Data Sheet

Control IT
Harmony Distributed Control Unit

Highlights

The Harmony Distributed Control Unit (Harmony DCU or HDCU) is a DCI System Six® compatible microprocessor-based area management and control node for the Symphony Enterprise Management and Control System. The Harmony DCU interfaces directly to the process, performing all functions necessary to monitor and control the process on a stand-alone basis. The controller communicates with other system nodes over the control network (Cnet). It collects process I/O, performs control algorithms, and outputs control signals to process level devices. The controller also imports and exports process data from and to other system nodes, and accepts operator control commands through network connected workstations.

Designed for applications requiring sequence control combined with regulatory control, the Harmony DCU incorporates Controlware II™, a language specifically designed for process control, which supports a full range of analog control functions in addition to parameter setup and interlocking functions for both continuous and batch processes. Multiple programming and control languages are supported including standard Controlware II modules, Controlware™ command language (CCL), ChemFlex™ sequence modules (MSEQ), and custom control modules (CCM) for user-defined functionality. The superior processing power and large capacity of the Harmony DCU enable it to meet the needs of a wide range of requirements from data acquisition to the most complex process management and control strategies.

The Harmony DCU is comprised of a P-HC-DCU controller and S-HB-DCU software. Field I/O access is achieved when connected by 40CA32 cables to 40TE32 interface termination boards.

Specifications

Property	Characteristic/Value
CPU microprocessor	32-bit processor running at 50 MHz
CPU memory	8, 16, or 32 Mb of DRAM
Power requirements	Nominal 115 VAC (99 to 132 VAC) at 2.5 A typical, 6.3 A maximum Nominal 230 VAC (198 to 264 VAC) at 1.3 A typical, 3.2 A maximum Nominal 24 VDC (21.6 to 32 VDC) at 8 A typical, 20 A maximum
Overvoltage category	I per IEC 61010-1
Heat dissipation	50 W to 450 W maximum
Communication channels	
Cnet	1 redundant (Ethernet™ network 1 and 2) per processor
Serial port (diagnostics)	1 RS-232-C per processor

Property	Characteristic/Value
Communication rate	
Cnet	10 Mbaud
Serial port (diagnostics)	Up to 9600 baud
I/O	
DCU boards	23 maximum (dual frame)
DIO modules	120 modules
CIO points	Nominal 1,000
Profibus slaves	78 devices (maximum)
Application programming	Standard Controlware II modules, Controlware command language (CCL) ChemFlex sequence modules (MSEQ), and custom control modules (CCM)
Dimensions	
Single card frame	Height: 487 mm/19.2 in. Width: 483 mm/19.0 in. Depth: 333 mm/13.1 in.
Dual card frame	Height: 975 mm/38.4 in. Width: 483 mm/19.0 in. Depth: 333 mm/13.1 in.
Weight	
Empty card frame	7.3 kg (16 lb 0 oz)
Full card frame	32.5 kg (71 lb 6 oz)
Environmental	
Air quality	Operating and storage: noncorrosive (level 1)
Altitude	Operating: sea level to 3,048 m (10,000 ft) Storage: sea level to 12,000 m (40,000 ft)
Relative humidity (noncondensing)	Operating: 5% to 95% Storage: 5% to 100%
Barometric pressure	Operating: 82.7 to 103.4 kPa Storage: 13.8 to 103.4 kPa
Airborne contaminants	Operating and storage: 1000 Angstroms Cu coupon reactivity, 30 day typical
Shock	Operating: 5 g, 11 ms (½ sine wave) Storage: 8 in. drop topple
Temperature (internal enclosure)	Operating: 0° to 60° C (32° to 140° F) Storage: -40° to +85° C (-40° to 185° F)
Vibration (crossover)	Operating and storage: 14 Hz
Frequency	Operating: 5 to 200 Hz Storage: 5 to 60 Hz
Displacement	Operating and storage: 1.3 mm (0.05 in.) peak-to-peak
Acceleration	Operating and storage: 0.5 G

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

Design Standards and Certifications

Category	Standard	Description
Safety	ANSI/ISA S82.01 ANSI/ISA S82.02 ANSI/ISA S82.03	Safety standards for process control equipment
	FM Class 3810	Approval standard for electrical and electronic test, measuring and process control equipment
Environmental	MIL-STD-810E 502.3 & 501.3	Storage/transportation temperature
	ISA S71.04 (level 1 liquids, solids, gases)	Air quality

Category	Standard	Description
EMI, RFI, and electrical surge	IEC 61000-4-2 (level 3)	ESD (6 kV contact discharge, 8 kV air discharge)
	IEC 61000-4-3 (level 3)	EMI susceptibility (test field strength = 10 V/m)
	SAMA PMC 33.1-1978, Class3-abc	EM susceptibility of process control instrumentation (test field strength = 44 V/m)
	IEC 61000-4-4 (level 4)	Electrical fast transient (P/S test = 2 kV, I/O = 1 kV)
	ANSI/IEEE C37.90-1978	Surge withstand capability (3 kV)
Flammable atmospheres (for nonincendive ITBs)	FM class 3611	Division 2 equipment
	ISA S12.12	Nonincendive equipment
Flammability of product components	UL 94 V-0, V-1, V-2, 5 V	Flammability of plastic materials
CE mark directives	73/23/EEC	Low voltage directive
	89/336/EEC 92/31/EEC	EMC directive
	90/683/EEC 93/68/EEC 93/465/EEC	CE marking directives
Additional	Factory Mutual (FM)	FM approval pending for A-Output, D-Optput, and PBUS board; all others specification tested per ANSI/UL508

Design Features

Card Frame

Feature	Description
Chassis material	Aluminum
Painted finish	Polyurethane enamel
Mounting	Mounts in ANSI standard 19 in. equipment rack (EIA RS-310-C) or in DIN standard 483 mm equipment rack. (DIN 41-494, Part 1). Recommended mounting is in a single bay equipment cabinet. If mounting in two adjacent bays, refer to ***Harmony DCU Instruction***. Mounting brackets included with card frame for wall mount option
Weight	7.27 kgs (16.0 lbs)

DCUPS-EG	
Feature	**Description**
Processor	Power supply controller uses an MC68HC711D3 microcontroller with a 3.6864 MHz clock
Voltages	Internal voltages provided: +5 V, and +15 V, +5 VBAT, +3.5 VBAT and +13.8 V battery charger
Communications	Communicates with the CPU via an RS-485 serial bus
Connection	Connects into backplane assembly via a 60 pin connector
Battery backup	Lead-acid battery backup to preserve I/O boards SRAM and DCP DRAM for 4 hrs
Weight	2.63 kgs (5.8 lbs)
Test points	Test points used to measure the 5 VDC output from the power supply using a voltmeter. The +5 V ADJ is a potentiometer which controls the value of the +5 V output

DCUPS-µP	
Feature	**Description**
Processor	80C32 microcontroller running at 16.6 MHz
Diagnostics	On-board self diagnostics
Voltages	Internal voltages provided: +5 V, +15 V, -15 V, +5 VBAT, +3.5 VBAT and +13.8 V battery charger
Memory	Contains 64 kbytes of internal memory
Signals	Supports a 32 analog input multiplexer with a 12 bit (+ sign) ADC converter
Communications	Communicates with the CPU via an RS-485 serial bus
Testing	One RS-232-C serial port on-board for diagnostic testing
Connection	Connects into backplane assembly via a 60 pin connector
Battery backup	Lead-acid battery backup to preserve I/O boards SRAM and DCP DRAM for 4 hrs
Weight	2.85 kgs (6.3 lbs)

DCU Control Processor (DCP II)	
Feature	**Description**
CPU	68060 main processor with coprocessor implementing the IEEE standard binary floating point arithmetic (ANSI-IEEE Std. 754-1985)
I/O bus	Two independent process I/O buses
Weight	1.36 kgs (3 lbs)

Intelligent Input / Output Boards (IOBs)

There are nine types of IOBs which are:

- A-Loop.
- D-Loop.
- P-Loop.
- A-Input.
- D-Output.
- A-Output.
- Communication I/O (CIO).
- Distributed I/O (DIO).
- Profibus DP I/O (PBUS)

The I/O count for each of the Loop boards and the A-Input board is listed below:

I/O Type	A-Loop	D-Loop	P-Loop	A-Input	D-Output	A-Output
Analog input	8	0	0	24	0	0
Pulse input	0	0	8	0	0	0
Analog output	4	0	4	0	0	16
Discrete input	16	32	16	0	0	0
Discrete output	8	16	8	0	48	0

An HDCU can be comprised of one or two card frames. Each HDCU Frame has 14 slot locations. Two slots (1 and 14) are reserved for HDCU power supplies. Another two slots (2 and 13) can be used for DCP IIs or IOBs. The remaining 10 slots (3 through 12) are reserved for IOBs. Any of the IOBs can be mounted in slots 3 through 12 of a single frame HDCU. Slot 13 can be used for an IOB

provided that there is no redundant DCP II. Slots 2 through 13 can be used for any of the IOBs in the second frame of a dual frame HDCU.

The number and type of I/O points for monitoring and control by the HDCU determines the number and type of IOBs required. The following table provides I/O point counts for single and dual frame HDCUs with nonredundant DCP IIs and nonredundant IOBs when all available frame slots are populated by only one type of IOB.

I/O Type	I/O Points per HDCU									
	1 Frame, 1 DCP II					2 Frames, 1 DCP II				
	11 A-Loop	11 D-Loop	11 A-IN	11 D-OUT	11 D-OUT	23 A-Loop	23 D-Loop	23 A-IN	23 D-OUT	23 D-OUT
Analog in	88	0	264	0	0	184	0	552	0	0
Analog out	44	0	0	0	176	92	0	0	0	368
Discrete in	176	352	0	0	0	368	736	0	0	0
Discrete out	88	176	0	528	0	184	368	0	1104	0

A-Loop, D-Loop, P-Loop, A-Input, D-Output and A-Output Board Signal Characteristics

Analog Inputs	
Feature	**Description**
Number of inputs	8 for A-Loop; 24 for A-Input
Operational type	Lightly filtered, differential measurement of high-level voltage signals with per-point common mode isolation amplifiers
Input range	±5.3 VDC
Differential input resistance	800 kΩ
Common mode input resistance	400 kΩ
Filter – 3 dB point	6 Hz
Filter response (63%)	0.030 sec
Input open circuit detection	ITB cable disconnect is sensed by on-board CPU instantly and can initiate switchover for redundant IOBs. Signal wire disconnect results in error indication after input filter discharge (4 minutes for A-Loop, 12 seconds for A-Input)
Adjustments	None. Software calibration only
Isolation method	High input impedance (400 k ohm/line) per point unity-gain common-mode separating differential amplifiers
Common mode rejection	66 dB min; 80 dB typ 60/50 Hz
Normal mode rejection	21 dB at 60 Hz (250 ohm source), 19.5 dB at 50 Hz
Common mode operating range	±50 V
Common mode limit	±200 V
Normal mode limit	12 V

Analog Outputs	
Feature	**Description**
Number of outputs	4 for A-Loop and P-Loop boards, 16 for A-Output.
Operational type	Isolated mA current output
Output range	0-20.8 mA ±0.3 mA 0-20 mA with overrange, software calibrated 4-20 mA with under/over ranges, software calibrated
Resolution	12 bits
Load resistance	0 - 750 Ω
Accuracy	99.9%
Linearity	0.05% (+2 LSB)
Response (63%)	150 µsec
Indication	Each output internally monitored by an ADC and available for system display
Loopback	Each current loop is shorted under program control with an optically isolated switch to enable calibration (or monitor in backup mode) without external load resistor
Adjustments	None. Software calibration only
Isolation method	Galvanic for output power Optical for data transfer
Common mode rejection	66 dB min; 80 dB typ 60/50 Hz
Common mode operating range	±50 V
Common mode limit	±200 V
Output protection	0.250 A overcurrent fuse in positive line

Discrete Inputs	
Feature	**Description**
Number of inputs	16 for A-Loop and P-Loop boards 32 for D-Loop board
Operational type	Pulse-power sampling of dry contact status. Optional continuous power sampling available
Grouping	8 with one common return per group
Input connections	9 wires per group of 8
Sense voltage	22 V ±15%
Sense current	10 mA ±25%
Power pulse width	3.5 ms
Isolation power	Per group of 8
Isolation method	Galvanic for power Optical for data
Indication	One LED per input, mounted on an ITB/DI
Common mode operating range	250 V_{RMS}; from min source impedance 39 kΩ

Discrete Inputs	
Feature	**Description**
Common mode limit	250 V_{RMS}; continuous without damage
Normal mode limit	125 V_{RMS}; continuous without damage
External contact characteristics including wiring Open contact Closed contact Capacitance Line length	 20 kΩ min at 30 Hz 1000 Ω max at 30 Hz 0.33 µF max including line capacitance Function of line impedance (1 mile typical)

Discrete Outputs	
Feature	**Description**
Number of outputs	8 for A-Loop and P-Loop boards 16 for D-Loop board, 48 for D-Output board.
Operational type	Form A optically isolated bipolar FET
Grouping	8 with one common return per group
On resistance	10 Ω typical, 15 Ω max
Pull-in delay	5 ms max
Drop-out delay	5 ms max
Switch breakdown	100 V max
In-rush load	500 mA avg for 10 µsec
Carry load	200 mA_{RMS}; continuous
Switched load Max power Max voltage Min voltage Max current	 8 W +/- 50 VDC, 35 VAC_{RMS} 3.5 VDC plus voltage required for load 200 mA DC or peak AC
Contact protection	62 V bipolar zener clamp on each output
Contact protection shunt current	50 µA leakage into shield at 24 VAC_{RMS} 60 Hz
Off-state leakage current	10 µA max
Isolation method	Optical
Indication	One LED per output, mounted on an ITB/DO
Output protection	¼-A fuse each output
Output monitoring	Each output current is internally monitored by an optical coupler and is available for system display. The ITB/DO LED current provides sufficient load to activate the monitoring circuitry
Common mode operating range	250 V_{RMS}
Common mode limit	250 V_{RMS}; continuous without damage

Pulse/Frequency Inputs	
Feature	**Description**
Number of inputs	8 for P-Loop

Pulse/Frequency Inputs	
Feature	**Description**
Operational type	Differential high common mode voltage measurements for frequency and pulse totalization
Reference oscillator stability	100 ppm (0.01%)
Input ranges	0 to 32 kHz for pulse totalization 0.5 Hz to 32 kHz for frequency measurement
Frequency measurement accuracy	99.99% of input rate
Pulse totalizer	24 bits of accumulation (16,777,215 counts)
Pulse totalizer input scaler	16 bit programmable, divide by 1 to 65,535
Rate measurement	<table><tr><th>Number</th><th>Time base</th><th>Fin Cutoff</th><th>Scan</th></tr><tr><td>1</td><td>0.040 sec</td><td>25 Hz</td><td>0.1 sec</td></tr><tr><td>2</td><td>0.125 sec</td><td>8 Hz</td><td>0.3 sec</td></tr><tr><td>3</td><td>0.375 sec</td><td>2.6 Hz</td><td>1.0 sec</td></tr><tr><td>4</td><td>2.000 sec</td><td>0.5 Hz</td><td>5.0 sec</td></tr></table>
Input pulse width	10 µsec minimum
Input pulse voltage	4 V minimum
Differential input resistance	800 kΩ for V pulse differential ≤12 V 2 kΩ for V pulse differential > 12 V
Common mode input resistance	400 kΩ for V pulse common ≤60 V 1 kΩ for V pulse common > 60 V
Open input detection	Cable disconnect is sensed on board
Isolation method	High input impedance per point unity-gain common-mode differential amplifiers
Common mode rejection	80 dB typ (66 to 94 dB spread) at 60/50 Hz
Common mode operating range	±50 V
Common mode limit	±60 V
Normal mode limit	55 VDC

Interface Termination Boards (ITBs)

Input and output wiring requirements may differ substantially from one application to another. To meet this variation, a full range of field termination options are available to conveniently adapt field wiring to the Harmony DCU. Different ITB types are selected depending on the service. These boards are categorized as one of the following:

- Power supply.
- Analog I/O.
- Analog inputs.
- Discrete inputs.
- Discrete outputs.
- Foreign device I/O.

Environmental Requirements	
Feature	**Description**
Temperature	0° to +60° C (+32° to +140° F)
Relative humidity	5% to 95%, noncondensing

Environmental Requirements	
Feature	**Description**
Barometric pressure	82.7 to 103.4 kPa
Vibration	
Frequency	50 to 200 Hz
Displacement	0.05 in. p-p
Acceleration	0.3 g
Crossover	14 Hz of p-p displacement to acceleration
Shock	5 g, 11 msec, (½ sine wave)

Mechanical Specifications	
Feature	**Characteristic**
PC board	Each ITB PC board is 3 inches (76.2 mm) wide; 1/16 inch (1.6 mm) thick; 2 sided copper traces; single sided, thru hole component mounting.
Mounting	ITBs are intended for mounting in 3 inch (76.2 mm) snap track. ITBs are optionally available with a DIN rail adapter assembly. The DIN adapter supports rails which meet DIN EN50022 or DIN EN 50035 standards.

Physical Characteristics

All ITB field wiring is terminated with terminal block connections supporting up to 12 AWG stranded wire. ITBs requiring power provide a green LED to indicate +24 VDC power is present. All red LED ITB indicators show a state or condition related to the associated input or output. All ITBs provide a white silkscreen area for customer tag identification.

There are 22 interface terminal boards. Below is a list of supported I/O types, power, and physical sizes of each ITB.

ITB Type	Inputs	Outputs	Power	Length	Weight
PS-24			110/220 VAC 4.6/2.3 A	343 mm (13.5 in.)	936 g (33 oz)
AX	8 analog (direct)	4 analog (direct)	24 VDC	178 mm (7.0 in.)	171 g (6 oz)
AXNI	8 analog (direct)	4 analog (direct)	24 VDC	178 mm (7.0 in.)	171 g (6 oz)
AM	8 analog (5B module)	4 analog (direct)	5 VDC	292 mm (11.5 in.)	256 g (9 oz)
AM7B	8 analog (7B module)	4 analog (direct)	24 VDC	242 mm (9.5 in.)	171 g (6 oz)
AX-12	12 analog (direct)	None	24 VDC	178 mm (7.0 in.)	199 g (7 oz)
AXNI-12	12 analog (direct)	None	24 VDC	178 mm (7.0 in.)	227 g (8 oz)
AM7B-12	12 analog (7B module)	None	24 VDC	292 mm (11.5 in.)	171 g (6 oz)
AO8	None	8 analog (direct)	24 VDC		
DI	16 Discrete (direct)	None	None	178 mm (7.0 in.)	171 g (6 oz)
DIM	16 Discrete (Opto-22 or Grayhill)	None	24 VDC	292 mm (11.5 in.)	227 g (8 oz)
DIX	None	None (8 discrete pass thru)	None	76 mm (3.0 in.)	57 g (2 oz)
DO	None	8 discrete (direct)	24 VDC	115 mm (4.5 in.)	114 g (4 oz)

ITB Type	Inputs	Outputs	Power	Length	Weight
DONI	None	8 discrete (direct)	24 VDC		
DOM	None	8 discrete (Opto-22 or Grayhill)	24 VDC	153 mm (6.0 in.)	142 g (5 oz)
DOR	None	8 discrete (relay)	24 VDC	242 mm (9.5 in.)	454 g (16 oz)
DOE	None	None (8 discrete pass thru)	None	115 mm (4.5 in.)	57 g (2 oz)
DO16	None	16 discrete (direct)	24 VDC		
DONI16	None	16 discrete (direct)	24 VDC		
DOM16	None	16 discrete (Opto-22 or Grayhill)	24 VDC		
DOR16	None	16 discrete (relay)	24 VDC		
CIO	Serial	Serial	None	216 mm (8.5 in.)	171 g (6 oz)

A number of ITBs require plug mount signal conditioning modules to convert the field signal type to ones supported by the IOBs. Below is a list of signals supported by various suppliers of the conditioning modules.

ITB Type	Conditioning Module	Signal	Weight per Module
AM	Analog devices 5B30 series	mV	86 g (3 oz)
	Analog devices 5B31 series	VDC	86 g (3 oz)
	Analog devices 5B32 series	4-20 mA DC	86 g (3 oz)
	Analog devices 5B34 series	RTD	86 g (3 oz)
	Analog devices 5B40 series	Wide bandwidth mV	86 g (3 oz)
	Analog devices 5B41 series	Wide bandwidth VDC	86 g (3 oz)
	Analog devices 5B47 series	Linearized T/C	86 g (3 oz)
AM7B and AM7B-12	Analog devices 7B30 series	mV and low bandwidth VDC	64 g (2.25 oz)
	Analog devices 7B31 series	High bandwidth VDC	64 g (2.25 oz)
	Analog devices 7B32 series	4-20 mA DC	64 g (2.25 oz)
	Analog devices 7B33 series	1-5 VDC	64 g (2.25 oz)
	Analog devices 7B34 series	RTD	64 g (2.25 oz)
	Analog devices 7B35 series	Powered Xmtr 4-20 mA DC	64 g (2.25 oz)
	Analog devices 7B37 series	Nonlinear T/C	64 g (2.25 oz)
	Analog devices 7B47 series	Linearized T/C	64 g (2.25 oz)
DIM	Opto 22 G4 IDC series	Low VDC or VAC (10-32 V)	29 g (1 oz)
	Opto 22 G4 IAC series	High VDC or VAC (90-140 V)	29 g (1 oz)
	Grayhill 70G IDC series	Low VDC (10-32 V)	29 g (1 oz)
	Grayhill 70G IAC series	High VAC (90-140 V)	29 g (1 oz)
	Grayhill 70G IAC series	High VAC (180-280 V)	29 g (1 oz)
	Grayhill 70G IDC series	Dry contact	43 g (1.5 oz)

ITB Type	Conditioning Module	Signal	Weight per Module
DOM	Opto 22 G4 ODC series	Low VDC (5-60 V)	29 g (1 oz)
	Opto 22 G4 OAC series	High VAC (12-140 V)	29 g (1 oz)
	Opto 22 G4 OAC series	High VAC (24-280 V)	29 g (1 oz)
	Grayhill 70G ODC series	Low VDC (3-60 V)	29 g (1 oz)
	Grayhill 70G OAC series	High VAC (24-140 V)	29 g (1 oz)
	Grayhill 70G OAC series	High VAC (24-280 V)	29 g (1 oz)

ITB to IOB Cable Nomenclature

All ITB assemblies (with the exception of the ITB/PS-24 and ITB/DOE) cable directly to the HDCU Intelligent I/O boards (IOBs) using the same 28 conductor cable design. Two cable connectors are provided on each of these ITBs for cabling to redundant IOBs. Each of these cables is identical in construction other than differing lengths. Cable lengths from four feet up to 100 feet are available in varying increments.

Network/Frame Expansion Cables

Connection of the HDCU to the Control Network is supported by Dual Ethernet AUI connectors on each DCP II board. Angled mounted connectors used on the HDCU Transceiver cables simplify the connection and cable routing to Ethernet transceivers and hubs.

When an HDCU requires two frames of I/O, the frames can be mounted vertically or as an option, horizontally. These cables are specifically designed for making the connections between two frames.

Controlware II Software

Controlware II application software provides the basic process control and data acquisition building blocks which are supplied in the form of preprogrammed software modules loaded into the memory of the DCP II. Designed for the process or instrumentation engineer, Controlware II software employs a real-time process control language which provides I/O handling, regulatory control, and sequential logic control. Implementation of a control scheme is achieved by configuring the software modules using a simple pop-up window and menu format, or the Windows®-based Composer Configuration ToolKit (CTK) interface. Modules are assembled by the engineer to form control loops by a process called softwiring. Softwiring the Controlware II modules is analogous to implementing a control loop block diagram and is accomplished by using a fill-in-the-blanks menu procedure or softwiring through graphics via Composer CTK. This enables the engineer to configure control strategies without the need for programming skills.

Controlware II consists of various types of software modules that perform unique process control functions which can be configured to work together as an operational system. The software modules use a function index code or FIX to modify a module's behavior. As an example, by changing the FIX of a CAL module, the module can change from performing multiplication to performing addition. Each of the Controlware II software modules is listed below.

Modules for Input/output

- Input/Output Board Module (IOB).
- Communication Input/Output Module (CIO).
- Analog Input Module (ANI).
- Discrete Input Module (DI).
- Discrete Input Block Module (DIB).
- Profibus Board Module (PBUS)
- Discrete Output Module (DO).
- Discrete Output Block Module (DOB).
- Analog Output Module (ANO).
- Peer-to-Peer Module (PTP).
- Simulation Module (SIM).
-

Modules for Continuous Control

- Calculation Module (CAL)

Add/Subtract

Multiply/Divide

Mass Gas Flow Compensation for DP Gas Flow Meter

Mass Gas Flow Compensation for Vortex Shedding Flow Meter

Volumetric Gas Flow Compensation for DP Gas Flow Meter

Absolute/Deviation Signal Limiter

Square Root Extraction

Arithmetic Functions

Power, X to Y

Random Number and Noise Generator

Value Selector

Filters

Rate of Change Computation

Function Generator with Hysteresis

Fifth Order Polynomial

Four Input Value Selector

Multiple Data Selector

Ratio Setting for Blending

Free Running Program Generator

Synchronous Program Generator

Dead Time and Lag Simulator

Dead Time Compensator

Running Average

Moving Average

Moving Average and Standard Deviation

- Controller Module (CON)

  Standard PID Controller with Nonlinear Gain

  Incremental PID Controller with Nonlinear Gain

  Dual Mode Controller with PID Algorithm

  On-Off Controller

  Manual Loader Station

- Totalizer Module (TOT)
- Custom Control Module (CCM)

Modules for Discrete Control

- Multi-State Device Control Module (MSDC)
- Discrete Control Device Module (DCD)
- Timer/Counter Module (TMR)
- Boolean Logic Module (BLM)
- PCU Status Display Module (PSDM)

Equipment Characterization and Data Exchange Modules

- Message Module (MSG).
- Record Module (REC).
- Distributed Control Unit Module (DCU).
- Power Supply Board Module (PSB).
- Module Set Module (MSET).
- Function Block Module (FBLK).

External Interface Modules

- Digital Input or Output Block (DIOB).
- Analog Input or Output (AIO).
- Analog Input or Output Block (AIOB).
- Profibus Map (PMAP)
- External Control (XCON).
- External Message (XMSG).
- Profibus Slave (PSLV)

Modules for Sequence Control

- Phase Module (PHS).
- Parameter Module (PAR).
- Security Module (SEC).
- PCU Security Module (PSEC).
- Pseudo Device Module (PDEV).
- Device Module (DEV).
- Discrete Device Test Module (DTM).
- Pointer Table Module (PTB).
- Transfer Module (XFER).
- State Module (STAT).

Controlware II Command Language (CCL)

Most control strategies can be configured using the standard preprogrammed Controlware II modules and soft-wiring. There are applications which require more flexibility for the control scheme to meet a user's special requirements. For these applications the control solution should be programmed by a high-level language. Controlware II command language (CCL) provides programmable custom control functionality. CCL statements are stored in the PHS Module.

Sequential	Arithmetic	Relational	Logical
IF	EXPONENTIAL	GREATER THAN	BOOLEAN NOT
ELSE	MULTIPLY	GREATER THAN OR EQUAL	BOOLEAN OR
FOR	DIVIDE	LESS THAN	BOOLEAN AND
WHILE	MODULUS	LESS THAN OR EQUAL	AND BITS
RETURN	ADD	EQUAL	OR BITS
END	SUBTRACT	NOT EQUAL	ONE'S COMPLEMENT BITS
CONTINUE	SQUARE ROOT		EXCLUSIVE OR BITS
BREAK	SIN		SHIFT LEFT BITS
CASEOF	COS		SHIFT RIGHT BITS
CASE	TAN		ASSIGNMENT
GOTO	ABSOLUTE		OPEN
WAIT	LOG BASE 10		CLOSE
DELAY	NATURAL LOG		ON
	POWER X TO Y		OFF
			START
			STOP

For more information on the Control IT *suite of products , contact us at ControlIT@us.abb.com*
For the latest information on ABB visit us on the World Wide Web at http://www.abb.com

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