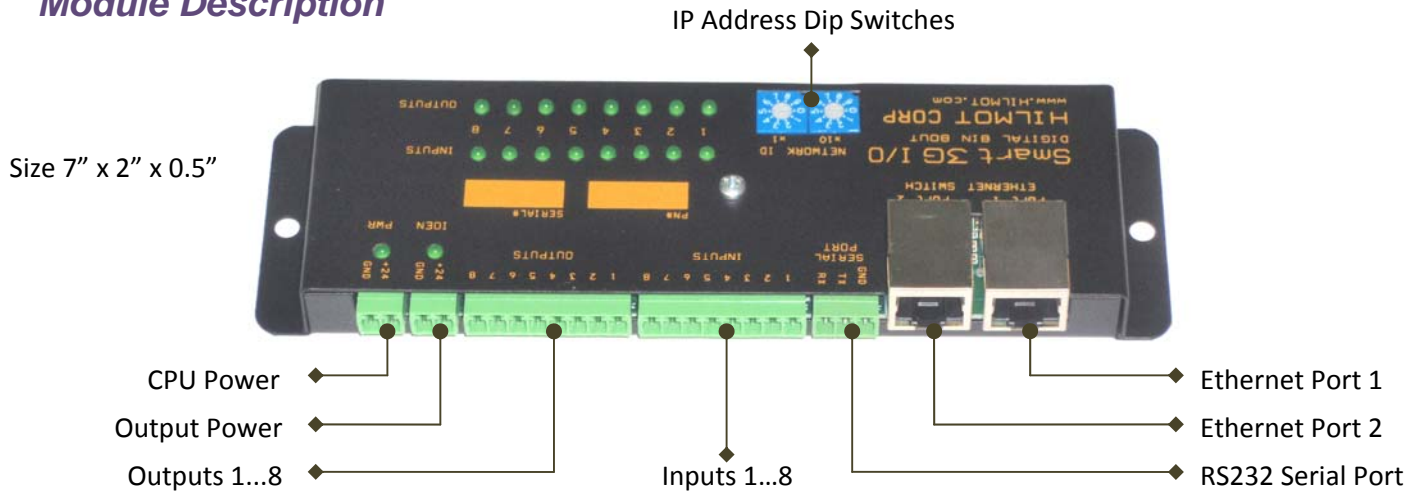


**Smart-3G - Ethernet Programmable Controller / Ethernet I/O**

The **Smart-3G - Ethernet Programmable Controller** provides networked 24volts Digital I/O for MDR Powered Roller Conveyor systems, as well as general purpose Fast Local/Remote Machine I/O. These Devices are fully programmable for any type of control application, and can act as a programmable master device, or a slaved network I/O device. The modules communicate over Ethernet to master or peer devices using **Ethernet/IP**, **Modbus/TCP** and **S3G-Master/Slave** protocols. For **MDR** systems, interlocking messaging bits e.g., upstream, downstream, merge, divert, etc are handled by the firmware for simplified Ladder Logic Programming.

**Module Description**



**Electrical Specs**

<b>CPU Input Power</b>	18-30Volt DC, 350mA
<b>I/O Voltage</b>	18-30Volt DC
<b>Total Max I/O Current</b>	8 Amps
<b>I/O Type</b>	PNP
<b>Output Current</b>	2 Amps Per Output
<b>Input Voltage Range</b>	0...30Volts
<b>Input Threshold Voltage</b>	4 Volts. (Logic Low: 0...4v, Logic High: 4.1v...30v)
<b>Network</b>	Ethernet 100MB/S
<b>Ethernet Switch</b>	2 Ports. (Always use Port 1 when single port is required)

\* NPN I/O also available, Typically 6-8 week delivery.

**Operating Modes**

The **Smart-3G** controller has two main operating modes:

1. Network I/O controller
2. Programmable Logic Controller

**Network I/O controller Mode**



Using the **SuperLogic** configuration window, if the Network-I/O check box is **ON**, the device allows an external master to control the I/O directly over Ethernet. Any of the three protocols can be used to control the I/O this way. This mode is active by default from factory. The controller does not execute any user downloaded ladder logic program.

The CPU Led blinks in the following two patterns:

- When a Master **Is** Online: One second On/Off cycle with 2% duty cycle. (very short blips)
- When Master **Is Not** Online: One second On/Off cycle with 50% duty cycle

### **Programmable Logic controller Mode**

If the Network-I/O check box is **OFF**, the device executes the downloaded user ladder logic program to control the I/O. In this mode, any Master device can still connect to the device, but the outputs will remain in the Ladder Logic program control. The master can write to Control Word file which the device can pick up and take appropriate actions as defined by the user ladder logic program.

In this mode, the CPU Led blinks in the following patterns:

- Ladder Logic Run Mode: Heart-beat blink mode (blip-blip, blip-blip, blip-blip...)
- Ladder Logic Stopped: One second On/Off cycle with 50% duty cycle.

The ladder logic program controls the local I/O as well as access and control the I/O on remote **Smart-3G** devices using the **S3G-Master/Slave** protocol. The remote I/O appears as local I/O and is accessed the same way as the local I/O. You can control up to eight remote **Smart-3G** devices from a single master **Smart-3G** device, providing a total of 72 inputs and 72 outputs.

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## **Network Configuration and Protocols**

### **IP Address**

The Device IP address is configured partly by the rotary switches and partly by the **SuperLogic** software configuration window. The default IP address is set to 192.168.0.1. With the rotary switches, the address range for the device is 192.168.0.1 thru 192.168.0.99. The first three digits of IP address can be changed using the software configuration tool. In addition to the IP address, the default Gateway and Address Mask can also be changed by the configuration software.

### **Ethernet/IP Protocol**

#### **Configuration Parameters:**

Device Type: Generic  
Name: Any user defined name  
Data Format: SINT (byte)  
IP Addr: Device IP Address  
Input: 112, Size 12 Bytes (Produce Data)  
Output: 111, Size 8 Bytes



Config: 113, Size 0

### Ethernet/IP Polling Message Format:

#### Input / Produce Format:

Size 12 Bytes (4 byte header and 8 byte data), Type SINT(8bit)

Byte 0 = 1 Header 4 Bytes (always set to 1)

Byte 1 = 0

Byte 2 = 0

Byte 3 = 0

Byte 4 = Input States, 8 bits

Byte 5 = Output Enable Bit, 1 bit

Byte 6 = Output States, 8 bits

Byte 7 = 0

Byte 8, 9 = Contents of Control Word 1 (CW:1)

Byte 10, 11 = Contents of Control Word 2 (CW:2)

Data to Ethernet/IP Master is read from **Smart-3G** Internal control words file CW:1 and CW:2, 16bit integers.

#### Output / Consume Format:

##### Using Allen Bradley RSLogix:

Size 4 Data Bytes, Type SINT(8bit)

Note: *Allen Bradley RSLogix* does not use Header bits when mapping outputs, so output size should be set to 4.

Byte 0, 1 → Control Word 9 (or directly to the Output pins)

Byte 2, 3 → Control Word 10

Data from Ethernet/IP Master controller is saved in CW:9 and CW:10 in **Smart-3G** internal control words file.

If Network-I/O check-box is checked in **SuplerLogic** configuration window, Byte 0 is mapped to outputs for direct master PLC control:

Byte 0 → Outputs 1...8 (bits 0...7 are mapped to Outputs 1...8).

##### Using 3GScan Software Library for Windows and Linux:

The output size is set to 8 bytes.

Byte 0 = 1 Header 4 Bytes (Always set to 1)

Byte 1 = 0



Byte 2 = 0

Byte 3 = 0

Byte 4, 5 → Control Word 9 (or directly to Outputs)

Byte 6, 7 → Control Word 10

If Network-I/O check-box is checked in **SuplerLogic** configuration window, Byte 4 is mapped to outputs for direct PC software control:

Byte 4 → Outputs 1...8 (bits 0...7 are mapped to Outputs 1...8).

## Modbus / TCP Protocol

Modbus/TCP protocol can read the entire Control Words file CW: 1...56. The writes are allowed to CW 9, 10, 23 and 24 only.

In addition, the following special condition applies to CW 23 and 24:

Read Word 23 = Read 8 Inputs and new barcode bit (Bit position 8)

Read Word 24 = Read 8 Outputs and Output Enable Bit (Bit position 8)

Write Word 23 = Write to CW:23

Write Word 24 = Write to CW:24, or Write directly to output pins if Network-I/O Checkbox is checked.

## S3G-Master/Slave Protocol

The **Smart-3G** controller allows expanding the local I/O by using remote **Smart-3G** devices (configured as Network-I/O). Up to eight slave **Smart-3G** cards can be scanned by the master, providing a total of 72 inputs and 72 outputs. The ladder logic program controls the local I/O as well as access and control remote I/O of **Smart-3G** devices using the **S3G-Master/Slave** protocol.

The remote **Smart-3G** devices must have their Network-I/O check box turned **ON**, so they do not run their own ladder program. To enable scanning of remote **Smart-3G** device(s), enter the device id (last digit of the IP address) in Control Words 41 thru 48 inside the ladder logic program. The default value is 0, which disables the particular slot of the slave scanner.

The remote I/O is accessed as follows:

Remote Device	Address Control Word	Input File	Output File
#1	41	IN: 9..16	OUT: 9..16
#2	42	IN:17..24	OUT:17..24
#3	43	IN:25..32	OUT:25..32
#4	44	IN:33..40	OUT:33..40



#5	45	IN:41..48	OUT:41..48
#6	46	IN:49..56	OUT:49..56
#7	47	IN:57..64	OUT:57..64
#8	48	IN:65..72	OUT:65..72

For example, to scan device at 192.168.0.88, copy 88 to CW:41. The I/O of device 88 will appear in files IN:9..16 and OUT:9..16.

## Programming and Configuring Smart-3G Devices

The Programming and configuration of **Smart-3G** devices is accomplished by the **SuperLogic** PC software. This software allows editing, downloading, monitoring/debugging of the ladder logic program. The configuration window allows editing the IP address and other parameters of the device. Please refer to the **SuperLogic** Software manual for more detail.

The **SuperLogic** software can be connected to the **Smart-3G** devices by the PC Serial Port or by using the Ethernet connection to the device. Once connected to a device, **SuperLogic** can be then connected to any other device available on the Ethernet by using the Bridge connection method, thereby allowing easy access to the entire network.

## Control Word File

The Control Word file is a 16-bit integer file. The ladder logic program can read and write any Control Word using the CW:n syntax, although some Control Words are read only as mentioned in the following table. **Device ID is the last digit of the IP address.** Modbus/TCP can read any control word and write is allowed to only certain control words. Ethernet/IP can read/write certain locations only.

File Index	Description
<b>CW:1,2</b>	Data is transmitted to master in Ethernet/IP poll. Can be used to transmit status info to master.
<b>CW:3,4,5</b>	Reserved
<b>CW:6</b>	Merge Device ID (Read Only)
<b>CW:7</b>	Divert 1 Device ID (Read Only)
<b>CW:8</b>	Divert 2 Device ID (Read Only)
<b>CW:9, 10</b>	Ethernet/IP or Modbus/TCP – Data Write from Master
<b>CW:11</b>	Local Device ID
<b>CW:12</b>	Downstream Device ID
<b>CW:13</b>	Upstream Device ID
<b>CW:14</b>	Master/Slave Protocol Scan List Status. Bits 0...7 indicate online status for each device. Bits 8...15 indicate Output Power Status.
<b>CW:15</b>	User Defined. This value is read from the SuperLogic Zone Count configuration parameter. (Read Only).
<b>CW:16</b>	Ladder Logic Transmit Message Destination Device ID
<b>CW:17...22</b>	Ladder Logic Transmit Message Data. Each control word can have value of 0 thru



	255.
<b>CW:23, 24</b>	Special Definition for <b>Modbus/TCP</b> Read CW:23 = Read 8 Inputs (Bit 0..7) and new serial port data bit (Bit 8) Read CW:24 = Read 8 Outputs (Bit 0..7) and Output Enable Bit (Bit 8) Write CW:23 = Write to CW:23 Write CW:24 = Write to CW:24, or Write directly to output pins if Network-I/O Checkbox is checked.
<b>CW:25...30</b>	Ladder Logic Receive Message Data. Each control word can have value of 0 thru 255.
<b>CW:31...40</b>	Serial Data Received from Serial Port. Must be terminated by carriage return or Line feed.
<b>CW:41...48</b>	Device IDs for remote (slave) <b>Smart-3G</b> controllers. Used to enable slave device scanning for the S3G Master/Slave protocol. Value of 0 disables scanning.
<b>CW:49..56</b>	Input / Output data for slave devices for S3G protocol. Bit 0...7 are inputs and bits 8...15 are outputs. This data is also accessible using the IN/OUT file, eg IN:55, OUT:71 etc.

