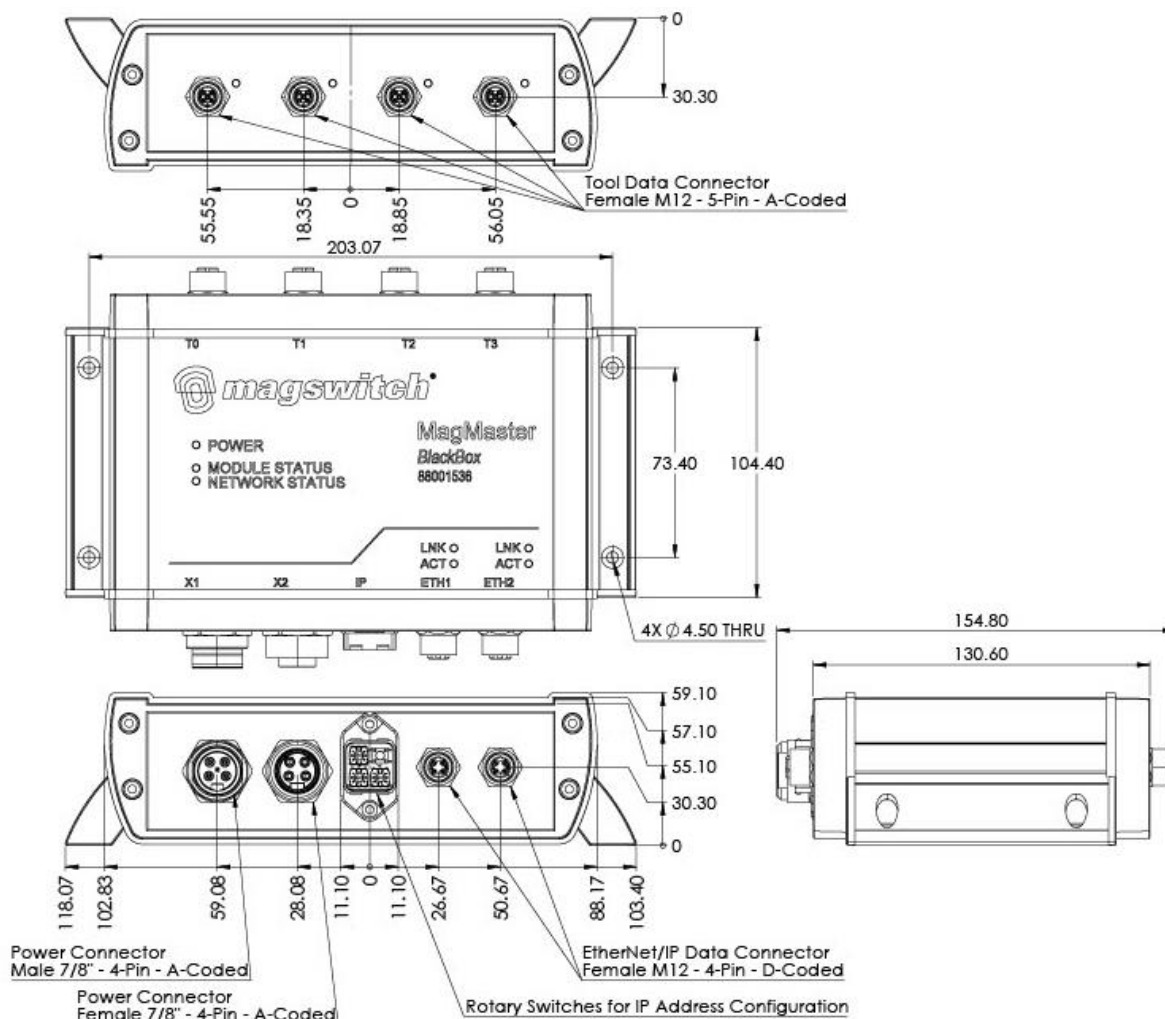


## MagMaster BlackBox Manual 88001536

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## BlackBox Diagram



**Figure 1: BlackBox 2D Drawing**

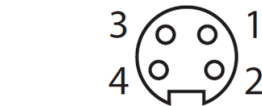
## Specifications

<b>Nominal Supply Voltage</b>	24 V DC	
<b>Peak Power Draw</b>	10 A @ 24 V DC	
<b>Net Weight</b>	3.3 lb	1.5 kg
<b>Connector Type</b>	Power: Male 7/8" - 4-Pin - A-coded Power: Female 7/8" - 4-Pin - A-coded 2x Ethernet/IP Data: Female M12 - 4-Pin - D-coded 4x Tool Data: Female M12x1.0 - 5 Pin - A-coded	
<b>Mounting Options</b>	4x M4	

## Connector Pinouts

### Male/Female Power Connectors (7/8" 4-Pin)

Pin #	Function	Logic
1	V2 (V+)	+24 VDC
2	V1 (V+)	+24 VDC
3	GND V1 (V-)	GND
4	GND V2 (V-)	GND



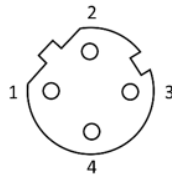
Pin Assignment 7/8", 4-pin, A-coded, Female Connector (socket-side) View



Pin Assignment 7/8", 4-pin, A-coded, Male Connector (pin-side) View

### Female EtherNet/IP Connectors (M12 4-Pin D-coded)

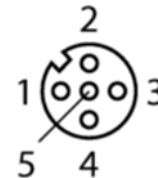
Pin #	Function
1	TX +
2	RX +
3	TX -
4	RX -



Pin Assignment M12, 4-pin, D-coded, Female Connector (socket-side) View

### Tool Data Connector (M12 5-Pin)

Pin #	Function	Logic
1	Signal Shield	-
2	V1 (V+)	+24 V DC
3	GND V1 (V-)	GND
4	CANopen bus high	TX/RX high line (D1) (CAN H)
5	CANopen bus low	TX/RX low line (D0) (CAN L)



Pin Assignment M12, 5-pin, A-coded, Female Connector (socket-side) View

## IP Address Setup



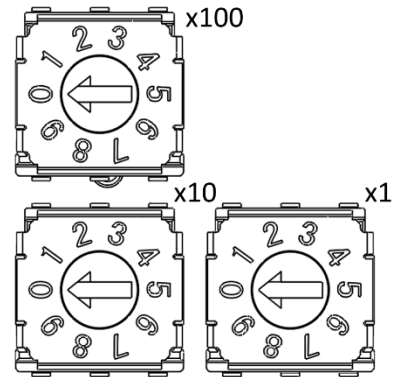
**Figure 2 Rotary Cap Removal**

Remove rotary cap by rotating the cap counter clockwise and pulling backwards to access rotary switches for IP address changes.

## Rotary Switches for IP Address Configuration

Rotary Switch Code*	IP Address	Note
999 (Default)	192.168.1.254	
255 or Greater	192.168.1.254	
254 or less	Sets the last octet	First 3 octets can be customized from web interface. Default is 192.168.1.XXX
000	DHCP	

\*Requires restart after changing rotary switches



Default Gateway: 192.168.1.1 – changeable via web interface when rotary switches 254 or less

Default Subnet Mask: 255.255.255.0 – changeable via web interface when rotary switches 254 or less

Default IP Address: 192.168.1.39 – The rotary switches ship with the IP address set to “039”

## LED Color Codes

LED	Color	Status	Description
Power	Green	Solid	The $\mu$ C part of the device has power
		Off	No power or device damaged
Module Status	Green	Solid	Device is ready
		Off	Device is not ready, usually still in boot process
Network Status	Green	Solid	EtherNet/IP connection established
		Flashing	EtherNet/IP connection is gone
	Red	Flashing	EtherNet/IP Time Out
		Off	No EtherNet/IP connection since bootup
LNK (ETH1/ETH2)	Green	Solid	Ethernet link established
		Off	No Ethernet link
ACT (ETH1/ETH2)	Orange	Flashing	Ethernet activity
		Off	No Ethernet link
T0 – T3	Green	Solid	CANopen bus logic level “high”, usually bad wiring or damaged CANopen device
		Flashing	CANopen bus communication
		Off	CANopen bus logic level “low”, normal if no CANopen communication

## Equipment and Cables required:

The below table shows the list of equipment, cables and connectors needed for setting up the tool. In the links column, example links have been provided to obtain this equipment from the Cable Manufacturer website.

Item No.	Turck PN	Description	Link	Single-Mag Quantity	Multi-Mag Quantity (For P number of tools)	Maximum Cable Length Recommendation
1	RSC RKC 572-xM*	Cable: Magmaster Blackbox to E-Series Tool	<a href="http://pdb2.turck.de/en/DE/products/00000006000218520002003a">http://pdb2.turck.de/en/DE/products/00000006000218520002003a</a>	1	P	20 Meters **
2	RSSD RJ45S-441-xM*	Cable: M12 4 pin connector to RJ45	<a href="http://turck.de/en/DE/products/0000003700030d270003003a">http://turck.de/en/DE/products/0000003700030d270003003a</a>	1	1	100 Meters (328 ft)
3	RKM 43 - xM*	7/8" Male Power Cable to Field wires	<a href="https://www.turck.de/en/product/0000000600003251c0001003a">https://www.turck.de/en/product/0000000600003251c0001003a</a>	1	1	N/A
4	7700-A4A01-U1C0500	7/8" 4 Pin Power	<a href="https://shop.murrelektronik.com/en/Connection-Technology/Connection-cables/Power/Mini-7-8-4-pole-Male-Ext-0-Female-0-7700-A4A01-U1C0500.html">https://shop.murrelektronik.com/en/Connection-Technology/Connection-cables/Power/Mini-7-8-4-pole-Male-Ext-0-Female-0-7700-A4A01-U1C0500.html</a>	1	0	N/A
5	7700-A4021-U1C0500	7/8" Female Power Cable to Field wires	<a href="https://shop.murrelektronik.com/en/Connection-Technology/With-open-ended-wires/Power/Mini-7-8-4-pole-Female-0-w-Cable-7700-A4021-U1C0500.html">https://shop.murrelektronik.com/en/Connection-Technology/With-open-ended-wires/Power/Mini-7-8-4-pole-Female-0-w-Cable-7700-A4021-U1C0500.html</a>	0	P	N/A

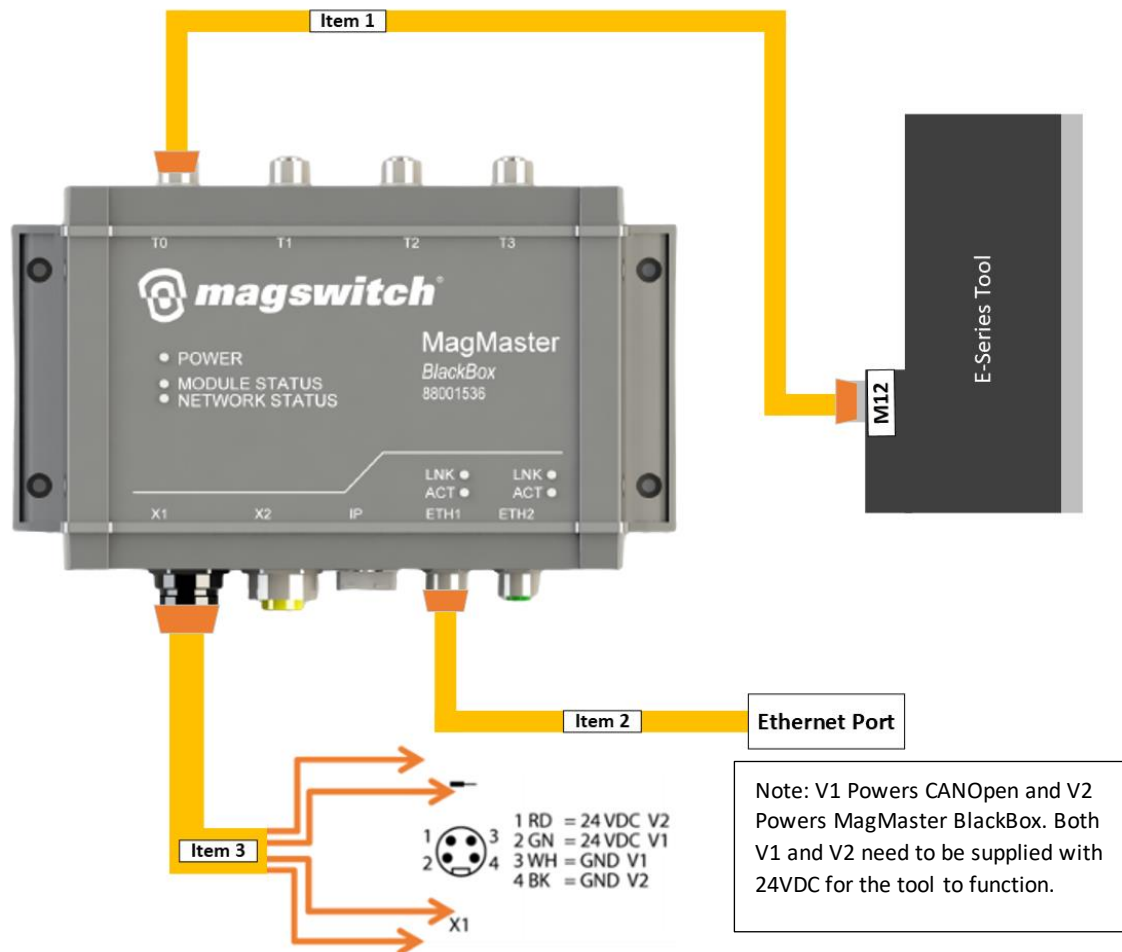
\* The x in the Turck PN refers to the length of the cable in Meters. Some of the links contain example lengths for these cables. Please order cables of lengths that are of the right length based on your requirements

\*\* If longer cable lengths are required please contact Magswitch for more information.

After all the above cables are available, please follow the steps below to correctly connect all the required tools. The cable names are referenced based on the item number in the above table. Images are provided below each step for reference.

## Single-Mag Setup:

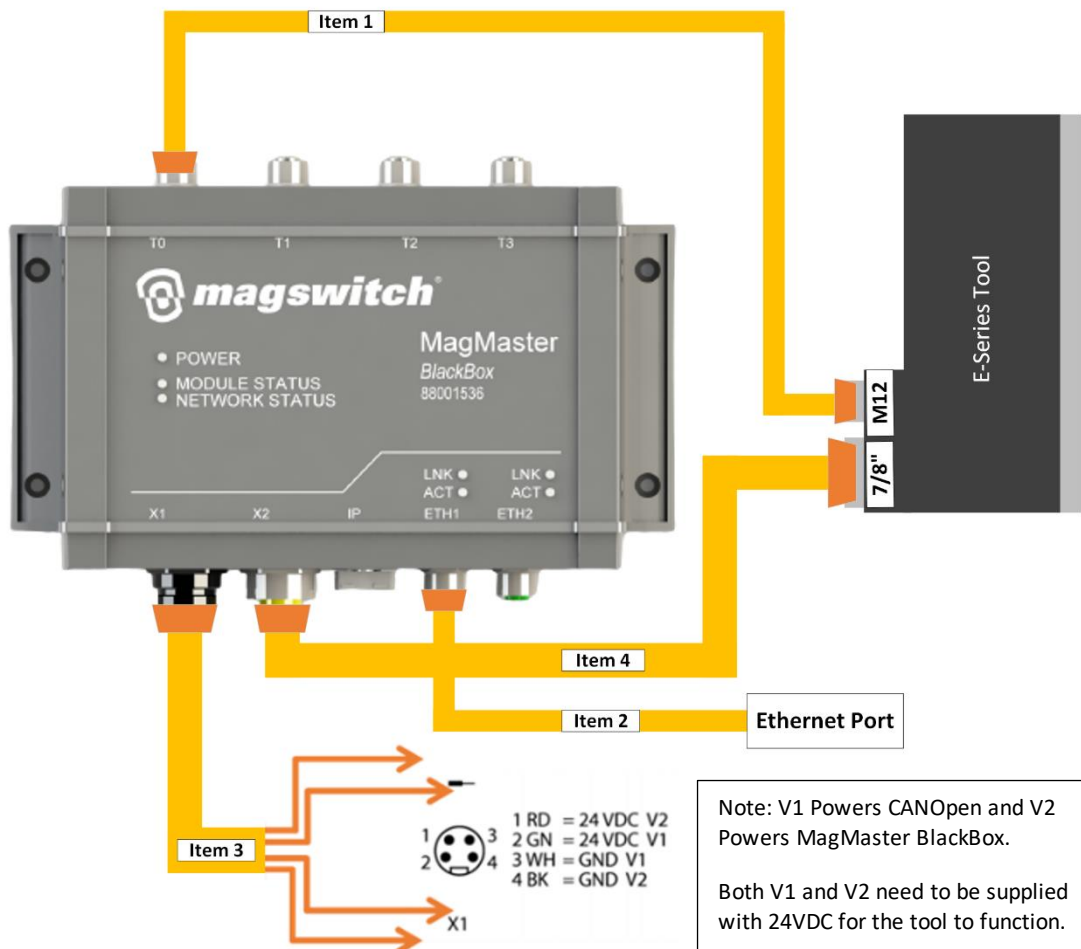
Please refer to the schematic diagram below in Figure 3 for the wiring diagram setup for a Single Mag Setup **ONLY FOR THE TOOLS: E30, E50, ELAY30X5 AND ELAY 30X7**



**Figure 3: Single-Mag Setup for E30, E50, ELAY 30x5, ELAY 30x7**

**Note:** In the above image (Figure 3) refer to the connector pinouts detailing the four pins connected to Item No.3. Only V1 needs to be wired and powered up. V1 powers the Serial Interface and MagMaster BlackBox.

Please refer to the schematic diagram below in Figure 4 for the wiring diagram setup for a Single Mag Setup  
**ONLY FOR THE TOOLS: ELAY 50X5 AND ELAY 70X6**



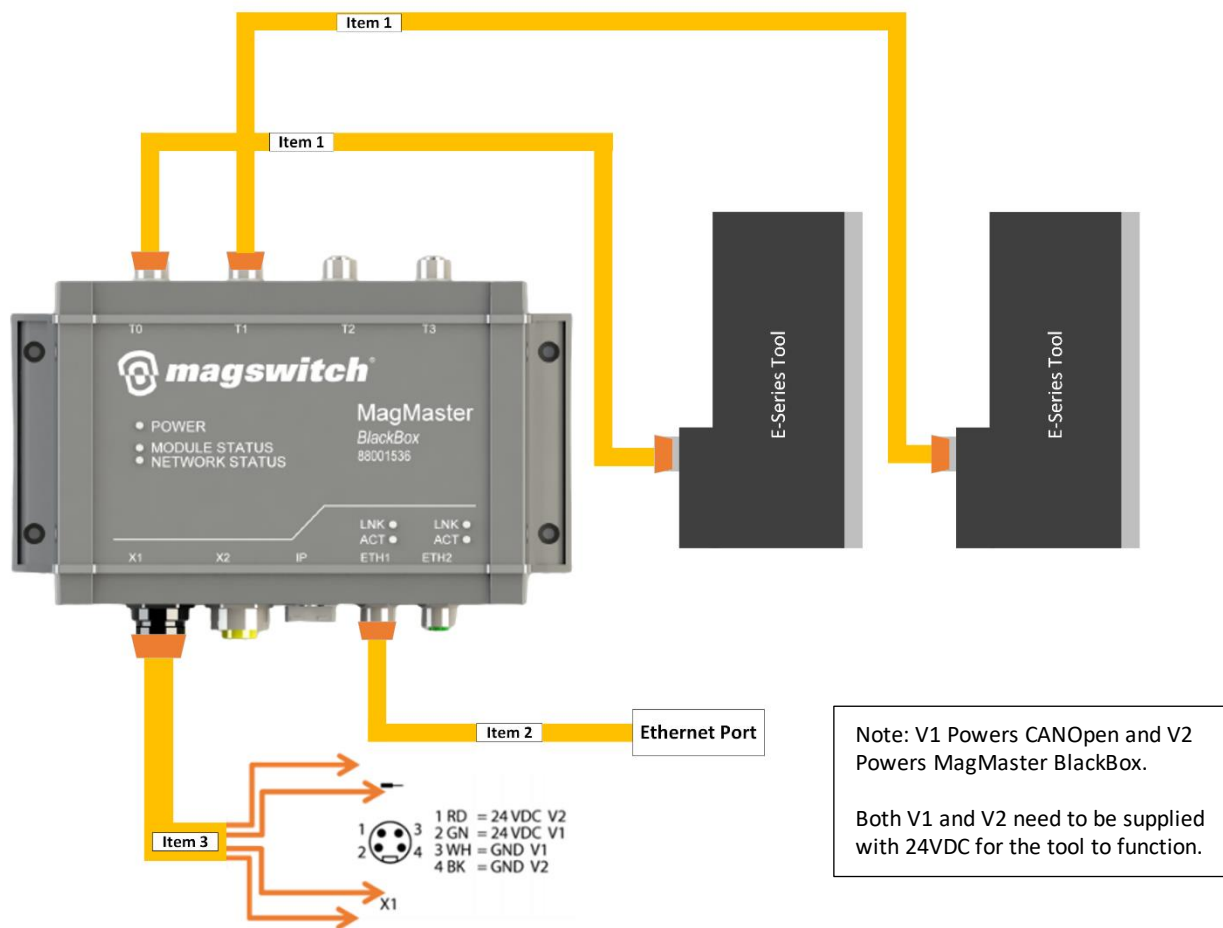
**Figure 4: Single-Mag Setup for ELAY 50x5 and ELAY 70x6**

**Note:** In the above image (Figure 4) refer to the connector pinouts detailing the four pins connected to Item No.3. Only V1 needs to be wired and powered up. V1 powers the Serial Interface and MagMaster BlackBox. Item No.4. can also be powered from external power supply rather than Blackbox connector X2

## Multi-Mag Setup:

Please refer to the schematic diagram below in Figure5 for the wiring diagram setup for a Multi - Mag Setup.

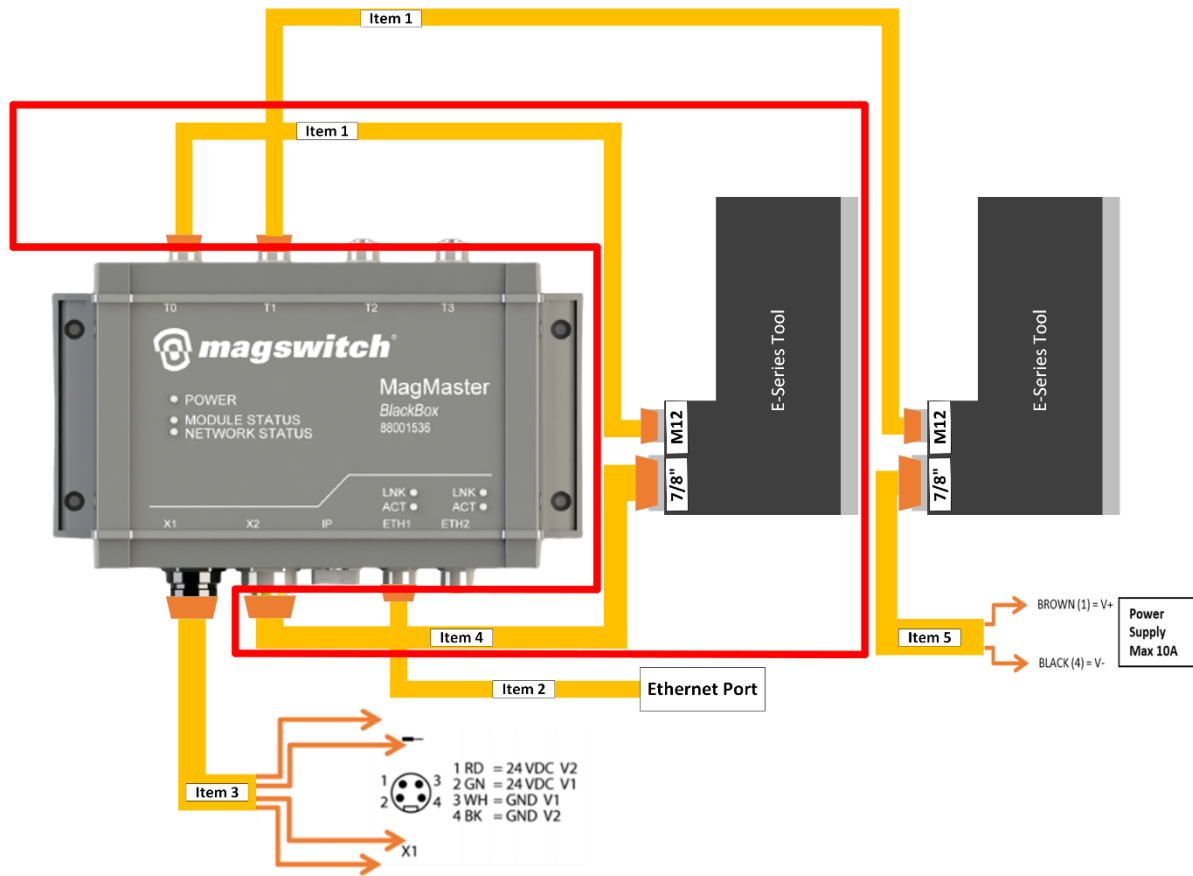
Each Magmaster Blackbox can connect up to 4 tools at a time. Each tool has it's own dedicated Serial network and is connected to T0,T1,T2,T3. During a multimag setup tools may actuate at different intervals. If there are 4 tools connected and any of the tools are an E50 or ELAY 30x5 or 30x7, that internal firmware will actuate the magnets in two separate groups to manage power consumption.



**Figure 5: Multi-Mag Setup for E30, E50, ELAY 30x5, ELAY 30x7**

**Note:** In the above image (Figure 5) refer to the connector pinouts detailing the four pins connected to Item No.3. Only V1 needs to be wired and powered up.



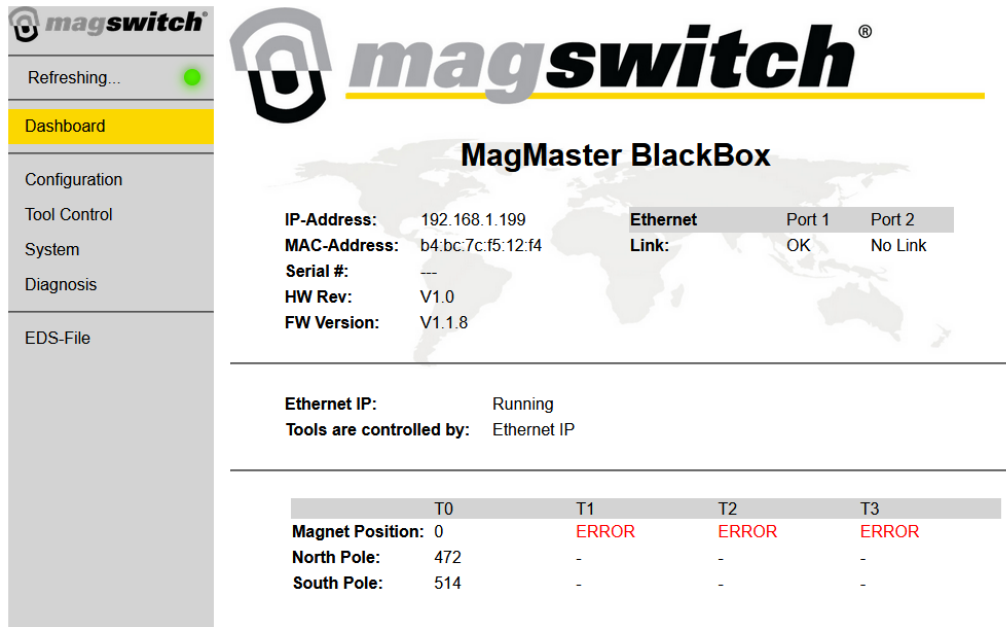


**Figure 6: Multi-Mag Setup for E30, E50, ELAY 30x5, ELAY 30x7**

**Note:** In the above image (Figure 6) refer to the connector pinouts detailing the four pins connected to Item No.3. Only V1 needs to be wired and powered up. V1 powers the Serial Interface and MagMaster BlackBox. Item No.4. can also be powered from external power supply rather than Blackbox connector X2.

## Web Interface Access


To access web interface, go to IP address in a web browser. Please review prior section for IP address setup. The default Dashboard page will look as follows upon loading the web browser page. This page contains basic information about the device and established connections. The Dashboard, Configuration, Tool Control, and EDS-File pages can all be accessed without a password. The System and Diagnosis pages require a username and password. Username: Debug / Password: m@gDB



**Figure 7: MagMaster BlackBox Web Interface**

## Web Interface – Configuration

The Configuration page allows the user to enable power and communication for Magswitch E Series tools on ports T0-T3. The page also gives additional information about the connected tool such as tool type and software version. When checking or unchecking the Power Enabled or the Tool Enabled, the user must click Apply for the changes to take effect.



Refreshing...

Dashboard

**Configuration**

Tool Control

System

Diagnosis

EDS-File

## Port Configuration

Apply the changes for all ports:
 

Apply

Discard

T0

T1

T2


T3

Power Enabled:	<input checked="" type="checkbox"/>
Braking Chopper State:	OK
Braking Chopper Temp:	29 °C / 84 °F
Tool:	
Enabled:	<input checked="" type="checkbox"/>
Node ID:	2
Type:	30
Serial No:	32519225
SW Version:	18
Cycle Count:	0
Error Code:	h0

**Figure 8: Configuration Page**

## Web Interface – Tool Control

To control the connected Magswitch tools from the web interface, please select the Tool Control tab from the left hand side of the screen. This screen now has four tabs similar to the configuration screen for monitoring and controlling each tool T0-T3 individually from the web interface. In order to control the selected tool from the web interface, the Force Control checkbox must be enabled. If this checkbox is disabled, the tools will be controlled by EtherNet/IP communication. However, the status can still be seen from the web interface even when being controlled by the EtherNet/IP network. Please note that to return tool to normal operation the Force Control box must be unchecked.



Refreshing... ●

Dashboard

Configuration

Tool Control

System

Diagnosis

EDS-File

## Tool Control

---

Force Control
☐
**Note:** If this box is checked, all tools are controlled by the WebIF only.


---

T0
T1
T2
T3

Control	Status
<div style="background-color: #f0f0f0; padding: 5px; margin-bottom: 5px;">Home Magswitch</div>	Magswitch Online: <input checked="" type="checkbox"/>
<div style="background-color: #f0f0f0; padding: 5px; margin-bottom: 5px;">Turn Magswitch Full On</div>	Magswitch Ready: <input type="checkbox"/>
<div style="background-color: #f0f0f0; padding: 5px; margin-bottom: 5px;">Turn Magswitch Full Off</div>	Magswitch Full On: <input type="checkbox"/>
<div style="background-color: #f0f0f0; padding: 5px; margin-bottom: 5px;">Restart Tool</div>	Magswitch Full Off: <input type="checkbox"/>
<div style="background-color: #f0f0f0; padding: 5px; margin-bottom: 5px;">Request Position</div>	Magswitch Partial On: <input type="checkbox"/>
50 <input type="text"/>	Magswitch Position: 0
	North: 472
	South: 514

**Figure 9: Tool Control**

After selecting the desired tool, simply click on the Home magswitch. This will initiate the homing process for the E-Series tool, and the Magswitch Ready box should be checked, as depicted in Figure 10 below. Once the Magswitch Ready feature has been confirmed, the user may proceed to power the tool on or off. By selecting Full On, the tool will activate to its full capacity, and the user can effortlessly switch between full on, partial on, or full off modes without any further steps. If users encounter any unexpected behavior from the tool, they have the option to perform a restart. This action will initiate a reset of the tool's firmware, which may help address any issues they are experiencing. However, it's important to note that after the restart, the tool will need to be homed again.



Refreshing... ●

Dashboard

Configuration

Tool Control

System

Diagnosis

EDS-File

## Tool Control

---

Force Control
☐
**Note:** If this box is checked, all tools are controlled by the WebIF only.

---

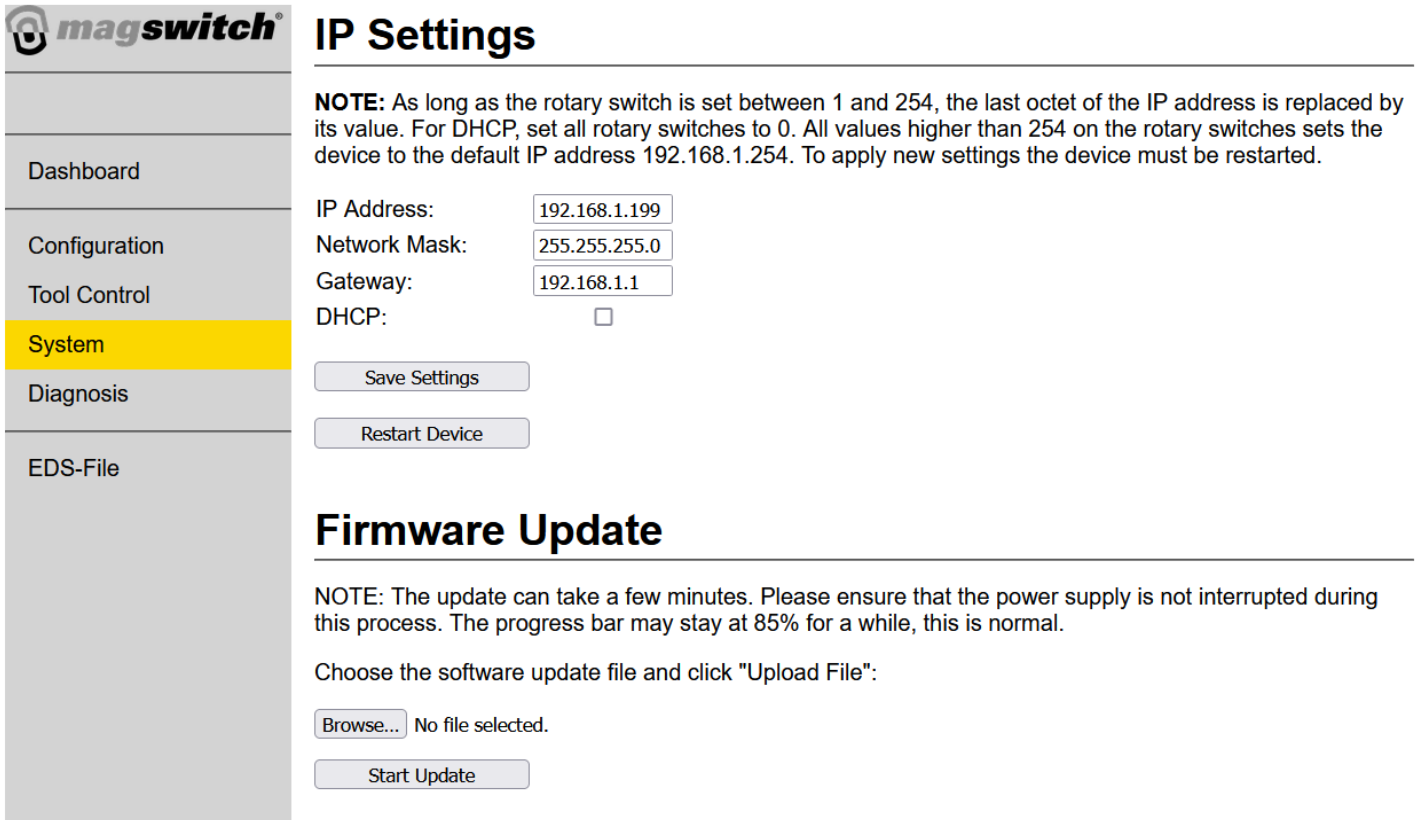
T0
T1
T2
T3

Control	Status
<div style="background-color: #f0f0f0; padding: 5px; margin-bottom: 5px;">Home Magswitch</div>	Magswitch Online: <input checked="" type="checkbox"/>
<div style="background-color: #f0f0f0; padding: 5px; margin-bottom: 5px;">Turn Magswitch Full On</div>	Magswitch Ready: <input checked="" type="checkbox"/>
<div style="background-color: #f0f0f0; padding: 5px; margin-bottom: 5px;">Turn Magswitch Full Off</div>	Magswitch Full On: <input type="checkbox"/>
<div style="background-color: #f0f0f0; padding: 5px; margin-bottom: 5px;">Restart Tool</div>	Magswitch Full Off: <input type="checkbox"/>
<div style="background-color: #f0f0f0; padding: 5px; margin-bottom: 5px;">Request Position</div>	Magswitch Partial On: <input type="checkbox"/>
50 <input type="text"/>	Magswitch Position: 0
	North: 472
	South: 514

**Figure 10: Tool Ready**

## Web Interface – System

The System page allows the user to view and configure the IP address and network settings as well as restart the BlackBox. In addition, it allows the user to update firmware if a firmware updated is provided by Magswitch to the user.



The screenshot shows the Magswitch web interface. On the left is a sidebar with navigation links: Dashboard, Configuration, Tool Control, System (highlighted in yellow), Diagnosis, and EDS-File. The main content area is titled "IP Settings" and contains a "NOTE" about rotary switch settings. Below the note are input fields for IP Address (192.168.1.199), Network Mask (255.255.255.0), and Gateway (192.168.1.1), along with an unchecked checkbox for DHCP. There are "Save Settings" and "Restart Device" buttons. Below this is a "Firmware Update" section with another "NOTE" and instructions to upload a file. It includes a "Browse..." button (showing "No file selected.") and a "Start Update" button.

**IP Settings**

**NOTE:** As long as the rotary switch is set between 1 and 254, the last octet of the IP address is replaced by its value. For DHCP, set all rotary switches to 0. All values higher than 254 on the rotary switches sets the device to the default IP address 192.168.1.254. To apply new settings the device must be restarted.

IP Address:

Network Mask:

Gateway:

DHCP: ☐

**Firmware Update**

**NOTE:** The update can take a few minutes. Please ensure that the power supply is not interrupted during this process. The progress bar may stay at 85% for a while, this is normal.


Choose the software update file and click "Upload File":

No file selected.

**Figure 11: System**

## Web Interface – Diagnosis

The Diagnosis page allows the user to control and monitor the tool similar to the setup page, but also adds additional features for the debugging. The Reset Reference button is intended for debug purposes only and should only be used when directed by Magswitch. This function is utilized to reset some of the internal values of the tool in event of specific errors and needs to be used with caution as the magnet will turn on and off during this process.



- Refreshing...
- Dashboard
- Configuration
- Tool Control
- System
- Diagnosis
- EDS-File

## Diagnosis

Force Control ☐ **Note:** If this box is checked, all tools are controlled by the WebIF only.

T0

T1

T2

T3

Control	Status
<div style="border: 1px solid #ccc; padding: 5px; text-align: center;">Home Magswitch</div>	
<div style="border: 1px solid #ccc; padding: 5px; text-align: center;">Turn Magswitch Full On</div>	Magswitch Online: <input checked="" type="checkbox"/>
<div style="border: 1px solid #ccc; padding: 5px; text-align: center;">Turn Magswitch Full Off</div>	Magswitch Ready: <input type="checkbox"/>
<div style="border: 1px solid #ccc; padding: 5px; text-align: center;">Restart Tool</div>	Magswitch Full On: <input type="checkbox"/>
	Magswitch Full Off: <input type="checkbox"/>
	Magswitch Partial On: <input type="checkbox"/>
Request Position <div style="border: 1px solid #ccc; padding: 2px 5px; display: inline-block; text-align: center;">50</div>	Magswitch Position: 0
	North: 472
<div style="border: 1px solid #ccc; padding: 5px; text-align: center;">Reset Reference</div>	South: 513

**Figure 12: Diagnosis**

## Web Interface – EDS File

To download the EDS file, click the EDS-File tab on the left hand side of a the screen on the web interface. “MagMaster\_BlackBox.eds” will be begin downloading as soon as this tab is clicked.

For controllers that do not accept EDS file uploads and require manual input please use the following information:

<u>Device/Vendor info</u>	
Vendor ID	1730
Device Type	12
Product Code	1001

<u>Class 1 Connection Information</u>		
	Instance	Size in Bytes:
Configuration	103	
Output	102	8
Input	101	24

## Output Datamap (from Robot/Controller Perspective)

Tool #	Word #	Bit #	Function	Description
<b>T0</b>	Word 0	0	Enable MultiMag	Enable MultiMag Communication and allows all tools connected to be controlled from word 0 of memory map for easy and fast tool synchronization
		1	Magnet Full ON	Turns Magnet to full on position (Magnet Full Off must be off)
		2	Magnet Full Off	Turns Magnet to full off position
		3	Magnet Partial ON	Enables tool to have partial position (Magnet Full ON and Magnet Full Off must be off)
		4	HOME	Starts tool homing sequence
		5	Restart Tool	Reboots tool for fault and or debug purposes
		6	N/A	
		7	N/A	
		8	REQ PSN 1	Sends numerical value for requested position of tool (0-100) range
		9	REQ PSN 2	
		10	REQ PSN 4	
		11	REQ PSN 8	
		12	REQ PSN 16	
		13	REQ PSN 32	
		14	REQ PSN 64	
		15	N/A	
<b>T1</b>	Word 1	0	N/A	
		1	Magnet Full ON	Turns Magnet to full on position (Magnet Full Off must be off)
		2	Magnet Full Off	Turns Magnet to full off position
		3	Magnet Partial ON	Enables tool to have partial position (Magnet Full ON and Magnet Full Off must be off)
		4	HOME	Starts tool homing sequence
		5	Restart Tool	Reboots tool for fault and or debug purposes
		6	N/A	
		7	N/A	
		8	REQ PSN 1	Sends numerical value for requested position of tool (0-100) range
		9	REQ PSN 2	
		10	REQ PSN 4	
		11	REQ PSN 8	
		12	REQ PSN 16	
		13	REQ PSN 32	
		14	REQ PSN 64	
		15	N/A	
<b>T2</b>	Word 2	0	N/A	

Tool #	Word #	Bit #	Function	Description
		1	Magnet Full ON	Turns Magnet to full on position
		2	Magnet Full Off	Turns Magnet to full off position
		3	Magnet Partial ON	Enables tool to have partial position (Magnet Full ON and Magnet Full Off must be off)
		4	HOME	Starts tool homing sequence
		5	Restart Tool	Reboots tool for fault and or debug purposes
		6	N/A	
		7	N/A	
		8	REQ PSN 1	Sends numerical value for requested position of tool (0-100) range
		9	REQ PSN 2	
		10	REQ PSN 4	
		11	REQ PSN 8	
		12	REQ PSN 16	
		13	REQ PSN 32	
		14	REQ PSN 64	
		15	N/A	
<b>T3</b>	Word 3	0	N/A	
		1	Magnet Full ON	Turns Magnet to full on position
		2	Magnet Full Off	Turns Magnet to full off position
		3	Magnet Partial ON	Enables tool to have partial position (Magnet Full ON and Magnet Full Off must be off)
		4	HOME	Starts tool homing sequence
		5	Restart Tool	Reboots tool for fault and or debug purposes
		6	N/A	
		7	N/A	
		8	REQ PSN 1	Sends numerical value for requested position of tool (0-100) range
		9	REQ PSN 2	
		10	REQ PSN 4	
		11	REQ PSN 8	
		12	REQ PSN 16	
		13	REQ PSN 32	
		14	REQ PSN 64	
		15	N/A	



## Input Datamap (from Robot/Controller Perspective)

Tool #	Word #	Bit #	Function	Description
<b>T0</b>	<b>Word 0</b>	0	Magnet is Full ON	Magnet in tool is in fully on position
		1	Magnet is Full Off	Magnet in tool is in fully off position
		2	Magnet is Partial ON	Magnet in tool is in partial on position
		3	Magnet 1 Ready	Magnet in tool is ready
		4	Comm OK Magnet 1	Communication from tool is OK
		5	Tool Error**	See Note **
		6	N/A	
		7	N/A	
		8	Act PSN 1	Actual numerical value of magnet position in tool (0-100)
		9	Act PSN 2	
		10	Act PSN 4	
		11	Act PSN 8	
		12	Act PSN 16	
		13	Act PSN 32	
		14	Act PSN 64	
		15	N/A	
	<b>Word 1</b>	0	North 1	Value of magnet sensor on north pole (0-1023)
		1	North 2	
		2	North 4	
		3	North 8	
		4	North 16	
		5	North 32	
		6	North 64	
		7	North 128	
		8	North 256	
		9	North 512	
		10	North 1024	
		11	North 2048	
		12	North 4096	
		13	North 8192	
		14	North 16384	
		15	North 32768	
	<b>Word 2</b>	0	South 1	Value of magnet sensor on south pole (0-1023)
		1	South 2	
		2	South 4	
		3	South 8	
		4	South 16	

Tool #	Word #	Bit #	Function	Description
		5	South 32	
		6	South 64	
		7	South 128	
		8	South 256	
		9	South 512	
		10	South 1024	
		11	South 2048	
		12	South 4096	
		13	South 8192	
		14	South 16384	
		15	South 32768	
<b>T1</b>	Word 3	0	Magnet is Full ON	Magnet in tool is in fully on position
		1	Magnet is Full Off	Magnet in tool is in fully off position
		2	Magnet is Partial ON	Magnet in tool is in partial on position
		3	Magnet 2 Ready	Magnet in tool is ready
		4	Comm OK Magnet 2	Communication from tool is OK
		5	Tool Error**	See Note **
		6	N/A	
		7	N/A	
		8	Act PSN 1	Actual numerical value of magnet in tool (0-100)
		9	Act PSN 2	
		10	Act PSN 4	
		11	Act PSN 8	
		12	Act PSN 16	
		13	Act PSN 32	
		14	Act PSN 64	
	Word 4	15	N/A	
		0	North 1	Value of magnet sensor on north pole (0-1023) . When tool is fully off and off target the value will hover around 500. When tool is fully on and off target the value will approach 1023 and typically be in the 800-950 range.
		1	North 2	
		2	North 4	
		3	North 8	
		4	North 16	
		5	North 32	
		6	North 64	
		7	North 128	
		8	North 256	
		9	North 512	
		10	North 1024	
		11	North 2048	

Tool #	Word #	Bit #	Function	Description
		12	North 4096	
		13	North 8192	
		14	North 16384	
		15	North 32768	
	Word 5	0	South 1	Value of magnet sensor on south pole (0-1023). When tool is fully off and off target the value will hover around 500. When tool is fully on and off target the value will approach 0 and typically be in the 200-50 range.
		1	South 2	
		2	South 4	
		3	South 8	
		4	South 16	
		5	South 32	
		6	South 64	
		7	South 128	
		8	South 256	
		9	South 512	
		10	South 1024	
		11	South 2048	
		12	South 4096	
		13	South 8192	
		14	South 16384	
		15	South 32768	
T2	Word 6	0	Magnet is Full ON	Magnet in tool is in fully on position
		1	Magnet is Full Off	Magnet in tool is in fully off position
		2	Magnet is Partial ON	Magnet in tool is in partial on position
		3	Magnet 3 Ready	Magnet in tool is ready
		4	Comm OK Magnet 3	Communication from tool is OK
		5	Tool Error**	See Note **
		6	N/A	
		7	N/A	
		8	Act PSN 1	Actual numerical value of magnet in tool (0-100)
		9	Act PSN 2	
		10	Act PSN 4	
		11	Act PSN 8	
		12	Act PSN 16	
		13	Act PSN 32	
		14	Act PSN 64	
		15	N/A	
	Word 7	0	North 1	Value of magnet sensor on north pole (0-1023). When tool is fully off and off target the value will hover around 500. When tool is fully on and off
		1	North 2	
		2	North 4	

Tool #	Word #	Bit #	Function	Description
		3	North 8	target the value will approach 1023 and typically be in the 800-950 range.
		4	North 16	
		5	North 32	
		6	North 64	
		7	North 128	
		8	North 256	
		9	North 512	
		10	North 1024	
		11	North 2048	
		12	North 4096	
		13	North 8192	
		14	North 16384	
		15	North 32768	
	Word 8	0	South 1	Value of magnet sensor on south pole (0-1023). When tool is fully off and off target the value will hover around 500. When tool is fully on and off target the value will approach 0 and typically be in the 200-50 range.
		1	South 2	
		2	South 4	
		3	South 8	
		4	South 16	
		5	South 32	
		6	South 64	
		7	South 128	
		8	South 256	
		9	South 512	
		10	South 1024	
		11	South 2048	
		12	South 4096	
		13	South 8192	
		14	South 16384	
		15	South 32768	
T3	Word 9	0	Magnet is Full ON	Magnet in tool is in fully on position
		1	Magnet is Full Off	Magnet in tool is in fully off position
		2	Magnet is Partial ON	Magnet in tool is in partial on position
		3	Magnet 4 Ready	Magnet in tool is ready
		4	Comm OK Magnet 4	Communication from tool is OK
		5	Tool Error**	See Note **
		6	N/A	
		7	N/A	
		8	Act PSN 1	Actual numerical value of magnet in tool (0-100)
		9	Act PSN 2	

Tool #	Word #	Bit #	Function	Description
		10	Act PSN 4	
		11	Act PSN 8	
		12	Act PSN 16	
		13	Act PSN 32	
		14	Act PSN 64	
		15	N/A	
	Word 10	0	North 1	Value of magnet sensor on north pole (0-1023) When tool is fully off and off target the value will hover around 500. When tool is fully on and off target the value will approach 1023 and typically be in the 800-950 range.
		1	North 2	
		2	North 4	
		3	North 8	
		4	North 16	
		5	North 32	
		6	North 64	
		7	North 128	
		8	North 256	
		9	North 512	
		10	North 1024	
		11	North 2048	
		12	North 4096	
		13	North 8192	
		14	North 16384	
		15	North 32768	
	Word 11	0	South 1	Value of magnet sensor on south pole (0-1023). When tool is fully off and off target the value will hover around 500. When tool is fully on and off target the value will approach 0 and typically be in the 200-50 range.
		1	South 2	
		2	South 4	
		3	South 8	
		4	South 16	
		5	South 32	
		6	South 64	
		7	South 128	
		8	South 256	
		9	South 512	
		10	South 1024	
		11	South 2048	
		12	South 4096	
		13	South 8192	
		14	South 16384	
		15	South 32768	

**\*\* If the Tool Error bit is set, kindly navigate to the web interface tool configuration, as shown in Figure 8, to check the error code. Please make a note of the error code and consult with Magswitch for further assistance.**

## Sensor Values

Accurately determining the presence and thickness of parts on the tool is essential for proper functioning. When the tool is in operation with no part present, the north sensor reading will approach 1023, while the south sensor will approach 0. However, if a part is present, the north and south sensor values depend on the thickness of the part and quality of the magnetic circuit. The thicker the part or better the magnetic circuit, the closer the north and south pole magnetic sensor values will move towards approximately 500 as shown in Figure 13. The quality of the magnetic circuit can be affected in different ways such as by air gaps, pole shoe geometry, pole shoe coatings or part conditions (rust, burrs, casting imperfections, etc.).

Customers can program their respective controller or robot to learn various part specifications through sensor values, ensuring precise part selection. By leveraging sensor values, we can guarantee that the correct part is present, accurately selected, and correctly gripped.

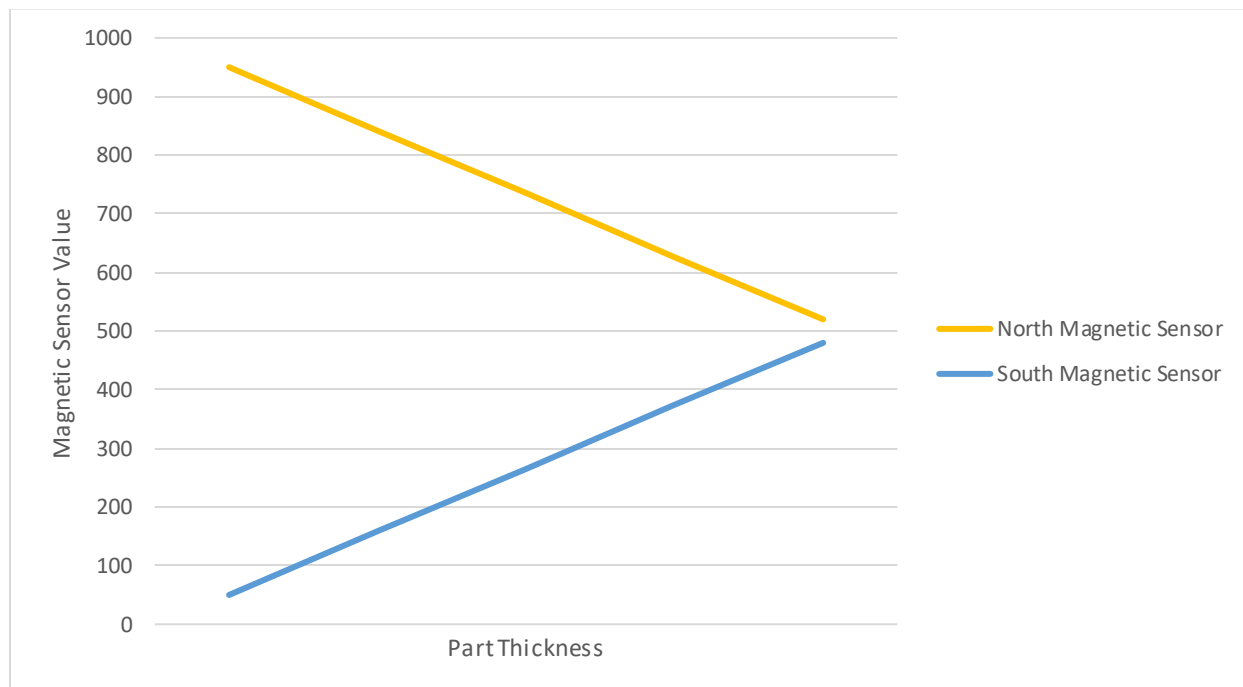


Figure 13 North and South magnetic sensor value's, with tool fully on and part thickness increases