

SYSTEM OVERVIEW

The Telesis® BenchMark®320 marking system permanently prints messages into a variety of materials such as steel, aluminum, and plastic. An electric solenoid accelerates a hardened pin to indent dot matrix characters into the item being marked. Character shape, size, density, and location are determined by the user through the marking system software.

The **BenchMark320 Marking Head** is an electromechanical marker. A thermo-formed cover houses the internal, mechanical components that position the pin cartridge and fire the marking pin. A spring returns the pin to its idle position within the cartridge. The marking head moves the pin cartridge through X- and Y-axis 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 0.032 mm (0.00125"). The marker accommodates the rigorous dynamics of impacting, rebounding, and rapid positioning of the marking pin through a system of rigid rails and ball bearing saddles, timing belts, and direct-drive, toothed pulleys.

The pin design permits high quality, consistent marks on irregular, slightly curved surfaces. It also accommodates applications where marking surfaces cannot be positioned at a consistent distance from the marker.

The unique design of the BenchMark320 provides liberal access for securing and positioning parts for printing. Using a gantry arm and a programmable park position, you can tuck the impact pin out of the way when the marker finishes printing. Parts can then be easily secured and removed in front of the marking head.

The **Marker Cable** connects the marker to the BM470M Controller. The cable is 4 m (13 ft.) long and is pre-wired to the marking head.

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.

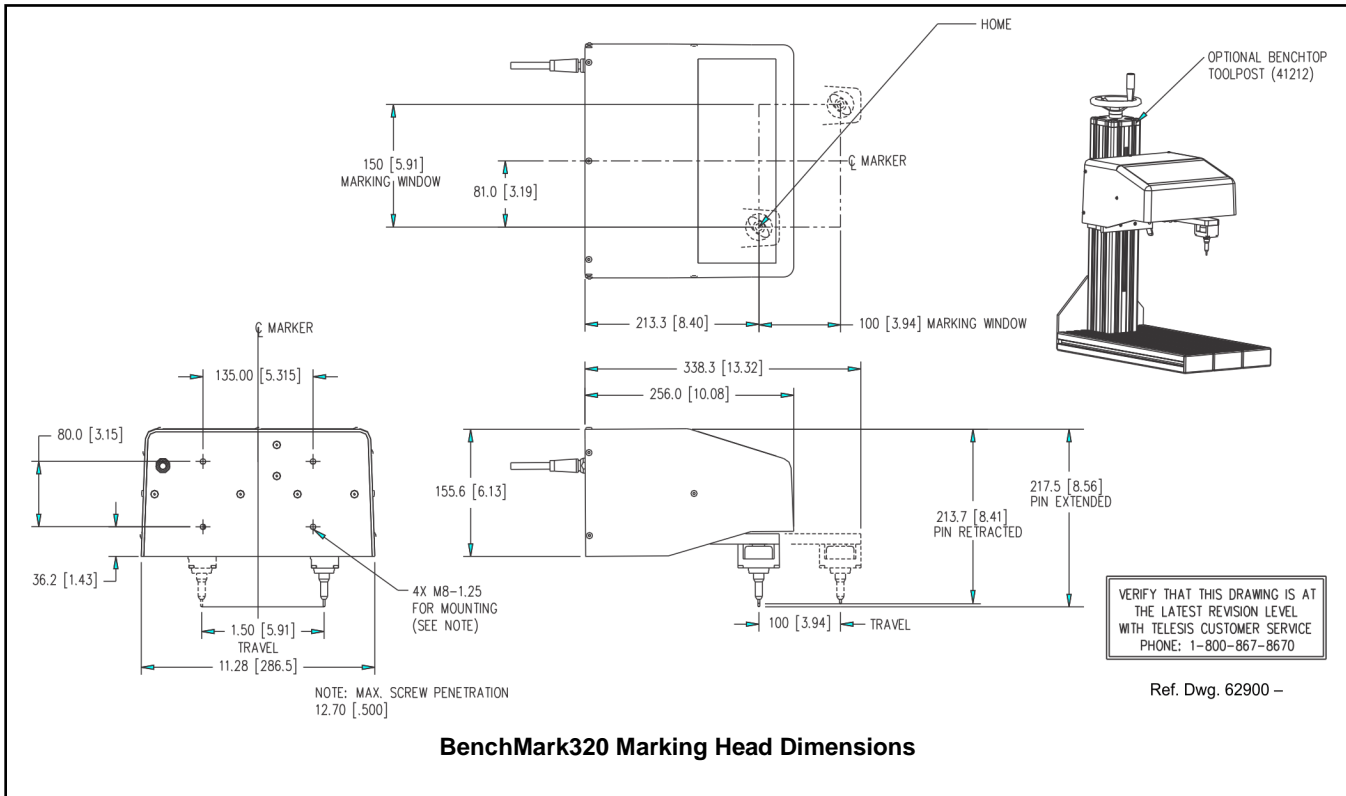
The **25XLE-series Marking Pins** are made of tungsten carbide and are available in 30° and 45° cone angles.

BM470M Controller serves as motor-driver interface between the Merlin III software (installed in the system computer) and the marking head. Optionally, it may be used to connect a rotary drive unit or remote I/O devices. Refer to *BM470M Controller Specifications* for details.

System Computer runs the Merlin® III Visual Design Software and connects to the BM470M Controller through a TCP/IP interface. The system computer is typically provided by the customer. Refer to *System Computer Specifications* for details.

The **Tool Stand** holds the marking head and provides a base for securing parts to be marked. It uses a screw jack with an adjustment wheel to position the marker above the marking surface. Adjustment locks secure it in place. The generous vertical adjustment accommodates parts up to 298.4 mm (11.75") high. The tool stand base contains slots to accommodate part fixtures. The tool stand comes with two 8mm T-nuts to aid in securing the parts for marking.

BenchMark320/BM470M Marking System



SYSTEM SETUP

1. Position tool stand assembly in desired location.
2. Mount marking head to tool stand assembly using four M8x1.25 socket head cap screws. Screws must extend into back plate at least 9mm (0.375 in.) but not more than 12mm (0.5 in.). Refer to the BenchMark320 Marking Head Dimensions drawing for details.
3. Locate controller as close as practical to marking head. Standard marker cable length is 4 m (13 ft.).
4. Install controller as a table-top or wall-mounted unit.
5. Ensure power to controller and system computer is OFF.
6. Verify/configure controller fuse arrangement for facility power.
7. Connect marker cable and power cable to controller.
8. Connect system computer to the controller Ethernet port.
9. Configure Ethernet communications for controller.
10. Install Merlin III software on system computer.
11. Start marking system software.
12. Adjust marking depth, as required.



The BMC470M is not a sealed unit. Protect it from potentially damaging conditions and contaminants. Do not block vents in bottom of case. Ensure marking system is electrically isolated from any devices that may generate extreme electromagnetic interference (EMI).

3. Locate controller as close as practical to marking head. Standard marker cable length is 4 m (13 ft.).
4. Install controller as a table-top or wall-mounted unit.
5. Ensure power to controller and system computer is OFF.
6. Verify/configure controller fuse arrangement for facility power.

SYSTEM OPTIONS

- Marking Head Extension Cables
- Auxiliary Axis Driver Board Kit
- Motorized, Programmable Theta-axis Rotary Drive Unit
- BM470M Controller Wall-mounting Bracket Kit
- Bar Code Scanner or Bar Code Wand with Cable
- Foot Switch (Start Print) or Pushbutton Station (Start/Abort)
- Logo/Font Generator Software

BENCHMARK320 MARKING HEAD

Specifications

The BenchMark320 marking head specifications are subject to change without prior notice.

Dimensions.....	see <i>BenchMark320 Marking Head Dimensions</i> drawing for details.
Weight	6.39 Kg (14.055 lb.) marker & cable 5.84 Kg (12.865 lb.) marker only 16.0 Kg (35.200 lb.) tool stand only
Noise	65.4 dB (max); 59.1 dB (LEQ) See <i>Marking Noise</i> for details
Operating Temperature.....	0° to 50° C (32° to 122° F), non-condensing
Marking Area	150 x 100 mm (6.0 x 4.0")
Pin Types.....	25XLE-series
Pin Material.....	Tungsten Carbide

Marking Characteristics

The BenchMark320 can accommodate character sizes from .762 to 100 mm (.030 to 4.0") in .025 mm (.001") increments. Characters can be rotated in 1° increments with printing resolutions from 5 dots/cm (10 dots/in.) to 75 dots/cm (200 dots/in.) for an engraved look.

Marking Speeds

Generally, the system will mark three characters per second using 5x7 font, 3 mm (.118") high, 2mm (.080") wide characters. Speeds will vary slightly 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 BenchMark320 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 65.4 dB. The time-weighted average (LEQ) using the 3 db rule without threshold was 59.1 dB. Typical applications average a 20% to 30% duty cycle where the time-weighted average would not exceed 70 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.

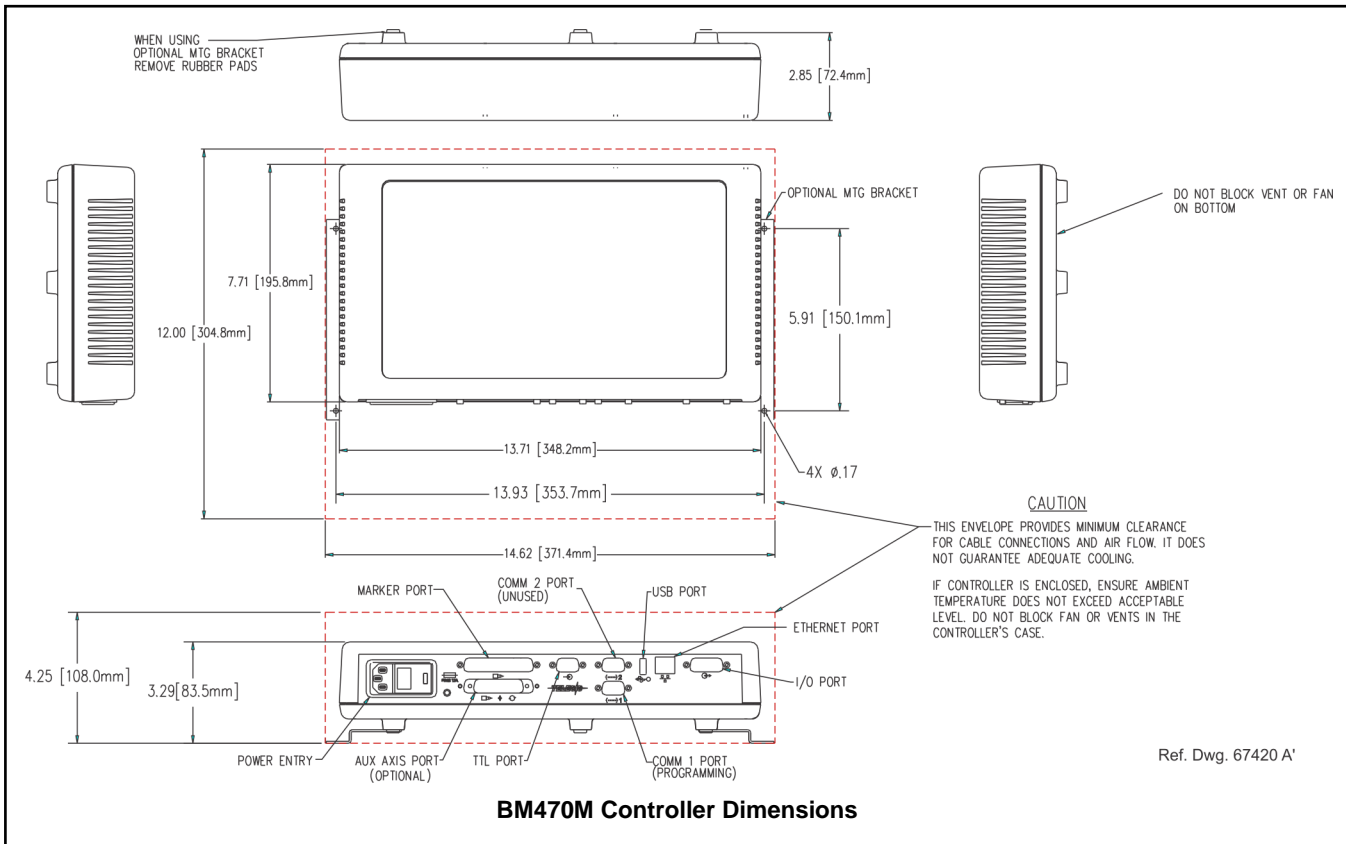
Marking Depth

The BenchMark320 can obtain a marking depth of .127 mm (.005") in mild steel (Rb53) using a 25XLE carbide pin with a 45° cone angle. The depth of mark can be adjusted over a significant range by changing the impact force (via software parameter) or by changing the impact distance (pin stroke). Specific depths can be verified by a Telesis representative.

Pin Life

Pin life depends largely on the type of material being marked, how hard or abrasive it is, and the required marking depth. On typical metals with a hardness of Rockwell Rb47, marking at a depth of .127 mm (.005"), carbide pins average approximately 9 million impressions before needing sharpened.

BenchMark320/BM470M Marking System



BM470M CONTROLLER

Specifications

The BM470M Controller specifications are subject to change without prior notice.

Compliance.....	CE, RoHS
Rating	NEMA 1 (I.P. 30)
Dimensions (H x W x D)....	2.95 x 13.71 x 7.71 in. (74.9 x 348.2 x 195.8 mm) Controller Only
	3.29 x 14.62 x 8.29 in. (83.6 x 371.4 x 210.6 mm) Controller & Mounting Brackets
	4.25 x 14.62 x 12.00 in. (108.0 x 371.4 x 304.8 mm) Free-air Surrounding Envelope
Weight	3.69 lb. (1.68 kg) controller only
	3.90 lb. (1.77 kg) controller and wall-mount. hardware
Power Requirements.....	95 to 250 VAC, 2 amps, 50-60 Hz, single phase

Communications.....	TTL, Discrete I/O, TCP/IP (connection to Merlin III), RS232 (controller update only)
Input Signals	Six (6) total, optically isolated; (customer-supplied) 2 dedicated, 4 available (pattern select or pattern input tool) 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; 3 dedicated, 3 available (pattern output tool) 0.25 amps (maximum current) 0.50 ohms (maximum On resistance) 40 VDC (maximum line voltage) 12 to 24 VDC (nominal line voltage)
Operating Temperature...	32° to 122°F (0° to 50°C), non-condensing
Operating Humidity	10% to 80%
Cooling	Internal, thermostat-controlled fan

Environmental Considerations

The following environmental considerations must be taken into account when installing the BM470M controller.

Contaminants. The vented and fan-cooled controller is rated NEMA 1 (IP30). Accordingly, in environments where solid and/or liquid contaminants are present, the possibility exists that these contaminants can be drawn into the controller and possibly result in failure of a number of electronic components. 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.

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.

Marker Port provides a DB37S connector to connect the marker cable from the BenchMark marking head.

Ethernet Port provides a standard RJ45 connector to connect the controller, through a TCP/IP interface, to the system computer running the Merlin III software.

I/O Port is optically-isolated and provides a DB26P connector to connect a remote DC I/O source such as a PLC. The I/O device can remotely start or stop the marking cycle and may remotely select and load patterns. Output signals from the marker may be transmitted to the I/O device to report system status.. See *Discrete I/O Controls* for details.

TTL Port provides a DB9S connector for connecting a remote push button device to start/stop print operations. Unless the device is supplied by Telesis, the customer/installer must supply the mating connector, cabling, and switches..

Aux Axis Port is available only if the optional Auxiliary Axis board is installed. This board/port is required if the system will use a Theta-axis rotary drive unit.

Comm 1 Port is used solely for programming and upgrading the software stored in the BM470M Controller

Comm 2 and USB Ports are not used when the BM470M Controller is connected to the system computer (Merlin III software).

Note: All remote RS232 communication is handled through the serial port(s) on the system computer running the Merlin III software.

Discrete I/O Controls

The BM470M 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

BenchMark320/BM470M Marking System

SYSTEM COMPUTER

The marking system requires an IBM-compatible computer for running the Merlin III Marking Software. The computer is typically supplied by the customer.

The system computer must use the following software:

- Operating System Windows® 2000, XP, 7, or Vista® (Business Edition)
- Operator Interface..... Telesis Merlin III Marking Software

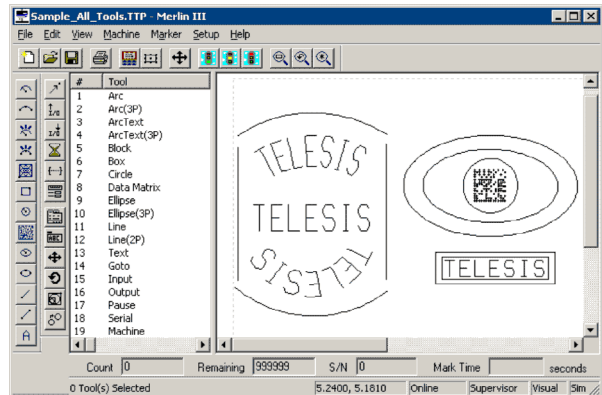
Additionally the system computer must, at a minimum, meet the following specifications:

- Processor..... Pentium® 4 with RAM as recommended per operating system
- Hard Drive 2 GB Hard Disk Drive
- External Drives CD-ROM Drive
- Comm Ports..... One available Ethernet Port,
One available RS-232 Serial Port,
One available USB Port
- Circuit Cards..... Video Board
- Peripherals SVGA Color Monitor, Mouse,
Keyboard

SYSTEM SOFTWARE

The powerful Telesis Merlin III Marking Software is a Windows® based software package. It is a graphical user interface that makes marking 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. Just “click and drag” for immediate adjustment to field size, location, or orientation.

The Merlin III software includes tools to create and edit text at any angle, arc text, rectangles, circles, ellipses, and lines. 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.



Merlin III User Interface

Merlin III Software Highlights

- Text Tools..... Human-readable: Text and ArcText
Machine-readable: 2D Data Matrix, QR Code, and Micro QR Code
- Drawing Tools Arcs, Blocks, Circles, Ellipses, Lines, Rectangles
- Command Tools Go To, Pause, Input, Output, Machine, Log, Serial I/O
- Serialization Automatic and Manual Input, Host Interface Capable
- Communications..... RS232, TCP-IP (Programmable or Extended Protocol), and DC I/O
- Misc. Multiple Text Buffers, Real-time Data (time, date, user-supplied text, programmable shift and date codes)

SYSTEM SOFTWARE

Remote Communications

The communication capability of the Merlin III software allows you to control the marking system from a remote source. Remote communications can be performed by connecting to a Host computer or to remote I/O devices.

Host Communications. Remote communications may be executed from a host computer using RS232 or Ethernet (TCP/IP) connections to the system computer. The software provides parameters to define the data transmitted to and from the host. For more information on using and configuring these parameters, refer to the *Merlin III Operating Instructions*.

I/O Devices. The BM470M controller is configured with an opto-isolated DB26P I/O connector. Separate I/O racks or opto-isolated board assemblies are not required. In addition to the standard input signals (Go, Abort, Input 1 through Input 4) and standard output signals (Done, Ready, Paused, Output 1 through Output 3), this connector provides two programmable inputs and two programmable outputs. For more information on connecting and using the opto-isolated I/O connector, refer to the *BM470M BenchMark Controller Installation & Maintenance Manual* and the *Merlin III Operating Instructions*.

Communications Protocol

Two types of host interface are supported (RS-232 or TCP/IP) and two communication protocols are provided through the Merlin III software: Programmable and Extended.

Programmable Protocol. Programmable protocol provides one-way (receive only) communication with no error checking or acknowledgment of the transmitted data. You may use Programmable protocol to extract a continuous portion of a message string to print. This can be used with a host computer or a bar code scanner. Note that XON/XOFF Protocol applies even when Programmable Protocol is selected.

The Programmable Protocol Message Type identifies the type of message sent from the host. It determines how the marker uses the data it extracts from the host message string when Programmable Protocol is used.

- 49 Message type 49** (ASCII 1) overwrites the content of the first text-based field in the pattern with the data extracted from the host message. Note that if the field contains message flags, they will be overwritten, not updated.
- 80 Message type 80** (ASCII P) indicates the data extracted from the host message is the name of the pattern to be loaded.
- 81 Message type 81** (ASCII Q) updates the text in the first query text buffer (buffer 0) with the data extracted from the host message.
- 86 Message type 86** (ASCII uppercase V) updates the text in the first variable text field in the pattern with the data extracted from the host message.
- 118 Message type 118** (ASCII lowercase v) updates the first text field encountered in the pattern that contains a variable text flag that matches the specified string length.
- 0 Message type 0** (zero) indicates that host will provide message type, field number (if applicable), and data;. This delegates message type selection to the host on message-by-message basis. The host message must use the format:

Tnn<string>

where:

T = the message type (1, P, Q, V, or v)

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

<string>= the pattern name to load (Message Type P).
or
the data to be inserted into the field or the query text buffer, as applicable
(Message Types 1, Q, V, or v).

BenchMark320/BM470M Marking System

SYSTEM SOFTWARE (continued)

Communications Protocol (continued)

Extended Protocol. Extended protocol provides two-way communication with error checking and transmission acknowledgment. It is designed to provide secure communications with an intelligent host device using pre-defined message formats and response formats 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. The following describes the Extended Protocol message format as sent from the host to the Merlin III software.

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

where:

- SOH** ASCII Start of Header character (001H). The system 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** provides data to a text string in the pattern or polls the pattern for data. See [DATA] for details.
 - E Message Type E** allows the host to take the machine offline. It also provides the option of displaying an error message box with the provided data string. See [DATA] for details.
 - G Message Type G** initiates a print cycle.
 - I Message Type I** polls the system for the I/O status.
 - O Message Type O** places the marker online. This allows a host computer to reset. For example, this may be used to recover from a power outage when the marker is unattended.
 - P Message Type P** loads a pattern or polls the system for the current pattern name. See [DATA] for details.
 - Q Message Type Q** provides data to the system query text buffer or polls the system for data. See [DATA] for details.
 - S Message Type S** polls the system for the machine status. The machine status is returned to the host in an eight-character hexadecimal mask.
 - V Message Type V** provides data to a variable text string in the pattern or polls the pattern for data. See [DATA] for details.
- [##]** Optional two-digit ASCII number that specifies the Station ID of the system 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] Character string that may be required for certain message types (e.g., Type 1, P, Q, or V).

Typically, data is sent in the format:

nn<string>

where:

nn = the two-digit field number or query text buffer where data will be placed. (Message Types 1, Q, or V).

<string> = the data to be inserted into the field or the query text buffer, as applicable (Message Types 1, Q, or V).

or

the pattern name to load (Message Type P).

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

Telesis, BenchMark, and Merlin are registered trademarks of Telesis Technologies, Inc. in the United States and/or other countries.

Pentium is a registered trademark of Intel Corporation in the United States and other countries.

Windows and Vista are registered trademarks of Microsoft Corporation in the United States and other countries.