. Non-sync energy in a range, Sync energy in a range, Sync peak, Sync phase, True peak, HFD, Waveform peak-to-peak, RPM, Gap, Orbit)

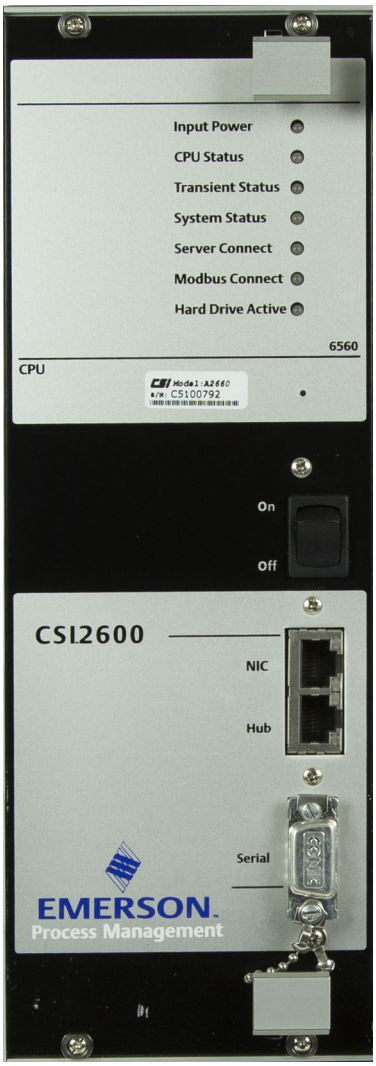
Table A-4: 6560 Processor module specifications at 25°C *(continued)*

Averaging Types	Normal, PeakVue, Order Tracking, Synchronous Time Averaging
Units Types	English, Metric, HZ, CPM, Order
Scaling Types	Linear, Log, dB
Windows Types	Hanning, Uniform

Processor module LEDs

The 6560 Processor module has seven two-color LEDs. From top to bottom these are: Input Power, CPU Status, Transient Status, System Status, Server Connect, Modbus Connect, and Hard Drive Active.

Figure A-1: 6560 Processor module LEDs



Input Power LED

The Input Power LED indicates the status of the power converters that distribute various voltages within the 6560 Processor module. A steady green color indicates that all power converters are within the proper voltage ranges, while a steady or blinking red condition indicates a power fault somewhere inside the 6560 Processor module.

CPU Status LED

The CPU Status LED indicates the status of the Main Processor board. The four status conditions are listed in *Table A-5* along with their assigned priorities.

More than one status condition may be active at one time. When this happens, the LED will indicate the active status condition with the highest priority. For example, if the module is both Uncalibrated (Priority 3) and is also currently In POST (Priority 1), the LED would indicate In POST.

Table A-5: CPU status conditions

LED Color	Status	Priority	Comments
Blinking Green	In POST	1	Typically only seen during system startup. Indicates that POST (Power On Self Test) is being performed, which involves Processor board resources.
Solid Red	Failure	2	Power supply POST failure, or other hardware failure on processor board.
Alternating Red/ Green	Uncalibrated	3	The onboard Test Function generator is uncalibrated.
Solid Green	OK	4	Normal operation.

Transient Status LED

The Transient Status LED indicates the status of the Transient Daughterboard. The LED is always off when a Transient board is not installed in the system. The four status conditions are listed in *Table A-6* with their assigned priorities.

More than one status condition may be active at one time. When this happens, the LED will indicate the active status condition with the highest priority.

Table A-6: Transient Daughterboard status conditions

LED Color	Status	Priority	Comments
Blinking Green	In POST	1	Typically only seen during system startup. Indicates that POST (Power On Self Test) is being performed, which involves Processor board resources.
Solid Red	Failure	2	Power supply POST failure, or other hardware failure on processor board.
Alternating Red/ Green	Uncalibrated	3	One or more Transient channels are uncalibrated.

Table A-6: Transient Daughterboard status conditions *(continued)*

LED Color	Status	Priority	Comments
Solid Green	OK	4	Normal operation.

System Status LED

The System Status LED indicates the status of the overall system. It indicates the active status condition with the highest priority of all boards in the system. For example, if the Test Function generator on the Main Processor board is uncalibrated and the first MSIG module has a power fault, the LED will show a solid red color to indicate the MSIG module power fault, which is a “Failure” state.

When all the firmware components are operating as expected, this LED overlays a “heartbeat” pulse pattern on top of the system status. The heartbeat pattern occurs in a four-count cycle. The LED is pulsed off briefly during each of the first and second counts, and then left on during the 3rd and 4th counts. In practice, it gives the appearance of a human heartbeat. If the heartbeat stops, it indicates a firmware fault has occurred. Many times the system is capable of recovering from a missed heartbeat. However, if the system cannot recover quickly, it will automatically reboot itself to clear the fault and will then resume monitoring.

Server Connect LED

The Server Connect LED indicates when Machinery Health Manager software or the DHM diagnostic software are connected.

- A green color indicates that at least one Machinery Health Manager software client is connected or that the DHM software is connected in the client mode.
- A red color indicates the DHM software is connected in the Single User mode. In this state, no other clients can connect.
- If the LED is off, it indicates that neither of these types of software clients are connected.

There is no indication of client data transfer, only the presence of at least one established connection.

Modbus Connect LED

The Modbus Connect LED indicates when a Modbus client, Web Browser, or Transient Live client are connected.

- A green color indicates that at least one of these types of clients has established a connection.
- If the LED is off, it indicates that none of these types of clients is connected.

The red color is not used with this LED.

There is no indication of client data transfer, only the presence of at least one established connection.

Hard Drive Active LED

The Hard Drive Active LED indicates when the onboard Transient hard drive is being accessed with read/write activity.

The green LED blinks on each time a read or write activity accesses the Transient hard drive. The more time the LED is green, the more hard drive activity.

This LED is always off if there is no Transient board installed in the system.

A.2.2 6510 Signal Input module

Signal Input module specifications at 25°C

Table A-7: Signal Input module specifications at 25°C

Sensor Input Types	Dynamic displacement probe, Accelerometer, Velocity probe, AC input - custom definable (for example, Flux, Dynamic pressure sensor, Dynamic basis weight input, etc.), DC input - custom definable (for example, Temperature or other process input), 4-20 mA Signal (with external shunt resistor).
Number of Sensor Inputs	16 inputs per module (12 sensor, 2 tach, 2 I/O, 2 modules per rack)
Analysis Bandwidth	0.2 Hz to 40 kHz (0.2 Hz to 2 kHz for Transient Analysis)
AC Coupling Corner Frequency	0.5 Hz
RMS Conversion Accuracy	1% at full scale amplitude 30 Hz - 40 kHz 2.5% at full scale amplitude 20 Hz 5% at full scale amplitude 10 Hz (uncalibrated below 10 Hz)
DC Accuracy	1% at full scale amplitude
Analog Integration	1 per channel (acceleration to velocity or velocity to displacement)
Analog Integrator Accuracy	2% (frequency and amplitude)
AC Input Range	Software configurable: ± 5 V pk, ± 10 V pk
DC Input Range	± 22 VDC
Maximum AC + DC Input Range	± 22 V
Powered Sensor Types	ICP Accelerometer and velocity probes by each sensor channel, and displacement probes by fused -24 VDC power supply on each channel
Sensor Power	4 mA (nominal) constant current, with 22 V compliance per current
Powered Channel Input Impedance	500 kOhm (single ended)
Non-Powered Channel Input Impedance	1 MOhm (differential)
Non-Powered Sensor Type	Displacement, AC or DC process
RMS to DC Converter	1 per channel, 1 Hz to 40 kHz
Number of Tachometer Channels	2 inputs per module, 4 total per rack
Tachometer Frequency Range	0.1 Hz to 2 kHz (6 RPM to 120,000 RPM)
Tachometer Frequency Accuracy	0.1%
Tachometer Resolution	0.002 Hz @ 60 Hz (0.1 RPM)
Tachometer Types	Eddy current displacement probe, TTL, passive magnetic
Tachometer Amp. Range	Input and trigger pulse range ± 0.5 V pk to ± 22 V pk
Pulse Characteristics	1 pulse per revolution, 500 uS minimum pulse width, tach divider on module

Table A-7: Signal Input module specifications at 25°C *(continued)*

Modes	Volt compare, automatic adaptive, divide by N (N=1-1024)
Input Impedance	1 MOhm (differential)
Number of Digital I/O Channels	2 per module (configurable as input or output), 4 total per rack
Relay Type	SPST 24 VDC @ 0.5 ADC dry contact
Digital Input Current Max.	10 mA @ 24 VDC
Digital Input High Voltage	5 VDC - 24 VDC
Digital Input Low Voltage	<3 VDC

Signal Input module LEDs

Every 6510 Signal Input module has two, two-color LEDs. The top LED indicates the power converter status and the bottom LED indicates overall module status.

Figure A-2: 6510 Signal Input module LEDs

Power LED

The Power LED indicates the status of the MSIG module power converters.

A steady green color indicates that all voltage levels are OK, while a steady or blinking red condition indicates a power fault somewhere within the module.

Status LED

The Status LED indicates the overall status of the module. The four status conditions are listed in *Table A-8* along with their assigned priorities.

More than one status condition may be active at a time. When this happens, the LED will indicate the active status condition with the highest priority.

If the Status LED is off, the Signal Input module is being ignored by the 6560 Processor module. This is a special case which should not be encountered in practice. Modules are only ignored if the addition of the module would exceed the maximum channel count limits that the 6560 Processor module can support (24 analog, 4 Tach, 4 I/O). Channels are counted starting in the left-most.

Table A-8: Signal Input Module status conditions

LED Color	Status	Priority	Comments
Blinking Green	In POST	1	Typically only seen during system startup. Indicates that POST (Power On Self Test) is being performed, which involves Processor board resources.
Solid Red	Failure	2	Power supply POST failure, or other hardware failure on processor board.
Alternating Red/ Green	Uncalibrated	3	One or more channels are uncalibrated.
Solid Green	OK	4	Normal operation.

Transient Filter Board specifications

Table A-9: Transient Filter Board specifications

Number of channels	12
Filter type	8th order elliptic low pass
Filter passband frequency	DC to 2 kHz
Attenuation	80 dB
Passband ripple	<1 dB
Stop band frequency	3.12 kHz

Appendix B
System calibration

The CSI 2600 uses internal calibration tables to compensate for slight measurement variations that can occur across the temperature, voltage ranges, and variations in individual electronic components used by processing circuitry. These calibration tables are stored in each CSI 2600 when it is assembled and verified at the factory. The units apply calibration corrections automatically during signal measurement and processing.

The CSI 2600 system calibration consists of two steps:

1. Calibrate the on-board signal generator.
2. Calibrate the system.

The Processor Module signal generator should be recalibrated at least once a year.

The CSI 2600 should be recalibrated at least once a year, or when the processor or a signal input module has been replaced. To recalibrate an installed system, contact a local Emerson Online Product Support office to schedule recalibration during an equipment outage. Calibrations can be completed in less than an hour, but units cannot monitor rotating equipment during that time.

B.1 The CSI 6560 Processor module

Four circuits are calibrated:

- Test Signal Generator (TSG)
- Gross Scan (GS)
- Digital Signal Processor (DSP)
- Transient

The TSG circuit is a key element. This circuit provides an extremely precise output signal, which is used as an input during GS, DSP/Tachometer, and Transient calibrations (Tachometer channels are calibrated during DSP calibration). During calibrations, the TSG output is routed internally in the 6560 Processor Module, to processing electronics (GS, DSP, Tach, Transient), and individual calibration tables for each processing circuit are created and stored in 6560 Processor Module memory. These tables are stored in non-volatile memory, which means that the tables are not erased if the 6560 Processor Module is powered down.

The TSG circuit provides an output signal, which is used to create all of the other calibration tables. The TSG circuit has its own calibration table, stored in the CPU board. If a CPU board is replaced, then the other calibrations need to be rerun for that 6560 Processor Module, since their original calibration tables used the TSG signal from the original CPU board.

Calibration tables may be copied from each 6560 Processor Module onto an online server, and those can be downloaded into the same 6560 Processor Module. Emerson Online Product Support personnel and Online Systems Engineers can assist customers with this type of operation.

Calibration circuit inputs and outputs are shown in *Section B.1.1*

B.1.1 Calibration circuits input and output

Table B-1: Calibration circuits input and output

Calibration circuit	Input	Output
TSG (Test Signal Generator)	(external) signal	TSG table (internal) TSG signal
GS (Gross Scan)	TSG signal	GS table
DSP (Digital Signal Processor)	TSG signal	DSP table
Transient	TSG signal	Transient table

B.1.2 Test Signal Generator (TSG) calibration

All CPU boards provided by Emerson are shipped with a calibrated TSG circuit. If the CPU board is purchased as part of a system, the entire system is calibrated using the CPU board TSG circuit.

The TSG circuit is the only element that requires an external piece of test equipment and special connection cables. TSG calibration requires:

- Digital Multi Meter (such as the HP 34401A)
- computer configured as online server
- special calibration utility program (DHM)
- cable that connects the computer to the 6560 Processor module Ethernet port
- cable that connects the computer to the Digital Multi Meter
- cable that connects the Digital Multi Meter to the test port on the unit

TSG calibration is unique in that it requires a separate test instrument, unique cables, and a computer that is configured as an online server. It is recommended that qualified Emerson Online Systems Engineers perform TSG calibration or recalibration.

B.1.3 Gross Scan (GS) calibration

GS calibration:

- uses a 6560 Processor module's TSG output signal.
- does not require that any wire harnesses be disconnected.
- is completed in about 10 minutes.
- does not require any special cables or test equipment.

- uses a special calibration utility program (DHM).

GS recalibration should be performed:

- annually.
- whenever a 6510 Signal Input module is replaced.
- whenever a 6560 Processor module is replaced.
- if the calibration table has a status of "Unknown".

Product Support personnel can guide a plant engineer or technician through GS calibration over the phone.

B.1.4 Digital Signal Processor (DSP) calibration

Digital Signal Processor (DSP) calibration:

- uses a CPU board's TSG output signal.
- does not require that any wire harnesses be disconnected.
- is completed in about 30-40 minutes.
- does not require any special cables or test equipment.
- uses a special calibration utility program (DHM).

DSP recalibration should be performed:

- annually.
- whenever a 6510 Signal Input module is replaced.
- whenever a 6560 Processor module is replaced.
- if the calibration table has a status of “Unknown”.

Product Support personnel can guide a plant engineer or technician through DSP calibration over the phone.

B.1.5 Transient calibration

The Transient unit includes two processing boards—a Main Processor board and a Transient board. Both boards include separate Digital Signal Processors. The DSP on the Transient board uses an internal calibration table, in much the same way that the Main Processor DSP circuit does. However, it is calibrated separately, and not as part of a DSP calibration for a Main Processor.

Transient calibration:

- uses a Processor module's TSG output signal.
- does not require that any wire harnesses be disconnected.
- is completed in about 30-40 minutes.
- does not require any special cables or test equipment.
- uses a special calibration utility program (DHM).

Transient calibration should be performed:

- annually.
- whenever a 6510 Signal Input module is replaced.
- whenever a Transient board is replaced.
- whenever Main Processor board is replaced.
- if the calibration table has a status of "Unknown".

Product Support personnel can guide a plant engineer or technician through Transient calibration over the phone.

Appendix C
Data types

Topics covered in this appendix:

- *Gross Scan analysis*
- *Spectral analysis*
- *Time Waveform analysis*
- *Non-Vibration unit analysis types*
- *Set DC offset*

C.1 Gross Scan analysis

Includes Overall RMS Level, Sensor DC Bias, Gap, DC, or AC Process signals.

Note
Some DC Process Inputs could provide pk, pk-pk, or other Measurement Units.

Gross Scan parameters

All Gross Scan inputs must be DC in nature. Any Gross Scan input of a dynamic nature must be fed through the RMS/DC converter path. It is not technically valid to convert RMS values from an RMS/DC converter to pk or pk-pk Measurement Units unless the input is sinusoidal in nature. However, the CSI 2600 allows this. RMS values are multiplied by 1.414 or 2.828 to convert from RMS to pk and pk-pk, respectively.

C.1.1 Gross Scan units conversion

Table C-1: Gross Scan units conversion

Input Type	Input Unit	HW Int.	RMS/DC	Meas. Unit	Disp. Unit
DC	V / E.U.	no	no	DC	E.U.
AC	V / E.U.	no	yes	RMS	E.U.
ACCEL	V / 32.2 ft/s	no	yes	RMS	g
	V / 32.2 ft/s	yes	yes	RMS	in./s
	V / 9.81 m/s	no	yes	RMS	g
	V / 9.81 m/s	yes	yes	RMS	mm/s

Table C-1: Gross Scan units conversion *(continued)*

Input Type	Input Unit	HW Int.	RMS/DC	Meas. Unit	Disp. Unit
VEL	V / i/s	no	yes	RMS	i/s
	V / i/s	yes	yes	RMS	mil
	V / mm/s	no	yes	RMS	mm/s
	V / mm/s	yes	yes	RMS	micron
DISP	V / mil	no	yes	RMS	mil
	V / micron	no	yes	RMS	micron

C.2 Spectral analysis

Spectral analysis includes:

- Total Energy
- Energy within a Frequency Range
- Synchronous Energy within a Frequency Range
- Non-Synchronous Energy within a Frequency Range
- HFD
- Relative Synchronous Harmonics
- Average
- Synchronous Peak

Note

Total Energy, Energy within a Frequency Range, Synchronous Energy within a Frequency Range, Non-Synchronous Energy within a Frequency Range, HFD, Relative Synchronous Harmonics, Average, Synchronous Peak.RMS, pk, pk-pk Measurement Units are valid and can be freely converted.

Spectral Scan parameters

All Spectral Scan parameters must be AC in nature. It is possible to convert some analysis type results between Measurement Unit types and Display Unit types.

C.2.1 Spectral units conversion

Table C-2: Spectral units conversion

Input Type	Input Unit	HW Int.	SW Int.	SW Diff.	Disp. Unit
AC	V / E.U.	no	no	no	E.U.

Table C-2: Spectral units conversion *(continued)*

Input Type	Input Unit	HW Int.	SW Int.	SW Diff.	Disp. Unit
ACCEL	V / 32.2 ft/s	no	no	no	g
	V / 32.2 ft/s	no	single	no	in./s
	V / 32.2 ft/s	no	double	no	mil
	V / 32.2 ft/s	yes	no	no	i/s
	V / 32.2 ft/s	yes	single	no	mil
	V / 32.2 ft/s	yes	no	single	g
	V / 9.81 m/s	no	no	no	g
	V / 9.81 m/s	no	single	no	mm/s
	V / 9.81 m/s	no	double	no	micron
	V / 9.81 m/s	yes	no	no	mm/s
	V / 9.81 m/s	yes	single	no	micron
	V / 9.81 m/s	yes	no	single	g
VEL	V / i/s	no	yes	no	i/s
	V / i/s	no	yes	no	mil
	V / i/s	yes	yes	no	mil
	V / i/s	no	yes	single	g
	V / i/s	yes	no	single	i/s
	V / mm/s	no	single	no	mm/s
	V / mm/s	no	no	no	micron
	V / mm/s	yes	no	no	micron
	V / mm/s	no	no	single	g
	V / mm/s	yes		single	mm/s
DISP	V / mil	no	no	no	mil
	V / mil	no	no	single	i/s
	V / mil	no	no	double	g
	V / micron	no	no	no	micron
	V / micron	no	no	single	mm/s
	V / micron	no	no	double	g

C.3 Time Waveform analysis

Time Waveform analysis includes:

- Variance
- True Peak
- Waveform pk-pk

Note

Measurement Unit type is specific to Analysis type. No Software Integration Differentiation can be performed.

C.3.1 Time Waveform units conversion

Table C-3: Time Waveform units conversion

Input Type	Input Unit	HW Int.	Disp. Unit
AC	V / E.U.	no	E.U.
ACCEL	V / 32.2 ft/s V / 32.2 ft/s V / 9.81 m/s V / 9.81 m/s	no yes no yes	g in./s g mm/s
VEL	V / i/s V / i/s V / mm/s V / mm/s	no yes no yes	i/s mil mm/s micron
DISP	V / mil V / micron	no no	mil micron

C.4 Non-Vibration unit analysis types

Non-Vibration unit analysis includes:

- Peak to Average Ratio
- Average to Minimum Ratio
- Kurtosis
- Skewness
- Synchronous Phase

These analysis types produce non-unit ratios or specific unit types such as degrees of phase. Measurement Unit Type will not apply to these parameters.

C.5 Set DC offset

For thrust probes, the input channel is defined as a DC Process input. Set the DC offset so that the thrust reading may be zeroed.

Procedure

1. Use a DC voltmeter (or the DHM program) to measure the DC voltage as seen directly on the inputs.
2. In Online Configuration, right-click on a unit and select Configure Unit.
3. Right-click a channel icon and select Define.
4. Set the Signal Type to Process.
5. Select Properties and select the Sensor button.
6. Highlight New and select OK to define a new sensor.
7. Enter the voltage value into Offset Field.

Appendix D
Internal wiring of the CSI 2600

Topics covered in this appendix:

- *Rear termination panel*
- *Internal wiring diagram for the CSI 2600*
- *Terminal descriptors*
- *Rear terminal power connections*
- *CSI 2600 DIP switch settings*

D.1 Rear termination panel

The rear termination panel plugs directly onto the backplane. This termination panel has connectors for sensor inputs, tachometer inputs, and discrete input/output relays into the 12-2-2 modules. All these connections are available through BNC connectors on the rear of the CSI 2600.

Figure D-1: A6500-M-RTRM

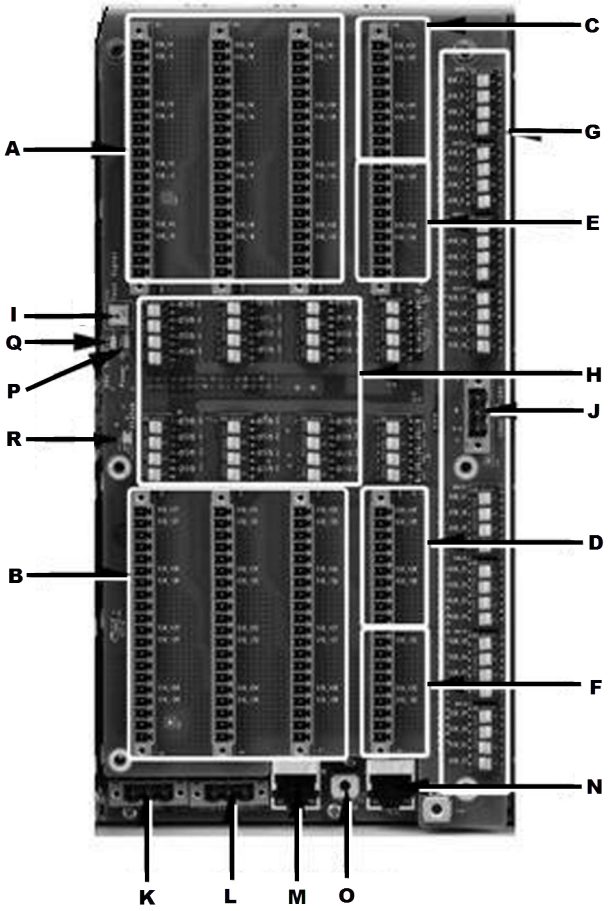


Table D-1: A6500-M-RTRM

Termination panel	
A B	Sensor inputs: MSIG1 (Ch1–12) Sensor inputs: MSIG2 (Ch13–24)
C D	Tach inputs(1): MSIG1 (Ch1–2) Tach inputs(1): MSIG2 (Ch 3–4)
E F	Relay I/O(1): MSIG1 (I/O 1–2) Relay I/O(1): MSIG2 (I/O 3–4)
G	DIP switches for routing buffered sensor/tach inputs from the A6500-P-RTRM side of the rack
H	DIP switches for configuring sensor power On or Off(2) (SW1, SW2, SW3, SW5, SW6, and SW7)
I	Calibration test signal output port (SMB connector)

Table D-1: A6500-M-RTRM *(continued)*

Termination panel	
J	-24 V sensor power input for eddy current sensors

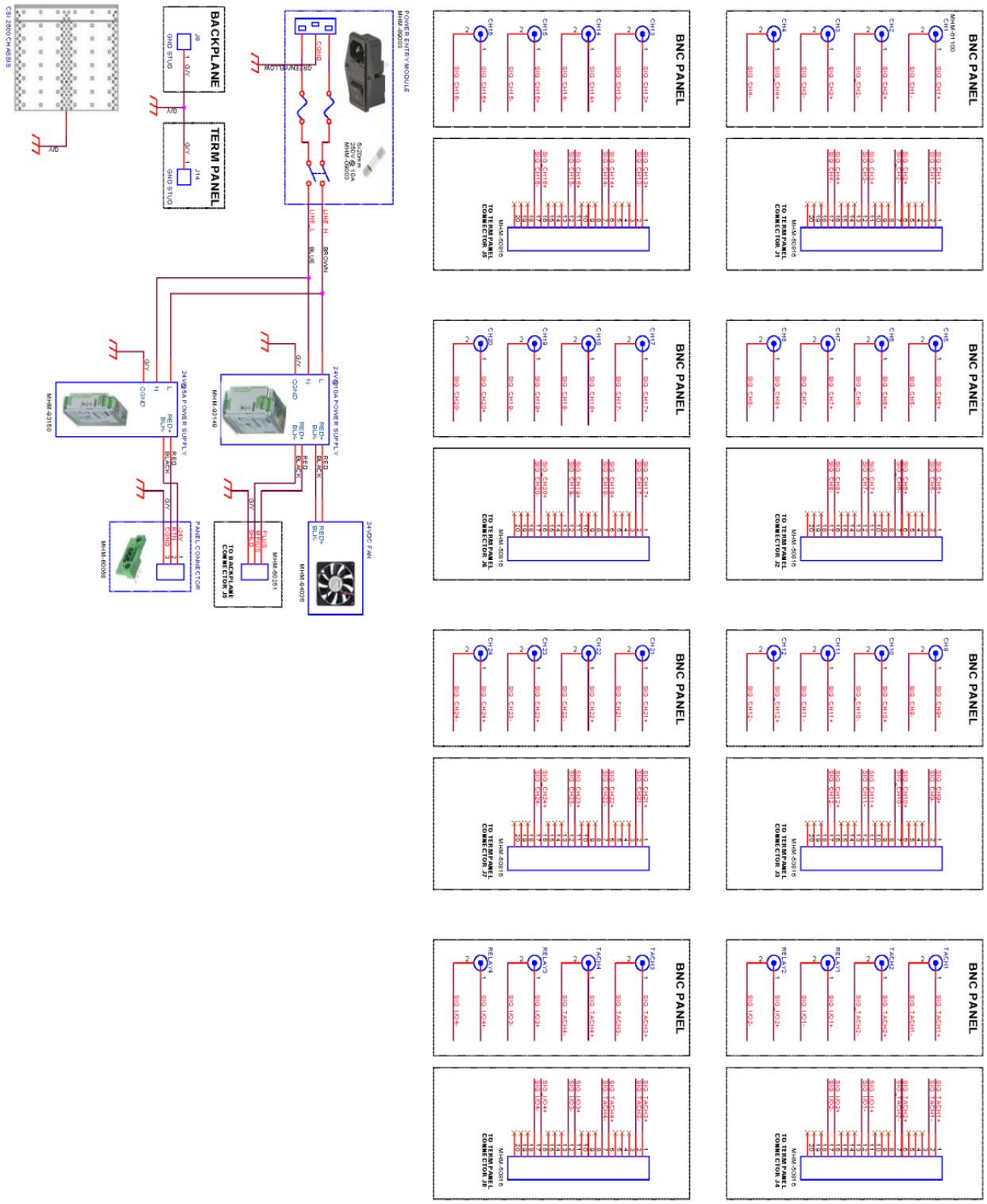
(1) For Tach and Relay channels, leave the sensor power DIP switches in the OFF position.

(2) SW4 and SW8 correspond to tach and relay channels, and are not used.

Table D-2: A6500-M-BP backplane components

Backplane	
K	SysFail relay connector
L	DC Power input connector for Prediction Side
M	HUB network connector
N	NIC network connector
O	Chassis Ground lug
P	Power On LED
Q	+24 V Input LED
R	Status LED

D.2 Internal wiring diagram for the CSI 2600



D.3 Terminal descriptors

Each channel has five terminals. The first two are for the plus (+) and minus (-) signal inputs. If the associated DIP switch is set to ON, these terminals will also supply +24 V constant current accelerometer power.

The second two are for the -24 V power supply for eddy current probes. These terminals only supply power if an external -24 V power supply is connected to the J19 power input terminal at the edge of the termination panel.

Note

For the CSI 2600, this connection is not used and the -24 V power is available on the panel-mounted Phoenix connector on the rear of the case.

The last terminal for each channel is a chassis ground for connecting the sensor cable shield.

Table D-3: Terminal descriptors for MSIG 1

J1		J2		J3		J4	
CH1	SIG+1/+24V	CH5	SIG+5/+24V	CH9	SIG+9/+24V	TACH1	Tach+1
	SIG-1/+24V return		SIG-5/+24V return		SIG-9/+24V return		Tach-1
	-24V		-24V		-24V		-24V
	Gnd (-24V return)		Gnd (-24V return)		Gnd (-24V return)		Gnd (-24V return)
	Chassis GND (Shield)		Chassis GND (Shield)		Chassis GND (Shield)		Chassis GND (Shield)
CH2	SIG+2/+24V	CH6	SIG+6/+24V	CH10	SIG+10/+24V	TACH2	Tach+2
	SIG-2/+24V return		SIG-6/+24V return		SIG-10/+24V return		Tach-2
	-24V		-24V		-24V		-24V
	Gnd (-24V return)		Gnd (-24V return)		Gnd (-24V return)		Gnd (-24V return)
	Chassis GND (Shield)		Chassis GND (Shield)		Chassis GND (Shield)		Chassis GND (Shield)
CH3	SIG+3/+24V	CH7	SIG+7/+24V	CH11	SIG+11/+24V	I/O1	I/O+1
	SIG-3/+24V return		SIG-7/+24V return		SIG-11/+24V return		I/O-1
	-24V		-24V		-24V		-24V
	Gnd (-24V return(1))		Gnd (-24V return(1))		Gnd (-24V return(1))		Gnd (-24V return(1))
	Shield		Shield		Shield		Shield
CH4	SIG+4/+24V	CH8	SIG+8/+24V	CH12	SIG+12/+24V	I/O2	I/O+2
	SIG-4/+24V return		SIG-8/+24V return		SIG-12/+24V return		I/O-2
	-24V		-24V		-24V		-24V
	Gnd (-24V return)		Gnd (-24V return)		Gnd (-24V return)		Gnd (-24V return)
	Chassis GND (Shield)		Chassis GND (Shield)		Chassis GND (Shield)		Chassis GND (Shield)

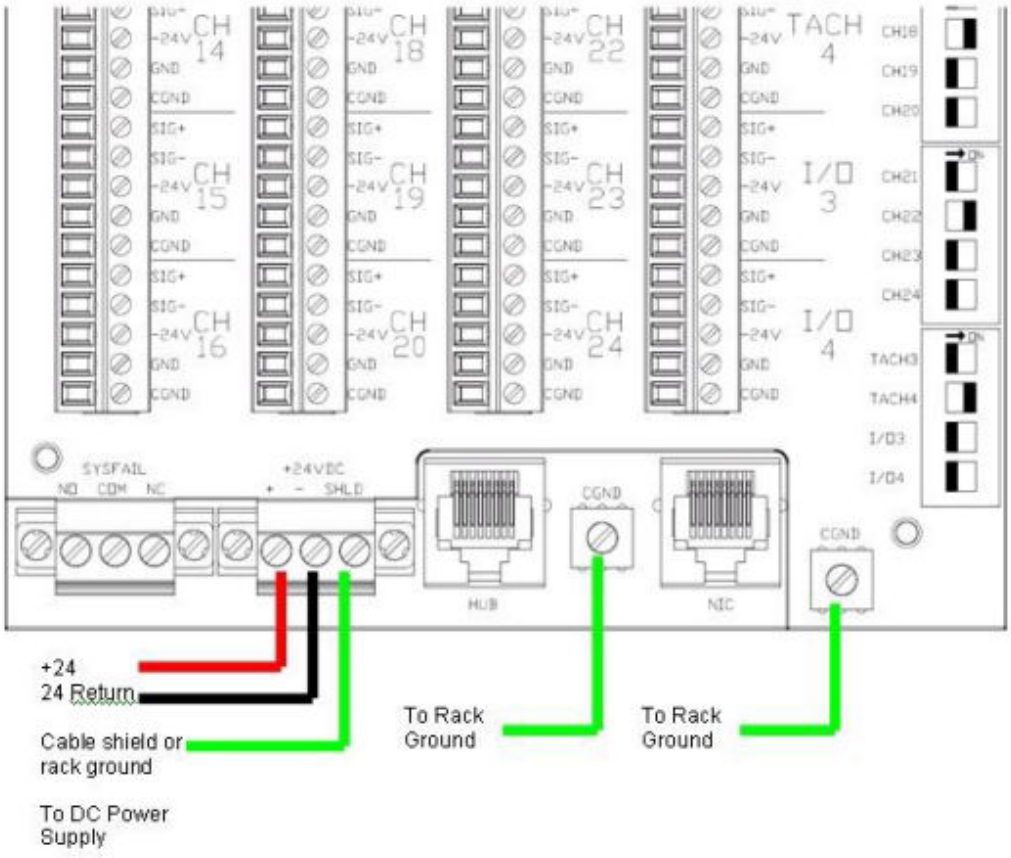
(1) -24 V terminals on I/O channels are not used for I/O connections.

Table D-4: Terminal descriptors for MSIG 2

J5		J6		J7		J8	
CH13	SIG+13/+24V	CH17	SIG+17/+24V	CH21	SIG+21/+24V	TACH3	Tach+3
	SIG-13/+24V return		SIG-17/+24V return		SIG-21/+24V return		Tach-3
	-24V		-24V		-24V		-24V
	Gnd (-24V return)		Gnd (-24V return)		Gnd (-24V return)		Gnd (-24V return)
	Shield		Shield		Shield		Shield
CH14	SIG+14/+24V	CH18	SIG+18/+24V	CH22	SIG+22/+24V	TACH4	Tach+4
	SIG-14/+24V return		SIG-18/+24V return		SIG-22/+24V return		Tach-4
	-24V		-24V		-24V		-24V
	Gnd (-24V return)		Gnd (-24V return)		Gnd (-24V return)		Gnd (-24V return)
	Shield		Shield		Shield		Shield
CH15	SIG+15/+24V	CH19	SIG+19/+24V	CH23	SIG+23/+24V	I/O3	I/O+3
	SIG-15/+24V return		SIG-19/+24V return		SIG-23/+24V return		I/O-3
	-24V		-24V		-24V		-24V
	Gnd (-24V return)		Gnd (-24V return)		Gnd (-24V return)		Gnd (-24V return)
	Shield		Shield		Shield		Shield
CH16	SIG+16/+24V	CH20	SIG+20/+24V	CH24	SIG+24/+24V	I/O4	I/O+4
	SIG-16/+24V return		SIG-20/+24V return		SIG-24/+24V return		I/O-4
	-24V		-24V		-24V		-24V
	Gnd (-24V return)		Gnd (-24V return)		Gnd (-24V return)		Gnd (-24V return)
	Shield		Shield		Shield		Shield

D.4 Rear terminal power connections

Figure D-2: Rear terminal power connections



D.5 CSI 2600 DIP switch settings

Each signal input channel has an associated DIP switch for connecting accelerometer power. For accelerometer channels that require power from the CSI 2600, set the associated DIP switch to the right, or On position. For sensor channels that do not require power, set the associated DIP switch to the left or Off position.

Note

For the Tach and Relay channels, the DIP switches must be left in the Off position.

Appendix E
Troubleshooting

During the lifetime of a CSI 2600 system, an analyst may need to troubleshoot the following situations:

Table E-1: Troubleshooting

Issue	Solution/reference
FTP server IP address changed.	Update boot flag settings.
Measurements in Online Watch or Vibration Analysis seem incorrect or inconsistent.	If two instruments are showing different measurements for the same signal, it is likely that: • Different units are being used by the two instruments. • The monitoring rack output signal is not an exact replica of the input signal, rather it is a conditioned version. • The monitoring rack output signal is a current-level signal (4-20 mA) not a voltage signal.
Online Watch/ Online Configuration shows status of Node(Unit)Down.	The following are possible solutions: 1. Restart CsiO_Server service. 2. Verify that IP addresses set in boot parameters match those set in AMS Machinery Manager. 3. With the unit connected to the network, ping the unit's IP address. If the ping is successful, there is probably a configuration mismatch between the unit and the server. Check the boot parameters. If the ping fails, there may be a physical error (bad Ethernet connection, gateway between two units, mismatching IP addresses).
System Status LED is red.	Establish a Telnet connection to check unit status. If there was a POST failure, a flag will be set, and the title of the failure will be listed. Use these details to diagnose the issue.
Automatic archive was not created.	Predicate must change state from either FALSE or INDETERMINATE to TRUE.
Archive was truncated.	An archive will have a status of Truncated if an analyst extracts a block of data across a gap in the time frame requested.
Unable to make changes to a database.	The system is in the process of storing an archive created with an earlier database configuration. Either wait for the archive to complete or cancel the archive.
	The online server is attached to a different database. In RBM Network Administration, change the database associated with the online server.

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