

SYSTEM OVERVIEW

The Telesis[®] TMP4500E marking system permanently prints messages into a variety of materials such as steel, aluminum, and plastic. A hardened pin is accelerated to indent dot matrix characters into the item being marked at depths up to .45 mm (.018 in.) in mild steel. Character shape, size, density, and location are determined by the user through the marking system software.

The **Marking Head** is an electromechanical marker. A metal-formed cover houses the internal, mechanical components that position the pin cartridge. An electric solenoid fires the marking pin and an internal spring returns the pin to its idle position within the cartridge. The marking head moves the pin cartridge through X- and Y-axis rectilinear motions to reach the correct position for each dot of the characters to be marked. The system software automatically controls pin extension to mark the message.

The marker uses two stepper-motor drives to rapidly and accurately position the pin at coordinate-defined locations in the marking window within .006 mm (.00024 in.). The marker accommodates the rigorous dynamics of impacting, rebounding, and rapid positioning of the marking pin through a linear rail/ball bearing saddle assembly, ceramic-coated guide shaft/linear bushing assemblies, and drive motors with concentric, linear drive screws.

The lightweight and portable TMP4500E is designed for remote operation. The hand-held marker incorporates a pistol grip handle with a Start Print pushbutton switch. A rear-mounted handle provides additional stability during marking. It can be used in virtually any orientation.

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A tapped hole is provided in the top of the marking head (beneath the label) to allow for installation of an eye bolt. The eyebolt allows the marker to be suspended from a mechanical-assist device such as a cable or cable balancer.

The **Pin Cartridge**, machined from engineered plastic materials, offers long life with little maintenance. Screws attach the pin cartridge to the marking head for easy removal, cleaning, and pin replacement. The cartridge/solenoid assembly can be configured for Long Throw or Short Throw operation. Long Throw configuration allows for deeper marks while Short Throw configuration allows for faster marking.

The **Marking Pins** are made of powdered metal and are available in 30° and 45° cone angles.

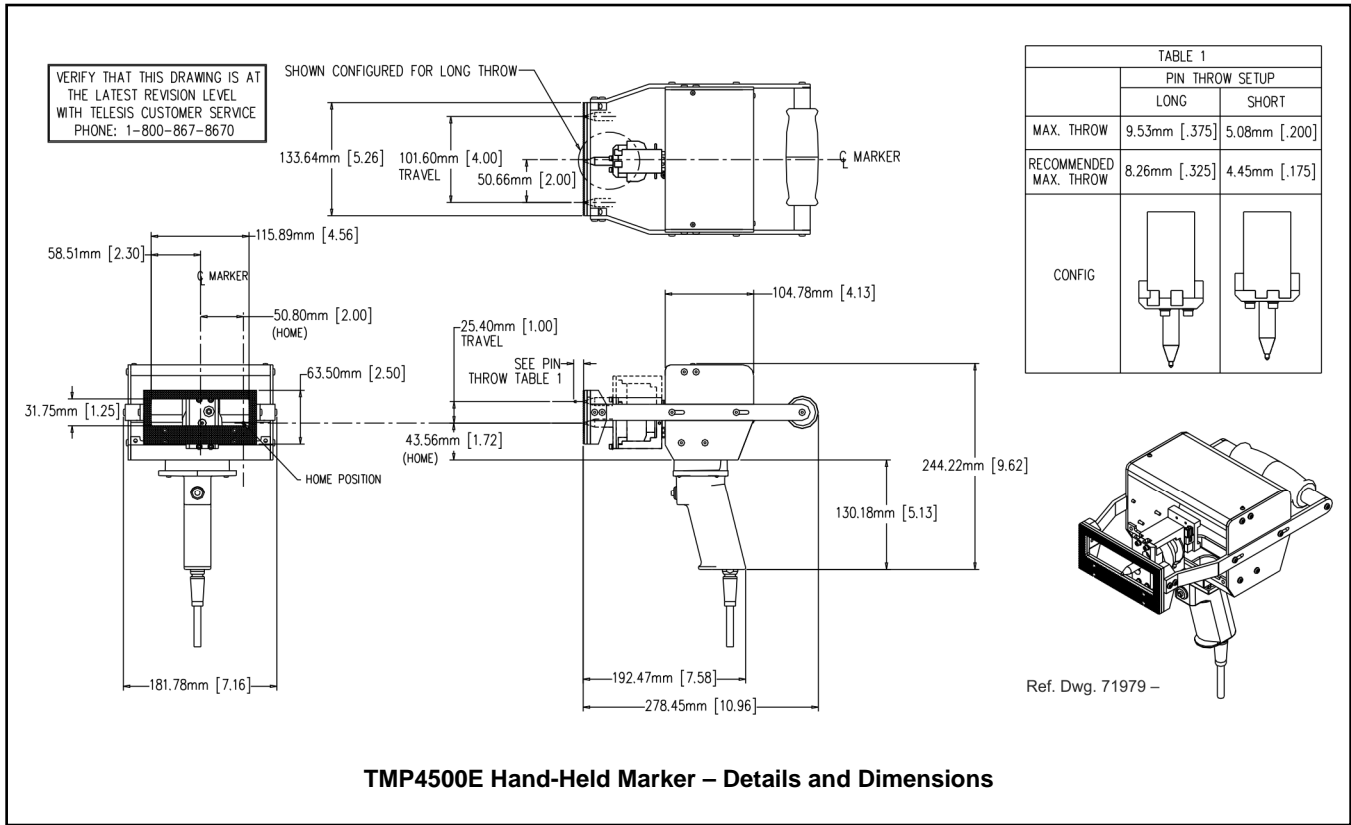
The **Marker Cable** connects the marker to the controller. The cable is 4 m (13 ft.) long and is pre-wired to the marking head.

TMC470 Controller provides the electrical interface and software control of the TMP4500E marking head. (Refer to *TMC470 Controller Specifications* for details.)

SYSTEM OPTIONS

- Backup Utility Software
- Bar Code Scanner
- Bar Code Wand
- Logo/Font Generator Software
- Marking Head Extension Cables
- TMC470 Controller Panel-mounting Bezel/Bracket Kit
- TMC470 Controller Wall-mounting Bracket Kit
- TMC470N NEMA[®] Enclosure
- Tool Stand (for fixed-mounting applications)
- Upgrade Utility Software

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SYSTEM SETUP

The marking head is designed to be used as a hand-held marker. Optionally, it may be suspended from a cable balancer or mounted on a Telesis tool stand.

The following procedures provide only a general overview of the installation process. For complete installation instructions, refer to the *TMP4500E Installation & Maintenance Manual* and the *TMC470 Controller Installation & Maintenance Manual*.

CAUTION

The TMC470 is not a sealed unit. Protect it from potentially damaging conditions and contaminants. Do not block vents in bottom of case. Ensure the marking system is electrically isolated from any devices that may generate extreme electromagnetic interference (EMI).

1. Locate controller as close as practical to marking head. Standard marker cable length is 4 m (13 ft.).
2. Install the controller as a table-top, wall-mounted, panel-mounted, or enclosure-mounted unit, as applicable.
3. Ensure controller power switch is OFF.
4. Connect marker cable to controller.
5. Connect power cable to controller.
6. Position controller power switch to ON (on back panel) to start the marking system software.
7. Adjust pin stroke for impact depth, as required.

TMP4500E MARKING HEAD

Specifications

The TMP4500E marking head specifications are subject to change without prior notice.

Dimensions	see illustration
Rating	NEMA [®] 1 (I.P. 30)
Weight	3.82 kg (8.4 lb) marker & cable 3.00 kg (6.6 lb) marker only
Noise	81.4 dB (max); 73.1 dB (LEQ) See <i>Marking Noise</i> for details
Vibration	Does not exceed 2.5 m/s ² See <i>Vibration Data</i> for details
Marking Area (W x H).....	100 x 25 mm (4.0 x 1.0 in.)
Number of Impact Pins.....	1
Pin Types	30° or 45° cone angle
Pin Type	Powdered Metal with 30° or 45° cone angle
Pin Stroke (max.).....	8.26 mm (.325 in.) Long Throw 4.45 mm (.175 in.) Short Throw
Operating Temp.....	0° to 50°C (32° to 122° F), non-condensing
Humidity	10% to 80%

TMP4500E MARKING HEAD *(continued)*

Marking Characteristics

The TMP4500E can produce character sizes from 1.5 to 25 mm (.060 to 1.0 in.) increments. Characters can be rotated 359° in 1° increments with a printing resolution range from 5 dots/cm (10 dots/in.) to 75 dots/cm (200 dots/in.) for an engraved look. The depth of mark can be adjusted over a significant range by adjusting the pin stroke and/or adjusting the Depth parameter in the marking system software.

Marking Speeds

The system can mark 3.175 mm (.125 in.) high characters in the 5x7 font at a rate of 2 characters per second at a depth of .45 mm (.018 in.) in mild steel. Speeds will vary widely depending on the selected character size, style, and dot density. Specific times can be verified by a Telesis representative.

Marking Noise

Sound pressure-level tests were conducted on the TMP4500E Marking System using a Larson-Davis Model 710 sound pressure meter while dry firing the marker at a 50% duty cycle. The maximum sound pressure level during the test cycle was measured at 81.4 dB. The time-weighted average (LEQ) using the 3 db rule without threshold was 73.1 dB. Typical applications average a 20% to 30% duty cycle where the time-weighted average would not exceed 69.1 dB(A).

The sound pressure-level tests were carried out under controlled conditions, imitating as closely as possible, predicted normal operation. However, noise level is heavily dependent on the part being impacted. Conditions such as the material being marked, the rigidity of the work piece, machine settings, ambient noise, etc., may all vary when in operational use. Such variables will alter the actual noise level.

Despite detailed guidance provided with each machine, variable operating conditions are beyond the control of Telesis. The responsibility of establishing safe working levels of use remains with the end user. Accordingly, you should conduct your own sound pressure-level tests for your application while marking actual work pieces.

Pin Life

Pin life depends largely on the type of material being marked, how hard or abrasive it is, and the required marking depth.

Vibration Data

Total hand-arm vibration does not exceed 2.5 m/s².

Vibration tests were performed under controlled conditions imitating, as closely as possible, typical normal operation.

Conditions such as rigidity of the work piece, material, setting of the machine, etc. may vary in actual operational use and would alter the actual vibration level. Despite detailed guidance instructions provided with each machine, such conditions are beyond the control of Telesis and must remain the responsibility of the end user. Accordingly, you should conduct your own tests to establish safe working levels of use.

The vibration tests were conducted using the following parameters:

Pin Stroke.....	8 mm (.31 in) set for Long Throw
Marking Base	20 mm (.79 in) thick steel
Marking Surfaces.....	3 mm (.125 in) thick steel plate
Marking Mode	Dot
Text Marked	QWERTYUI12345678 5x7 font, 3mm (.12 in) characters

The following test results reflect the worst-case scenarios under the given test conditions.

Pistol Grip Handle		
VM	T _(EAV)	T _(ELV)
0.933 m/s ²	more than 24 hr	more than 24 hr

Padded (rear-mounted) Handle		
VM	T _(EAV)	T _(ELV)
0.87 m/s ²	more than 24 hr	more than 24 hr

where:

VM = hand/arm Vibration Magnitude.

T_(EAV) = time to reach the Exposure Action Value based on continuous marking.

T_(ELV) = time to reach the Exposure Limit Value based on continuous marking.

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TMC470 CONTROLLER

The TMC470 controller may be installed as a table-top unit, a wall-mounted unit, a panel-mounted unit, or an enclosure-mounted unit. All configurations provide features and connectivity for external communications. Differences occur only in the mounting configuration.

TMC470 Specifications

The TMC470 Controller specifications are subject to change without prior notice.

Compliance	CE, RoHS
Configurations	Table-top, Wall-mounted, Panel-mounted, or Enclosure-mounted
Rating	NEMA® 1 (I.P. 30) table-top or wall-mounted NEMA® 12 (I.P. 65) panel-mounted using customer-supplied panel NEMA® 12 (I.P. 65) using Telesis-supplied TMC470N enclosure
Dimensions	refer to TMC470 Mounting Drawings
Weight	3.69 lb. (1.68 kg) controller only 3.90 lb. (1.77 kg) with wall-mount kit 5.52 lb. (2.51 kg) with panel-mount kit 28.1 lb. (12.77 kg) with TMC470N enclosure
Op. Temperature	32° to 122° F (0° to 50°C)
Op. Humidity	10% to 80% non-condensing
Cooling	Internal, thermostat-controlled fan
Power Requirements ...	95 to 250 VAC, 2 amps, 50-60 Hz, single phase
Communications	TTL, Discrete I/O, RS232, RS485, TCP/IP, and USB (data backup and data transfer)
Input Signals	Twelve (12) total, optically isolated: 8 dedicated, 1 programmable, 3 available 10 VDC (minimum voltage) 30 VDC (maximum voltage) 12 to 24 VDC (nominal voltage) 2.3 mA @ 12VDC; 4.9 mA @ 24VDC (nominal current)
Output Signals	Six (6) total, optically isolated: 4 dedicated, 2 available 0.25 amps (maximum current) 0.50 ohms (maximum On resistance) 40 VDC (maximum line voltage) 12 to 24 VDC (nominal line voltage)

Environmental Considerations

The following environmental considerations must be taken into account when installing the TMC470 Controller.

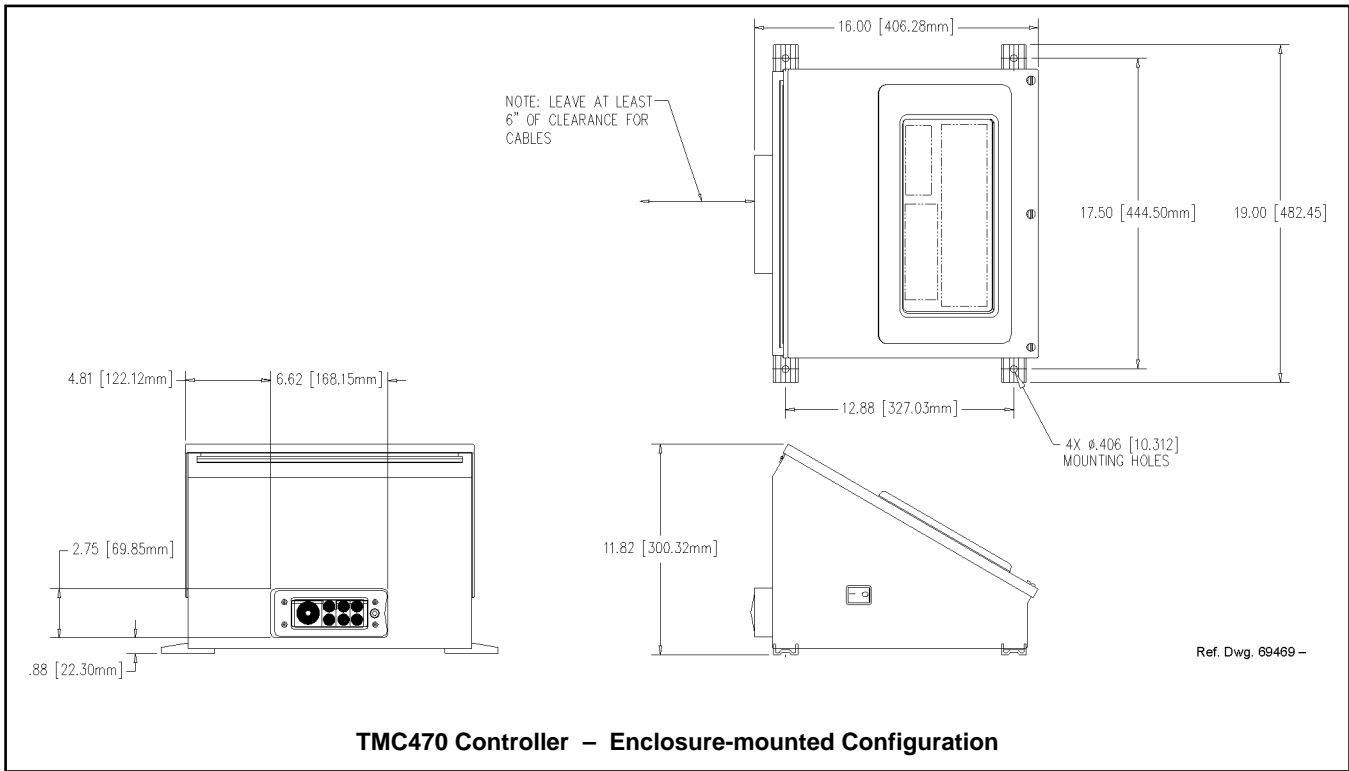
Contaminants. The vented TMC470 is rated NEMA® 1 (IP30) and contains a thermostatically-controlled, variable speed fan. Accordingly, in environments where solid and/or liquid contaminants are present, the possibility exists that these contaminants can be drawn into the TMC470 controller and possibly result in failure. For that reason, in these types of environments, the controller must be located in a sealed industrial enclosure. To facilitate such installations, Telesis offers an optional panel mounting kit for use with an appropriate customer-supplied panel or enclosure. Telesis also offers an optional TMC470N NEMA® 12 (I.P. 65) enclosure in which the controller can be mounted.

EMI Susceptibility. Although the system has been found to be in compliance with pertinent susceptibility standards, care should be taken when installing near welders and other extreme generators of electromagnetic interference (EMI). Particular care should be taken to ensure welder currents are not injected through the marking head chassis. The marking head chassis is connected to the electrical service earth ground through the marking head cable. The marking head should be electrically isolated from all surfaces which could become part of a welder current path.

TMC470-based System Software

The system software is permanently installed in the controller. It provides the user interface for the operator to control the marker. The software also provides a library for storing, loading, and editing user-defined patterns. Patterns are files stored in the controller's memory. Depending on the size of the pattern files, the controller can store up to 200 patterns. Each pattern contains one or more fields; each field defines a single object. Printable objects may be created to define text strings, arc-text strings, geometric shapes, graphics, and machine-readable data matrix symbols. Non-printable objects may be defined to specific commands to the marker (e.g., Pause, Go to, Input, or Output). Printable text fields may include alphanumeric characters, symbols, and special message flags. Message flags automatically insert data into the text string, such as serial numbers, times, dates and user-defined codes.

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Interface Panel

The back panel of the controller provides various ports for connecting the marker, host computers, logic controllers, optional accessories, and remote I/O devices. See below.

Serial Interface. The Comm 1 and Comm 2 Ports allow connection to remote serial devices such as a host computer or a bar code scanner. See Host Communications for details.

Discrete I/O Interface. The optically-isolated I/O Port allows you to connect a Programmable Logic Controller (PLC) or other DC I/O source for remotely controlling marker operations. See Discrete I/O Controls for details.

TTL Interface. The TTL Port allows the system to connect with a simple contact closure circuit such as a remote push button station or foot pedal switch. These types of devices can remotely control Start Print and Stop Print operations.

TCP/IP Interface. The Ethernet Port typically connects to a PC over a local area network (LAN). It allows you to define the controller as a client or a server socket using Telesis Extended Protocol. See *Host Communications* for details.

USB Interface. The USB Port allows you to connect a memory stick/flash drive for pattern storage/retrieval and for software upgrades.

Discrete I/O Controls

The TMC470 is configured for 12 VDC to 24 VDC I/O only and is provided to connect a PLC or other DC I/O source. The optically-isolated I/O Port allows you to remotely select and load patterns, start printing, stop printing, place the marker online, and monitor the system output signals. Cable connectors and connector pins are supplied with the controller for constructing appropriate interface cables.

Input Signals. These input signals provide the following controls:

- INPUT COMM For all inputs (+ or – supply)
- START PRINT Begins print cycle
- STOP Stops the print cycle
- SEL_0 thru _6 * Remotely selects & loads up to 127* pattern files
- SPARE_1, 2, 3 Three (3) spares for custom applications

* System software allows SEL_6 signal to be configured for remotely selecting patterns or for remotely placing the marker online. If used for marker online, pattern selection is reduced to 63 patterns (max).

Output Signals. These output signals indicate the following states:

- OUTPUT COMM For all outputs (+ or – supply)
- DONE Print cycle is complete
- READY System ready for message or for start print command
- PAUSED System paused (waiting timeout or command)
- NO FAULT System status (normal or fault detected)
- SPARE_1, 2 Two (2) spares for custom applications

Host Communications

The marking system software allows you to configure communication parameters to transmit and receive data to and from a host computer. To provide maximum integration flexibility, the system software supports RS-232 and RS-485 serial interfaces and Ethernet TCP/IP interfaces. The system software also provides two protocol choices: Programmable Protocol and Extended Protocol.

RS-232 Interface. The serial (RS-232) communications interface is most often used with remote devices such as host computers, terminals, or bar code scanners. The Comm 1 RS-232 interface supports both Telesis Extended Protocol and Telesis Programmable Protocol. The Comm 2 RS-232 interface supports only Telesis Programmable Protocol.

RS-485 Interface. The RS-485 interface is normally used for long transmission distances or multi-drop networks of up to 31 TMC470 controllers. You must use Telesis Extended Protocol with the RS-485 interface.

The following describes the serial data character format on all transmissions to and from the TMC470 Controller.

- Asynchronous
- 1200, 2400, 4800, 9600, 19200, 38400, or 115200 Baud
- 1 or 2 Stop Bits
- 7 or 8 Data Bits
- None, Even or Odd Parity

TCP/IP Interface. The Ethernet (TCP/IP) interface is most often used with host computers communicating over a local area network (LAN). You must use Telesis Extended Protocol with the TCP/IP interface.

The Port parameter identifies the host computer socket that is assigned to the marking system. If more than one marking system is installed in a network configuration, each system must use a separate and unique port number. The Address parameter identifies the IP address of the host computer. The marking system software supports both fixed addressing and dynamic addressing.

Programmable Protocol. Use this protocol where very simple one-way communications are required (such as with bar code scanners). Programmable Protocol provides no error checking or acknowledgment of the transmitted data. Note that XON/XOFF Protocol applies even when Programmable Protocol is selected.

Starting Character specifies where the software begins to count character positions. This number must be entered in ASCII decimal format such as 2 for STX.

Terminating Character identifies the end of transmitted string (usually ASCII carriage return character, decimal 13).

Character Position counted from the starting character ignoring all characters preceding it.

Character Length accepts variable length messages (if set to 0) or messages of a pre-specified, fixed number of characters.

Ignore Character identifies the character to ignore when sent from the host (usually ASCII line feed character, decimal 10).

Message Type allows message-type recognition which defines how the marking system will use data it receives from the host.

- 49** Message type 49 (1) overwrites first text field with data extracted from the host
- 80** Message type 80 (P) loads a specific pattern identified by data extracted from host
- 81** Message type 81 (Q) updates text in first query buffer with data extracted from host
- 86** Message type 86 (V) updates first variable text field with data extracted from host
- 0** Message type 0 (zero) indicates that host will provide message type, field number (if applicable), and data; delegates message type selection to the host on message-by-message basis. The host message must use the format:

Tnn<string>

where:

T = 1, P, Q, or V to indicate message type
nn = two-digit field number or query text buffer where data will be placed. (Note: No number is used with Message Type P.)

<string> = field data (Message Types 1, Q, or V) or pattern name (Message Type P)

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Host Communications (continued)

Extended Protocol. This protocol selection includes error checking and transmission acknowledgment. It should be used in applications where serial communication is a vital part of the marking operation. All communications are carried out in a parent/child relationship with the host being the parent. Only the host has the ability to initiate communications. If the host does not receive a response within three seconds, it should re-transmit its original message. If no response is received after three tries, it should declare the link to be down.

The following describes the Extended Protocol message format as sent from the host to the TMC090 controller.

SOH TYPE [##] STX [DATA] ETX BCC CR

where:

SOH ASCII Start of Header character (001H). The controller ignores all characters received prior to the SOH.

TYPE A single, printable ASCII character that defines the meaning (type) and content of the message downloaded from the host, where:

- 1** Message Type 1 overwrites specified field of currently loaded pattern, using the data format nn<string> where nn is the field number.
- P** Message Type P specifies pattern name to be loaded for printing
- Q** Message Type Q updates specified query buffer with data received from host, using the data format nn<string> where nn is the buffer number.
- V** Message Type V updates specified variable text field of currently loaded pattern, using the data format nn<string> where nn is the field number.
- O** Message Type O resets marker and places it online
- G** Message Type G initiates a print cycle to mark the currently loaded pattern
- I** Message Type I requests the marker return the status of standard output and input signals. The system will return a hexadecimal code for the 6 output signals and 12 input signals in the following format:

O O ; I I I

where:

bit 1	READY	0x01
bit 2	DONE	0x02
bit 3	PAUSED	0x04
bit 4	NO_FAULT	0x08
bit 5	SPARE_1	0x10
bit 6	SPARE_2	0x20
bit 1	START	0x001
bit 2	STOP	0x002
bit 3	SEL_0	0x004
bit 4	SEL_1	0x008
bit 5	SEL_2	0x010
bit 6	SEL_3	0x020
bit 7	SEL_6 *	0x040
bit 8	SEL_4	0x080
bit 9	SEL_5	0x100
bit 10	SPARE_1	0x200
bit 11	SPARE_2	0x400
bit 12	SPARE_3	0x800

Note: Input SEL_6 may be configured to place machine online (default) or for Remote Pattern Selection.

[##] Two optional ASCII decimal digits that specify the Station ID number for use in multi-drop network applications. The ID may range from 00-31. Note that "00" is reserved for applications where only one controller is used. In such applications, this field may be eliminated and "00" will be assumed.

STX ASCII Start of Text Character (002H).

[DATA] Optional character string that may be required for certain message types (e.g., Type 1, P, Q, and V).

ETX ASCII end of text character (003H).

BCC Optional Block Check Code that is generated and sent to improve link reliability by providing fault detection. The BCC is calculated by taking an eight bit addition of the TYPE and DATA TEXT characters and transmitting them as a three digit ASCII decimal number in the range from 000 to 255. If the sum is greater than 255, the most significant bit overflows and is discarded.

CR ASCII Carriage Return Character (00DH).

TRADEMARKS

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