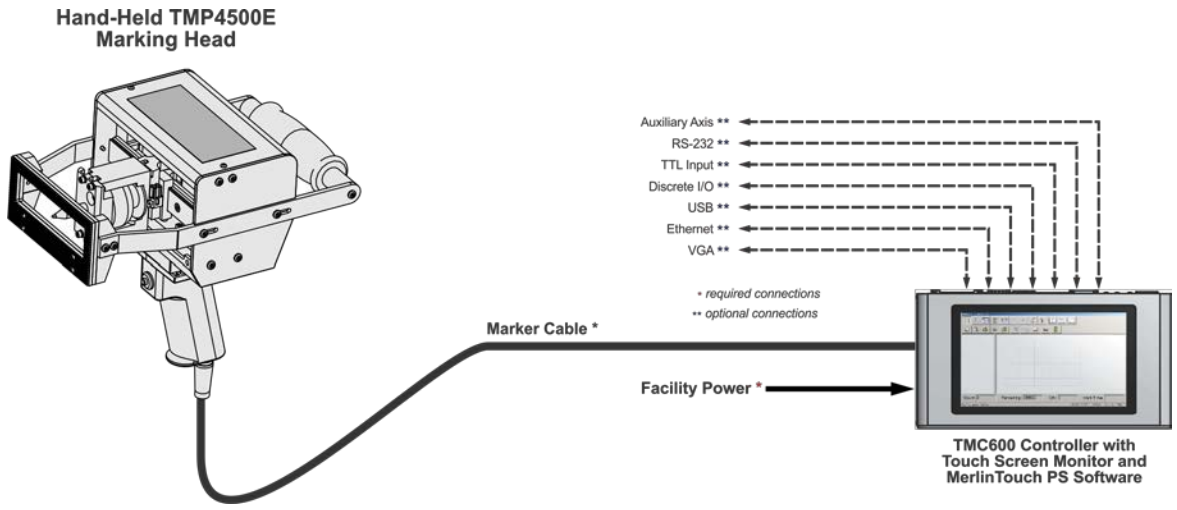


**TMP4500E/600 Marking System – General Arrangement**

## 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.

The integral standoff with its padded front surface is held against the marking surface while marking. The standoff can be adjusted forward and aft to change the pin stroke..

The integral standoff with its padded front surface is held against the marking surface while marking. The standoff can be adjusted forward and aft to change the pin stroke.

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 carbide 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.

**TMC600 Controller** runs the MerlinTouch PS software and provides the user interface for operating the marking system. The controller features an integrated, 10-in., high-resolution, touch screen monitor in the top panel. The back panel of the controller provides the electrical interface for connecting to optional, remote I/O sources. See *TMC600 Controller Specifications* for details.

## SYSTEM OPTIONS

- Bar Code Scanner
- Bar Code Wand
- Logo/Font Generator Software
- Marking Head Extension Cables
- TMC600 Controller Wall-mounting Bracket Kit
- USB mouse and Keyboard
- Tool Stand (for fixed-mounting applications)


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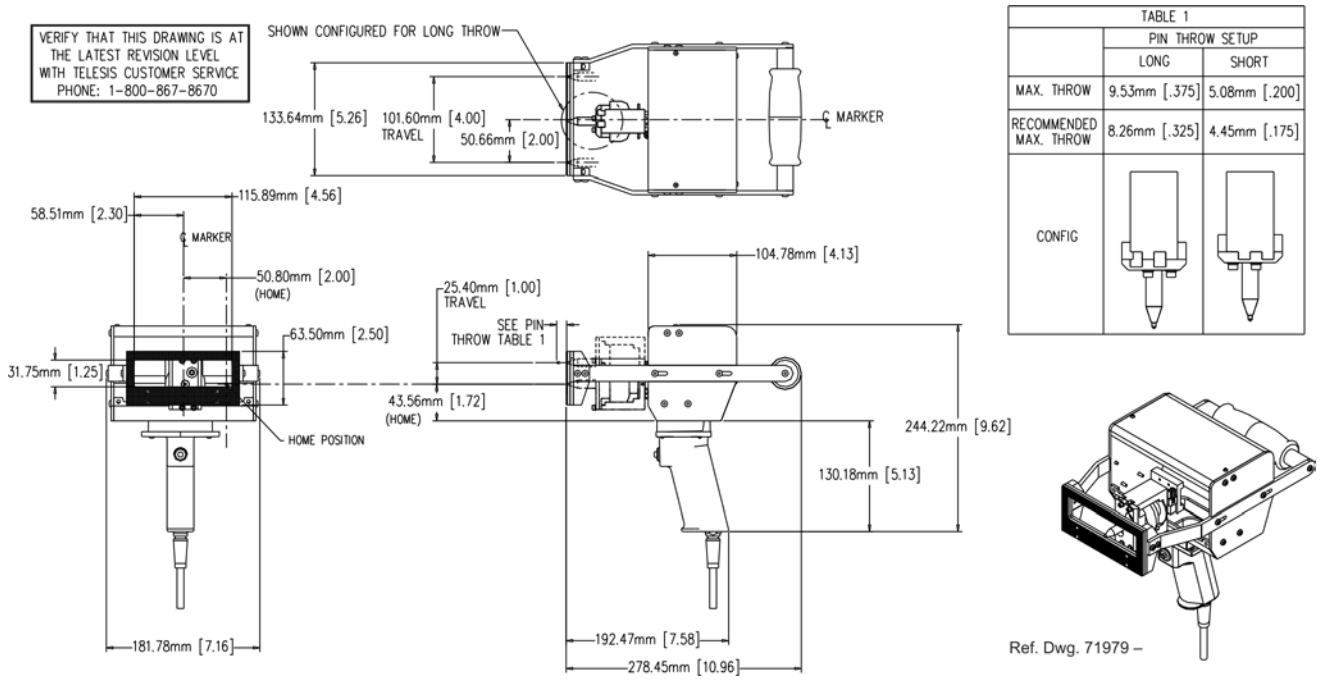
## SYSTEM SETUP

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.

## TMP4500E MARKING HEAD

### Specifications




**TMP4500E Hand-Held Marking Head Dimensions**

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 *TMC600 Controller Installation & Maintenance Manual*.

**CAUTION**

**The TMC600 is not a sealed unit. Protect it from potentially damaging conditions and contaminants. Do not block the vents in 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.

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

| | |
|---|---|
| Dimensions | *see TMP4500E Hand-Held Marking Head Dimensions* |
| Rating | NEMA® 1 (I.P. 30) |
| Weight | 3.82 kg (8.4 lb) marker & cable<br>3.00 kg (6.6 lb) marker only |
| Noise | 81.4 dB (max); 73.1 dB (LEQ)<br>See *Marking Noise* for details |
| Vibration | Does not exceed 2.5 $m/s^2$<br>See *Vibration Data* 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 | Carbide with<br>30° or 45° cone angle |
| Pin Stroke (max.) | 8.26 mm (.325 in) Long Throw<br>4.45 mm (.175 in.) Short Throw |
| Operating Temp. | 0° to 50°C (32° to 122° F),<br>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 4 dots/cm (10 dots/in.) to 31 dots/cm (80 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 $m/s^2$.

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<br>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:

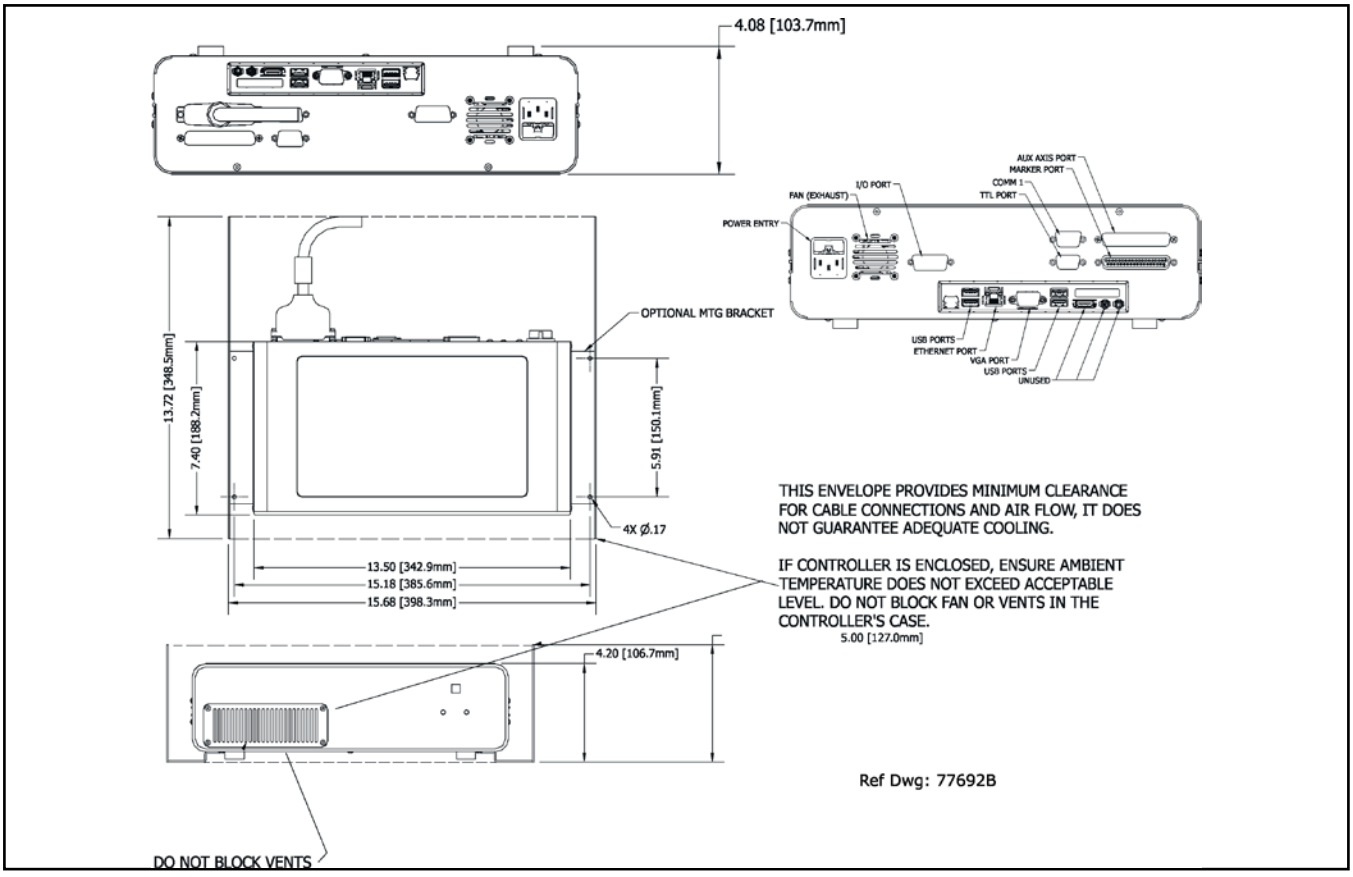
- **VM** = hand/arm Vibration Magnitude.
- **$T_{(EAV)}$** = time to reach the Exposure Action Value based on continuous marking.
- **$T_{(ELV)}$** = time to reach the Exposure Limit Value based on continuous marking.

## TMC600 CONTROLLER

The TMC600 controller may be installed as a table-top unit, wall-mounted unit, or panel-mounted unit. All configurations provide features and connectivity for external communications. Differences occur only in the mounting configuration.

The TMC600 Controller specifications are subject to change without prior notice.

| | |
|---|---|
| Integrated Processor | Intel® Dual-Core Atom™ |
| Integrated Monitor | 10.1 in., color, 1024 x 600, capacitive touch screen LCD |
| Compliance | CE |
| Rating | NEMA 1 (I.P. 30) |
| Configurations | Table-top or wall-mounted |
| Dimensions | see *TMC600 Controller Dimensions* drawing |
| Weight | 7.00 lb. (3.18 kg) controller only<br>7.21 lb. (3.28 kg) with wall-mount kit |
| Operating Temp. | 32° to 104° F (0° to 40°C) |
| Operating Humidity | 10% to 80% non-condensing |
| Power Requirements | 115/230 VAC, 3/1.5 amps, 50/60 Hz, single phase |
| Cooling | Internal, thermostatically controlled fan |
| Filtering | Integrated, 60 ppi contaminant filter |
| Communications | RS232, TTL, Discrete I/O, TCP/IP, and USB (for data backup & transfer) |
| Input Signals | Twelve (12) total, optically isolated<br>8 dedicated, 1 programmable, 3 available<br>10 VDC minimum voltage<br>30 VDC maximum voltage<br>12 to 24 VDC nominal voltage<br>2.3 mA @ 12VDC nominal current<br>4.9 mA @ 24VDC nominal current |
| Output Signals | Six (6) total, optically isolated<br>3 dedicated, 3 available<br>0.25 amps maximum current<br>0.50 ohms maximum On resistance<br>40 VDC maximum line voltage<br>12 to 24 VDC nominal line voltage |



## TMC600 Controller (continued)

### Environmental Considerations

The following environmental considerations must be taken into account when installing the TMC600 Controller.

**Contaminants.** The vented TMC600 is rated NEMA 1 (IP30) and contains a thermostatically-controlled, variable speed fan. It also incorporates a 60 ppi filter which will filter most common contaminants. However, in certain environments, the possibility exists that contaminants can be drawn into the TMC600 controller and possibly result in failure. For that reason, in these types of environments, the controller must be located in a sealed industrial enclosure.

**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.

### System Software

The powerful Telesis MerlinTouch PS software is a Windows® based software package that comes installed in the TMC600 controller. It is a graphical user interface that makes pattern marking and pattern design quick and easy.

The WYSIWYG (what-you-see-is-what-you-get) interface provides a to-scale image of the pattern as it is created. The MerlinTouch PS software includes tools to create and edit a library of pattern files for marking. 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. Note that for design purposes, Telesis recommends using a mouse for more precise use of the visual editing capabilities via the Drag/Drop option.

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. Multiple fields may be grouped and saved as a block to form a logo. Existing DXF files can also be imported for marking. Non-printable fields can be created to clearly display a graphical representation of the part being marked. Commands may be defined to perform specific tasks during the marking cycle (e.g., Pause, Go to, Input, or Output).

### Touch Screen User Interface

The top panel of the controller contains an integrated, 10-in., high resolution, touch screen monitor. The monitor displays the MerlinTouch PS software and provides the user interface for operating the marking system.

*TMC600 Controller with Touch Screen Monitor and MerlinTouch PS Software*

## 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.

**RS-232 Interface.** The Comm 1 port allows connection to remote serial devices such as a host computer or a bar code scanner. See *Host Communications* 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.

**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.

**USB Interface.** The USB ports allow you to connect an optional mouse and keyboard. You may also connect a memory stick/flash drive for pattern storage and retrieval and for performing software upgrades.

**Ethernet Interface.** The Ethernet Port may be used to connect a host computer 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.

**VGA Interface.** The VGA Port allows you to connect a separate VGA monitor for troubleshooting, diagnostics, and testing. Connecting a separate monitor to operate the system is not recommended since the MerlinTouch PS software is specifically designed to display on the controller's integrated, high-resolution, touch screen monitor.

**(optional) Auxiliary Axis Interface.** The Auxiliary Axis Port allows the system to connect with two optional motion devices such as motorized tool posts, rotational drive units. Note that this port is available only if the optional Auxiliary Axis Driver Board is installed in the controller.

## Discrete I/O Controls

The TMC600 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* patterns |
| SPARE_1, 2, 3..... | Three (3) spares for use with the Input command tool or 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) |
| SPARE_1, 2, 3..... | Three (3) spares for use with the Output command tool or 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 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 RS-232 interface supports both Telesis Extended Protocol and Telesis Programmable Protocol.

**TCP/IP Interface.** The Ethernet (TCP/IP) interface is most often used with host computers communicating over a local area network (LAN).

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 decimal format (e.g., "2" for ASCII Start of Text "STX").

**Terminating Character** identifies the end of transmitted string (usually "13" for ASCII carriage return character).

**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 "10" for ASCII line feed character)).

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

| | |
|---|---|
| 1 | Message type 1 overwrites the *first line of the first text field* with data extracted from the host |
| P | Message type P loads a specific pattern identified by data extracted from host |
| Q | Message type Q updates the text in the *first query buffer* with data extracted from the host |
| V | Message type V updates the *first variable text flag* found in the pattern with data extracted from the host |
| 0 | Message type 0 (zero) indicates that host will provide message type, field number (if applicable), line 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**: Not used with Message Type P.

<string> = For Message Type P, indicates the pattern name to be loaded.

For Message Types 1, Q, or V, indicates the data to be inserted into the field or the query text buffer, as applicable.

## 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 TMC600 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 a specific field in currently loaded pattern with data supplied in the host message. See [DATA] for details.
- P Message Type P specifies the pattern name to be loaded for printing. See [DATA] for details.
- Q Message Type Q updates a specific query buffer with data supplied in the host message. See [DATA] for details.
- V Message Type V updates the variable text in a specific text field of the currently loaded pattern with data supplied in the host message. See [DATA] for details.
- 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 | SPARE_1 | 0x08 |
| bit 5 | SPARE_2 | 0x10 |
| bit 6 | SPARE_3 | 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 |

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

{##} Optional two-digit ASCII number that specifies the Station ID of the controller when used in multi-drop network applications. The Station 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).

Typically, data is sent in the format:

**nn<string>**

where:

nn = two-digit field number or query text buffer where data will be placed.

**Note**: Not used with Message Type P.

<string> = For Message Type P, indicates the pattern name to be loaded.

For Message Types 1, Q, or V, indicates the data to be inserted into the field or the query text buffer, as applicable.

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).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