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CATALOG  
1102

CONTROL SOLUTIONS





### ABOUT DIVELBISS CORPORATION

Divelbiss Corporation is located in Fredericktown, Ohio and was founded in 1974 with the goal of providing quality electronic product engineering and assembly services to original equipment manufacturers.

Since then, Divelbiss has grown and evolved into a diversified corporation. In 1978 we introduced the first ICM Programmable Controllers to compliment the complex systems engineering and product design being done for various client organizations. These early controllers featured modular construction and were designed from the beginning for use in factory environments.

As acceptance of electronic automation control grew, so did our commitment to meet or exceed the highest quality standards while maintaining fair prices for our products. Our commitment caused many OEM clients to begin using our staff as an extension of their own.

In 2004, Divelbiss introduced the patented PLC on a Chip™ Technology; which provides complete PLC functionality in one integrated circuit. PLC on a Chip™ allows OEMs to create a unique product, utilizing PLC technology without time consuming expense of developing low level software and device drivers.

Unlike other companies, Divelbiss does not avoid the word *custom*. In fact, Divelbiss welcomes the opportunity to develop and provide custom solutions. Whether you wish to private label, require a modification to our standard product offering or would like a completely custom product, Divelbiss has the experience.

Divelbiss Corporation currently operates a 17,000 square foot manufacturing facility that operates both Thru-hole and Surface Mount (SMT) assembly lines and can provide mechanical assembly, cable assembly and panel assembly. In addition, Divelbiss offers technical services programming and testing.

### COMMITMENT TO EXCELLENCE

**Divelbiss Corporation is committed to resolving customer application problems through effective design and production of electronic products. Dedicated to continuous improvements of products and processes, Divelbiss Corporation will exceed our customers' expectations of technology, quality and delivery.**



*Terry L. Divelbiss  
President, Divelbiss Corporation*

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Products

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Programmable  
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Digital I/O

PLC on a Chip  
Products

Education  
Products

# EZ LADDER TOOLKIT

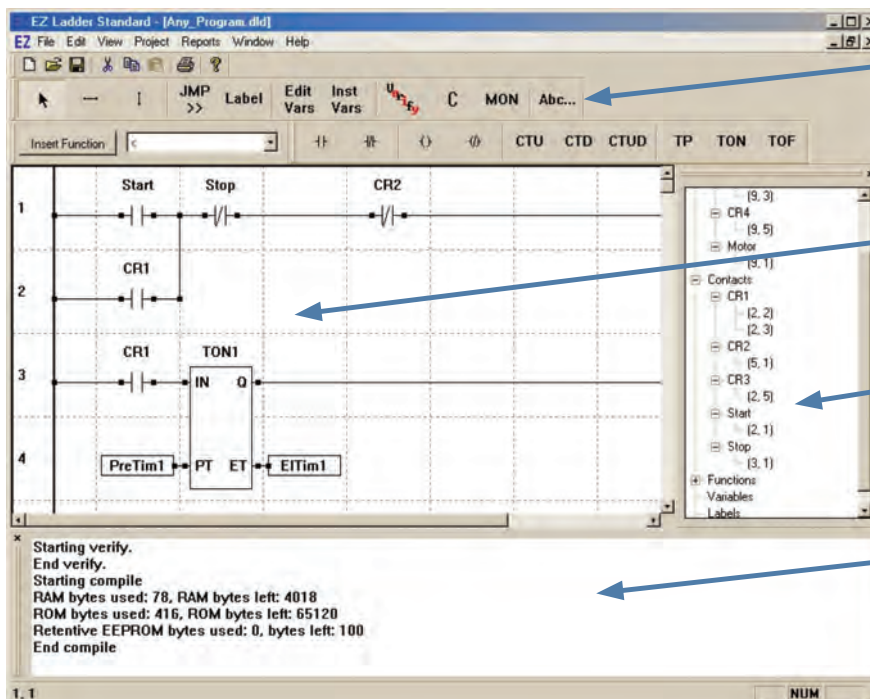
The Divelbiss EZ Ladder® Toolkit software is a powerful and easy-to-use Windows® based programming platform used to create the ladder diagram programs for any PLC on a Chip™ based controller. When used in conjunction with any PLC on a Chip™ based controller, EZ LADDER Toolkit provides a quick and easy to use GUI interface for designing and drawing ladder diagram projects using function blocks and ladder diagram objects. Controllers (*targets*), that will be the final destination are configured using a built-in menu system. With the target selected, only the supported features are available for creating the ladder diagram project. OEM branding is available for EZ LADDER.

- Parallels IEC61131-3 Standard
- Ladder Diagram and Function Blocks
- RS232 Serial Interface
- Modbus Slave Support
- SAE J1939 Support
- Real Time Monitoring
- Debugging Tools
- Printable Reports



When coupled with the PLC on a Chip Development Kit it provides a full featured design and proof-of-concept capability at very reasonable cost. Includes support for OptiCAN network for up to 10 nodes without purchasing additional hardware or software.

Production tooling is easier since any programs developed are *transportable* for use with the final product. Code libraries are easily created to allow for simple *cut and paste* reuse of previously designed circuit elements. All elements are cross referenced making it easy to locate all instances of an element used in multiple rungs of the program ladder.



## Tool Bars:

Easy to use shortcut buttons for object placement, drawing links, and variable insertion.

## Ladder Diagram Workspace:

Power rails with numbered rungs.

## Cross Reference Window:

Quick reference for contacts, coils, functions, and variables used in the displayed ladder.

## Output Window:

Displays status, memory use, and any errors encountered during the Compile or Verify process.

## EZ LADDER TOOLKIT FUNCTION LIST

Absolute	Drum Sequencer	Keypad	Optican Nodestatus Read	Shift Left
Add	Equal To	Latching Coil	Optican Txnetmsg Send	Shift Right
And	EEPROM_Read	Clear LCD Display	Bitwise Or	Clear Digital Display
Average	EEPROM_Write	Print to LCD Display	PID	Print to Digital Display
Bit Pack	Falling Trigger	Less Than	PWM	Set Dominant SR Flip Flop
Bit Unpack	Gray Code SSI	Less Than Or Equal To	PWM Frequency	Subtract
Convert to Boolean	Get Current Date	Limit	Convert to Real	Convert to Timer
Compare	Get Current Time	Moving Average	Rising Trigger	Time Delay OFF
Counter Timer	Greater Than	Max	Rotate Left	Time Delay ON
Counter LS7366R	Greater Than Or Equal To	Min	Rotate Right	Pulse Timer
Count Down	High Speed Timer/Counter	Modulo	Reset Dominant RS Flip Flop	Unlatch Coil
Count Up	Hysteresis	Multiply	Select	Bitwise XOR
Count Up / Down	Convert to Integer	Multiplexer	Serial Print	
Direct Coil	J1939 SPN Read	Bitwise Not	Set the Date	
Divide		Not Equal To	Set the Time	

- Hardware Targets may not support all functions.

## EZ LADDER TOOLKIT PRICING

Model #	Description	Price
<b>EZLDCD-01</b>	EZ LADDER Toolkit Standard Edition on CD. Operates with all targets. Allows for installation on two computers.	FREE**
<b>EZLD-LDR-01</b>	EZ LADDER Loader Software. Provides method to EZ LADDER programs loaded on hardware targets by creating and sending executable file (.exe) that can be loaded into target with only PC serial port and programming cable. Does not allow end-user to view or change program in any way	FREE**
** Free to all customers with qualifying hardware purchase.		

## OPTICAN CONFIGURATION TOOL PROFESSIONAL

OptiCAN is a CAN network employed by PLC on a Chip™ controllers. The OptiCAN network is register based and allows for communication between supported controllers, other supported controllers, and I/O. The network includes built-in status monitoring capabilities and error detection.

Using OptiCAN, a controller can receive or transmit data across the 2-wire CAN network to another controller or dedicated I/O devices such as the HEC-1100. Transmissions are global allowing all nodes to be able to receive the data. Nodes will only receive data when the desired source node is selected to be received from.

EZ LADDER Toolkit provides support for up to 10 nodes internally with its built-in OptiCAN Configuration Tool. OptiCAN Configuration Tool Professional is available in the event more than 10 nodes are required, or additional trouble shooting tools are needed. The professional version includes a USB-CAN interface module and software required to be able to print reports, monitor network traffic in real-time, see statistics including transmit rates, view the heartbeat and control the network (start, stop, reset).

## OPTICAN CONFIGURATION TOOL PROFESSIONAL PRICING

Model #	Description	Tier	Price
<b>OPTICFGTOOL-01</b>	OptiCAN Configuration Tool Professional. Includes USB-CAN module, connection cabling and software for advanced control and monitoring of OptiCAN networks.	1	\$665.00

## SOFTWARE COMPATIBILITY MATRIX

FEATURE	CONTROLLER SERIES / FAMILY								
	Harsh Environment Controllers	Harsh Environment HMI / Controllers	Enhanced Baby Bear Controllers	PCS Controllers	Micro Bear Controllers	Solves-It! Plug-in PLCs	Application Modules	Boss Bear Controllers	Boss 32 Controllers
EZ LADDER Toolkit Standard	•	•	•	•	•	•	•		
OptiCAN Configuration Tool Pro.	•	•	•	•					
EZ LADDER Loader	•	•	•	•	•	•	•		

# HARSH ENVIRONMENT CONTROLLERS

Divelbiss Harsh Environment Controllers are designed for use in areas with less than ideal conditions such as moisture, temperature and vibration. Perfect for off-road and mobile applications, the Harsh Environment Controllers are housed in a sealed, water-tight enclosure and operate on wide range DC Power. The Harsh Environment Controllers are easily programmed in ladder diagram and function block using the powerful EZ LADDER Toolkit.



Each of the Harsh Environment Controller models provide a combination of Digital Inputs, Digital Outputs and High Speed Counter Inputs - all DC voltage. Digital Outputs can be operated as a standard DC Voltage Output or as a Pulse Width Modulated (PWM) Output. Some models also provide analog inputs for voltage or current (DC).

Communications and Networking are standard on all Harsh Environment Controllers. All models support the SAE J1939 protocol and our OptiCAN network. Using the OptiCAN network, multiple Harsh Environment Controllers may be networked together and to other controller families and I/O Modules. Optional serial ports are available for serial printing and for communication as a slave on a Modbus network.

- ▶ 8-32VDC POWER
- ▶ -40°C to +80°C
- ▶ Quick Disconnects
- ▶ 40KHZ Counters
- ▶ 4 Amp Outputs\*
- ▶ May be Submersed to 3 Feet of Water

CHART LEGEND		MODELS																		
• = Supports Feature Num = Qty of Feature • FS = Field Selectable Feature		HEC-1000-E-R	HEC-1010-E-R	HEC-1011-E-R	HEC-1500-E-R	HEC-1504-E-R	HEC-2000-E-R	HEC-2004-E-R	HEC-4000-E-R	HEC-4004-E-R	HEC-4010-E-R	HEC-4014-E-R	HEC-4100-E-R	HEC-4104-E-R	HEC-4110-E-R	HEC-4114-E-R	HEC-4200-E-R	HEC-4204-E-R	HEC-4210-E-R	HEC-4214-E-R
FEATURE																				
8-32VDC Sinking Inputs	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
# of Inputs	6	6	6	6	6	8	8	4	4	4	4	4	4	4	4	4	4	4	4	4
High Speed Counter Inputs***	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
High Speed Count Type - PNP/NPN	PNP	PNP	PNP	•FS	•FS	PNP	PNP	PNP	PNP	PNP	PNP	PNP	PNP	PNP	PNP	PNP	PNP	PNP	PNP	PNP
High Speed Counter Freq Max. (HZ)	40K	40K	40K	40K	40K	40K	40K	40K	40K	40K	40K	40K	40K	40K	40K	40K	40K	40K	40K	40K
8-32VDC Sourcing Outputs	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
# of Outputs	6	6	6	6	6	8	8	6	6	6	6	6	6	6	6	6	6	6	6	6
Outputs selectable as PWM	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Output Current per Output Pair *	4A	4A	4A	4A	4A	4A	4A	4A	4A	4A	4A	4A	4A	4A	4A	4A	4A	4A	4A	4A
Output Current Feedback								•	•	•	•	•	•	•	•	•	•	•	•	•
Real Time Clock	•	•	•	•	•															
# of CAN Ports	2	2	2	2	2	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2
SAE J1939	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Divelbiss OptiCAN	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Modbus Slave**			•	•	•	•		•		•		•		•		•		•		•
Multipurpose RS232 Serial Port**			•		•FS		•FS		•FS		•FS		•FS		•FS		•FS		•FS	
Multipurpose RS422 Serial Port**					•FS		•FS		•FS		•FS		•FS		•FS		•FS		•FS	
Multipurpose RS485 Serial Port**					•FS		•FS		•FS		•FS		•FS		•FS		•FS		•FS	
# of Analog Inputs	2	2	2	2	2			4	4	4	4	4	4	4	4	4	4	4	4	4
0-20mADC Analog Inputs	•			•FS	•FS			•	•				•	•			•	•		
0-5VDC Analog Inputs		•	•	•FS	•FS					•	•				•	•			•	•
0-10VDC Analog Inputs				•FS	•FS															
10 Bit Resolution Analog	•	•	•	•	•			•	•	•	•									
12 Bit Resolution Analog													•	•	•	•				
15 Bit Resolution Analog																	•	•	•	•
* Total Max. Current for Output Pair																				
** Serial Communications Port available on additional models. Refer to <a href="http://www.divelbiss.com">http://www.divelbiss.com</a> for a full listing of HEC Models that support serial communications.																				
*** # of Digital Inputs (Part of total Digital Inputs) that also operate as High Speed Counters.																				



### HEC CONTROLLER PRICING

Model #	Tier	Price	Model #	Tier	Price
<a href="#">HEC-1000-E-R</a>	0	\$294.00	<a href="#">HEC-4004-E-R</a>	0	\$408.00
<a href="#">HEC-1003-E-R</a>	0	\$349.00	<a href="#">HEC-4010-E-R</a>	0	\$333.00
<a href="#">HEC-1500-E-R</a>	0	\$310.00	<a href="#">HEC-4014-E-R</a>	0	\$408.00
<a href="#">HEC-1504-E-R</a>	0	\$357.00	<a href="#">HEC-4100-E-R</a>	0	\$377.00
<a href="#">HEC-2000-E-R</a>	0	\$277.00	<a href="#">HEC-4104-E-R</a>	0	\$452.00
<a href="#">HEC-2001*</a>	0	\$340.00	<a href="#">HEC-4110-E-R</a>	0	\$377.00
<a href="#">HEC-2002*</a>	0	\$338.00	<a href="#">HEC-4114-E-R</a>	0	\$452.00
<a href="#">HEC-2003*</a>	0	\$337.00	<a href="#">HEC-4200-E-R</a>	0	\$438.00
<a href="#">HEC-2004-E-R</a>	0	\$345.00	<a href="#">HEC-4204-E-R</a>	0	\$513.00
<a href="#">HEC-4000-E-R</a>	0	\$333.00	<a href="#">HEC-4210-E-R</a>	0	\$438.00
<a href="#">HEC-4003-E-R</a>	0	\$410.00	<a href="#">HEC-4214-E-R</a>	0	\$513.00

Models shown are normally stocked. For additional models and features available, please see <http://www.divelbiss.com>.

\* Non-RoHS Model. Other specifications same as E-R Part number.  
Available while supplies last.

## HARSH ENVIRONMENT I/O MODULES



- ▶ 8-32VDC POWER
- ▶ -40°C to +70°C
- ▶ 4 Amp Outputs\*
- ▶ May be Submersed to 3 Feet of Water

CHART LEGEND		MODELS
• = Supports Feature		
FEATURE		HEC-1100
8-32VDC Sinking Inputs	•	
# of Inputs		8
High Speed Counter Inputs		
8-32VDC Sourcing Outputs	•	
# of Sourcing Outputs		8
Outputs selectable as PWM	•	
Output Current per Output Pair *		4A
* Total Max. Current for Output Pair		

Harsh Environment I/O Modules allow for additional I/O requirements in any system. HEC I/O Modules are designed to withstand the same environments as the Harsh Environment Controllers.

HEC I/O Modules connect to any Divelbiss controller that supports OptiCAN. The modules individual I/O are controlled from the connected controller(s) using OptiCAN network registers.

### HEC I/O MODULE PRICING

Model #	Tier	Price
<a href="#">HEC-1100</a>	0	\$248.00

# HARSH ENVIRONMENT HMI & HMI CONTROLLERS

The Divelbiss HEC-HMI series expands the Harsh Environment Controller product family with a harsh environment HMI and combination HMI / Controller. Built to withstand rugged environments including temperature extremes, the HEC-HMI series provides an easy to implement, feature rich, and powerful HMI and HMI with controller. All models program using EZ LADDER Toolkit.

Common to all HEC-HMI models is an LCD Display with Backlight, programmable buttons, power monitor, programmable LED indicators, SAE J1939, OptiCAN and Modbus Slave networking.

Models with integrated controllers, include analog, digital and high speed counter inputs with digital, PWM and relay outputs.



- ▶ **8-32VDC POWER**      ▶ **4 Amp Outputs \***      ▶ **2x16 or 4x20 Display**      ▶ **10 or 15 Bit Analog**
- ▶ **-40°C to +80°C**      ▶ **Relay Outputs**      ▶ **9 Programmable Keys**      ▶ **NEMA 4X, IP66, UL94V-0**
- ▶ **200KHZ Counters**      ▶ **Networking**      ▶ **4 Programmable LEDs**

CHART LEGEND	MODELS					
<ul style="list-style-type: none"> <li>• = Supports Feature</li> <li>Num = Qty of Feature</li> <li>• FS = Field Selectable Feature</li> </ul>						
FEATURE	HEC-HMI-2-ER	HEC-HMI-4-E-R	HEC-HMI-C2100-E-R	HEC-HMI-C2150-E-R	HEC-HMI-C4100-E-R	HEC-HMI-C4150-E-R
8-32VDC Sinking Inputs			•	•	•	•
# of Inputs			6	6	6	6
High Speed Counter Inputs			2	2	2	2
High Speed Count Type - PNP/NPN			•FS	•FS	•FS	•FS
High Speed Counter Freq Max. (HZ)			200K	200K	200K	200K
8-32VDC Sourcing Outputs			•	•	•	•
# of Sourcing Outputs			4	4	4	4
Outputs selectable as PWM			•	•	•	•
Output Current per Output Pair *			4A	4A	4A	4A
Output Current Feedback			•	•	•	•
# of Relay Outputs 2A, Form C			2	2	2	2
# of CAN Ports	1	1	1	1	1	1
SAE J1939	•	•	•	•	•	•
Divelbiss OptiCAN	•	•	•	•	•	•
Modbus Slave	•	•	•	•	•	•
# of Analog Inputs			2	2	2	2
RS232 / RS422 / RS485 Port	•	•	•	•	•	•
0-20mADC Analog Inputs			•FS	•FS	•FS	•FS
0-5VDC Analog Inputs			•FS	•FS	•FS	•FS
Input Power Monitor	•	•	•	•	•	•
10 Bit Resolution Analog			•		•	
15 Bit Resolution Analog				•		•
2x16 Large Character Display	•		•		•	
4x20 Standard Character Display		•		•		•
* Total Max. Current for Output Pair						

HEC HMI PRICING		
Model #	Tier	Price
HEC-HMI-2-E-R	0	\$473.00
HEC-HMI-4-E-R	0	\$473.00
HEC-HMI-C2100-E-R	0	\$548.00
HEC-HMI-C2150-E-R	0	\$654.00
HEC-HMI-C4100-E-R	0	\$548.00
HEC-HMI-C4150-E-R	0	\$654.00



# HARSH ENVIRONMENT CABLES

HEC SERIES CABLE COMPATIBILITY CHART

CABLE	MODELS															
	HEC-1000-E-R	HEC-1001-E-R	HEC-1010-E-R	HEC-1011-E-R	HEC-1500-E-R	HEC-1504-E-R	HEC-2000-E-R	HEC-2004-E-R	HEC-4000-E-R	HEC-4004-E-R	HEC-4010-E-R	HEC-4014-E-R	HEC-4100-E-R	HEC-4104-E-R	HEC-4110-E-R	HEC-4114-E-R
HEC-10	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
HEC-20	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
HEC-100	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
HEC-110	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
HEC-900	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
HEC-910	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
HEC-920	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
126-102860	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
138-106865	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
SI-PGM															•	•

I/O & POWER CABLES / KITS PRICING

Model #	Description	Tier	Price
<b>HEC-10</b>	"A" Plug Connector kit with keyed connector, wedge lock and crimp pins.	0	\$25.00
<b>HEC-20</b>	"B" Plug Connector kit with keyed connector, wedge lock and crimp pins.	0	\$34.00
<b>HEC-100</b>	"A" Plug Cable Assembly with 6 Ft. Flying Leads	0	\$47.00
<b>HEC-110</b>	"B" Plug Cable Assembly with 6 Ft. Flying Leads	0	\$50.00
<b>HEC-120</b>	"A" Receptacle Cable Assembly with 6 Ft. Flying Leads	0	\$49.00
<b>HEC-130</b>	"B" Receptacle Cable Assembly with 6 Ft. Flying Leads	0	\$49.00



PROGRAMMING CABLES PRICING

Model #	Description	Tier	Price
<b>HEC-900</b>	In-line Breakout Programming Cable Assembly with Deutsche Interface to PC.	0	\$81.00
<b>HEC-910</b>	In-line Breakout Programming Cable Assembly with 9 pin D-sub Interface to PC.	0	\$91.00
<b>HEC-920</b>	Programming Cable with Deutsche to 9 Pin D-sub for PC. Mates with HEC-900.	0	\$44.00
<b>126-102860</b>	Null Modem Cable. Required to connect HEC-910 and HEC-920 to PC.	1	\$14.00
<b>138-106865</b>	USB to Serial Port Adapter Cable.	2	\$49.00



## HARSH ENVIRONMENT ACCESSORIES & COMBO KITS

HEC ACCESSORIES & COMBO KITS PRICING

Model #	Description	Tier	Price
<b>HEC-PS5</b>	5VDC Power Supply. Converts input power 8-32VDC to 5VDC for external devices.	0	\$39.00
<b>HEC-OC-INT</b>	HEC Open-Collector Interface for HEC High Speed Counter Inputs. Converts Open-Collector (NPN) device signals to PNP signals for counter inputs.	0	\$35.00
<b>SK-HEC</b>	Starter Kit for HEC Products. Includes HEC-100, HEC-110, HEC-910, 126-102860 and EZ LADDER Toolkit.	0	\$194.00

# PCS CONTROLLERS



PCS Controllers are powerful and easy to use programmable logic controllers. The PCS Series are DIN rail mounted and provide a wide variety of features and options. All PCS models support up to 128 digital inputs and 128 digital outputs from the High Density I/O Series. Enclosed in a plastic box, the PCS maintains a small footprint and can operate on 10VAC or 10-30VDC and programs using Divebiss EZ LADDER Toolkit.

CHART LEGEND		MODELS					
• = Supports Feature Num = Qty of Feature		PCS-100	PCS-101	PCS-102	PCS-200	PCS-201	PCS-202
FEATURE							
On-board Inputs							
Maximum # Inputs -HDIO		128	128	128	128	128	128
High Speed Counter Inputs					2	2	2
High Speed Count Type - PNP/NPN					PNP	PNP	PNP
High Speed Counter Freq Max. (HZ)					100K	100K	100K
On-Board Outputs							
Maximum # Outputs - HDIO		128	128	128	128	128	128
# of CAN Ports					2	2	2
SAE J1939					•	•	•
Divebiss OptiCAN					•	•	•
Modbus Slave*		•	•	•	•	•	•
# of Analog Inputs				2	2	2	2
0-20mADC Analog Inputs				•			•
0-5VDC Analog Inputs			•			•	
# Analog Outputs			4	4		4	4
0-20mADC Analog Outputs							
0-5VDC Analog Outputs			•			•	
# PWM Channels - Open Collector			2	2		2	2
Real Time Clock		•	•	•	•	•	•
SSI Port					•	•	•
* Other Models Available with factory installed serial port as RS232, RS422 or RS485.							

PCS CONTROLLER PRICING		
Model #	Tier	Price
<b>PCS-100</b>	1	\$193.00
<b>PCS-101</b>	1	\$337.00
<b>PCS-102</b>	1	\$346.00
<b>PCS-200</b>	1	\$226.00
<b>PCS-201</b>	1	\$370.00
<b>PCS-202</b>	1	\$379.00

Models shown are normally stocked. For additional models and features available, please see:

<http://www.divebiss.com>

## PCS CABLES & ACCESSORIES

PCS PROGRAMMING CABLES PRICING			
Model #	Description	Tier	Price
<b>126-102860</b>	Null Modem Cable. Required to connect PCS to PC Serial Port	1	\$14.00
<b>138-106865</b>	USB to Serial Port Adapter Cable.	2	\$49.00

PCS POWER & I/O CABLES			
Model #	Description	Tier	Price
<b>PIMS-CA-6</b>	Input Power Cable Assembly with 6 Ft. Flying Leads.	1	\$13.00
<b>PCS-CA-PWM</b>	PWM Breakout Cable. Provides connectivity to PWM Channels	1	\$15.00



# ENHANCED BABY BEAR CONTROLLERS

The Enhanced Baby Bear Series (EBB) is a family of open-board program-mable logic controllers. This series open-board construction provides powerful features at a lower cost. The Enhanced Baby Bear controllers program using EZ LADDER Toolkit.

Each controller boasts a different set of features and options including expandable I/O (using High Density I/O or EBB I/O) , High Speed Counters, CAN Network Port, Real Time Clock optional 2nd Serial Port.

All models have 10-30 VDC/VAC Inputs and Relay Outputs.



- 10VAC or 12VDC Power
- 10-30VAC / 10-30VDC Inputs
- -40°C to +60°C
- On-Board I/O

CHART LEGEND		MODELS						
• = Supports Feature Num = Qty of Feature		ICM-EBB-100	ICM-EBB-200	ICM-EBB-300	ICM-EBB-400	ICM-EBB-500	ICM-EBB-600	ICM-EBB-700
FEATURE								
Flash Memory (bytes)		128K	128K	128K	128K	128K	256K	256K
# On-board Inputs 10-30VDC/VAC		5	5	5	5	5	5	5
Input Expansion - HDIO / EBB					EBB	HDIO	EBB	HDIO
Max # Inputs w/Expansion (Total)		5	5	5	12	125	12	120
High Speed Counter Inputs			1	1	1	1	1	1
High Speed Count Type - PNP/NPN			PNP	PNP	PNP	PNP	PNP	PNP
High Speed Counter Freq Max. (HZ)			100K	100K	100K	100K	100K	100K
# On-Board Outputs - Relay		5	5	5	5	5	5	5
Output Expansion - HDIO / EBB					EBB	HDIO	EBB	HDIO
# of CAN Ports							2	2
SAE J1939							•	•
Divebiss OptiCAN							•	•
Modbus Slave*							•	•
Real Time Clock				•	•	•	•	•

\* With Optionally purchased RS232, RS422 or RS485 Serial Port Module..

EBB CONTROLLER PRICING		
Model #	Tier	Price
ICM-EBB-100	1	\$178.00
ICM-EBB-200	1	\$184.00
ICM-EBB-300	1	\$200.00
ICM-EBB-400	1	\$205.00
ICM-EBB-500	1	\$210.00
ICM-EBB-600	1	\$222.00
ICM-EBB-700	1	\$228.00

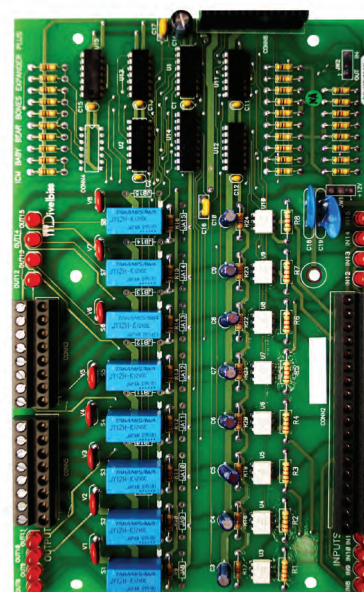
EBB SERIAL PORT MODULES PRICING			
Model #	Description	Tier	Price
ICM-EBB-RS232	RS232 Serial Port Module with Hardware	1	\$53.00
ICM-EBB-RS422	RS422 Serial Port Module with Hardware	1	\$56.00
ICM-EBB-RS485	RS485 Serial Port Module with Hardware	1	\$51.00

Programmable  
Logic Controllers

## ENHANCED BABY BEAR I/O, CABLES & ACCESSORIES

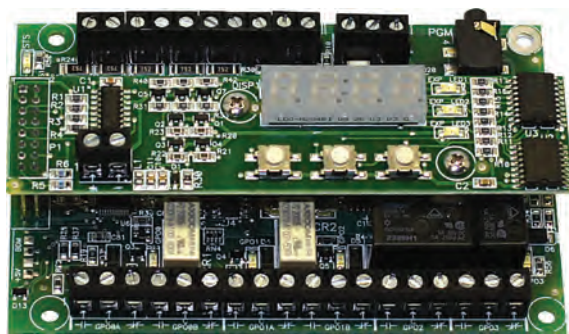
EBB I/O PRICING			
Model #	Description	Tier	Price
ICM-EBB-IO-54RE-P	EBB I/O Expansion Board, 8 Inputs 10-30VDC, 8 Relay Outputs, Stack mounts vertically to Enhanced Baby Bear Controller	1	\$190.00

EBB CABLES & ACCESSORIES PRICING			
Model #	Description	Tier	Price
126-102860	Null Modem Cable. Required to connect EBB Controller to PC Serial Port.	1	\$14.00
138-106865	USB to Serial Port Adapter Cable.	2	\$49.00
PIMS-CA-6	Input Power Cable Assembly with 6 Ft. Flying Leads.	1	\$13.00
ICM-HP-01	Enhanced Baby Bear Mounting Kit. Mounts EBB to Sub-plate with spacers and screws.	1	\$13.00
ICM-HP-08	EBB I/O Mounting Kit. Mounts ICM-EBB-IO-54RE-P to Enhanced Baby Bear (Stacking Configuration).	1	\$11.00





# MICRO BEAR CONTROLLERS



- ▶ 9-32VDC Input Power
- ▶ 9-32VDC Digital Inputs
- ▶ Two DPDT Relay Outputs
- ▶ Two Form C Relay Outputs
- ▶ 0°C to +60°C
- ▶ High Speed Counter Inputs
- ▶ Analog Inputs
- ▶ Sinking or Sourcing Inputs

The Micro Bear is a mini programmable logic controller with in an open-board design. Programmed using EZ LADDER Toolkit, the Micro Bear is rich in features and it's small form factor make it ideal for many control situations. In addition to it's base features, it can optionally be ordered with programmable push buttons and display.

CHART LEGEND		MODELS	
<ul style="list-style-type: none"> <li>• = Supports Feature</li> <li>Num = Qty of Feature</li> <li>• FS = Field Selectable Feature</li> </ul>			
FEATURE		ICM-MB-100	ICM-MB-110
# of Digital Inputs		6	6
Sinking Inputs		•FS	•FS
Sourcing Inputs		•FS	•FS
# High Speed Counter Inputs		2	2
High Speed Count Type - PNP/NPN		PNP	PNP
High Speed Counter Freq Max. (HZ)		25K	25K
# On-Board Outputs		4	4
DPDT Relays , 2 Amp		2	2
Form C Relays, 5 Amp		2	2
Programmable Push Buttons			3
4-digit Programmable LED Display			•
# Analog Inputs, 0-5VDC, 10 Bit		1	2

MICRO BEAR CONTROLLERS PRICING			
Model #	Description	Tier	Price
<b>ICM-MB-100</b>	Standard Micro Bear with Digital I/O and One Analog Input Channel	1	\$99.00
<b>ICM-MB-110</b>	Standard Micro Bear with Expansion Display Board, Push Buttons and additional Analog Input Channel (2 Total).	1	\$152.00

MICRO BEAR PROGRAMMING CABLES PRICING			
Model #	Description	Tier	Price
<b>SI-PGM</b>	Programming Cable for Micro Bear & Solves-It!	1	\$16.00
<b>138-106865</b>	USB to Serial Port Adapter Cable.	2	\$49.00

MICRO BEAR HARDWARE MOUNTING KITS PRICING			
Model #	Description	Tier	Price
<b>MB-HP-01</b>	Micro Bear DIN Rail Mount Kit.	1	\$22.00
<b>MB-HP-02</b>	Micro Bear Screw Tab Mount Kit.	1	\$23.00
<b>MB-HP-03</b>	Micro Bear Hardware Mount Pack, 1/2" Standoffs	1	\$9.00

## SOLVES-IT! PLUG-IN PLCs

The Solves-It! series of plug-in PLCs provide a new solution where a small, yet versatile logic controller is required. Based on patented PLC on a Chip™ technology, the Solves-It! is easy to apply and program using the included PC based EZ LADDER Toolkit.

The Solves-It! controllers are ideal for small system control and monitor applications, particularly in instances where panel space is limited. Solves-It! mounts in any standard 11-pin octal base and requires only 1.75" of DIN rail space in the panel.

Standard models include digital and/or analog I/O and programmable LED indicators. Enhanced models also include programmable push-buttons and programmable LED display.



- ▶ Digital I/O
- ▶ Analog Inputs
- ▶ Programmable LEDs
- ▶ Small Form Factor
- ▶ Fits Standard 11-pin Octal Socket
- ▶ Programmable Push Buttons
- ▶ Programmable Display
- ▶ DC Powered & I/O

CHART LEGEND		SOLVES-IT! PLUG-IN PLC MODELS					
• = Supports Feature Num = Qty of Feature							
FEATURE	SI-100	SI-101	SI-110	SI-200	SI-201	SI-210	
# Dedicated Digital Inputs	4	4		4	4		
Sinking Inputs		4			4		
Sourcing Inputs	4			4			
# Dedicated Outputs	4	4	2	4	4	2	
Sinking Outputs (300mADC)		4			4		
Sourcing Outputs (300mADC)	4			4			
# High Speed Counters	1	1	1	1	1	1	
High Speed Counter Freq Max.	25KHZ	25KHZ	25KHZ	25KHZ	25KHZ	25KHZ	
# Multi-purpose I/O*			4			4	
Input Power Voltage (DC)	10 - 24.5VDC	10 - 24.5VDC	10 - 32VDC	10 - 24.5VDC	10 - 24.5VDC	10 - 32VDC	
4-digit 7-Segment Display				•	•	•	
# Programmable LEDs	4	4	1	4	4	1	
# Programmable Push Buttons				2	2	2	
# Analog Inputs - Total			3			3	
Analog In External/ Internal			1 / 2			1 / 2	
Real Time Clock				•	•	•	

\*Multipurpose I/O can be used as Digital Input or Digital Output (not simultaneously). Inputs are Sinking, Outputs are Sourcing, 300mADC maximum each output.

SOLVES-IT! PLC PRICING		
Model #	Tier	Price
<b>SI-100</b>	1	\$91.00
<b>SI-101</b>	1	\$91.00
<b>SI-110</b>	1	\$106.00
<b>SI-200</b>	1	\$144.00
<b>SI-201</b>	1	\$144.00
<b>SI-210</b>	1	\$160.00

Each Solves-It! Plug-in PLC is available as a starter kit that includes everything needed to get started including the programming cable and EZ LADDER Toolkit Lite Software.

Programmable  
Logic Controllers

## SOLVES-IT! STARTER KITS

All Solves-It! Plug-in PLC models may be ordered in a starter kit. This kit is perfect for first time users as it provides everything needed to start using the Solves-It!.

Included is the Solves-It! Plug-in PLC, SI-PGM programming cable, 11-pin Octal Socket for mounting and wiring the Solves-It! and the EZLDCD-01 (EZ LADDER Toolkit on CD).

SOLVES-IT! STARTER KIT PRICING					
Model #	Tier	Price	Model #	Tier	Price
<b>SK-100</b>	1	\$104.00	<b>SK-200</b>	1	\$158.00
<b>SK-101</b>	1	\$104.00	<b>SK-201</b>	1	\$158.00
<b>SK-110</b>	1	\$120.00	<b>SK-210</b>	1	\$173.00

## SOLVES-IT! PROGRAMMING CABLES & ACCESSORIES

SOLVES-IT! PROGRAMMING CABLES PRICING			
Model #	Description	Tier	Price
<b>SI-PGM</b>	Solves-It! Programming Cable, RS232.	1	\$16.00
<b>138-106865</b>	USB to Serial Port Adapter Cable.	2	\$49.00

SOLVES-IT! ACCESSORIES PRICING			
Model #	Description	Tier	Price
<b>SI-DEMO-01</b>	Simulator/Demo Board for SI-100, SI-200. Provides connections, switches and indicators for I/O. Ideal for debugging ladder diagram projects.	1	\$72.00
<b>SI-DEMO-02</b>	Simulator/Demo Board for SI-110, SI-210. Provides connections, switches and indicators for I/O and Analog. Ideal for debugging ladder diagram projects.	1	\$69.00
<b>115-105328</b>	11-Pin Octal Socket for Solves-It!. Sub plate or DIN rail mount.	2	\$5.00
<b>130-105868</b>	Auxiliary Power Supply, 100-240VAC Input, 24VDC Output, 1.5ADC Maximum. DIN rail mount.	2	\$53.00



# SOLVES-IT! APPLICATION MODULES



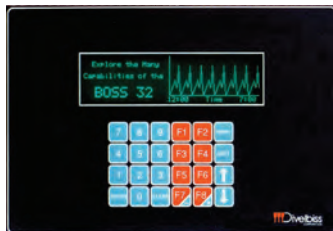
Based on the Solves-It! Plug-in PLC, Application Modules are pre-programmed to function as commonly needed applications for pump alternation, hour meters, tachometers and more. The application module ships with the software pre-loaded and includes the user's manual. The application module ladder diagram application software is available for download from <http://www.divelbiss.com>. The software allows for software modification to your exact needs. The SI-APPMOD-PGMKIT is required for customizing the application software.

## APPLICATION MODULES & ACCESSORIES PRICING

Model #	Description	Tier	Price
<a href="#">SI-APPMOD-2PUMPALTERNATE</a>	Controls and Alternates 2 Pumps as Master / Slave based on requirements.	1	\$179.00
<a href="#">SI-APPMOD-3PUMPALTERNATE</a>	Controls and Alternates 3 Pumps as Master / Slave based on requirements.	1	\$179.00
<a href="#">SI-APPMOD-DEADBAND</a>	Compares analog input signal to a +/- tolerance of the set point. Outputs: Above Dead band, Below Dead band, In Dead band	1	\$189.00
<a href="#">SI-APPMOD-TACHOMETER</a>	Input pulses are read and RPM is calculated and displayed. Based on a 60 Tooth Gear (can be changed). 4 Programmable RPM set points to control 4 individual alarm outputs.	1	\$179.00
<a href="#">SI-APPMOD-HOURMETER</a>	On power timer increments hour meter in 1 second increments. Two alarm set point outputs.	1	\$179.00
<a href="#">SI-APPMOD-RANGECOMPARE</a>	Analog input is compared to two set points to determine if between them (in range). Outputs: Above Range, Below Range, In Range.	1	\$189.00
<a href="#">SI-APPMOD-MULTICOUNT</a>	Three counter channels from a single input source. Each channel has individual set point, output and reset.	1	\$179.00
<a href="#">SI-APPMOD-TIMES4</a>	4 Channel Independent Timer Module, Configures as on-delay or off-delay.	1	\$179.00
<a href="#">SI-APPMOD-PGMKIT</a>	Solves-It! Application Module Programming Kit	1	\$21.00

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# MULTI-FUNCTION BASIC CONTROLLERS



## BOSS 32

The Boss 32 family controllers are fully integrated, 32-bit HMI and multi-functional, multi-tasking microcomputers. Powerful and versatile, Boss 32 controllers provide solutions for multiple control requirements such as temperature, pressure, speed, position, counting and communications. The Boss 32 family programs using an on-board multi-tasking BASIC compiler. Only a terminal program and optional text editor are needed. Transformer Included.

## BOSS BEAR

The Boss Bear is an 8 Bit multi-functional industrial controller with an integrated operator interface (HMI). The highly versatile Boss Bear provides control solutions for temperature, speed, counting, communications, monitoring and pressure. Panel mounted, the Boss Bear supports a 2 x 40 LCD, 2 x 40 LCD with Backlight or a 2x40 Vacuum Fluorescent Display. Blind, sub-plate mounted units are available upon request. Transformer included.



## UNIVERSAL CONTROL PANELS

The Universal Control Panel is an 8 Bit multi-functional industrial controller with an integrated operator interface (HMI). Versatile, the Universal Control Panel (UCP) provides control solutions for temperature, speed, counting, communications, monitoring and pressure.

Panel mounted, the UCP supports a 2 x 20 LCD with Backlight or a 2x20 Vacuum Fluorescent Display. Blind, sub-plate mounted units are available upon request. Transformer included. In addition to normally stocked models, the UCP may be ordered with additional internal options including analog inputs, analog outputs, digital inputs, digital outputs and thermocouple inputs.



# HIGH DENSITY INPUT/OUTPUT

The High Density I/O Series of I/O Expansion cards provide digital I/O for Divelbiss PLCs and Controllers with a variety of input and output voltages and configurations.

Each card is designed to function with the Divelbiss HDIO bus system and are DIN rail mounted. Connections are made to High Density I/O (HDIO) cards from controllers using a power and data cable series (HDCA).

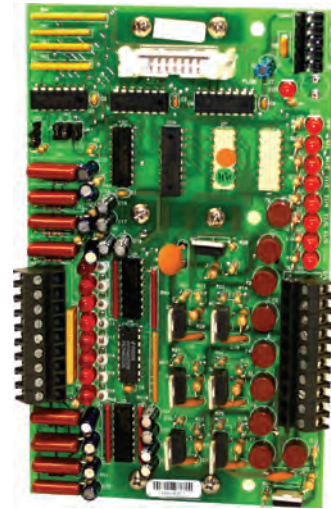


CHART LEGEND		MODELS														
• = Supports Feature Num = Qty of Feature		ICM-HDIO-01P	ICM-HDIO-03P	ICM-HDIO-06P	ICM-HDIO-11P	ICM-HDIO-12P	ICM-HDIO-13P	ICM-HDIO-17P	ICM-HDIO-19P	ICM-HDIO-20P	ICM-HDIO-22P	ICM-HDIO-23P	ICM-HDIO-24P	ICM-HDIO-25P	ICM-HDLEAK-01	
FEATURE																
# of Inputs		16	8	16	8	8		8		Up to 8*	8		8	8	4	
Inputs: 10-32 VDC		•	•	•				•						•		
Inputs: 24 VAC													•			
Inputs: 115 VAC					•	•					•					
Inputs: Common Returns				•	•	•		•			•		•	•		
Inputs: Isolated Returns		•	•													
Conductivity Detection Inputs															•	
# of Outputs (1 Amp per point **)		16	8	16	8		8	8	8	Up to 8*	8	8	8	8		
Outputs: 10-32 VDC		•	•	•												
Outputs: 24-115 VAC					•		•									
Outputs: Relay (5 Amp) 1 Form A								•	•							
Outputs: Relay (10 Amp) 1 Form C											•	•	•	•		
Outputs: Opto 22 Solid-state I/O*										•						
Outputs: Common Returns				•	•		•									
Outputs: Isolated Returns		•	•					•	•	•	•	•	•	•		
Fused Outputs				•	•		•			•						
* 8 total I/O Module Slots per card. I/O Modules available as single point input or output. Uses Solid-State Opto-22 I/O Plug-in Modules.																
** 1 Amp Outputs standard on all models except relay output and Opto-22 types.																

\* 8 total I/O Module Slots per card. I/O Modules available as single point input or output. Uses Solid-State Opto-22 I/O Plug-in Modules.

\*\* 1 Amp Outputs standard on all models except relay output and Opto-22 types.

## HIGH DENSITY I/O PRICING

Model #	Tier	Price
ICM-HDIO-01P	1	\$318.00
ICM-HDIO-03P	1	\$163.00
ICM-HDIO-06P	1	\$313.00
ICM-HDIO-11P	1	\$226.00
ICM-HDIO-12P	1	\$140.00
ICM-HDIO-13P	1	\$165.00
ICM-HDIO-17P	1	\$194.00
ICM-HDIO-19P	1	\$151.00
ICM-HDIO-20P	1	\$147.00
ICM-HDIO-22P	1	\$228.00
ICM-HDIO-23P	1	\$159.00
ICM-HDIO-24P	1	\$220.00
ICM-HDIO-25P	1	\$192.00
ICM-HDLEAK-01	1	\$237.00

Models shown are normally stocked. For additional models and features available, please see

## HIGH DENSITY I/O AND CABLING COMPATIBILITY MATRIX

I/O SERIES	CONTROLLER FAMILY / SERIES									
	Harsh Environment Controllers	PLC on a Chip™ IC & Modules	PCS Controllers	Enhanced Baby Bear Controllers	Solves-It! Plug-in PLCs	Micro Bear Controllers	Boss Bear Controllers	Boss 32 Controllers	Universal Control Panels	Application Modules
	High Density I/O Compatibility	•	•	•			•	•	•	
	HDCA-0X Compatibility	•	•	•				•	•	
	HDCA-1X Compatibility						•			

## HIGH DENSITY I/O CABLES PRICING

Model #	Description	Tier	Price	Model #	Description	Tier	Price
ICM-HDCA-01	Power & Data Cable Set. PLC to 1 HDIO.	1	\$22.00	ICM-HDCA-11	Power & Data Cable Set. PLC to 1 HDIO.	1	\$22.00
ICM-HDCA-02	Power & Data Cable Set. PLC to 2 HDIO.	1	\$32.00	ICM-HDCA-12	Power & Data Cable Set. PLC to 2 HDIO.	1	\$33.00
ICM-HDCA-03	Power & Data Cable Set. PLC to 3 HDIO.	1	\$42.00	ICM-HDCA-13	Power & Data Cable Set. PLC to 3 HDIO.	1	\$43.00
ICM-HDCA-04	Power & Data Cable Set. PLC to 4 HDIO.	1	\$52.00	ICM-HDCA-14	Power & Data Cable Set. PLC to 4 HDIO.	1	\$53.00
ICM-HDCA-05	Power & Data Cable Set. PLC to 5 HDIO.	1	\$62.00	ICM-HDCA-15	Power & Data Cable Set. PLC to 5 HDIO.	1	\$63.00
ICM-HDCA-06	Power & Data Cable Set. PLC to 6 HDIO.	1	\$72.00	ICM-HDCA-16	Power & Data Cable Set. PLC to 6 HDIO.	1	\$73.00

# PLC ON A CHIP™ INTEGRATED CIRCUITS & MODULES

Designed to provide embedded intelligence in OEM products, the Patented PLC on a Chip™ is a cost-effective programmable logic controller packaged in a single integrated circuit or as a module. All I/O and integrated functions are pre-assigned for use within the Divelbiss EZ LADDER Toolkit software - a PC based industrial ladder diagram software. The full featured PLC on a Chip controller and EZ Ladder combination provides for solutions that are both versatile and easy to implement.

PLC on a Chip Technology is easy to integrate. Just add the required conditioning circuits for I/O, communications and analog or adapt our pre-designed interface circuits that are provided as part of our Development Kits. Either way, you will be quickly past the hardware stage and with no low-level software to write; you will be writing your ladder diagram immediately.

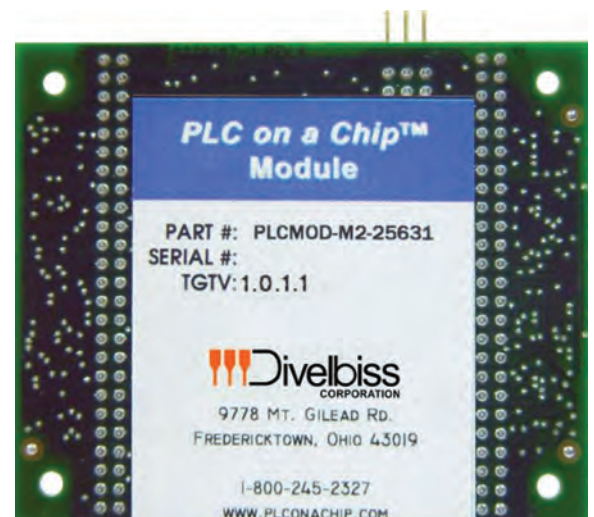


- ▶ Quick to Market Solutions
- ▶ Full Featured Industrial PLC
- ▶ I/O, PWM and PID Functionality
- ▶ Integrated Circuit is RoHS Compliant
- ▶ Powerful Networking & Communications
- ▶ No Low Level Programming Required
- ▶ Programs Using EZ LADDER Toolkit Software
- ▶ Fully Integrated IC or Module Construction

CHART LEGEND	MODELS								
• = Supports Feature Num = Qty of Feature	Integrated Circuits			Modules					
FEATURE	PLCHIP-M2-12800	PLCHIP-M2-25600	PLCHIP-M2-25620	PLCMOD-M2-128000	PLCMOD-M2-128010	PLCMOD-M2-256000	PLCMOD-M2-256010	PLCMOD-M2-256200	PLCMOD-M2-256210
128K Flash	•			•	•				
256K Flash		•	•			•	•	•	•
512K Flash									
Program Port (TTL)	•	•	•	•	•	•	•	•	•
Multipurpose Serial Port (TTL)		1	1			1	1	1	1
# of Inputs (Total)*	33	33	33	33	33	33	33	33	33
# of Outputs (Total)*	33	33	33	33	33	33	33	33	33
# CAN Ports*			2					2	2
# SPI Interface Ports*		2	2			2	2	2	2
PWM Outputs*	•	•	•	•	•	•	•	•	•
# Counter Inputs*	2	2	2	2	2	2	2	2	2
# Analog Inputs*	8	8	8	8	8	8	8	8	8
# Analog Outputs*									
High Density I/O Support	•	•	•	•	•	•	•	•	•
Real Time Clock Support	•	•	•		•		•		•
Ethernet Support									
SAE J1939 Support			•			•	•	•	•
OptiCAN Support			•			•	•	•	•
SD Flash Card Support									
USB Support									
I <sup>2</sup> C Support									
Keypad / LCD Support	•	•	•	•	•	•	•	•	•
Modbus Slave		•	•			•	•	•	•

\* Up to # Shown (Maximum). I/O and Features share multiple pins.

PLC ON A CHIP™ PRICING		
Model #	Type	Price
<a href="#">PLCHIP-M2-12800</a>	Integrated Circuit	Consult Factory
<a href="#">PLCHIP-M2-25600</a>	Integrated Circuit	Consult Factory
<a href="#">PLCHIP-M2-25620</a>	Integrated Circuit	Consult Factory
<a href="#">PLCMOD-M2-128000</a>	Module	Consult Factory
<a href="#">PLCMOD-M2-128010</a>	Module	Consult Factory
<a href="#">PLCMOD-M2-256000</a>	Module	Consult Factory
<a href="#">PLCMOD-M2-256010</a>	Module	Consult Factory
<a href="#">PLCMOD-M2-256200</a>	Module	Consult Factory
<a href="#">PLCMOD-M2-256210</a>	Module	Consult Factory



# PLC ON A CHIP™ DEVELOPMENT KITS

The PLC on a Chip™ Development Kits provide the complete library of documentation required to apply PLC on Chip at the module and integrated circuit level as well as a development board, I/O modules, and the EZ Ladder Tool Kit software. The development kit may be ordered with options including display and keypad, serial ports and additional I/O modules.

The library provides information required to implement PLC on a Chip and the peripheral circuitry, including PCB layout requirements, standard part numbers, and more.



## Advantages of a PLC on a Chip™ Solution

- ▶ Low Integration Cost
- ▶ Quick to Market Solutions
- ▶ Full Factory Support
- ▶ Pre-designed Circuits Library
- ▶ No Low Level Programming
- ▶ RAPID Design Program Available
- ▶ Protects Intellectual Property
- ▶ Increased Product Value
- ▶ Increased Replacement Parts Sales

Included in Base Development Kit		
Qty	Part Number	Description
1	PLCMOD-M2-256210	PLC on a Chip™ Module with Real Time Clock and 2 CAN Ports
1	PLCDKMB(U)	PLC on a Chip™ Development Kit Main Board with HMI support.
4	BM-0470048-2AC	110 VAC Input Module, Optically Isolated with Status LED Indicator. Plugs into main board.
4	BM-0470048-2DC	12-24 VDC Input Module, Optically Isolated with Status LED Indicator. Plugs into main board.
4	BM-0470048-4	110 VAC Output Module, Optically Isolated with Status LED Indicator. Plugs into main board.
4	BM-0470048-3	12-24 VDC Output Module, Optically Isolated with Status LED Indicator. Plugs into main board.
2	BM-0470048-5	Relay Output Module, 110VAC @ 2A with Status LED Indicator. Plugs into main board.
1	PLCDKCD-01	Development Library CD with Design Documentation and Circuit Guidelines
1	EZLDCD-01	EZ LADDER Toolkit Standard Edition on CD.
1	PLCDKPS	Power Supply for PLCDKMB(U) Main Board.

PLC ON A CHIP™ DEVELOPMENT KIT AND OPTIONS PRICING		
Option	Description	Price
<b>PLCDK-01</b>	Original PLC on a Chip™ Development Base Kit - Does not support HMI Options or PWM to Analog Out.	Consult Factory
<b>PLCDK-03</b>	PLC on a Chip™ Development Base Kit with HMI Support	Consult Factory
<b>BM-0470048-2AC</b>	110 VAC Input Module, Optically Isolated with Status LED Indicator. Plugs into main board.	Consult Factory
<b>BM-0470048-2DC</b>	12-24 VDC Input Module, Optically Isolated with Status LED Indicator. Plugs into main board.	Consult Factory
<b>BM-0470048-4</b>	110 VAC Output Module, Optically Isolated with Status LED Indicator. Plugs into main board.	Consult Factory
<b>BM-0470048-3</b>	12-24 VDC Output Module, Optically Isolated with Status LED Indicator. Plugs into main board.	Consult Factory
<b>BM-0470048-5</b>	Relay Output Module, 110VAC @ 2A with Status LED Indicator. Plugs into main board.	Consult Factory
<b>PLCDK-IO-2x20</b>	Operator Interface Option, 2x20 LCD Display with 20 Button Keypad and connection cabling.	Consult Factory
<b>PLCDK-IO-2x40</b>	Operator Interface Option, 2x40 LCD Display with 20 Button Keypad and connection cabling.	Consult Factory
<b>PLCDK-IO-4x20</b>	Operator Interface Option, 4x20 LCD Display with 20 Button Keypad and connection cabling.	Consult Factory
<b>BM-0770564-12</b>	Digital to Analog Converter Module (PWM to Analog Output). Plugs into main board.	Consult Factory
<b>PLCDK-RS232</b>	Plug-in RS232 Serial Port Module for the main board. Provides RS232 Serial Port.	Consult Factory



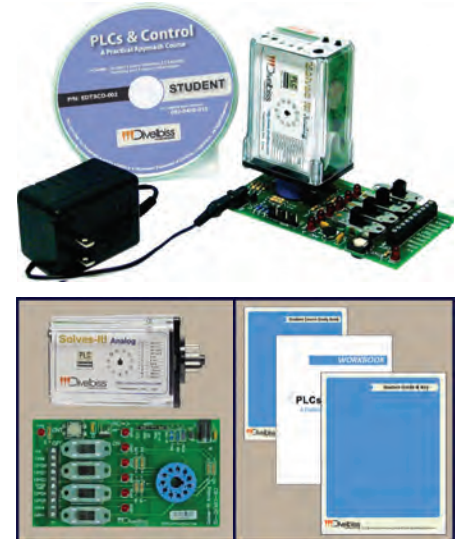
# PLCs: A PRACTICAL APPROACH EDUCATOR EDITION

In an effort to make learning PLC application and programming more affordable, the Divelbiss Technical Services Group developed this training course for use by educators. The basic outline closely mirrors the material presented when providing training for our industrial customers. The hardware items are the same products being used worldwide in commercial and industrial control applications.

The study outline is comprised of 16 blocks which, taken in order, build on one another to teach the basics of PLCs in addition to programming a controller using ladder logic with function block. The course is designed for hands-on study using standard hardware manufactured by Divelbiss.

The idea is each student receives their own kit which includes all the PLC and trainer hardware and EZ LADDER Toolkit software for the education process. Additionally, text and workbooks are included in portable document format (.pdf).

The teacher's kit includes all the same hardware, software and standard documentation, but also includes the Teacher's Guide.



## Course Outline - Chapter Titles

- |                                      |                                 |                                  |
|--------------------------------------|---------------------------------|----------------------------------|
| I. PLC & Control - An Overview       | VII. Counter Circuits           | XIII. Drum Sequencer Circuits    |
| II. PLC/Control Digital I/O Circuits | VIII. Analog Circuits with Math | XIV. Displaying Control Values   |
| III. PLC/Control Wiring Practices    | IX. Comparison Circuits         | XV. Variable Conversion Circuits |
| IV. PLC Programming Basics           | X. Bit Manipulation Circuits    | XVI. Putting it all Together     |
| V. Basic Circuits                    | XI. Trigger & Latching Circuits |                                  |
| VI. Timer Circuits                   | XII. Memory Types & Circuits    |                                  |

EDUCATOR PLC TRAINING PRODUCTS PRICING		
Model #	Description	Price
<b>ETS-KIT-TEACH-001</b>	Teacher Edition Training Kit. Includes SI-210, SI-DEMO-02, SI-PGM and Teacher Edition CD with EZ LADDER Toolkit Standard, Teacher Versions of Workbook, Textbook and Manuals.	Consult Factory
<b>ETS-KIT-STDNT-001</b>	Student Edition Training Kit. Includes SI-210, SI-DEMO-02, SI-PGM and Student Edition CD with EZ LADDER Toolkit Standard, Student Versions of Workbook, Textbook and Manuals.	Consult Factory

# PLCs: A PRACTICAL APPROACH PERSONAL STUDY EDITION

The basic course of instruction of PLCs, A Practical Approach (Educator Edition) has been modified for use by companies in upgrading employee skill levels. The course is structured so it can be used for individual and/or home study as well as corporate level training.

The course material begins with an introduction to electrical control circuits and is fully illustrated to aid understanding of each topic presented. As the course progresses, I/O types and their usage is explained along with good wiring practices and networking. The balance of the material presented deals with the actual programming and covers each segment in detail. Exercises for each chapter make use of the Solves-It! PLC and development board to provide hands-on example of theory.

The Personal Study Kit includes the hardware, software and documentation required to learn PLC hardware and programming basics.

- Hands-on Training
- Illustrated Textbook
- Step by Step Instruction
- Real World Exercises



EDUCATOR PLC TRAINING PRODUCTS PRICING			
Model #	Description	Tier	Price
<b>EHSTDY-KIT-001</b>	Personal PLC Training Kit. Includes SI-210, SI-DEMO-02, SI-PGM and Personal Study Edition CD with EZ LADDER Toolkit Standard, Workbook, Textbook and Manuals.	1	\$299.00

# INDUSTRY FORMULAS & CONSTANTS

## Reference Only

### Ohm's Law AC Circuits

$I$  = Current in Amperes  
 $P$  = Power in Watts  
 $Z$  = Impedance in Ohms  
 $E$  = Volts across  $Z$   
 $\theta$  = Phase angle in degrees

Phase Angle is defined as the difference in degrees by which current leads voltage in a capacitive circuit or lags voltage in an inductive circuit, and in series circuits is equal to the angle whose tangent is given by

ratio  $\frac{X}{R}$  and is expressed by

$$\arctan \frac{X}{R} \text{ where}$$

$X$  = the inductive or capacitive reactance in ohms,

$R$  = the non-reactive resistance in ohms,

of the combined resistive and reactive components of the circuit under consideration.

Therefore:

in a purely resistive circuit,  $\theta = 0^\circ$

in a purely reactive circuit,  $\theta = 90^\circ$

in purely resonant circuit,  $\theta = 0^\circ$

also when:

$$\theta = 0^\circ, \cos \theta = 1 \text{ and } P = EI,$$

$$\theta = 90^\circ, \cos \theta = 0 \text{ and } P = 0$$

$$\text{radians} = \text{Degrees} \times 0.0175$$

$$1 \text{ radian} = 57.3^\circ$$

$$E = IZ \quad Z = \frac{E}{I} \quad I = \frac{E}{Z}$$

### Ohm's Law DC Circuits

$I$  = Current in Amperes  
 $E$  = Potential across  $R$  in volts  
 $R$  = Resistance in Ohms  
 $P$  = Power in Watts

$$E = IR \quad P = IE \quad P = I^2 R$$

$$I = \frac{E}{R} \quad R = \frac{E}{I}$$

### Reactance

$$X_L = 2\pi fL \quad X_C = \frac{1}{2\pi fC}$$

$X_L$  = Inductive Reactance in Ohms

$X_C$  = Capacitive Reactance in Ohms

$f$  = Frequency in Cycles per second (Hertz)

$L$  = Inductance in Henrys

$C$  = Capacitance in farads

$2\pi = 6.28$

### Series / Parallel Resistance

$R_x$  = Resistance in Ohms

In Series:  $R_{Total} = R_1 + R_2 + R_3 \dots \text{etc.}$

In Parallel:  $R_{Total} = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \dots \text{etc.}}$

Two Resistors in Parallel:  $R_{Total} = \frac{R_1 R_2}{R_1 + R_2}$

### Series / Parallel Capacitance

$C_x$  = Capacitance in farads

In Parallel:  $C_{Total} = C_1 + C_2 + C_3 \dots \text{etc.}$

In Series:  $C_{Total} = \frac{1}{\frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} \dots \text{etc.}}$

Two Capacitors in Series:  $C_{Total} = \frac{C_1 C_2}{C_1 + C_2}$

### Conversion Factors & Constants

#### Metric / US Conversions / Other

1 meter = 39.37 inches = 3.28 feet

1 kilometer = 0.621 miles

1 inch = 2.54 centimeters

1 kilogram = 2.2 pounds

1 liter = 1.06 quarts = .26417 gallons

1 ounce = 28.35 grams

1 PSI = 0.06895 Bars

1 PSI = 0.06805 Atmospheres

1 PSI = 70.307 Grams square centimeter

1 PSI = 2.036 Inches Hg @ 32°F

1 PSI = 27.6778 Inches H<sub>2</sub>O @ 39.2°F

1 FT-LB Force = 1.35582 Joules

1 Gallon (US LIQ) = 3.7854 liters

1 Gallon (US LIQ) = 128 Ounces

1 Gallon (US LIQ) = 231 Cubic Inches

#### Power Conversions & Calculations

1 horsepower = 746 watts

1 horsepower = 42.4 BTU/min

Efficiency = Output / Input

#### Temperature Conversions

°F = 9/5 °C + 32

°C = 5/9 (°F-32)

#### Sinusoidal Voltages / Currents

Effective (RMS) value = 0.707 x peak value

Average value = 0.637 x peak value

Peak value = 1.414 x effective value

### Frequency & Period

$$T = \frac{1}{f} \quad f = \frac{1}{T}$$

$T$  = Period in Seconds

$f$  = Frequency in Hertz (Cycles per second)

### Notes:

## INDUSTRY CHARTS

### Current Carrying Capacity of Copper Conductors

Conductor Size	Polyethylene Neoprene Polyurethane Polyvinylchloride (Semi - Rigid) @ 80°C	Polypropylene polyethylene (High Density) @ 90°C	Polyvinylchloride PVC (Irradiated) Nylon @ 105°C	Kynar Polyethylene (Crosslinked) Thermoplastic Elastomers @ 125°C	Kapton Teflon Silicone @ 200°C
8 AWG	65 Amperes	70 Amperes	75 Amperes	90 Amperes	100 Amperes
10 AWG	47 Amperes	55 Amperes	58 Amperes	70 Amperes	75 Amperes
12 AWG	36 Amperes	40 Amperes	45 Amperes	50 Amperes	55 Amperes
14 AWG	27 Amperes	30 Amperes	33 Amperes	40 Amperes	45 Amperes
16 AWG	19 Amperes	22 Amperes	24 Amperes	26 Amperes	32 Amperes
18 AWG	15 Amperes	17 Amperes	18 Amperes	20 Amperes	24 Amperes
20 AWG	10 Amperes	12 Amperes	13 Amperes	14 Amperes	17 Amperes
22 AWG	8 Amperes	9 Amperes	10 Amperes	11 Amperes	13 Amperes
24 AWG	6 Amperes	7 Amperes	7 Amperes	8 Amperes	10 Amperes
26 AWG	4 Amperes	5 Amperes	5 Amperes	6 Amperes	7 Amperes
28 AWG	3 Amperes	4 Amperes	4 Amperes	5 Amperes	6 Amperes
30 AWG	2 Amperes	3 Amperes	3 Amperes	3 Amperes	4 Amperes

Single Conductor in Free Air with 30°C Ambient Temperature

### Average Electric Motor Specifications - General Guide only

For General purpose motors such as for fans, furnace and pump applications with normal duty cycles. Currents can vary greatly, so this should be used only as a general guide. Refer to actual motor for specifications.

115 Volt, 60 Hz, 1 Phase AC Electric Motors. For 230 Volt, Divide Full Load Amps by 2.

Motor Horsepower	RPM	Full Load Amps	Motor Horsepower	RPM	Full Load Amps
1/20	1550	2.5	1/4	1075	3.4 - 6.8
1/15	1550	2.8	1/4	850	6.9
1/12	1725	2.2 - 2.8	1/3	3450	5.6 - 6.5
1/12	1550	4.1	1/3	1725	5.3 - 6.8
1/12	850	3.2	1/3	1140	5.0 - 7.2
1/10	1550	3.5	1/3	1075	5.1
1/10	1050	3.4 - 4.2	1/2	3450	9.8
1/8	1725	1.8 - 2.7	1/2	1725	7.0 - 9.2
1/8	1140	3.8	1/2	1075	7.3
1/8	1075	1.8 - 5.0	3/4	3450	11.8
1/6	1725	3.3 - 4.7	3/4	1725	11.6
1/6	1550	4.0 - 4.8	3/4	1075	9.5
1/6	1140	4.0 - 4.9	1	3450	13.0 - 15.0
1/6	1075	2.4 - 5.0	1	1725	13.6 - 16.0
1/4	1725	4.4 - 6.3	1-1/2	3450	16.4 - 19.6
1/4	1625	3.1 - 3.6	1-1/2	1725	19.6
1/4	1140	5.6 - 6.8	2	2450	19.0 - 23.0

### Resistor Color Code

Color	1st Color Band	2nd Color Band	Multiplier (Tolerance)
Black	0	0	1
Brown	1	1	10
Red	2	2	100
Orange	3	3	1,000
Yellow	4	4	10,000
Green	5	5	100,000
Blue	6	6	1,000,000
Violet	7	7	10,000,000
Gray	8	8	100,000,000
White	9	9	-----
Gold	-----	-----	.1 (5%)
Silver	-----	-----	.01 (10%)
No Color	-----	-----	----- (20%)

### Typical Power Wiring Color Code

120 / 240 Volt	
Black	Phase 1
Red	Phase 2
Blue	Phase 3
White	Neutral
Green	Ground
277 / 480 Volt	
Brown	Phase 1
Orange	Phase 2
Yellow	Phase 3
Gray	Neutral
Green w/ Yellow Strip	Ground

### Conduit Size vs TW Wire Size

Wire Size AWG	Minimum Conduit Size per Number of Type TW Wires. Number of Wires inside Conduit.				
	2	3	4	5	6
14	1/2"	1/2"	1/2"	1/2"	1/2"
12	1/2"	1/2"	1/2"	1/2"	1/2"
10	1/2"	1/2"	1/2"	1/2"	3/4"
8	1/2"	3/4"	3/4"	1"	1"
6	3/4"	1"	1"	1-1/4"	1-1/4"
4	1"	1"	1-1/4"	1-1/4"	1-1/2"
2	1"	1-1/4"	1-1/2"	1-1/2"	2
1/0	1-1/4"	1-1/2"	2	2	2-1/2"
2/0	1-1/2"	1-1/2"	2	2	2-1/2"
3/0	1-1/2"	2	2	2-1/2"	2-1/2"

Refer to the National Electric Code for wire types other than TW.

### Commonly Used Enclosure Types

Type	Service Conditions
1	Indoor - General Conditions
3	Outdoor - Windblown dust, rain, sleet and ice.
3R	Outdoor - Falling rain and ice.
4	Indoor / Outdoor - Windblown dust and rain, splashing water, hose directed water and ice.
4X	Indoor / Outdoor - Corrosion, windblown dust and rain, splashing water, hose directed water and ice.
12	Indoor - Dust, falling dirt and dripping non-corrosive liquids.

**NOTICE:** All information provided is for general reference only. For actual specifications and information, refer to the product manufacturer's data sheet.