

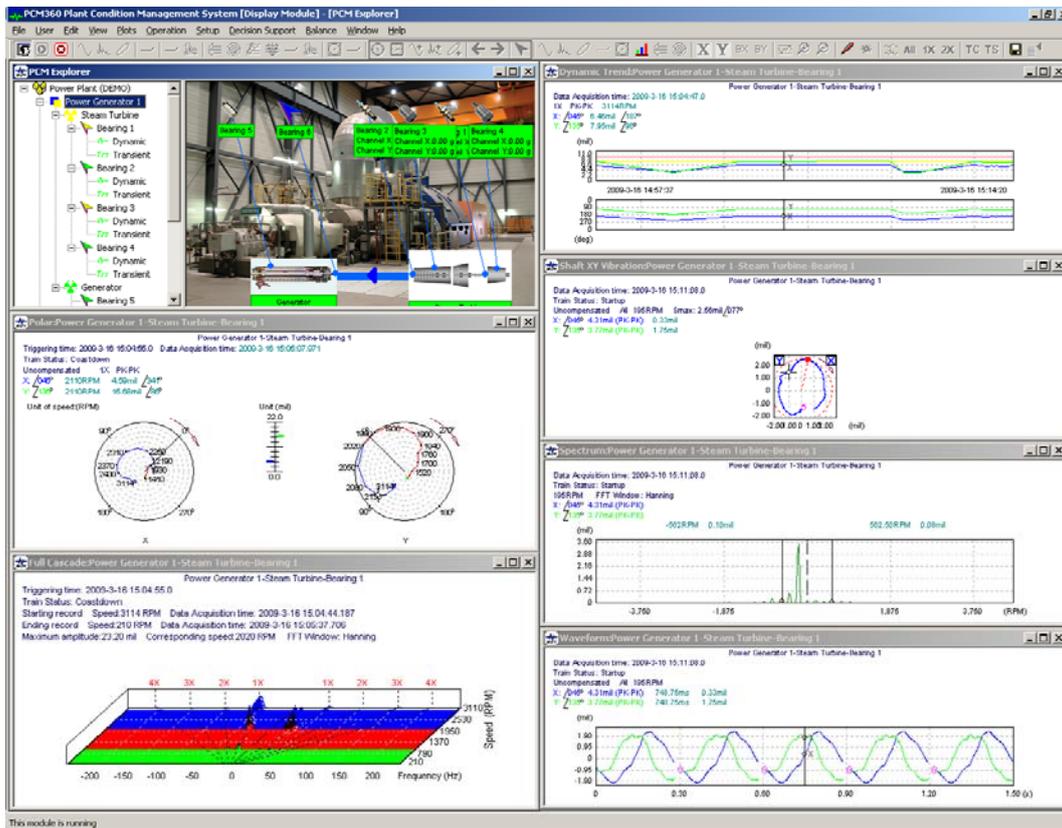


ProvibTech

Innovative Machine Monitoring

Plant Condition Management System

PCM360



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Table of Contents

PCM360 CONDITION MANAGEMENT SYSTEM	1
Introduction	1
Leading Features of PCM360	1
PCM360 Advantage	1
PCM360 Unique Features	2
PCM360 Data Acquisition Input	4
PCM360 Data Acquisition Output.....	4
PCM360 Specifications	5
PCM360 Technical Support	5
PT360-DAQ Data Acquisition Hardware	5
PT360-SC Signal Conditioning Unit	5
PT371 Universal Input Module	6
PT372 4-20mA Output Module.....	6
PT373 Relay Module	6
PCM-SMS Cellular Phone GSM/GPRS Notifier Module	6
Order Information	7
PCM360 Online System Software.....	7
PCM360 Online Data Acquisition System Hardware	8
Accessories	8
PCM360 APPLICATION NOTES	10
I. PCM360 Minimum System Configuration	10
II. PCM360 Standard Network System Configuration	11
III. PCM360 Connection to PT2060 Monitor	12
IV. PCM360 Connection with Modbus Devices or Any Process Data Monitors	12
V. PCM360 Connection Direct To Sensors	12
VI. PCM360 Hardware Output of Programmed Relay Alarms and 4-20mA	12
VII. PCM360 System Layout	13



PCM360 Plant Condition Management System

PCM360 Condition Management System

Introduction

ProviTech's PCM360 is a machine condition management system that collects, stores, analyzes and distributes machine status monitoring information to LAN or internet. The PCM360 provides static, dynamic and transient data collection and analysis, such as graphical indication of vibration level, trend, waveform, spectrum, bode plots, cascade plots and much more.

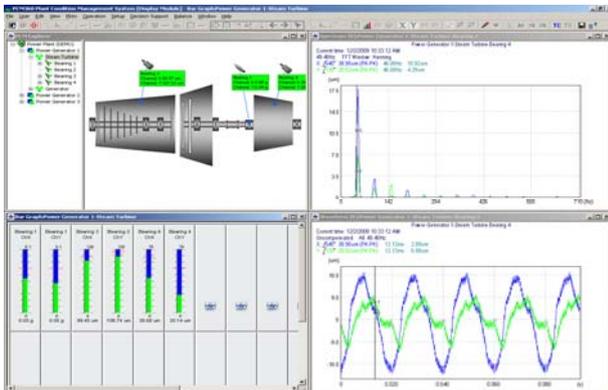
All ProviTech's monitors and transmitters can quickly and easily be integrated to upload static and dynamic data to the PCM360. The PCM360 can obtain both critical machinery running status and balance of plant running status. The PCM360 is also capable of collecting process data with 4-20mA, Modbus, etc. The PCM360 provides an integrated system solution for asset management supplying a total solution for machine maintenance and protection.

Leading Features of PCM360

- ✓ Integrate plant condition monitoring and process data into one database.
- ✓ User-friendly interface for instant data analysis with minimum training.
- ✓ Maximum flexibility and expandability of the software system with object oriented modular design.
- ✓ Transient data collection, dynamic data collection and process data collection.
- ✓ Build on Microsoft® SQL Server database to assure better data management and reliable networking.
- ✓ Client/Server architecture let Display terminal has access to database to display historical data.
- ✓ Browser/Server architecture enables user to access PCM360 system via IE terminal.



- ✓ Rich hardware input modules ready to integrate with any third-party vibration monitors and process monitors.
- ✓ Multiple digital input modules, such as Modbus, and OPC.
- ✓ Multiple hardware output modules ready for further data transfer and annunciation in relays and current transmission.
- ✓ 24 hour notification through on site alarms, operator interface and even SMS messaging on GPRS mobile.
- ✓ Advanced post-processing of transient data minimizes data loss, maximizing analysis capability.
- ✓ Display the specific status data on Display Terminal.
- ✓ Attach notes to dynamic and transient samples.
- ✓ Multiple trigger modes: alarm trigger, band alarm trigger, time trigger, speed trigger, and manually trigger.
- ✓ Multiple real-time plots: waveform, waveform with DC Coupling, spectrum, shaft XY vibration, shaft XY vibration with DC Coupling, trend, shaft centerline, bode, polar, bar graph, etc.



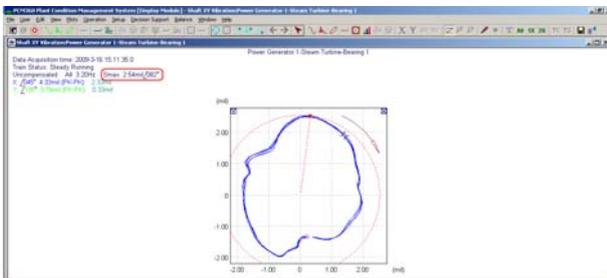
PCM360 Advantage

- ✓ Maximize productivity by minimizing machine down time.
- ✓ Machine management with automatically status and process data collection into a centralized database.
- ✓ Sharing machine condition management information among various departments and managers.



PCM360 Plant Condition Management System

- ✓ Integrates and collects machine running data via third-party monitors.
- ✓ Around the clock machine condition monitoring, alarming operator of the machine problems instantly.
- ✓ Flexible software module and hardware module enables the system grows with the plant expansion.
- ✓ Ideal for working with turbines, pumps, blowers, motors, and compressors. Can be utilized on refinery, petroleum, steel, fossil power, hydro power, cement, transportation, etc.
- ✓ Assist plant managers to take maintenance decision.
- ✓ Simultaneous high speed data acquisition on all channels.



PCM360 Unique Features

User-friendly system with integrated layout

- ✓ Software modules works in one unified user interface.
- ✓ Designed for customer easy installation, configuration, and data analysis.
- ✓ Significantly decreases the learning and training time and cost with the user-friendly interface.

Universal vibration interface module that works with vibration monitors

- ✓ Works with all ProvibTech's hardware monitors.
- ✓ Works with any other third-party monitors.

Universal process interface module that works with any third-party process monitors

- ✓ Isolated voltage input.
- ✓ 4-20mA input.

Advanced post-processing algorithm

- ✓ The algorithm allows customer to save the raw data into temporary file.
- ✓ Customer is capable of processing the collected transient data till satisfactory result. And then save to the database.
- ✓ Critical transient data will be saved and never get lost during the wrong configuration of the system.

Baseline reference

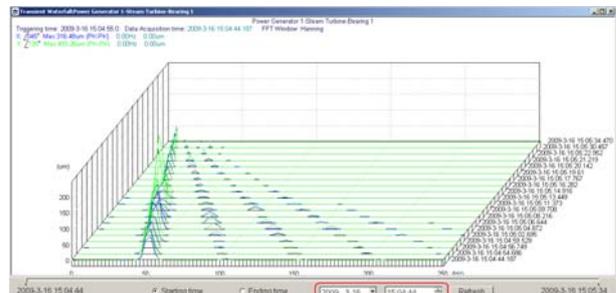
- ✓ A unique feature with PCM360. Standard baseline data can be collected when machine is running in good condition.
- ✓ This baseline data can always be integrated into plots for comparison with the newly collected data.
- ✓ Difference will be noted for machine condition change.

More information on dynamic plots

- ✓ In addition to just one channel data analysis, each of the PCM360 dynamic plot contains both X and Y data, and phase information.
- ✓ Baseline data can also be included in the plot.
- ✓ All the above can be put into one standard plot. This will make analysis much easier.

More information on transient plots

- ✓ In addition to just one channel data analysis, each of the PCM360 transient plot contains both X and Y data, and phase information.
- ✓ PCM360 has one group of unique plot, the trend plot, waterfall plot and the shaft XY vibration plot with transient data.



Unique transient data acquisition setup

- ✓ Customer definition of amount data collected before transient data triggering.
- ✓ Transient data collected on both speed and on time.
- ✓ Much higher sampling frequency with PT360-DAQ hardware system than the built-in data-acquisition in some monitors.

Alarms output with programmable relays, and overall output with 4-20mA

- ✓ The processed alarms from PCM360 can be programmed to drive relays. Programming is similar with ladder logic to allow our customer to program multiple alarms in logical combination.



PCM360 Plant Condition Management System

Each PCM360 system can drive up to 1,024 relays.

- ✓ The overall of each channel can be programmed for 4-20mA output.

Remote notification to operator's mobile phone

- ✓ Timed status and overall notification with pre-defined machines, and measurement points.
- ✓ Notification triggered by alarms with machine running status and overall vibration values.

Static, dynamic and transient data collection and analysis

Static:

- ✓ PCM Explorer for Hierarchy structural machine view
- ✓ Machine mimic photo image status view
- ✓ Trend plot with historical and real-time
- ✓ Alarm list
- ✓ Status list
- ✓ Bar graph
- ✓ Process data view
- ✓ Print the plot as you seen
- ✓ Save plot as .bmp format

Dynamic:

- ✓ Waveform XY with optional baseline plot
- ✓ Spectrum XY with optional baseline plot
- ✓ Full spectrum plot
- ✓ Shaft XY vibration plot
- ✓ Waterfall XY plot
- ✓ Shaft average centerline plot
- ✓ 3-D shaft XY mode shape plot with multi-planes
- ✓ Band Alarm
- ✓ Attach notes
- ✓ Status definition

Transient:

- ✓ Bode plot



- ✓ Polar plot
- ✓ Cascade plot
- ✓ Full Cascade plot
- ✓ Trend on Transient
- ✓ Waterfall on Transient
- ✓ Attach notes
- ✓ Status definition

Analysis:

- ✓ X, Y with their baselines and phase reference on one plot
- ✓ Zoom in, zoom out
- ✓ Harmonics
- ✓ Sideband
- ✓ Overall, 1X, 2X, NX, NOT1X
- ✓ FFT Windows
- ✓ Plot group on measurement point
- ✓ Plot group on waveform
- ✓ Plot group on spectrum
- ✓ Plot group on shaft XY vibration
- ✓ Baseline contrast
- ✓ Slow roll compensation
- ✓ Auto full-scale
- ✓ Synchronized marker on multi-plots
- ✓ Smax on most of the plots
- ✓ Revealing waveform and spectrum by double clicking the measurement point on the machine photo
- ✓ Waveform and spectrum visible with double clicking the point on dynamic waterfall plot
- ✓ Real-time waveform and spectrum visible with double clicking on the related channel's bar graph
- ✓ Waveform and spectrum visible with double clicking the point on dynamic trend plot
- ✓ Display the specific status data on Display Terminal



PCM360 Plant Condition Management System

Network Ready: Multiple User Access

Microsoft® SQL Server software:

- ✓ PCM360 adopts the MS SQL Server for data storage and management.
- ✓ Database can be attached, maintained, backed up and restored.

Three levels of user access:

- ✓ Administrator: has un-limited access right.
- ✓ Super user: capable of configuring the data acquisition units and output units.
- ✓ User: analysis and report.

PCM360 Data Acquisition Input

ProvibTech supplies various data acquisition input modules in digital and analog format. These input modules enable our customer to put all the possible plant machine running status information and plant machine process information into one integral system. This makes the PCM360 a significant better system than others. The rich inputs modules insure the future expansion of the system.

Direct interface with the following data acquisition hardware unit:

- ✓ PT360-DAQ

Monitors link with PCM360 via PT360-DAQ:

- ✓ PT2060/80-BK
- ✓ TM

Direct interface with the monitors via digital Modbus link:

- ✓ DTM
- ✓ DM200
- ✓ PT580

Direct interface with PVT sensors via PT360-DAQ and PT360-SC:

- ✓ TM0782A or any accelerometers
- ✓ TM0793V or any velocity sensors
- ✓ TM079VD Low frequency velocity sensors
- ✓ 5mm, 8mm, 11mm and 25mm proximity sensors

Monitors link with PCM360 via PT371:

- ✓ TR
- ✓ VS102

Third-party vibration monitors link via PT360-DAQ:

- ✓ Most Rack based monitoring system
- ✓ Any monitors with buffer output

Third-party process variable monitors link via PT371:

- ✓ Any transmission monitors with 4-20mA output

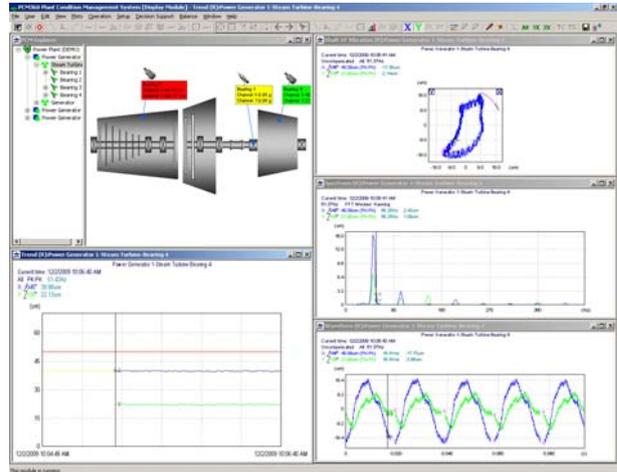
- ✓ Any monitors with voltage output

Third-party process variable monitors link via Modbus:

- ✓ Any monitors with Modbus RTU/Modbus TCP

Additional digital link via OPC:

- ✓ Any OPC output from monitors.



PCM360 Data Acquisition Output

ProvibTech supplies various data acquisition output modules in digital and analog format. These output modules could offer other plant management systems the information from the PCM360.

Digital Modbus output:

- ✓ Modbus TCP

Programmable relays output:

- ✓ Program various channel alarms into one logic combination to drive relays (PT373)
- ✓ Relays are dry contact for ideal contact and isolation

Programmable current output:

- ✓ 4-20mA output corresponding with any channels overall

Digital OPC server:

- ✓ More information than analog output with OPC connection.

Remote notification on group of cellular phone:

- ✓ Notification on any alarm events
- ✓ Notification on pre-selected channel status
- ✓ Notification on pre-selected channel overall

Generic Microsoft® SQL Server:

- ✓ Ready for data transfer via MS SQL Server software



PCM360 Plant Condition Management System

PCM360 Specifications

Frequency Response (+/- 3db)

- 0.5 - 100 Hz
- 0.5 - 1000 Hz
- 2 - 4,000 Hz
- 10 - 20,000 Hz

Measurement Range

Acceleration (PK or RMS):

0 - 20g

Velocity (PK or RMS):

0 - 100 mm/sec (0 - 4 in/sec)

Displacement (PK-PK):

0 - 20 mm (0 - 800 mil)

Unit of Measurement

- Peak
- Peak-peak
- RMS
- AVER

Waveform and Spectrum

Resolution depends on customer configuration.

Maximum spectrum resolution is 12,800 lines.

Storage and Network Database

MS SQL Server 2000 Personal Edition or MS SQL Server 2008 WorkGroup Edition.

Operating System

Windows XP SP2 or later version of Windows.

Data Storage Capacity

Unlimited by software.

Limited by hardware storage capacity only.

Routing Capacity

Unlimited in plant, machine train, machine, and measurement point.

System Processing Capability

Limit of data acquisition units per system: 240.

Limit of Modbus devices per system: 240.

Computer Specifications

Please consult Pro vibTech for details.

Data Acquisition Format

Synchronous sampling:

32 to 1,024 points per waveform time period.

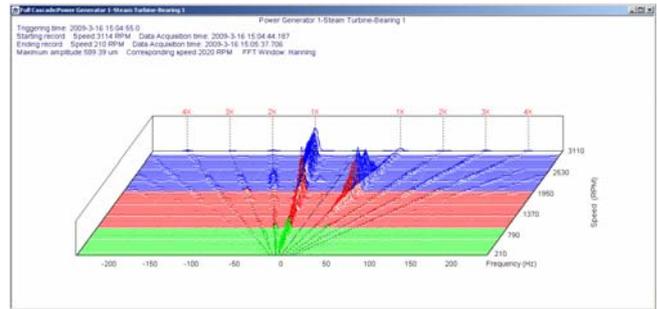
Asynchronous sampling:

Based on frequency response.

PCM360 Technical Support

PCM360 comes standard with one year technical support.

Additional support may be purchased.



- ✓ Free software updates for one year.
- ✓ Enable technical support with the software.

PT360-DAQ Data Acquisition Hardware

PT360-DAQ is an industrial computer with data acquisition modules and accessories. It can work as a data acquisition system and a client work station.

Sampling Frequency

Up to 15 KHz per channel with standard data acquisition module.

Up to 62 KHz per channel with high-speed data acquisition module.

Number of Channels per Module

16

Maximum Dynamic Channels per PT360-DAQ

64

A/D Resolution

16 bit

Input Voltage Range

-20VDC to +20VDC

Modbus Input

Modbus RTU is available with RS485 converter and optional interface software.

Modbus TCP is available with standard Ethernet connection.

PT360-SC Signal Conditioning Unit

PT360-SC is a signal conditioning unit. It can directly power any current mode accelerometer and velocity sensor. It can also power proximity probes with its' built in -24VDC power supply. Additionally, a +24VDC is available to power the process sensors directly.

Each PT360-SC can power up to 32 sensors. The PT360-SC power supply is isolated from the AC power supply.

Power Input:



PCM360 Plant Condition Management System

110VAC +/- 10% with maximum current of 1.0A.
230VAC +/- 10% with maximum current of 1.0A.

Constant Current Sources:

16 channels or 32 channels.
Nominal current: 4mA, constant.

-24VDC Sensor Power:

-24VDC +/- 5% @ 200mA

+24VDC Sensor Power:

+24VDC +/- 5% @ 200mA

PT371 Universal Input Module

The PT371 is a 16 channel input module.



Signal Inputs:

Voltage input: 0 - 10V; -5 to +5V.
Current input: 4 - 20mA (with the shunt resistor).
Thermocouple or thermo resistors:
Discrete input: any 0-24V; 0-12V; 0-5V.
TC: K, E, S, T, N, J, B, R, EU-2.
Compensation mode: Inner (Specify) and Exterior.
RTD: Pt100, Cu50, Cu100, BA1, BA2, G.
Wire Unit: 2-wires, 3-wires.

Data acquisition rate:

1.0 sec

Amplitude A/D resolution:

PT371 module: 12 bit.
0.2% FS.

Power supply:

24VDC +/- 10% @ 150mA

PT372 4-20mA Output Module

The PT372 is a 4 channel 4-20mA output module.



Amplitude A/D resolution:

PT372 module: 12bit

Power supply:

24VDC +/- 10% @ 100mA

Maximum load:

750 ohms

PT373 Relay Module

The PT373 is a 16 channel relay module. The PT373 can be configured for any logic combination of alarms or status of each channel.

The relays are selectable as: energized/de-energized, latching/non-latching and bypass.



Power supply:

24VDC +/- 10% @ 150mA

Relays:

Seal: epoxy
Capacity: 0.5A/230VAC/30VDC, resistive load
Relay type: SPDT
Isolation: 1000VDC

PCM-SMS Cellular Phone GSM/GPRS Notifier Module

PCM-SMS is a quad-band universal transmission and receiving module that will transmit machine running status and overall about predefined measurement points into any GSM cellular phone. This is useful while operator and service personnel are off site, and there is an alarm due to machine running status change. The module can also be programmed to regularly transmit the status and overall data into a cellular phone. The operator or service personnel can obtain machine condition when off site.



Power supply:

6 - 40 VDC @ 500mA or 90 - 250 VAC @ 100mA,
from 47 - 65 Hz.

Transmit format:



PCM360 Plant Condition Management System

GSM; GPRS

Transmission frequency band:

850MHz

900MHz

1800MHz

1900MHz

Order Information

PCM360 Online System Software

PCM360 on-line condition monitoring system consists of the PCM360 software and PT360-DAQ data acquisition unit.

PCM360-COM-AX

PCM360-COM is a software module that interfaces with communication and data acquisition hardware.

AX: Software option

A0*: Original version

A1: Software updates CD

PCM360-DISP-AX

PCM360-DISP is a display and analysis software module.

AX: Software option

A0*: Original version

A1: Software updates CD

PCM360-MODBUS-AX

PCM360-MODBUS is a Modbus RTU and Modbus TCP software module. This module is for both input and output.

AX: Software option

A0*: Original version

A1: Software updates CD

PCM360-DBM-AX

PCM360-DBM is the database management software module (only needs to be installed on DB server).

AX: Software option

A0*: Original version

A1: Software updates CD

PCM360-OPC-AX

PCM360-OPC is an OPC software module. This module is for both server and client.

AX: Software option

A0*: OPC Original version (Contains both server and client)

OPC-Server: Offering the PCM360 data for the third-party's OPC software.

OPC-Client: Collecting the data from the third-party's OPC devices.

A1: Software updates CD

PCM360-SMS-AX

PCM360-SMS is a SMS software module.

AX: Software option

A0*: Original version

A1: Software updates CD

PCM360-TextOutput-AX

PCM360-TextOutput is a Text Output software module.

AX: Software option

A0*: Original version

A1: Software updates CD

PCM360-Web Server-AX

PCM360-Web Server is a web service software module.

AX: Software option

A0*: Original version

A1: Software updates CD

PCM360-LIS-AXX-BXX-CX-DX-EX-FX-GX-HX

PCM360-LIS is a software module that controls user options and licenses.

AXX: Communication and data acquisition module user licenses

XX: Number of interface modules

BXX: Display module user licenses

XX: Number of simultaneous user displays

CX: Analysis options

C0: Process, dynamic and transient

C1: Process and dynamic

C2: Process

DX: Remote cellular phone notification (software module only)

D0: With remote notification

D1: No remote notification

EX: Text Output Option

E0: With Text Output

E1: Without Text Output

FX: Digital Communication

F0: No digital communication

F1: With Modbus

F2: With Modbus and digital condition monitoring

GX: OPC Option



PCM360 Plant Condition Management System

G0: With OPC
G1: Without OPC
HX: Web Server Option
H0: With Web service
H1: Without Web service

PCM360 Online Data Acquisition System Hardware

The PT360-DAQ on-line data acquisition unit is fully configured with the industrial computer or work station, 19" LCD display unit, and signal process modules.

PT360-DAQ-AX-BX-CX-DX

AX: Number of dynamic channels (includes phase reference)

A0*: 16 (14** for PT2060)
A1: 32 (28** for PT2060)
A2: 48 (42** for PT2060)
A3: 64 (56** for PT2060)
A10*: 16 high frequency (14** for PT2060)
A11: 32 high frequency (28** for PT2060)
A12: 48 high frequency (42** for PT2060)
A13: 64 high frequency (56** for PT2060)

BX: Interface kit

B0*: General purpose
B1: PT2060 (standard 1.5 meters)

CX: SQL

C0*: Included
C1: Not included

DX: Configuration

D0*: As both data acquisition and display system (industrial computer)
D1: As a data acquisition system only (industrial computer; monitor display is not available)
D2: As both data acquisition and display system (work station)
D3: As a data acquisition system only (work station; monitor display is not available)

* Note: Default configuration

** Note: Each 14 channels include 12 dynamic channels and 2 phase reference channels.

Accessories

PCM360-SUP-AX-BXX

Extended technical support agreement

AX: Additional years

X = Number of additional years with the agreement

BXX: Machines

XX = Number of machines

PT360-SC-AX-BX

Signal condition module that directly interfaces and powers with accelerometers, velocity sensors or proximity probes. No monitor is required.

AX: Number of dynamic channels

A0: 16

A1: 32

BX: Power supply

B0: 230VAC

B1: 110VAC

PCM-SERV

Pre-configured server which is configured with PCM360 software and Microsoft® SQL Server database (software is purchased separately).

PCM-DPC

Pre-configured work station computer with PCM360 software (software is purchased separately).

PCM-LPC

Pre-configured laptop/notebook computer with PCM360 software (software is purchased separately).

PCM-485

RS485 module on PCI slot

PCM-SQL

Microsoft® SQL Server 2008 server database

PCM-GP

General purpose interface kit that includes PT360-DAQ cable, converter box.

PCM-SMS

SMS cellular phone message transmission and receiving hardware module. This module works with any GSM system.

PCM-PT2060-XXX

PT2060 and PT360-DAQ interconnection cable.

XXX: Cable length in meters



PCM360 Plant Condition Management System

PT2060/80-BK

Back panel of the data acquisition module on PT2060 monitor. Specially designed to directly interface with PT360-DAQ.

PT371

16 channels universal input module

PT372

4-20mA, 4 channels output module

PT373

16 channels relay alarm module

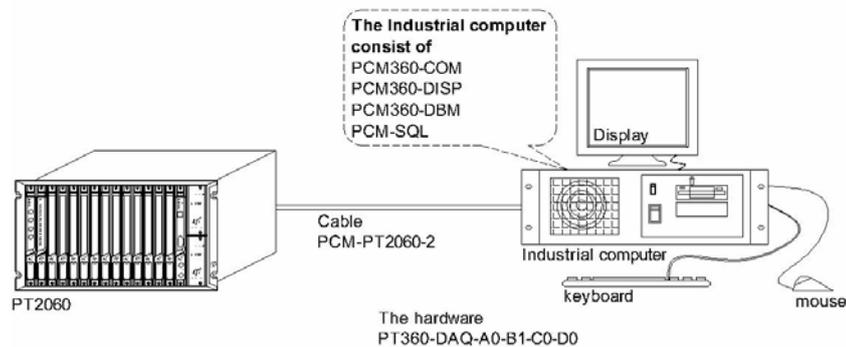


PCM360 Application Notes

I. PCM360 Minimum System Configuration

For example, the PCM360 minimum system is configured to interface with the PT2060 monitor. The system consists of:

- ✓ PCM360-COM-A0 communication and data acquisition module
- ✓ PCM360-DISP-A0 display and analysis module. Computers are equipped with Microsoft Windows XP professional or higher operational system
- ✓ PCM360-DBM-A0 database management
- ✓ PCM360-LIS-A01-B01-C1-D1-E1-F0-G1-H1 user options and licenses module
- ✓ PT360-DAQ-A0-B1-C0-D0 data acquisition system (hardware)



The minimum system

It is a 12 channel system. The entire system, with hardware and software, has been put into an industrial computer. This system will perform data acquisition with process data and dynamic data. The system is ideal for plant operators, maintenance engineers, and managers that perform general data analysis and maintenance.

The features of the system include:

- ✓ Integral system with one industrial computer
- ✓ Single user
- ✓ 12 dynamic channels, 2 phase reference channels
- ✓ Directly interfaces with PT2060 monitor
- ✓ Microsoft® SQL Server 2008 WorkGroup Edition software
- ✓ Capable of collecting, analyzing and storing dynamic data

Since PCM360 is a modular system, the system can easily expand into a standard plant-wide condition management system; additional features can be realized by adding more modules.

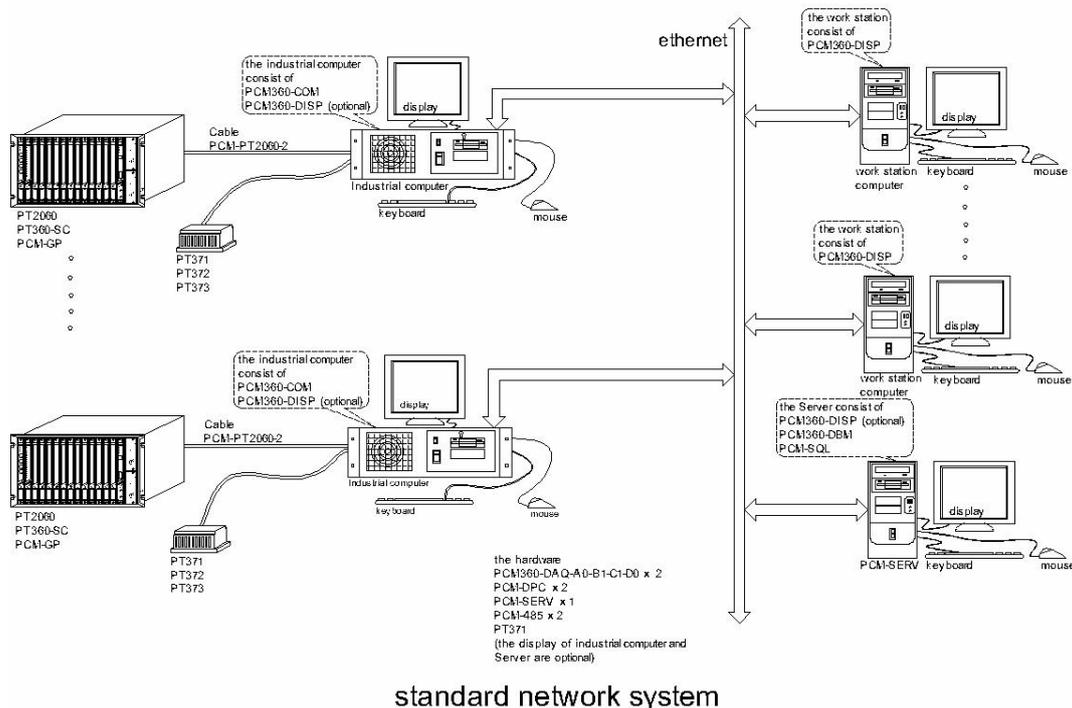
- ✓ Transient data collection and analysis
- ✓ Multiple users access
- ✓ Up to 240 PT360-DAQ
- ✓ Up to 240 Modbus RTU devices
- ✓ Dedicated server computer
- ✓ High frequency data acquisition
- ✓ Hardware output of programmed alarms and 4-20mA
- ✓ Remote access to the system with Citrix™ server
- ✓ Logon the system via IE terminal
- ✓ Interface with any third company process data and dynamic data
- ✓ On-site technical service and training



Application Notes Continued

II. PCM360 Standard Network System Configuration

Example: A plant has 10 machine trains. Each machine train includes a compressor and an electrical motor. The compressor has four proximity probes to measure shaft X, Y vibration; one proximity probe to measure thrust position and one proximity probe to measure phase reference. The motor has four channels of case mounted accelerometers to measure case vibration. Five PT2060 monitors are mounted in the control room. Each PT2060 can monitor two machine trains with 18 dynamic channels and 2 phase reference channels.



There will be five data acquisition units; assume the plant has 10 users.

Recommendation: the standard PCM360 system with the following modules:

- ✓ PCM360-COM-A0 x 1 communication and data acquisition module
- ✓ PCM360-DISP-A0 x 1 display and analysis module
- ✓ PCM360-DBM-A0 x 1 database management
- ✓ PCM360-MODBUS-A0 x 1 Modbus RTU communication module
- ✓ PCM360-LIS-A05-B10-C0-D1-E1-F1-G1-H1 x 1 x 1 user option and license module
- ✓ PT360-DAQ-A1-B1-C1-D1 x 5 Five data acquisition systems (hardware)
- ✓ PCM-SERV x 1 Server computer. Equipped with Windows 2003 server operation system
- ✓ PCM-SQL x 1 Microsoft® SQL Server 2008 WorkGroup Edition software
- ✓ PCM-DPC x 10 Work stations running DISP software module
- ✓ PCM360-SUP-A5-B10 x 1 Five year technical support plan for 10 machines



Application Notes Continued

III. PCM360 Connection to PT2060 Monitor

The PCM360 directly interfaces with the PT2060 monitor. Each PT2060 can hold a maximum of 48 channels (with condition monitoring modules).

The 4th slot from the right output dynamic signal of channel 1 to 24. The 3rd output channel 25 to 48. On each of the PT2060/80-BK modules, there are two multi-pin connectors, the top connector output data of channel 1 to 12 (25 to 36) with dual phase references. The bottom connector output data of channel 13 to 24 (37 to 48) with dual phase references.

PCM360 and PT2060 monitor could be integrated into a complete system to provide a better protection and data acquisition features.

IV. PCM360 Connection with Modbus Devices or Any Process Data Monitors

Modbus RTU communication is available with PCM360. Each system can hold a maximum of 240 Modbus devices.

For a large system, we recommend obtaining process data through Modbus communication. This will save many dynamic data acquisition channels on both hardware and software.

PT371 can be used to collect process data from any third-party monitors, and then it converts the process data into digital data and finally transfers the data to PCM360 DAQ software. A PCM-485 is required for this configuration.

V. PCM360 Connection Direct To Sensors

Optional rack mount hardware PT360-SC is required to connect sensors directly without monitors. Each PT360-SC can hold 16 or 32 channels (including phase reference channels). This signal conditioner can directly drive current mode accelerometers and velocity sensors.

VI. PCM360 Hardware Output of Programmed Relay Alarms and 4-20mA

This is a unique feature of PCM360. With PLC similar logic, user could program alarms of various channels to drive the PT373 dry contact relays. PT372 will output up to four channels of 4-20mA signals.



Application Notes Continued

VII. PCM360 System Layout

System Layout

