BestCode

Remote Communications Protocol

Version: 2.0

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BestCode
Ft. Worth, TX

Table of Contents

1 INTRODUCTION

1.1 Purpose

This document provides protocol information involving remote communications with a Series 8 BestCode device. The communication is allowed to be via the serial port or Ethernet port.

2 COMMUNICATION DESCRIPTION OVERVIEW

2.1 General Overview

Remote communication paths are identified as follows.

- Via Telnet over Ethernet (Telnet 192.168.1.50 23)
- Via serial COM port (internal UART3)

These commands are defined using a caret "^" symbol at the beginning of any given string of characters in an attempt to follow the ZPL command structure.

Generally the commands may be input using lower case values. This is also true for the message names when performing a select message command. When changing message data however, the data to be changed will be represented identical to the input data.

Output (response communications) is provided back to targeted input port.

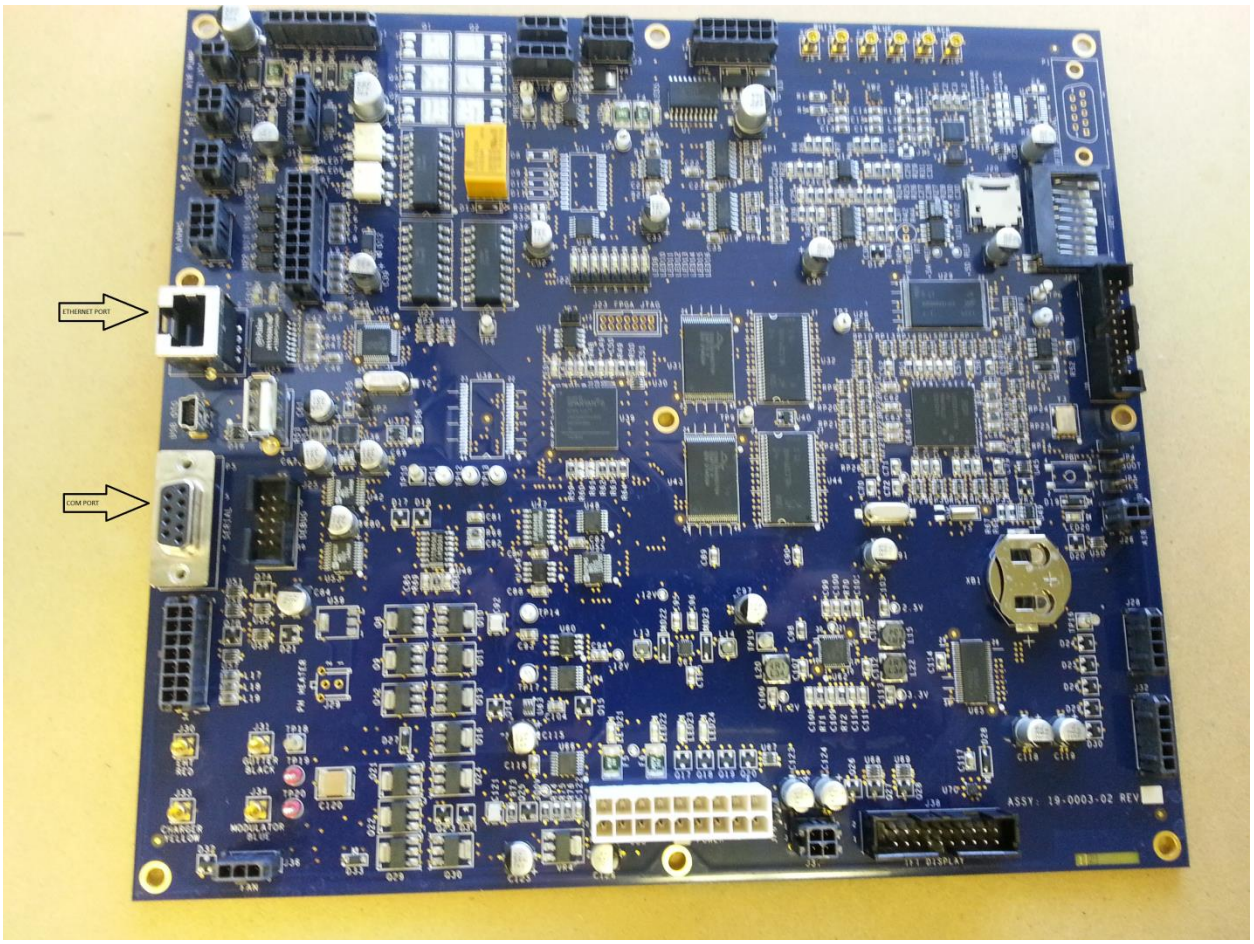
Remote communications can only be performed 5-10 seconds after the device is powered on and the main user screen is available.

3 RESOURCE REQUIREMENTS

3.1 Cabling Requirements

For Ethernet, you'll need a CAT5 Patch cable to connect to the Ethernet connector on the BestCode device. For COM port, you'll need a USB cable and a USB to COM port adapter. See Figure 1 for BestCode device connector locations.

Figure 1- Communication Ports

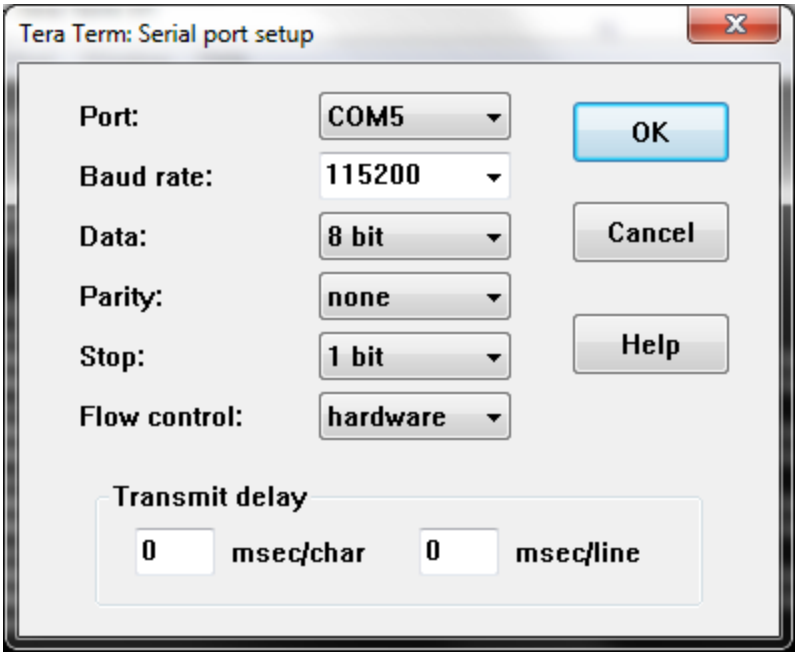


3.2 Serial COM port access

Remote access via serial port requires a terminal emulator, such as the Tera Term terminal emulator. See Figure 2 for a more detailed description of a Tera Term version successfully used. Tera Term is an open source software project.

Figure 2- About Tera Term

Figure 3 - Terminal Setup



For the serial setup use 115200 baud rate, 8 bit data, no parity, 1 stop bit and use “hardware” flow control. The BestCode device remote communication uses the RTS pin for inbound flow control. However, the BestCode device does not support any flow control outbound, so if echo is on and the message is large, the entire message is sent at one time.

Terminal settings may include local echo on, but under normal circumstances, the local echo is not necessary.

At system startup, when the serial communication service is ready to receive commands, a “greeting” message similar to the following will be output:

```
Remote Server v01.04.01.15 built Dec 03 2018 16:17:59
```

The serial communications path may be verified at any time, without affecting the BestCode device, by sending one of the following commands:

- Echo On (^EN); expected response: “Command Successful!”
- Echo Off (^EF); expected response: “>”
- Version 01.04.02.01 and later: View Version (^VV); expected response is the same as the “greeting” message described above.

3.3 Ethernet port access

Remote access via Ethernet requires a Telnet client, such as the Windows Telnet Client

The following instructions are based on Windows Version 7; the interface may be different on other versions of Windows.

To use the Windows Telnet Client, access “Control Panel,” then “Programs and Features,” then select “Turn Windows features on or off.” Then enable the Telnet Client box. See Figure 4 and Figure 5 for examples of the windows used.

Bring up a command prompt window and enter “Telnet 192.168.1.50 23(CR)” without the quotes. The response should be similar to the following:

```
Telnet Server v01.04.01.15 built Dec  2 2018 16:17:59
Command interpreter ready
>
```

The BestCode device will not close the socket on any Telnet session. It is up to the user to close the session.

Figure 4- Windows Programs and Features

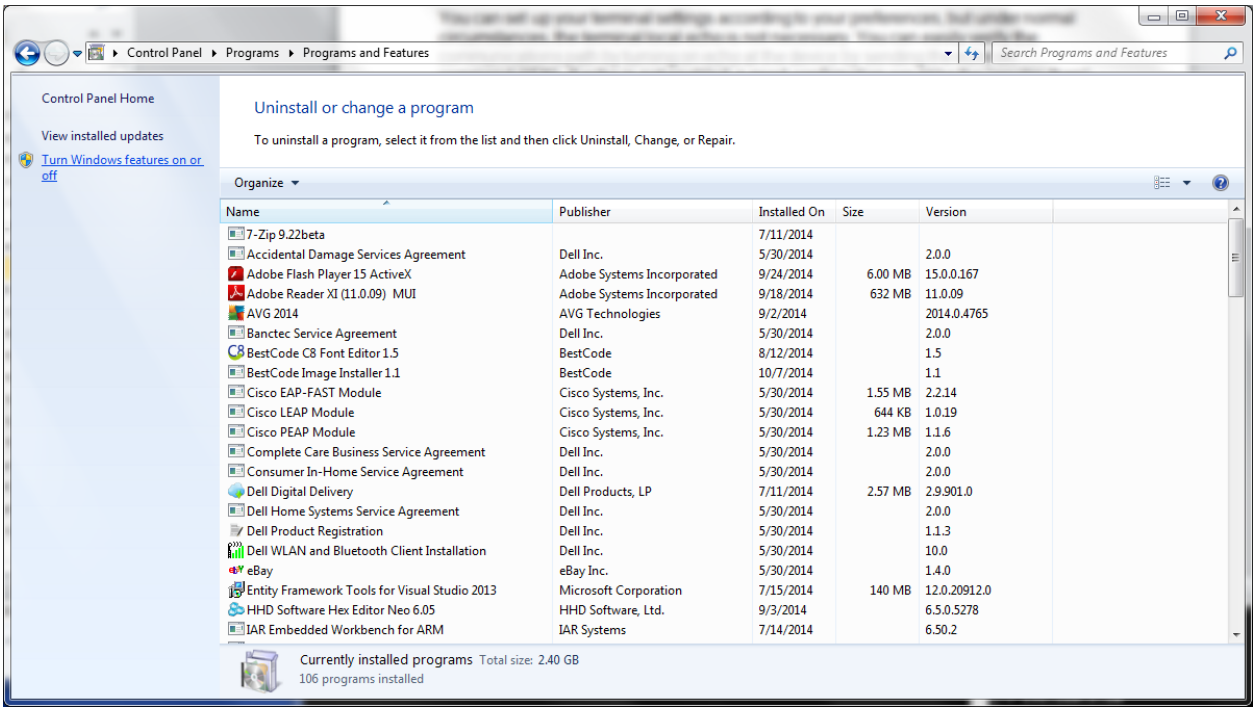
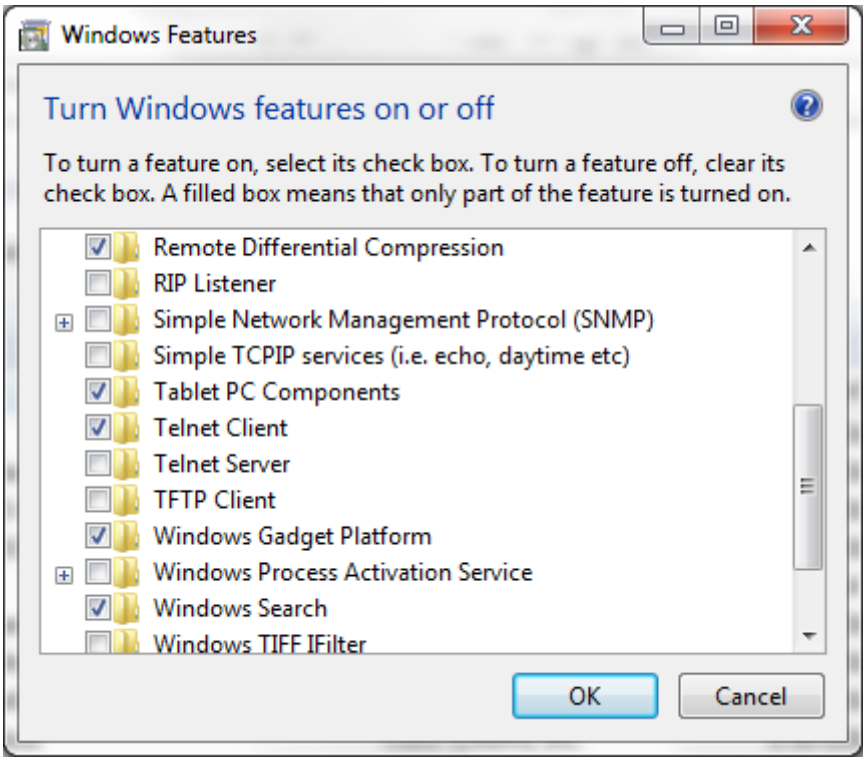


Figure 5 - Turn Windows features on or off



3.4 Command Entry/Response information

If commands are entered via an automated means (i.e. external PC application), each command string (or line) only needs a carriage return (hex 0D) to indicate end of line. The line feed (hex 0A) is not necessary.

Starting with version 1.3.0, command responses are made to the input port (Ethernet or COM). The responses are no longer restricted to the COM port.

4 Remote Commands Format

4.1 General Format

Each remote command follows the same general format:

```
^AA p1;p2...
```

Case is ignored, except for text to be part of a message. Spaces between command fields are optional

Some commands (Message Data “^MD” and New Message “^NM) include subcommands:

```
^MD^AT1 text
```

Each command or subcommand starts with a “caret” character (‘^’; hexadecimal 0x5E) followed by two alphabetic characters identifying the command. If the command requires or accepts parameters, the parameters follow the command identifier and are separated by semicolons (‘;’ – hexadecimal 0x3B).

Most parameters are decimal numbers, but some are text.

4.1.1 Text Parameter Format

With text parameters, leading and trailing spaces are ignored. To include a space, a caret or a semicolon in a text field, enclose that character or the entire field in quotation marks (“” – hexadecimal 0x22). To include a quotation mark in a text field, provide two consecutive quotation marks. See the following table for examples.

Contents of command parameter	*Contents of text field*
`"aa bb"`	`aa bb` *(5 characters)*
`aa" "bb`	`aa bb` *(5 characters)*
`"c""d"`	`c"d` *(three characters)*
`eee""fff`	`eee"fff` *(seven characters)*
`""g""`	`"g"` *(three characters)*

4.2 Common Parameters

This section describes command parameters that are used in several different commands or subcommands.

4.2.1 Message Templates

Message template is a parameter used by the New Message (^NM) and Change Message (^CM) commands. The message template defines the number of lines (first

number shown in following table) in the message and the height, in dots (second number), of each line. The message template values recognized are:

Value	*Sizes*	*Value*	*Sizes*	*Value*	*Sizes*	*Value*	*Sizes*
0	1x5	5	1x19	10	2x12	15	5x5
1	1x7	6	1x25	11	2x16	16	1x3
2	1x9	7	1x32	12	3x7		
3	1x12	8	2x7	13	3x9		
4	1x16	9	2x9	14	4x7		

4.2.2 Print Speed

Print speed is specified for the New Message (^NM) and Change Message (^CM) commands, Valid print speeds are:

- 0 = fast
- 1 = faster
- 2 = fastest
- 3 = ultra fast

4.2.3 Orientation

Orientation is specified for the New Message (^NM) and Change Message (^CM) commands. Valid orientations are

- 0 = normal
- 1 = flip
- 2 = mirror
- 3 = mirror and flip
- 4 = tower normal
- 5 = tower flip
- 6 = tower mirror
- 7 = tower mirror and flip

4.2.4 Print Mode

Print Mode is specified for the New Message (^NM) and Change Message (^CM) commands. Valid print modes are:

- 0 = normal
- 1 = auto
- 2 = repeat
- 3 = reverse

4.2.5 Font Sizes

The Font Size parameter is used in any command or subcommand that affects text in a message, including text fields, counter fields, user defined fields, date fields and time fields. Font size values recognized are shown in the following table.

Value	*Height*	*Value*	*Height*	*Value*	*Height*
0	5	3	9	6	19
1	7 (wide)	4	12	7	25
2	7 (narrow)	5	16	8	32

4.2.6 Counter Identifier

Commands and subcommands related to counters have a Counter Id parameter. Valid values are:

- 0 is the print counter
- 1-4 refer to Custom Counters 1-4
- 6 is the product counter.

Note that value 5 is not used

5 Remote Commands

5.1 ^HE, ^HM, ^HN – Help Commands

These commands display help messages.

^HE without parameters displays a list of recognized commands; with a parameter, displays help for that command or topic.

Topics (in addition to commands) for which help is available:

^HE Bar	Bar code types
^HE Date	Date formats
^HE DMAT	Data Matrix
^HE DOT	Dot Code
^HE Font	Fonts
^HE Mode	Print modes
^HE Orient	Orientation
^HE QRCode	QR Code
^HE Speed	Print speeds
^HE Temp	Templates
^HE Time	Time formats

^HM displays a list of subcommands recognized by the ^MD (Message Data) command.

^HN without parameters displays a list of subcommands recognized by the ^NM (New Message) command; with a parameter, displays help for that subcommand.

5.2 ^AL – Align Fields

Aligns fields to eliminate overlap. If one field overlaps another, the field that starts farther to the right is moved to eliminate the overlap.

Command format:

```
^AL [field]
```

With no arguments, the entire message is affected.

With one argument, which is a field number, the effect starts with that field and continues to the last field.

5.3 ^AO – Automatic Output

Controls whether events are automatcially reported to the Remote Communictions port when certain events occur. Events reported include change in printer ready status and various warnings about fluid levels, viscosity, phase, system and printhead temperatures and so forth.

Command format:

```
^AO option
```

Where option selects the destination of automatic output:

- 0: None
- 1: Serial port
- 2: Network connection
- 3: Both

5.4 ^CC – Change Counter

Changes the behavior (not the appearance) of a counter.

Command format (spaces are optional):

```
^CC C; V; S; Z; T; I; E; R
```

Where:

C is the Counter identifier; see section 4.2.6.

V, if provided, will become the Counter's current value.

S, if provided, will become the Counter's start value.

Z, if provided, determines whether leading zeros will be included when the Counter value is displayed or printed; 0 means do not include leading zeros and 1 means include leading zeros.

T, if provided, indicates whether the Counter is triggered by Print (0) or Photocell (1).

I, if provided, specifies the amount by which the Counter is incremented when triggered. Any value except zero is valid

E, if provided, specifies the Counter's end value.

R, if provided, specifies the Counter's repeat value.

Note that only the Counter identification, C, is required. Other values may be omitted.

For example, to change only the end value of Counter 1, the following command may be used:

```
^CC 1;;;;;;99999
```

In this example, V, S, Z, T and I are not provided, but the semicolons indicate that those values are skipped. The R value is omitted entirely. The following command specifies "End value" by name ('E') and is therefore equivalent:

```
^CC 1;E9999
```

5.5 ^CD – Change Date Delimiter

Changes the delimiter character used to separate the parts of a date.

Command format:

```
^CD char
```

where char is a single character.

NOTE: This affects all date fields in the printing message. It is not possible to use different date delimiters in different date fields in the same message

5.6 ^CF – Change Field

Changes one or more field parameters.

Command format (spaces are optional):

```
^CF n; x; y; s
```

Where:

- n – Field Number (required); see section 5.16.1.1.
- x – X (horizontal) position; see section 5.16.1.2.
- y – Y (vertical) position; see section 5.16.1.2.
- s – Font Size; see section 4.2.5.

Command fields can be identified by position (in the order listed above) or by beginning the field with the letter indicated (either upper or lower case). The following commands are therefore equivalent, and would set the first field's font size to 5 (16 dots high; see section 4.2.5):

```
^CF1;;;5
^CFN1;S5
^CFS5;N1
```

Note that the field number must be supplied, either by position or identifier.

5.7 ^CH – Change Time ("Hour") Delimiter

Changes the character delimiter used to separate the parts of a time.

Command format:

```
^CH char
```

Where char is a single character.

NOTE: This affects all time fields in the specified message. It is not possible to use different delimiters in different time fields in the same message

5.8 ^CM – Change Message

Changes one or more of the messate parameters

Command format (spaces are optional):

```
^CM t; s; o; p
```

Where:

- **t** – Template size; see section 4.2.1.
- **s** – Print speed; see section 4.2.2.
- **o** – Orientation of message; see section 4.2.3.
- **p** – Print mode; see section 4.2.4.

Command fields can be identified by position (in the order listed above) or by beginning the field with the letter indicated (either upper or lower case). The following commands are therefore equivalent, and would change the message orientation to “mirror”:

```
^CM;;2
^CMo2
^CMO2
```

5.9 ^CN – Count Query

Requests the current values of the product counter, print counter and custom counters.

Command format:

```
^CN
```

If echo is off, output will provide the product count, the print count and each custom count, separated by commas and followed by a “carriage return” and “line feed.” For example:

```
^CN
308,7,10,21,34,45
```

If echo is on, the output will have the following format:

```
^CN
Product:308, Print:7, Custom1:10, Custom2:21, Custom3:34,
Custom4:45
```

5.10 ^DA – Delay Adjust

Adjusts the delay for the **printing message**.

Command format:

```
^DA delay
```

Where delay is the amount of delay, expressed as a decimal number, before printing starts

The range of valid delays is 0 to 4,000,000,000.

5.11 ^DM – Delete Message

Deletes the specified message. If the message does not exist, or is a reserved message, or is the printing message, an error message is generated.

Command format:

```
^DM name
```

5.12 ^DP – Delay Print Trigger

Adjusts the delay time used in One-to-One printing mode between the time the message data is received and the time at which a photo eye interrupt is simulated.

Command format:

```
^DP delay
```

Where delay is the amount of delay in milliseconds. The delay can be between 0 and 30000.

Example:

```
^DP 10
```

Output (if echo is off):

```
PET:10
```

Output (if echo if on)

```
PhotoEye trigger = 10
```

5.13 ^DR – Delay Reverse Adjust

Adjusts the delay for the **printing message** when it is printed in reverse, similarly to the ^DA command. This command was added in Version 01.05.00.

Command format:

```
^DR delay
```

5.14 ^EF – Echo Off

Turns off echo provided by the BestCode device and sets output messages to terse. This is the initial state when remote communications commence.

Command format:

```
^EF
```

5.15 ^EN – Echo On

Turns on echo of commands and data received by the BestCode device and sets output messages to verbose.

Command format:

```
^EN
```

5.16 ^FE – Force Photo Eye Trigger

In One-to-one Print mode, enables the automatic generation of a product trigger when the ^MD command has been successfully processed. The state of this flag is ignored if One-to-one Print mode is not in effect

Command format:

```
^FE
```

Output (if echo is off):

```
On
```

Output (if echo is on):

```
Force PhotoEye trigger.
```

5.17 ^FF – Force Photo Eye Trigger Off

In One-to-one Print mode, disables the automatic generation of a product trigger as described above.

Command format:

```
^FF
```

Output (if echo is off):

```
Off
```

Output (if echo is on):

```
Disable PhotoEye trigger.
```

5.18 ^GM – Get Message Parameters

Displays parameters for the message with the specified name, or, if no name is supplied, for the current printing message.

Command format:

```
^GM [message]
```

Ouput format is:

T:<template size> S:<print speed> O:<orientation> P:<print mode>

5.19 ^GP – Set Gap

Adjusts the gap (width between characters) either for the specified field of the **printing message** or for every field in that message, or reports the current gap setting.

Command format (set gap for entire message):

```
^GP gap
```

Command format (set gap for specific field):

```
^GP field; gap
```

Command format (get gap for entire message):

```
^GP ?
```

Command format (get gap for specified field):

```
^GP ?; field
```

or

```
^GP ?field
```

For example

```
^GP 1
```

Change the gap between viewable characters of the entire printing message. The range of valid gap values is 0 to 9.

```
^GP 3; 2
```

Change the gap between viewable characters of the third field in the printing message.

5.20 ^LF – List Fields

Lists the fields in a message, either the message with the specified name, or the current printing message if no name is specified.

Command format:

```
^LF [message]
```

Example:

```
> ^LF bestcode
BESTCODE: H:16 L:1 W:135 S:0 R:0 P:0
Fields (3):
    Field 1: T:4000 (0, 0) W:87 H:16 B:0 G:1, R:0
        Element: T:0 D:BC-GEN2
    Field 2: T:4000 (88, 9) W:47 H:7 B:0 G:1, R:0
        Element: T:2 D:14:18:36
    Field 3: T:4000 (88, 0) W:47 H:7 B:0 G:1, R:0
        Element: T:3 D:06/15/18
```

The first line includes the name of the message and the following parameters:

H – Message height
L – Number of lines, as defined by the message template.
W – Message width
S – Speed
R – Rotation
P – Pitch

The next line indicates the number of fields.

For each field, the following parameters are displayed:

- T – Field type, in hexadecimal notation:
    - 0001 – Graphic
    - 0002 – Block
    - 4000 – Text
    - 8001 – ITF
    - 8002 – UPCA
    - 8003 – UPCE
    - 8004 – EAN13
    - 8005 – EAN8
    - 8006 – CODE39
    - 8007 – CODE128
    - 8008 – DataMatrix
    - 8009 – QR code
    - 800A – Dot Code
- (Xpos, Ypos) – Position where the field starts; (0, 0) is the lower left corner of the message.

- W – Field width
- H – Field height
- B – Field boldness
- G – Field gap
- R – Field rotation

Each field contains one or more elements. For each element, the following parameters are displayed:

- T – Element type:
  - 0 – Static element
  - 1 – User defined element
  - 2 – Time element
  - 3 – Date element
  - 4 – Programmed element
  - 5 – Counter element
  - 6 – Shift element
  - 7 – Block element
- D – Data

5.21 ^LL – List Logos (Graphics)

Outputs a list of all logos available for inclusion in a message, one logo name per line.

Command format:

```
^LL
```

NOTE: Names may have upper or lower case letters, or both.

5.22 ^LM – List Messages

Outputs a list of all messages available for printing, one message name per line, sorted alphabetically. The end of the list is marked with the string "//EOL" on a separate line.

Command format:

```
^LM
```

NOTE: Message names are displayed as all uppercase.

5.23 ^MB – One-to-One Mode Begin

Enables One-to-One printing mode. This printing mode can only be entered remotely. This mode will not be entered if the CIJ is not running. Once One-to-One print mode is entered, editing features on the device screen are disabled. However, the adjust parameters are available. Upon entering One-to-One print mode, the force photo eye

trigger (^FE) is reset and the trigger print delay (^DP) is set to zero. Therefore, to use the simulated product trigger, these values must be input each time One-to-One mode is entered.

Command format:

```
^MB
```

If the ink jet is not running, an error message will be generated:

Message with echo off:

```
? 7: JetStopped
```

Message with echo on:

```
Error 7: Jet not running
```

If the ink jet is running, a confirmation message will be generated:

Message with echo off:

```
1-1
```

Message with echo on (in addition to the usual "Command Successful!"):

```
OnetoOne Print Mode
```

5.24 ^MD – Message Data

Alters one or more data fields within the printing message. The Message Data Command must be followed by one or more Text Data (^TD) and/or Barcode Data (^BD), subcommands. Only text fields and barcode fields are currently supported. Message data is not saved until One-to-One print mode is exited; therefore, a remote command of ^ME must be done to save the last message contents.

Command format:

```
^MD sub-command; ...
```

The Message Data command is intended for use in One-to-One print mode; see section 6.1 for more information about One-to-One print mode.

5.24.1 ^BDx – Barcode Data

Modifies data in a barcode field.

Subcommand format (spaces are optional):

```
^BD field; text
```

The field parameter indicates which Barcode Data field is to be changed. The text parameter is the data which will replace the data in the field. For example:

```
^MD^BD1;12345678
```

This example would replace the encoded contents of the first barcode field (not necessarily the first field) in the printing message with “12345678”. There may or may not be space between the command and the field selector, but there should be a space or a semicolon between the field number and the text that is to be changed. To include a space, semicolon or quotation mark within the text, enclose the text in quotes. See section 4.1.1 for more information.

5.24.2 ^TDx – Text Data

Modifies data in a text field.

Subcommand format (spaces are optional):

```
^TD field; text
```

The field parameter which Text Data field is to be changed. The text parameter is the data which will replace the data in the text field. For example:

```
^MD^TD1;OCT
```

This example would replace the contents of the first text field (not necessarily the first field) of the printing message with “OCT”. To include a space, semicolon or quotation mark within the text, enclose the text in quotes. See section 4.1.1 for more information.

Example:

```
^MD^TD1; Nov^TD2 28^TD3; 2015
```

This example would replace the contents of the second text field of the printing message with “Nov” and the contents of the third text field with “2015”.

Example:

```
^MD^TD1 Nov^TD2 28^TD3 2015^BD1 45612378
```

This example would change text field 1 to “Nov”, text field 2 to “28” and barcode 1 to “45612378” of the printing message.

5.25 ^ME – One-to-One Mode End

Disables One-to-One printing mode, returning to normal print mode. ***This command must be performed to save the last printing message.***

Command format:

```
^ME
```

If echo is off the following message is generated:

```
NORM
```

If echo is on, the following message is generated (in addition to the usual "Command Successful!"):

```
Normal Print Mode
```

5.26 ^MS – One-to-One Mode Status

Outputs the current status of the One-to-One printing mode.

```
^MS
```

Results with echo off:

```
1-1=OFF
```

or

```
1-1=ON
```

Results with echo on:

```
OnetoOne mode=OFF
```

or

```
OnetoOne mode=ON
```

5.27 ^NM – New Message

Creates a new message on a BestCode device. Once the message has been created on the device, the message may be selected for printing. There is a limit of 512 messages that can be stored onto a device, including reserved messages. The total size of the New Message command, including all accompanying subcommands must be less than 1020 characters.

Command format (spaces are optional):

```
^NM t; s; o; p; x
```

Create a new message using the provided parameters:

t – Template size; see section 4.2.1.
s – Print speed; see section 4.2.2.
o – Orientation of message; see section 4.2.3.
p – Print mode; see section 4.2.4.
x = Message name.

The New Message must be followed by one or more subcommands to add fields to the message. The following sections describe the recognized subcommands and their parameters.

Creating a new message with a reserved name is prohibited.

Creating a message does not select it for printing; the ^SM command must be used.

If a message of the specified name already exists, it will be deleted, if possible (the current printing message cannot be deleted). If the existing message cannot be deleted, the New Message command fails.

5.27.1 Common Parameter Formats

5.27.1.1 Field Number

Each field has a field number. Valid values range from 1-127. When creating fields, the field number is ignored; the first field created will be numbered 1 and subsequent fields will be numbered in succession. With any command or subcommand that affects a field, the field number assigned when the field was created must be provided.

5.27.1.2 Field Position Parameters

Field position parameters are used in every command that creates a field of any type, and in the Change Field (^CF) command.

Each field has an X (horizontal) and Y (vertical) position. The origin (i.e., the location where both X and Y are zero) is the lower left corner of the message. Valid X positions range from 0 to 15999 and valid Y positions range from 0 to 31.

Prior to version 01.04.02.01, the position parameters are required to be decimal numbers, specifying the absolute value for the position.

Starting with version 01.04.02.01, wherever an X or Y position parameter is required, the form of the parameter value has one of the following forms:

- Empty, blank or omitted entirely. In the case of the X position, the value will be zero for the first field, and for subsequent fields the position immediately following the previous field. In the case of the Y position, the value will be zero for the first field and for subsequent fields the same as the previous field.
- A signed decimal integer specifies the position relative to the position that would be used in the previous case. For example, if "+10" is specified as the X position, there will be a gap of 10 dots between the previous field and the new field. If "-10" is specified for the X position, the new field will overlap the previous by 10 positions.
- An unsigned decimal integer specifies the absolute value for the position

5.27.2 Add Field Subcommands

5.27.2.1 ^AB – Add Barcode Field

Adds a Barcode field. Several forms are available.

Subcommand format previous to version 01.04.01.06:

```
^AB n; t; x; y; f; data
```

The above format is supported for backward compatibility, but not recommended for future use.

Subcommand format, starting with version 01.04.01.06, for field types other than Code 128, DataMatrix, or QR code (spaces are optional in all of the following formats):

```
^AB n; x; y; f; t; m; r; data
```

Subcommand format, starting with version 01.04.01.06, for Code 128:

```
^AB n; x; y; f; t; m; r; c; data
```

Subcommand format, starting with version 01.04.01.06, for DataMatrix:

```
^AB n; x; y; f; t; r; s; data
```

Subcommand format, starting with version 01.04.01.06, for QR code:

```
^AB n; x; y; f; t; s; data
```

In each case:

n = Field number within the message (1 – 30); see section 5.16.1.1.

t – Type of encoding for barcode. Recognized values are:

Value	*Type*	*Value*	*Type*	*Value*	*Type*

Value	*Type*	*Value*	*Type*	*Value*	*Type*
0	Interleaved 2 of 5	3	EAN-13	6	Code 128
1	UPC-A	4	EAN-8	7	DataMatrix
2	UPC-E	5	Code 39	8	QR Code

x = x position in the buffer (0 – 15999); see section 5.16.1.2,

y = y position in the buffer (0 – 31); see section 5.16.1.2

s = font size (0-8); see section 4.2.5:

m = 0 (checksum will be calculated automatically) or 1 (message must include checksum). Note: Not available for DataMatrix or QR code.

r = 0 (do not include human readable form of data) or 1 (include human readable form of data). Note: Not available for QR code or DataMatrix code.

c (Code 128 only) = Start Code value (0 = A, 1 = B, 2 = C)

s (DataMatrix) = size (0 through 15); sizes recognized are (first number is horizontal size; second is vertical size):

Value	*Size*	*Value*	*Size*	*Value*	*Size*	*Value*	*Size*
0	10x10	4	32x8	8	20x20	12	24x24
1	12x12	5	16x16	9	36x12	13	26x26
2	18x8	6	26x12	10	22x22	14	48x16
3	14x14	7	18x18	11	36x16	15	32x32

s (QR code) = size (0 – 2):

Value	*Size*	*Value*	*Size*	*Value*	*Size*
0	21x21	1	25x25	2	29x29

data = data string including checksum if necessary for the barcode encoding. As in other cases, to include a space or semicolon in the data, enclose the data in quotes, and to include a quote in the data, use a pair of quotes. See section 4.1.1

Note: If a checksum is required by the barcode type and manual is selected, the checksum digit must be provided as part of the data string.

Example:

```
^NM 4;0;0;0;MSG2^ab1,6,0,9,1,ABC123c
```

This example would insert the barcode value representing “ABC123c” into the barcode field 1 of the printing message. The ‘c’ at the end of the string represents the checksum for the previous data string with code128 encoding.

Example:

```
^NM
4;0;0;0;MSG3^AT1;0;0;5;Nov^AT2;40;0;5;2015^AB1;6;90;0;5;123ABC
%
```

This example would insert Nov into text field 1, 2015 into text field 2, and a representative barcode for the value "123ABC%" where '%' is the checksum for the previous data string encoded as a code 128 barcode field 1 of the printing message.

5.27.2.2 ^AC – Add Counter Field

Adds a Counter field.

Subcommand format (spaces are optional):

^AC n; x; y; s; c

where

n = the field number within the message (1 – 30); see section 5.16.1.1,

x = x position in the buffer (0 – 15999); see section 5.16.1.2

y = y position in the buffer (0 – 31); see section 5.16.1.2

s = font size (0-8); see section 4.2.5:

c = counter id; 0 is the print counter, 1-4 refer to Custom Counters 1-4, and 6 is the product counter (5 is not used).

This command can be followed by a Change Counter (^CC) command (described below). The ^CC command can also be used by itself, affecting the currently selected printing message.

5.27.2.3 ^AD – Add Date Field

Adds a Date field (current date) to the new message.

Subcommand format (spaces are optional):

^AD n; x; y; s; d

where

n = the field number within the message (1 – 30); see section 5.16.1.1.

x = x position in the buffer (0 – 15999); see section 5.16.1.2.

y = y position in the buffer (0 – 31); see section 5.16.1.2.

s = font size (0-8); see section 4.2.5:

d = the date type:

- 1 = Day of week, numeric
- 2 = Day of week, alphabetic
- 3 = Day of month
- 4 = Day of year
- 5 = Week number
- 6 = Month number
- 7 = Month alphabetic
- 8 = Year (1 digit)
- 9 = Year (2 digits)
- 10 = Year (4 digits)
- 11 = Month, Day, 2-digit Year, no delimiters (053018)
- 12 = Month, Day, 2-digit Year, with delimiters (05/30/18)
- 13 = Day, Month, 2-digit Year, no delimiters (300518)
- 14 = Day, Month, 2-digit Year, with delimiters (30/05/18)
- 15 = 2-digit Year, Month, Day, no delimiters (180530)
- 16 = 2-digit Year, Month, Day, with delimiters (18/05/30)
- 17 = Month, Day, 4-digit Year, no delimiters (05302018)
- 18 = Month, Day, 4-digit Year, with delimiters (05/30/2018)
- 19 = Day, Month, 4-digit Year, no delimiters (30052018)
- 20 = Day, Month, 4-digit Year, with delimiters (30/05/2018)
- 21 = 4-digit Year, Month, Day, no delimiters (20180530)
- 22 = 4-digit Year, Month, Day, with delimiters (2018/05/30)

The ^AD command may be followed by a ^CD command (described below) to change the delimiter used. The ^CD command can also be used by itself, affecting the currently selected printing message.

5.27.2.4 ^AE – Add Extended Date Field

Adds a Date field with expiration or rollover parameters to the new message.

Subcommand format (spaces are optional):

```
^AE n; x; y; s; d; ...
```

where

n = the field number within the message (1 – 30); see section 5.16.1.1.

x = x position in the buffer (0 – 15999); see section 5.16.1.2.

y = y position in the buffer (0 – 31); see section 5.16.1.2.

s = font size (0-8); see section 4.2.5:

d = date type (as described above for the ^AD command),

One or more of the following parameters, in any order, follow the date type (upper case letters must appear as shown; lower case letters represent numeric values):

Cc = Calendar type (0 for Gregorian; 1 for Hijri lunar calendar)

Rr = Rollover value, in hours.

Dd = Days until expiration (1-999)

Ww = Weeks until expiration (1-99)

Mm = Months until expiration (1-99)

Yy = Years until expiration (1-99)

Each parameter except the last must be terminated by a semicolon.

5.27.2.5 ^AH – Add Time Field

Adds a Time field (current time) to the new message.

Subcommand format:

```
^AH n; x; y; s; t
```

where

n = the field number within the message (1 – 30; see section 5.16.1.1.

x = x position in the buffer (0 – 15999); see section 5.16.1.2.

y = y position in the buffer (0 – 31); see section 5.16.1.2.

s = font size (0-8); see section 4.2.5:

t = time type:

- 1 or 25 = Seconds only
- 2 or 24 = Minutes only
- 3 or 23 = Hours only
- 4 or 26 = Hours and minutes (no delimiter)
- 5 or 27 = Hours, minutes and seconds (no delimiter)

- 6 or 28 = Hours and minutes (with delimiter)
- 7 or 29 = Hours, minutes and seconds (with delimiters)

Two different values are recognized for each time type; the result is the same for either choice. The first value listed is supported for compatibility with previous software versions. The second value listed is supported (and recommended) for consistency with the values recognized by the **^AP** subcommand.

The ^AH command may be followed by a ^CH command (described below) to change the delimiter used. The ^CH command can also be used by itself, affecting the currently selected printing message

5.27.2.6 ^AL – Add graphic ("Logo") field

Adds a Logo (Graphic) field to the new message.

Command format:

```
^AL n; x; y; l
```

where

n = the field number within the message (1 – 30); see section 5.16.1.1.

x = x position in the buffer (0 – 15999); see section 5.16.1.2.

y = y position in the buffer (0 – 31); see section 5.16.1.2.

l = Name of the graphic (which must have been previously stored on the BestCode device) to include.

5.27.2.7 ^AP – Add Program Date or Program Time Field

Adds a Program Date or Program Time field to the new message.

Subcommand format:

```
^AP n; x; y; s; d; ...
```

where

n = the field number within the message (1 – 30); see section 5.16.1.1

x = x position in the buffer (0 – 15999); see section 5.16.1.2.

y = y position in the buffer (0 – 31); see section 5.16.1.2.

s = font size (0-8); see section 4.2.5:

d = date or time type (as described above for the ^AD command), plus the following additional values:

- 23: Hours
- 24: Minutes
- 25: Seconds

One or more of the following parameters, in any order, may follow the date or time type (upper case letters must appear as shown; lower case letters represent numeric values):

Cc = Calendar type (0 for Gregorian; 1 for Hijri lunar calendar)

Rr = Rollover value, in hours.

Dd = Days until expiration (1-999)

Ww = Weeks until expiration (1-99)

Mm = Months until expiration (1-99)

Yy = Years until expiration (1-99)

Each parameter except the last must be terminated by a semicolon.

5.27.2.8 ^AT – Add Text Field

Adds a Text Data field.

Subcommand format:

```
^AT n; x; y; s; data
```

where

n = the field number within the message (1 – 127); see section 5.16.1.1.

x = x position in the buffer (0 – 15999); see section 5.16.1.2.

y = y position in the buffer (0 – 31); see section 5.16.1.2.,

s = font size (0-8); see section 4.2.5:

data = data to be included in the text field.

Examples:

```
^NM 4;0;0;0;mymsg^AT1;0;0;1;Bestcode
```

This example would create a message named “mymsg” with a template size of 1 line of 16, fast print speed, normal orientation, and normal print mode. This example also creates a text field of “Bestcode” in field 1 with a set position at (0, 0) of the new message.

```
^NM 4;0;0;0;MSG1^AT1;0;0;5;Nov^AT2;40;0;5;28,^AT3;75;0;5;2015
```

This example creates a message named “MSG1” with a template size of 1 line of 16, fast print speed, normal orientation, and normal print mode. This example also creates a text field of “Nov” in field 1, 28 in a text field 2, and 2015 in field 3 of the new message.

5.27.2.9 ^CC – Change Counter

The Change Counter command can be used as a New Message subcommand, in which case it affects the message being created instead of the current printing message. See section 5.4.

5.27.2.10 ^CD – Change Date Delimiter

The Change Date Delimiter command can be used as a New Message subcommand, in which case it affects the message being created instead of the current printing message. See section 5.5.

5.27.2.11 ^CH Change Time Delimiter

The Change Time Delimiter command can be used as a New Message subcommand, in which case it affects the message being created instead of the current printing message. See section 5.6.

5.28 ^PA – Pitch Adjust

Adjusts the pitch for the **printing message**.

Command format:

```
^PA pitch
```

For example:

```
^PA 2
```

There may be a space between the command and the pitch value. The value range is 0 to 4,000,000,000.

This command can only affect a message that has either the Repeat or Auto Print characteristics. If the printing message does not have either the Repeat or Auto Print characteristic, an error message will be generated With echo off:

```
^PA 1
? 9: PrintMode
```

With echo on:

```
^PA 1
Error 9: Wrong print mode for requested operation
```

5.29 ^PH – Print Height

Adjusts the print height for the **printing message**.

Command format:

```
^PH height
```

For example:

```
^PH 8
```

The range of valid heights is 0 to 10.

5.30 ^PR – Enable/Disable Printing

Enables or disables printing; does not turn the ink jet on or off.

Command format:

```
^PR option
```

Where:

option = 0 means disable printing

option = 1 means enable printing.

5.31 ^PT – Force Print

Causes the printing message to be printed as if the photoeye (or other sensor) had been triggered.

5.32 ^PW – Print Width

Adjusts the print (pad) width for the **printing message**.

Command format:

```
^PW width
```

For example:

```
^PW 5
```

The range of valid widths is 0 to 16,000.

5.33 ^RA – Repeat Adjust

Adjusts the repeat count for the **printing message**. This command can only affect a message that has the Repeat characteristic.

Command format:

```
^RA count
```

For example:

```
^RA 3
```

The range of valid repeat counts is 0 to 30,000.

5.34 ^SA – Set Auto Align

Sets or shows the value of the auto-align option for the printing message.

Command format:

```
^SA [option]
```

If option is omitted, the current state of the auto-align option is output.

If option is 0, auto alignment is disabled.

If option is 1, auto alignment is enabled.

5.35 ^SB – Set Bold

Adjusts the bold value of characters for the specified field of the **printing message, or for the specified field, or reports the current bold value**.

Command format (set bold for entire message):

```
^SB bold
```

Command format (set bold for specific field):

```
^SB field; bold
```

Command format (get bold for entire message):

```
^SB ?
```

Command format (get bold for specified field):

```
^SB ?; field
```

For example:

```
^SB 3; 1
```

Change the bold value for third field of the printing message to 1. The range of valid bold values is 0 to 9.

5.36 ^SD – Show Date

Displays the current date and time, in the currently configured format.

Command format:

```
^SD
```

5.37 ^SJ – Start/Stop Jet

Starts or stops the ink jet.

Command format:

```
^SJ option
```

Where:

- option = 0 means stop the jet;
- option = 1 means start the jet.

The output will be similar to the following:

```
^SJ 0
Command Successful!
Progress:   1%
Progress:   2%
...
Progress: 100%
```

In this case “Command Successful!” indicates that the command was recognized and the operation was started. Progress is then shown as percent of time accomplished until the operation is complete.

NOTE: The last line, showing 100%, may be repeated.

5.38 ^SM – Select Message

Selects a message for printing, or displays the name of the current printing message.

Command format:

```
^SM [message]
```

Previous to version 01.04.02.01, if no message name is supplied, an error message was generated.

Starting with version 01.04.02.01, if no message name is supplied, this command displays the name of the current printing message.

If a message name is supplied, this command selects the specified message on a BestCode device for printing. The message must exist on the device before it can be selected.

```
^SM BESTCODE
```

Select the message “BESTCODE” for printing.

If the printing message includes User-Defined fields, the user will be prompted using the touch screen on the BestCode device to enter the required data.

If no message of the specified name exists, an error message will be generated.

If echo is off, the message is:

```
? 4: MsgNotFnd
```

If echo is on, the message is:

```
Error 4: Message not found
```

5.39 ^SU – Status Update

Requests status information from the BestCode device. The resulting status provides modulation, charge, pressure, RPS, phase quality, errors on, high voltage deflection on, viscosity, ink level, makeup level, and print ready status.

Command format:

```
^SU
```

Output with echo off will resemble the following:

```
Mod[160] Chg[65] Prs[38] RPS[29.75] PhQ[100%] Err[1] HvD[1]
Vis[4.20]
```

```
INK:GOOD MAKEUP:GOOD
V300UP:0 MLT_ON:1 GUT_ON:1 MOD_ON:1
PRINT:Ready
```

Output with echo on will resemble the following:

```
STATUS: Modulation[160] Charge[65] Pressure[40] RPS[28.13]
PhaseQual[100%] AllowErrors[1] HVDeflection[1] Viscosity[4.20]
Ink Level: GOOD
Makeup Level: GOOD
V300UP:0 MLT_ON:1 GUT_ON:1 MOD_ON:1
Print Status Ready
```

5.40 ^TM – Show Run Time Hours

Requests the run hours from a BestCode device.

Command format:

```
^TM
```

Output (example; format is the same whether echo is on or off):

165.0 hours

5.41 ^TP – Show Temperature

Requests temperature information from a BestCode device. This will provide the temperature for two sensors – print head and electronics.

Command format:

```
^TP
```

Output with echo off:

```
P[24.71] E[30.78]
```

Output with echo on:

```
TEMPS: Printhead[24.71°C] Electric[30.78°C]
```

5.42 ^UT – Set UTF-8 Mode

Sets or shows the state of the UTF-8 option.

Command format:

```
^UT [option]
```

If option is omitted, the current state of UTF-8 mode is displayed.:

If option is 0, UTF-8 mode is disabled.

If option is 1, UTF-8 mode is enabled.

If UTF-8 mode is disabled, only characters in the ASCII-8 set are recognized or generated.

If UTF-8 mode is enabled, characters in UTF-8 format are recognized on input and generated on output.

5.43 ^VM – View Message

Generates a bit map of the message with the specified name, if any, or of the current printing message if no name is specified. The default action is to generate a bit map file internally, and convert that into an HTML <img> tag which is written to the terminal, and then delete the bit map file.

Command format (spaces are optional):

```
^VM m; c
```

Where:

- m – Message name; default is current printing message
- c – Command option. Recognized options are:
    - K – Keep bit map file in internal file system. It is stored in the Graphics folder and therefore could be inserted into other messages or backed up to and restored from a USB device along with any other graphics.
    - X – Write bit map file to USB device, if present. If no USB device is connected, bit map file will be retained internally.
    - F – Create bit map file, but do not create HTML. If a USB device is connected, the bit map file will be written to that device; otherewise it will be created and retained internally

The output to the terminal can be displayed by most web browsers.

For example, the following is the output generated for a message containing one text field whose contents are “T1”:

```
<img alt="" src="
```

```
Qk1+AAAAAAAAD4AAAAoAAAAFQAAABAAAAABAAEAAAAAAEAAAAB0EgAAdBIAAAAA
AAAAAAAAAAAA
AP///wDz+BgA8/gYAPP+eADz/ngA8/54APP+eADz/ngA8/54APP+eADz/ngA8/54
APP+eADz/ngA
8/h4AAA8eAAAPngA
">
```

5.44 ^VV – View Version

Send the “greeting” message, which includes the firmware version, to the Remote Com port.

Command format:

```
^VV
```

The message is the same message sent to the serial port at system startup and resembles the following:

```
Remote Server v01.05.00.03 NB v4.00 built Dec 22 2020
```

6 COMMAND USAGE

This section provides more information concerning command flow.

6.1 One-to-One Print Mode

The following data shows the procedure to enter One-to-One printing mode, alter data fields within the current printing message, and exit the mode when completed. The user MUST perform an ‘MD’ command to initiate the One-to-One process of filling the print buffer.

The message may also be selected prior to entering One-to-One print mode.

Remote commands may be entered manually or the message data string (^MD^TDX…) may be entered into a text file that can be submitted via the Tera Term window by selecting File, Send File…, and then selecting the saved file location.

When in One-to-One mode, an attempt has been made to reduce the response data via the remote com port. The remote com responses are not sent to the communications port during One-to-One operation. For example, when the ^MD^TDx command is entered while in One-to-One mode there is no success (>) or fail (?) response. The responses shown is when echo is off.

Depending on timing during One-to-One mode operation, each individual ‘R’, ‘T’, and ‘C’ response would contain a carriage return (0x0D) and line feed (0x0A). But it is possible that two or more of these response characters could be sent from the device at one

time. Therefore, the response could be TC followed by a carriage return and line feed. Or possibly all three (RTC) followed by a carriage return and line feed.

There are two other possible indications given by the device during One-to-One operation. One is when the high voltage (deflection) is disabled – DEF OFF with a carriage return and line feed will be sent. The other is when a device error occurs, for example gutter error, and a jet stop is performed. In such cases, a JET STOP with a carriage return and line feed will be sent from the device indicating to the remote communication device that the jet has stopped due to an error. In such a case, One-to-One mode is exited.

The “R” is sent when a valid Message Data (^MD) command is received. The Message Data command must include at least one Text Data (^TD) or Barcode Data (^BD), which must refer to valid field elements. A message begins with a Caret (‘^’) and ends with a carriage return (CR = 0x0D) and must be no longer than 1020 bytes. If anything other than a valid Message Data command is received, those characters are discarded and no response is sent.

The receiver uses four buffers, each 1020 bytes long to receive messages. Therefore, up to four messages can be received and held until used. A message which is received when there is no buffer available in which to store it (for example, messages are being sent faster than the printer can finish printing them) is discarded; no response is sent.

The ‘T’ is sent when a photoeye trigger is detected.

Figure 6 - Tera Term Send File

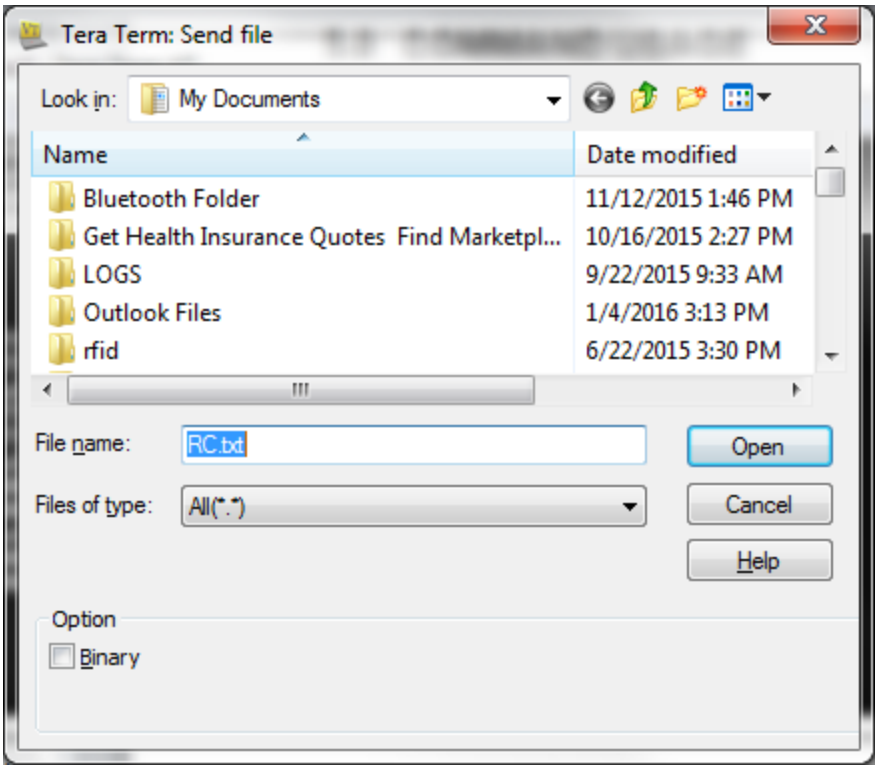
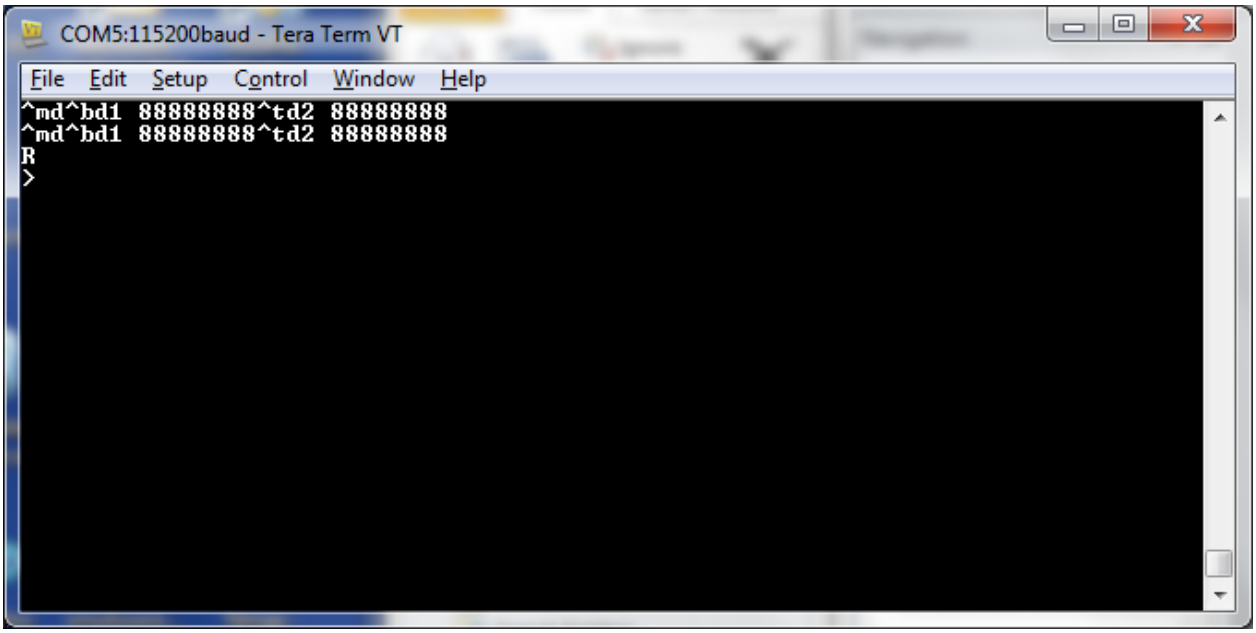


Figure 7 - One-to-One Modify Data



The following information provides an example of the event flow necessary to enter One-to-One print mode as well as adjusting field data.

1. Enter One-to-One print mode

```
^MB
OnetoOne Print Mode
Command Successful!
```

2. Select appropriate message

```
^SM rem1
Command Successful!
```

3. Enter updated data into field

```
^MD^TD2;0002
```

4. Receive acknowledgement of print buffer update

```
R
```

An external input (photo eye) must occur at this point. Any photo eye before the print buffer update acknowledgment is ignored.

5. Receive acknowledgement of photo eye

```
T
```

6. Receive acknowledgement of print completion

```
C
```

To continue the One-to-One print mode, return to step 3 entering updated field data. The BestCode device will respond with steps 4 – 6 as the printing process continues.

It is possible to enable the BestCode device to generate internal photo eye interrupts. This should only be used using internal timing, not encoder or external timing.

A chart is provided below to help explain the flow of commands and responses between the remote device and the BestCode device.

Step	*Description*	*Remote*	*Dir*	*BestCode*
1	Enter One-to-One print mode request	`^MB`	→	
	Response		←	`OnetoOne Print Mode`
2	Select Message	`^SM rem1`	→	
			←	`Command Successful!`
3	Message Data update	`^MD^TD2;0002`	→	
4	Print buffer update acknowledgement		←	`R`
	Product causes a photo eye signal			
5	On photo eye occurrence		←	`T`
6	On print completion		←	`C`

Note: It is possible, during high speed operations, for two or even all three of the acknowledgements (‘R’, ‘T’, and ‘C’) to occur together; e.g., “RT,” “TC” or “RTC.”

7 Error and Other Messages

The following table lists additional messages that may be generated.

Number	*Echo Off*	*Echo On*
0	Success	Success
1	Error	Generic error
2	CmdFormat	Invalid command format
3	CmdNotRec	Command not recognized
4	MsgNotFnd	Message not found
5	FldNotFnd	Message field not found
6	EleNotFnd	Message element not found
7	JetStopped	Jet not running
8	DelFailed	Failed to delete message
9	PrintMode	Wrong print mode for requested operation
10	InvNumber	Invalid number format
11	ComNotSup	Command not supported
12	ResName	Message name is reserved
13	InvName	Invalid messag name
14	MsgExists	Message already exists
15	FldType	Wrong field type for requested operation
16	NoText	No text supplied
17	NoFont	No font size supplied
18	FldCreate	Create field failed
19	EleCreate	Create element failed
20	InvBarType	Invalid barcode field type
21	NoCounter	No counter ID
22	DateType	Wrong date type for requested operation
23	NoDate	No date type provided
24	NoTime	No time type provided
25	InvDelim	Invalid delimiter
26	InvBold	Invalid Bold value
27	InvGap	Invalid Gap value
28	InvDelay	Invalid Delay value
29	InvTrig	Invalid Trigger Delay value
30	InvPitch	Invalid Pitch value
31	InvHeight	Invalid Pad Height value
32	InvWidth	Invalid Pad Width value
33	InvRepeat	Invalid Repeat value
34	InvTempl	Invalid Template
35	InvSpeed	Invalid Speed value
36	InvOrient	Invalid Orientation
37	InvPrintM	Invalid Print Mode
38	InvFldNum	Invalid Field Number
39	InvXpos	Invalid X Position

Number	*Echo Off*	*Echo On*
40	InvYpos	Invalid Y Position
41	InvFont	Invalid Font Size
42	InvCounter	Invalid Counter Id
43	InvRollOv	Invalid Rollover value
44	InvTimeFmt	Invalid Time Format
45	InvChksum	Invalid Checksum Method
46	InvHumRead	Invalid Human Readable flag value
47	InvDMsize	Invalid Data Matrix Size
48	InvQRsize	Invalid QR code Size
49	InvCode128	Invalid Code 128 Start value
50	InvDateFmt	Invalid Date Format
51	InvCal	Invalid Calendar value
52	InvExpDay	Invalid Expiration Days
53	InvExpWk	Invalid Expiration Weeks
54	InvExpMon	Invalid Expiration Months
55	InvExpYr	Invalid Expiration Years
56	InvYesNo	Invalid Yes-or-No parameter
57	InvInc	Invalid increment
58	CantStart	Cannot start jet
59	CantPrint	Cannot enable printing
60	CantOpen	Cannot open file
61	CantRead	Cannot read file
62	InvCharEnd	Invalid character encoding
63	IDotCDSize	Invalid DotCode size
64	IDotCDScale	Invalid DotCode scale
65	IDotCDMask	Invalid DotCode mask
66	DotCDOver	DotCode Data overflow

8 Remote Command Examples

Following is a list of examples of remote commands

- Show software version

```
^VV
```

Response:

```
Remote Server v01.04.01.XX built Aug  2 2018 07:54:14
```

- Turn echo (and verbose output) on

```
^EN
```

Response:

```
Command Successful!
```

- Turn echo (and verbose output) off

```
^EF
```

Response:

```
>
```

- List messages

```
^LM
```

Response:

```
BESTCODE
BESTCODE-AUTO
...
```

- List graphics (logos)

```
^LL
```

Response:

```
ENCODER.BMP
highVolt.bmp
phaseWave.bmp
running_2.bmp
USBdrive.bmp
```

```
USBMouse.bmp
```

- List fields

```
^LF bestcode
```

Response:

```
BESTCODE: H:16 L:1 W:135 S:0 R:0 P:0
Fields (3):
    Field 1: T:4000 (0, 0) W:87 H:16 B:0 G:1, R:0
        Element: T:0 D:BC-GEN2
    Field 2: T:4000 (88, 9) W:47 H:7 B:0 G:1, R:0
        Element: T:2 D:14:18:36
    Field 3: T:4000 (88, 0) W:47 H:7 B:0 G:1, R:0
        Element: T:3 D:06/15/18
```

- Delete messages

```
^DM REMMSG_00
```

Response:

```
Message 'REMMSG_00' deleted
Command Successful!
```

- Create message with one text field

```
^NM4;0;0;0;REMMSG_00^AT1;0;0;5;X
```

- Same, using default values

```
^NM4;;;;REMMSG_00^AT;;;5;X
```

- Same, using parameter names

```
^NMT4;REMMSG_00^ATS5;X
```

- Recreate message where text consists of a single space

```
^NM4;0;0;0;REMMSG_00^AT1;0;0;5;" "
```

- Create message with one text field and one counter

```
^NM4;0;0;0;REMMSG_01^AT1;0;0;5;RemMsg1^AC2;40;0;5;1
```

- Create message with one text field and one counter; change counter properties

```
^NM4;0;0;0;REMMSG_02^AT1;0;0;5;RemMsg2^AC2;75;0;5;1^CC1;;;1;;;
99999
```

- Create message with one text and one (current) date field

```
^NM4;0;0;0;REMMSG_03^AT1;0;0;5;X^AD2;23;0;5;21
```

- Create message with one text, one (current) date, and one (current) time field

```
^NM4;0;0;0;REMMSG_04^AT1;0;0;5;X^AD2;23;0;5;21^AH3;180;0;5;5
```

- Create message with one text, one date, one time and one graphics field

```
^NM7;0;0;0;REMMSG_05^AT1;0;0;5;X^AD2;23;0;5;21^AH3;180;0;5;5^A
L4;250;0;RUNNING_2.BMP
```

- Create message with one bar code field (UPCA); old format

```
^NM4;0;0;0;REMMSG_06^AB1;1;0;0;5;123456789449
```

- Create message with one bar code field (UPCA); new format; Include human readable part and automatically calculate checksum

```
^NM4;0;0;0;REMMSG_07^AB1;0;0;5;1;0;1;12345678944
```

- Create message with one QR code

```
^NM7;0;0;0;REMMSG_08^AB1;0;0;5;8;2;"Hello, world!"
```

- Create message with:
  Date code with expiration;
  Time code
  Time code with rollover
  Program time code with rollover
  Date code

```
^NM4;0;0;0;REMMSG_09^AE1;0;0;5;15;W12^AH2;90;0;5;4^AH3;150;0;5
;3;2^AP4;210;0;5;23;R2^AD5;300;0;5;15
```

- Create message with three text fields, using all possible defaults

```
^NMREMMSG_10^ATS5;Hello^ATS5;" "^ATS5;World!
```

- Create message using relative placement

```
^NM4;0;0;0;REMMSG_11^AT1;0;0;5;ABC^AT2;+10;0;5;DEF^AT3;+10;0;5
;GHI
```

- Move second field to the right 10 positions

```
^CF2;X+10
```

- Move second field to the left 6 positions

```
^CF2;X-6
```

- Change template to 1x32

```
^CMT7
```

- Move second field up - because of snapping; +1 - +15 do nothing

```
^CF2;Y+16
```

- Move second field back down

```
^CF2;Y-1
```

- Select message

```
^SM remmsg_05
```

- Set boldness to 1 on field 2

```
^SB 2;1
```

- Reset boldness on field 2

```
^SB 2;0
```

- Set Gap

```
^GP 1; 5
```

- Restore Gap to default value

```
^GP 1; 1
```

9 MOBA Commands

Starting with firmware version 01.05.00, BestCode printers support MOBA commands, with some variance from the MOBA specification.

For more information on MOBA commands, see:

```
MOBA OMNIA egg grader Egg Coding application
```

```
Integration Notes for Hitachi RX2-SD160W printer
07 January, 2016
```

9.1 MOBA Command Format

Except for Software Reset, each MOBA command starts with an Escape character (0x1B) and ends with an EOT (0x04). The Software Reset command is the single character 0xFF.

If no other response is listed in the next session, the response to a successfully processed command is an ASCII ACK chararacter (0x06).

If the command is not successfully processed, the response is an ASCII NAK character (0x15), optionally followed by an error code consisting of up to three decimal digits.

9.2 Supported MOBA Commands

The following table lists the MOBA commands supported by BestCode printers:

Command	Description
0xFF	Software Reset
‘0’	Report Status
‘D’	Shaft encoder divider value
‘E’	Echo on/off
‘F’	Print delay
‘R’	Erase all text
‘S’	Send text
‘T’	Encoder on/off
‘U’	Unicode text on/off
‘g’	Print format
‘O’	Oscillator frequency

9.2.1 MOBA Software Reset

Currently this command is recognized but otherwise ignored.

Command format:

```
0xFF
```

9.2.2 MOBA Report Status

Returns last error code.

Command format:

```
ESC 0 ? EOT
```

Response format:

```
ESC 0 status EOT
```

Where `status` is a single character indicating the last error code generated by the MOBA subsystem.

9.2.3 MOBA Shaft Encoder Divider Value

Reports or sets the shaft encoder dividier value

Command format (report):

```
ESC D ? EOT
```

Response format:

```
ESC D dddd EOT
```

Command format (set):

```
ESC D dddd EOT
```

Where `dddd` is a sequence of four decimal digits specifying the new encoder divider value.

The range of valid encoder divider values is 1-16, but the specified value is interpreted as one of the following values: 1, 2, 4, 8, or 16 by reducing it to the next closest value, if necessary.

9.2.4 MOBA Echo On/Off

Reports or sets echo state.

Command format (report):

```
ESC E ? EOT
```

Response format:

```
ESC E yn EOT
```

Command format (set):

```
ESC E yn EOT
```

Where `yn` is either ‘Y’ (turn echo on) or ‘N’ (turn echo off).

9.2.5 MOBA Print Delay

Reports or sets print delay value.

Command format (report):

```
ESC F ? EOT
```

Response format:

```
ESC F dddd EOT
```

Command format (set):

```
ESC F dddd EOT
```

Where `dddd` is a sequence of four decimal digits specifying the delay value.

9.2.6 MOBA Erase All Text

Deletes all MOBA messages.

Command format:

```
ESC R EOT
```

9.2.7 MOBA Send Text

Reports the contents of or creates a MOBA message.

Command format (report):

```
ESC S mm ? EOT
```

Response format:

```
ESC S mm data ... EOT
```

Command format (create):

```
ESC S mm data ... EOT
```

Where `mm` is a sequence of two decimal digits specifying the MOBA message id and `data` is sequence of the following elements:

- Literal characters;
- New line characters (0x0A);
- Character mode commands (normal: 0x18 or large: 0x0C);
- Graphic commands (0x18 followed by graphic ID).

9.2.8 MOBA Encoder On/Off

Reports or sets the encoder state.

Command format (report):

```
ESC T ? EOT
```

Response format:

```
ESC T yn EOT
```

Command format (set)

```
ESC T yn EOT
```

Where `yn` is either ‘Y’ (enable encoder) or ‘N’ (disable encoder).

9.2.9 MOBA Unicode Text On/Off

Reports or sets UNICODE-16 text mode.

Command format (report):

```
ESC U ? EOT
```

Response format:

```
ESC U yn EOT
```

Command format (set):

```
ESC U yn EOT
```

Where `yn` is either ‘Y’ (Unicode-16 text mode enabled) or ‘N’ (Unicode-16 text mode disabled).

9.2.10 MOBA Print Format

Reports or sets the print format.

Command format (report):

```
ESC g ? EOT
```

Response format:

```
ESC g mirror N N flip N EOT
```

Command format (set):

```
ESC g mirror N N flip N EOT
```

Where:

`mirror` indicates that messages are to be printed backward (right to left instead of left to right).

`flip` indicates that messages are to be printed upside down.

Note: MOBA formats Bold, Double Space and Reverse Character are not supported.

9.2.11 MOBA Oscillator Frequency

Reports or sets the oscillator frequency. The command is recognized and the value specified is stored and can be reported, but the value is otherwise ignored.

Command format (report):

```
ESC O ? EOT
```

Response format:

```
ESC O fff EOT
```

Command format (set);

```
ESC O fff EOT
```

Where `fff` is a sequence of three decimal digits specifying the oscillator frequency.

10 Kermit Support

Starting with firmware version 01.05.00, graphic images can be copied to or from the BestCode printer using the Kermit protocol.

Kermit support in BestCode printers is based on a subset of E-Kermit version 1.7. See http://www.kermitproject.org/ek.html for more information.