SIMPLE SERIAL INTERFACE PROGRAMMER'S GUIDE

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Revision History

Changes to the original manual are listed below:

Change	Date	Description
-03 Rev. A	5/2015	This guide was updated to include SSI Command changes. This guide is electronic only and replaces p/n 72-40451-02. Added CMD_ACK_ACTION; changed all references of EAN-128 to GS1-128; various additional modifications.
-04EN Rev. A	1/2021	Added to ’Code Types and Identifiers’ and ’Code Types by SSI ID’ tables: GS1 QR Mailmark Dotcode Multicode UK Plessey Grid Matrix Telepen UDI Parsed Code Updated: UPCA to UPC-A UPCE to UPC-E UPCE1 Change to UPC-E1 UPCA + 2 UPC-A + 2 UPC-E + 2 to UPC-E + 2 UPCA + 5 UPC-A + 5 UPCE + 5 to UPC-E + 5 UPCE1 + 5 - Change to UPC-E1 + 5 D25 to Discrete 2 of 5 ITF to Interleaved 2 of 5 C 2 of 5 to Chinese 2 of 5 Removed: UPCD Parameter (FNC3) Decode Data in Custom Defaults

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About This Guide

Introduction

The Simple Serial Interface (SSI) Programmer's Guide provides system requirements and programming information about Zebra's Simple Serial Interface, which enables decoders (e.g., SE955 scan engine, hand-held scanners, 2D scanners, etc.) to communicate with a serial host.

Chapter Descriptions

Topics covered in this guide are as follows:

- Chapter 1, Introduction to SSI provides an overview of SSI, including signal lines, protocol, and packeting information. Protocol layers are described in a "bottom-up" manner, from the hardware layer up through software handshaking.
- Chapter 2, SSI Commands describes each command supported by SSI.
- Appendix A, Transaction Examples illustrate sample transactions.
- Appendix B, Mandatory Parameter describes the Parameter Scanning option which must be used with each product using SSI.

Notational Conventions

The following conventions are used in this document:

- "User" refers to anyone using an SSI product.
- "You" refers to the End User, System Administrator or Programmer using this manual as a reference for SSI
- *Italics* are used to highlight the following:
  - Chapters and sections in this and related documents
  - Dialog box, window and screen names
  - Drop-down list and list box names
  - Check box and radio button names
- **Bold** text is used to highlight the following:
  - Key names on a keypad
  - Button names on a screen.
- bullets (•) indicate:
  - Action items
  - Lists of alternatives
  - Lists of required steps that are not necessarily sequential
- Sequential lists (e.g., those that describe step-by-step procedures) appear as numbered lists.

Related Documents

Refer to the Product Reference Guide for your product for product-specific information on SSI.

For the latest version of this guide and all guides, go to: http://www.zebra.com.

Service Information

If you have a problem with your equipment, contact Zebra Technologies support for your region. Contact information is available at: http://www.zebra.com.

When contacting support, please have the following information available:

- Serial number of the unit
- Model number or product name
- Software type and version number

Zebra responds to calls by e-mail, telephone or fax within the time limits set forth in service agreements.

If your problem cannot be solved by Zebra Technologies support, you may need to return your equipment for servicing and will be given specific directions. Zebra is not responsible for any damages incurred during shipment if the approved shipping container is not used. Shipping the units improperly can possibly void the warranty.

If you purchased your Zebra business product from a Zebra business partner, please contact that business partner for support.

Chapter 1 Introduction to SSI

Introduction

This chapter describes the system requirements of the Simple Serial Interface (SSI), which provides a communications link between Zebra Technologies decoders and a serial host. Information is provided from the perspective of both the host and the decoder.

The following must be understood before using SSI:

- The SSI interface provides a means for the host to control the decoder.
- SSI is a half-duplex communication protocol.
- SSI is transaction-based, that is, the host commands and the decoder responds. For example, the host commands “beep the beeper” and the decoder both beeps and “ACKs” as a response. Acknowledgments are vital for maintaining synchronization.

The following sections describe the basic hardware layer (signals and handshaking) first, followed by software protocol, and finishing with a description of message packets.

Serial Parameter Settings

For communication to occur serial parameters must match between the host and the decoder. These parameters can be set using information in the Product Reference Guide supplied with your decoder.

The default parameters are:

• Baud Rate:	9600 Baud
• Data Bits:	8 bits
• Number of parity bits:	1 bit
• Parity:	None
• Stop Bits:	1
• Hardware Handshaking:	Always
• Software Handshaking:	On
• Inter-Packet Delay:	0 milliseconds
• Multi-Packet Option:	Option 1

Settings for other parameters related to image capture, video capture and other decoder performances should also be reviewed before using SSI.

Hardware Signals

The hardware layer of SSI consists of four signals: Transmit Data (TXD), Receive Data (RXD), Request to Send (RTS) and Clear to Send (CTS).

From the decoder's perspective:

- TXD: Serial data transmit output. Drives the serial data receive input of the host.
- RXD: Serial data receive input. Driven by the serial data transmit output of the host.
- RTS: Drives host CTS, Decoder Output. Acknowledges host demand to transmit.
- CTS: Driven by HOST RTS. Decoder Input. Host Demand / Interrupt to receive.

From the host's perspective:

- HOST RXD: Serial data receive input. Driven by the serial data transmit output of the decoder.
- HOST TXD: Serial data transmit output. Drives the serial data receive input of the decoder.
- HOST CTS: Driven by decoder RTS. Host Input. Decoder ACK of host demand to transmit.
- HOST RTS: Host demand / interrupt to transmit. Must be honored by decoder.

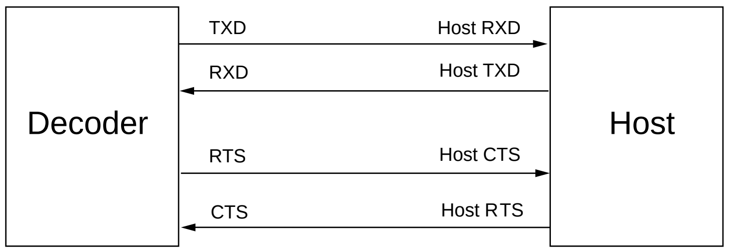


Figure 1-1 *Host/Decoder Interconnection*

Hardware Handshaking

The four hardware signals are used to perform host transmission to decoder, and decoder transmission to host. The host is the Bus Master and controls the actions of SSI. In cases of collision or arbitration, the decoder always defers to the actions of the host. The host programmer should adhere to these specifications closely.

Host Transmission to Decoder

When the host wants to transmit data to the decoder:

1. The host changes the state of the HOST RTS line from inactive to active.
2. The decoder replies by changing the state of the HOST CTS line from inactive to active, within the time frame set by the response timeout parameter.
3. Upon detecting the active HOST CTS, the host transmits the message on the HOST TXD line, verifying that HOST CTS remains active on a character-by-character basis.
4. After sending all characters in the message, the host must change the state of the HOST RTS line from active to inactive.
5. The decoder responds by changing the state of the HOST CTS line from active to inactive.

If the decoder does not respond with HOST CTS when it detects HOST RTS within the programmable (via parameters) response timeout, the host may retry the message. Only after multiple failure attempts spread over some period of time should the host declare the interface 'non-viable'. The decoder may be performing a time-intensive function which precludes talking to the host, resulting in the failure of the HOST CTS to go active.

Only one message per HOST RTS/CTS handshake is recognized, so if the host sends two (or more) messages without changing the state of the HOST RTS line, the decoder ignores the second (and subsequent) messages. Once the number of characters indicated by the host is received (plus the two bytes required for a checksum), further characters are ignored. The host may briefly toggle the state of the RTS line during this transaction, as long as the inter-character timeout is not exceeded.

While the host is not required to continuously stream characters, the maximum character-to-character delay cannot exceed the host Intercharacter Timeout parameter. If this timeout is exceeded, the decoder waits for the host to de-assert HOST RTS. Once the HOST RTS is in-active, the decoder issues a NAK message, which causes the host to re-try the entire message.

Host Transmission Sample Code

```
boolean host_transmit()
    request permission to send  [HOST RTS active]
    WHILE (the last character has not been sent) DO
        set up serial response time out
        WHILE (permission has not been granted [HOST CTS is inactive]) DO
            IF (serial response time out expired) THEN
                remove request to send   /* transmit failed */
                /* calling function may retry transmit */
                RETURN (FALSE)
            END
        END
        transmit a character
    END
    remove request to send [HOST RTS inactive]
    RETURN (TRUE)   /* transmit successful */
```

Decoder Reception of Host Transmission

The decoder constantly monitors the CTS line for activity:

1. When CTS is made active by the host, the decoder responds by making the RTS line active, even if the decoder was attempting to transmit, deferring to host action.
2. The decoder monitors the RXD line and receives the characters comprising the message.
3. When all characters are received (length of message plus the two byte checksum) the decoder acts upon the message/command and ignores further characters.
4. When the decoder detects that CTS is inactive, it makes RTS inactive and transmits the response.

If the host exceeds the inter-character timeout delay, the decoder waits for de-assertion of the CTS line to send a NAK message to the host.

There are two cases where the host may make the CTS line inactive before the message is complete. If the host did not send any characters, there is no message, so the decoder does not reply. If, however, the first character is sent, an incomplete message results in a NAK.

Decoder Reception Sample Code

This pseudo code assumes that the receiving is enabled.

```
void decoder_receive()
    IF (host is requesting to send [CTS active]) THEN
        give host permission to send [RTS active]
        WHILE (no characters received) DO
            IF (host not requesting to send [CTS Inactive]) THEN
                remove host's permission to send
                RETURN   /* NULL xmit - do not NAK */
            END
        END
        set up host character time out
        WHILE (not timed out AND not the last character) DO
            IF (a character was received) THEN
                reset host character time out
            END
        END
        WHILE (host is requesting to send [CTS active]) DO
            wait   /* for host to end handshake */
        END
        remove host's permission to send [RTS inactive]
        process received message and prepare response
    END
    RETURN
```

Decoder Transmission to Host

The decoder is sometimes required to send data to the host. This transaction is more complicated than the host transmission.

The decoder first ensures that the host is not attempting to send by examining the state of CTS. If the host is attempting to send, the decoder defers transmission and permits the host to send as described previously. The response to the host transmission is given by the decoder before the transmission pending. For example, if the decoder is sending decode data (as a result of scanning a bar code) and the host interrupts with a beep the beeper message, the beeper message is acted upon and acknowledged prior to transmitting the decode data message.

The host may temporarily hold off the decoder transmission by making the HOST RTS line active until it is ready to receive. If the host does not send any characters, the decoder resumes transmission when the HOST RTS line becomes inactive. If, however, the host sends one or more characters, the decoder resends the entire packet from the start when the HOST RTS line becomes inactive.

If the host is not trying to send, the decoder sends one character of the transmission on the TXD line. The decoder again checks the state of the CTS line, so the host may interrupt on a character-by-character basis. While the host should try to avoid interrupting the decoder transmission, bus collisions are possible and must defer to the host.

Decoder Transmission Sample Code

```
boolean decoder_xmit()
    /* insure that the host is not trying to send something */
    IF (host is requesting to send [CTS active]) THEN
        /* host attempt to send…grant permission */
        enable receiving
        give host permission to send [RTS active]
        set up serial response time out
        WHILE (host is still requesting to send [CTS active]) DO
            IF (character was received OR timed out) THEN
                /* abort transmission…try again later */
                RETURN (FALSE)
            END
        END
        disable receiving
        remove host's permission to send [RTS inactive]
    END
    WHILE (there are characters to send) DO
        IF (host is not requesting to send [CTS inactive]) THEN
            send next character
        ELSE
            /* the host is either holding us off or beginning  */
            /* a transmission to the decoder                   */
            enable receiving
            give host permission to send [RTS active]
            WHILE (host is still requesting to send [CTS active]) DO
                IF (character was received) THEN
                    /* beginning of a host transmission   */
                    /* abort transmission…try again later */
                    RETURN (FALSE)
                END
            END
            /* by virtue of code flow to here the host */
            /* was merely holding off the decoder      */
            disable receiving
            remove host's permission to send [RTS inactive]
        END   /* resume transmit */
    END
    RETURN (TRUE)
```

Host Reception of Decoder Transmission

The host must be ready to receive data from the decoder anytime the host is not transmitting. The host can temporarily hold off the decoder transmission by keeping the HOST RTS line asserted. The host can also interrupt an incoming message by asserting HOST RTS.

Since the decoder does not change the state of the HOST CTS line when transmitting, the host is aware of a decoder transmission only when it receives the first character. For each subsequent character, the host sets up an intercharacter timeout. If this timeout has not expired and the host has not received the last character of the transmission, the host receives the next character.

Host Reception Sample Code

```
void host_receive()
    IF (a character has been received) THEN
        set up intercharacter time out
        WHILE (not timed out AND not the last character) DO
            IF (host can receive right now) THEN
                deassert HOST RTS   /* in case host was holding off decoder */
                IF (a character was received) THEN
                    reset intercharacter time out
                END
            ELSE
                IF (host wants to send to decoder) THEN
                    RETURN   /* so host can transmit */
                ELSE
                    /* host does not want to send but needs some time */
                    assert request to send [HOST RTS active]   /*hold off
                    decoder */
                    set up new intercharacter time-out
                END
            END
        END
        process received message and prepare response
        RETURN
    END
    RETURN
```

Software Handshaking

Software handshaking provides an ACK/NAK response for commands that do not have a natural response. For example, the command “tell me your parameters” is followed by the response “my parameters are X”. A “start a decode session” command, however, has no natural response, so software handshaking provides an ACK/NAK response.

ACK/NAK handshaking may be enabled (default) or disabled. If enabled, all packeted messages must have a response in the form of an ACK, or a NAK of various types. We recommend this handshaking remain enabled to provide feedback to the host.

Raw decode data and the WAKEUP command do not use ACK/NAK handshaking since they are not packeted data.

Transfer of Decode Data

The Decode Data Packet Format parameter controls how decode data is sent to the host. When this parameter is enabled, the data is sent in a DECODE_DATA packet. When disabled, data is transmitted as raw ASCII data.

✓ ***NOTE*** When decode data is transmitted as raw ASCII data, ACK/NAK handshaking does not apply even if it is enabled.

ACK/NAK Enabled and Packeted Data

The decoder sends a DECODE_DATA message after a successful decode. The decoder waits for a programmable time-out for a CMD_ACK response. If it does not receive the response, the decoder tries to send two more times before issuing a host transmission error. If the decoder receives a CMD_NAK from the host, it may attempt a retry depending on the cause field of the CMD_NAK message.

ACK/NAK Enabled and Unpacketed ASCII Data

The decoder sends a RAW DATA message after a successful decode. No ACK/NAK handshaking occurs even though it is enabled because data is unpacketed.

ACK/NAK Disabled and Decode Data of Any Type

The decoder sends the decode data. No response is expected from the host since ACK/NAK handshaking is disabled. The security of this transaction is not guaranteed.

Unsolicited ACK/NAK

An unsolicited ACK or NAK is an unexpected message, and is ignored since the decoder can not interpret the message.

CMD_NAK Cancel is a special case of transmission by the host, so is considered a solicited message. This message halts (and discards) an unwanted transmission by the decoder. For example, a large image sent by the decoder to the host is typically multi-packeted, and consists of a large transmission. The host may cancel this by transmitting a CMD_NAK Cancel.

Expected Responses

The following tables list allowable decoder and host responses.

Table 1-1 *Decoder Responses to Host Transmission*

Host Transmission	Allowable Decoder Responses
AIM_OFF	CMD_ACK / CMD_NAK
AIM_ON	CMD_ACK / CMD_NAK
BATCH_REQUEST	BATCH_DATA / CMD_NAK
BEEP	CMD_ACK / CMD_NAK
CAPABILITIES_REQUEST	CAPABILITIES_REPLY
CHANGE_ALL_CODE_TYPES	CMD_ACK/CMD_NAK
CMD_ACK	None
CMD_ACK_ACTION	None
CMD_NAK	None
CUSTOM_DEFAULTS	CMD_ACK / CMD_NAK
FLUSH_QUEUE	CMD_ACK / CMD_NAK
ILLUMINATION_OFF	CMD_ACK / CMD_NAK
ILLUMINATION_ON	CMD_ACK / CMD_NAK
IMAGER_MODE	CMD_ACK / CMD_NAK
LED_OFF	CMD_ACK / CMD_NAK
LED_ON	CMD_ACK / CMD_NAK
PAGER_MOTOR_ACTIVATION	CMD_ACK / CMD_NAK
PARAM_DEFAULTS	CMD_ACK / CMD_NAK
PARAM_REQUEST	PARAM_SEND
PARAM_SEND	CMD_ACK / CMD_NAK
REQUEST_REVISION	REPLY_REVISION
SCAN_DISABLE	CMD_ACK / CMD_NAK
SCAN_ENABLE	CMD_ACK / CMD_NAK
SLEEP	CMD_ACK / CMD_NAK
SSI_MGMT_COMMAND	SSI_MGMT_COMMAND or CMD_NAK

Table 1-1 *Decoder Responses to Host Transmission (Continued)*

Host Transmission	Allowable Decoder Responses
START_SESSION	CMD_ACK / CMD_NAK Note that once the decoder gathers the appropriate data, it sends this data unsolicited.
STOP_SESSION	CMD_ACK / CMD_NAK
WAKEUP	None

Table 1-2 *Host Responses to Decoder Transmission*

Decoder Transmission	Allowable Host Responses
CAPABILITIES_REPLY	None
CMD_ACK	None
CMD_NAK	None
DECODE_DATA	CMD_ACK / CMD_NAK *
EVENT	CMD_ACK / CMD_NAK *
IMAGE_DATA	CMD_ACK / CMD_NAK *
PARAM_SEND	None
REPLY_REVISION	None
VIDEO_DATA	CMD_ACK / CMD_NAK
*** Multipacketed data; the host may ACK/NAK only the last packet of a multi-packeted message. Intermediate packets get no response. Intermediate packets always have the continuation bit set (1). The last packet has the continuation bit cleared (0). See *Multipacketing on page 1-9* for multi-packeting options.**	

Message Packets

All communications between the host and the decoder are exchanged in the form of packets. A packet is a collection of bytes framed by the proper SSI protocol formatting bytes. The maximum length of a packet is 257 bytes, consisting of a checksum (two bytes), a header (four bytes), and up to 251 characters of data. Note that the length field in the header does NOT include the length of the checksum, but DOES include the length of the header itself.

Multipacketing

SSI supports multiple packets for one message for cases when size is insufficient to transfer a complete message. Bit1 of the status byte in the message header is set to one for all packets except the last to indicate another packet is to follow. In the last packet, this bit is set to zero. The host must re-assemble these packets into one message. The decoder sends each packet in order.

Multipacketing, Option 1

The host ACK/NAKs each packet in a strict transaction-based method. If a CMD_NAK checksum message occurs, the decoder retransmits the packet that was NAK'd.

Multipacketing, Option 2

The decoder sends data packets continuously, with no ACK/NAK handshaking to pace the transmission. If the host is overrun, it can use hardware handshaking to temporarily hold off the decoder.

At the end of transmission, the decoder waits for a CMD_ACK or CMD_NAK. The host acknowledges the transmission, or requests the entire multi-packet message be resent from the first packet.

The host may stop the transmission from the decoder at any time by asserting hardware handshaking. The host then transmits either CMD_NAK, resend to instruct the decoder to resend the entire message, or CMD_NAK, cancel to cancel the transmission completely. Note that because these NAKs are unexpected, interruption of transmission must occur first.

Multipacketing, Option 3

Option 3 is similar to Option 2, except there is a programmable inter-packet delay. The decoder waits a programmed period after sending each packet. This may be faster than Option 1 because the host receives data on a periodic basis without attempting to send the ACK/NAK, but slower than Option 2 since the inter-packet delay transpires on each packet. However, it helps prevent host receiver overrun.

Packet Format

The general packet format for SSI messages is as follows:

Length	Opcode	Message Source	Status	Data....	Checksum

Table 1-3 *Field Descriptions*

Field Name	Format	Sub-Field	Meaning
Length	1 Byte	Length	Length of message not including the check sum bytes. Maximum value is 0xFF.
Opcode	1 Byte	See *SSI Command Lists on page 2-1*.	Identifies the type of packet data sent.
Message Source	1 Byte	0 = Decoder, 04 = Host	Identifies where the message is coming from.
Note: The checksum is a 2 byte checksum and must be sent as HIGH BYTE followed by LOW BYTE.			

Table 1-3 *Field Descriptions (Continued)*

Field Name	Format	Sub-Field	Meaning
Status	Bit 0	Retransmit	0 = First time packet is sent 1 = Subsequent transmission attempts
	Bit 1	Continuation Bit	0 = Last frame of a multipacket message 1 =Intermediate packet of a multipacket message
	Bit 2	Reserved	Always set to zero
	Bit 3	Change Type (applies to parameters)	0 = Temporary change 1 = Permanent change
	Bits 4 - 7		Unused bits must be set to 0.
Data...	Variable number of bytes	See individual sections for details.	
Checksum	2 Bytes	2s complement sum of message contents excluding checksum.	Checksum of message formatted as HIGH BYTE LOW BYTE
Note: The checksum is a 2 byte checksum and must be sent as HIGH BYTE followed by LOW BYTE.			

Chapter 2 SSI Commands

Introduction

This chapter describes each available SSI command, including field descriptions and host and decoder requirements.

SSI Command Lists

The following table lists the available SSI commands alphabetically.

Table 2-1 *SSI Commands*

Name	Type	Opcode	Description	Page
ABORT_MACRO_PDF	H	0x11	Terminates MacroPDF sequence and discards segments.	*2-6*
AIM_OFF	H	0xC4	Deactivates aim pattern.	*2-7*
AIM_ON	H	0xC5	Activates aim pattern.	*2-8*
BATCH_DATA	D	0xD6	Transmits stored decode data.	*2-10*
BATCH_REQUEST	H	0xD5	Requests stored decode data.	*2-10*
BEEP	H	0xE6	Sounds the beeper.	*2-10*
CAPABILITIES_REQUEST	H	0xD3	Requests commands which decoder will perform.	*2-13*
CAPABILITIES_REPLY	D	0xD4	Lists commands which decoder will perform.	*2-14*
CHANGE_ALL_CODE_TYPES	H	0xC9	Enables / Disables all code types.	*2-19*
CMD_ACK	H/D	0xD0	Positive acknowledgment of received packet.	*2-20*
Note: D = Decoder, H = Host, H/D = Host/Decoder				

Table 2-1 *SSI Commands (Continued)*

Name	Type	Opcode	Description	Page
CMD_ACK_ACTION	H	0xD8	This is a positive acknowledgment of a received packet and can be used in place of the CMD_ACK command to allow users to control the beeper, pager motor (i.e., vibration feedback) and LEDs after receiving decoded data or any other SSI command. **Note**: This command in not supported by all scanners.	*2-22*
CMD_NAK	H/D	0xD1	Negative acknowledgment of received packet.	*2-24*
CUSTOM_DEFAULTS	H	0x12	Host command to update Custom Defaults Buffer.	*2-27*
DECODE_DATA	D	0xF3	Decode data in SSI packet format.	*2-28*
EVENT	D	0xF6	Event indicated by associated event code.	*2-41*
FLUSH_MACRO_PDF	H	0x10	Terminates MacroPDF sequence and transmits captured segments.	*2-43*
FLUSH_QUEUE	H	0xD2	Tells the decoder to eliminate all packets in its transmission queue.	*2-44*
ILLUMINATION_OFF	H	0xC0	Deactivates Illumination	*2-45*
ILLUMINATION_ON	H	0xC1	Activates Illumination.	*2-46*
IMAGE_DATA	D	0xB1	Data comprising the image.	*2-47*
IMAGER_MODE	H	0xF7	Commands imager into operational modes.	*2-49*
LED_OFF	H	0xE8	Extinguishes LEDs.	*2-50*
LED_ON	H	0xE7	Activates LED output.	*2-51*
PAGER_MOTOR_ACTIVATION	H	0xCA	Actuates the vibration feedback.	*2-52*
PARAM_DEFAULTS	H	0xC8	Sets parameter default values.	*2-53*
PARAM_REQUEST	H	0xC7	Requests values of certain parameters.	*2-54*
PARAM_SEND	H/D	0xC6	Sends parameter values.	*2-57*
REPLY_REVISION	D	0xA4	Replies to REQUEST_REVISION with decoder's software/hardware configuration.	*2-59*
REQUEST_REVISION	H	0xA3	Requests the decoder's configuration.	*2-60*
SCAN_DISABLE	H	0xEA	Prevents the operator from scanning bar codes.	*2-61*
SCAN_ENABLE	H	0xE9	Permits bar code scanning.	*2-62*
SLEEP	H	0xEB	Requests to place the decoder into low power.	*2-63*

Note: D = Decoder, H = Host, H/D = Host/Decoder

Table 2-1 *SSI Commands (Continued)*

Name	Type	Opcode	Description	Page
SSI_MGMT_COMMAND	H/D	0x80	RSM command to read/set some scanner attributes.	*2-64*
START_SESSION	H	0xE4	Tells decoder to attempt to decode a bar code.	*2-65*
STOP_SESSION	H	0xE5	Tells decoder to abort a decode attempt.	*2-66*
VIDEO_DATA	D	0xB4	Data comprising the video.	*2-67*
WAKEUP	H	N/A	Wakes up decoder after it's been powered down.	*2-69*
Note: D = Decoder, H = Host, H/D = Host/Decoder				

Table 2-2 lists the SSI commands by Opcode.

Table 2-2 *SSI Commands by Opcode*

Opcode	Name
0x10	FLUSH_MACRO_PDF
0x11	ABORT_MACRO_PDF
0x12	CUSTOM_DEFAULTS
0x80	SSI_MGMT_COMMAND
0xA3	REQUEST_REVISION
0xA4	REPLY_REVISION
0xB0	Reserved
0xB1	IMAGE_DATA
0xB4	VIDEO_DATA
0xC0	ILLUMINATION_OFF
0xC1	ILLUMINATION_ON
0xC4	AIM_OFF
0xC5	AIM_ON
0xC6	PARAM_SEND
0xC7	PARAM_REQUEST
0xC8	PARAM_DEFAULTS
0xC9	CHANGE_ALL_CODE_TYPES
0xCA	PAGER_MOTOR_ACTIVATION
0xD0	CMD_ACK
0xD1	CMD_NAK
0xD2	FLUSH_QUEUE
0xD3	CAPABILITIES_REQUEST
0xD4	CAPABILITIES_REPLY
0xD5	BATCH_REQUEST
0xD6	BATCH_DATA
0xD8	CMD_ACK_ACTION
0xE4	START_SESSION
0xE5	STOP_SESSION
0xE6	BEEP

Table 2-2 *SSI Commands by Opcode (Continued)*

Opcode	Name
0xE7	LED_ON
0xE8	LED_OFF
0xE9	SCAN_ENABLE
0xEA	SCAN_DISABLE
0xEB	SLEEP
0xF3	DECODE_DATA
0xF6	EVENT
0xF7	IMAGER_MODE
N/A	WAKEUP

ABORT_MACRO_PDF

Description

Terminates MacroPDF sequence and discards all captured segments.

Table 2-3 *Packet Format - ABORT_MACRO_PDF*

Length	Opcode	Message Source	Status	Checksum
04h	11h	04h		

Table 2-4 *Field Descriptions - ABORT_MACRO_PDF*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	11h	1 Byte	Identifies this Opcode type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission **Bit 1: Continuation** 0 = Last packet of a multipacket message 1 = Intermediate packet **Bit 2: Reserved** Always 0 **Bit 3: Parameter Change Type (for parameters)** 0 = Temporary change 1 = Permanent change
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

Host Requirements

None.

Decoder Requirements

The decoder terminates the current MacroPDF sequence and discards all captured MacroPDF segments.

AIM_OFF

Description

Turns off aiming pattern.

Table 2-5 *Packet Format - AIM_OFF*

Length	Opcode	Message Source	Status	Checksum
04h	C4h	04h		

Table 2-6 *Field Descriptions - AIM_OFF*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	C4h	1 Byte	Identifies this Opcode type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission **Bit 1: Continuation** 0 = Last packet of a multipacket message 1 = Intermediate packet **Bit 2: Reserved** Always 0 **Bit 3: Parameter Change Type (for parameters)** 0 = Temporary change 1 = Permanent change
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

Host Requirements

This command applies only to decoders that support an aim pattern.

Decoder Requirements

The decoder turns off the aim pattern, and responds with a CMD_ACK (if ACK/NAK handshaking is enabled).

If the aim pattern is not supported, the decoder responds with NAK_DENIED (if ACK/NAK handshaking is enabled).

AIM_ON

Description

Turns on aiming pattern.

Table 2-7 *Packet Format - AIM_ON*

Length	Opcode	Message Source	Status	Checksum
04h	C5h	04h		

Table 2-8 *Field Descriptions - AIM_ON*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	C5h	1 Byte	Identifies this Opcode type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission **Bit 1: Continuation** 0 = Last packet of a multipacket message 1 = Intermediate packet **Bit 2: Reserved** Always 0 **Bit 3: Parameter Change Type (for parameters)** 0 = Temporary change 1 = Permanent change
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

Host Requirements

This command applies only to decoders which support an aim pattern.

Decoder Requirements

The decoder turns on the aim pattern, and responds with a CMD_ACK (if ACK/NAK handshaking is enabled).

If the aim pattern is not supported, the decoder responds with NAK_DENIED (if ACK/NAK handshaking is enabled).

The Aim Duration parameter controls the amount of time the aiming pattern stays on during a trigger pull. The valid values for this parameter are 0 - 99, which equal 0.1 to 9.9 seconds in 100 msec increments. Table 2-9 lists Aim mode behavior in various situations.

Table 2-9 *Aim Mode*

Command Sequence	Action Performed	Aim Duration Parameters
AIM_ON	Turns on the aiming pattern indefinitely.	aim duration = 0
AIM_OFF	Turns off the aiming pattern.	aim duration = 0
AIM_ON, START_DECODE	Turns on the aiming pattern, when START_DECODE received turns on scan pattern and begins decoding.	aim duration = 0
AIM_ON,AIM_OFF, START_DECODE	Turns on aiming pattern, turns off aiming pattern, turns on scan pattern and begins decoding.	aim duration = 0
START_DECODE	Turns on aiming pattern for aim duration time, turns on scan pattern and begins decoding.	aim duration > 0

BEEP

Description

Sounds the beeper.

Table 2-10 *Packet Format - BEEP*

Length	Opcode	Message Source	Status	Beep Code	Checksum
05h	E6h	04h			

Table 2-11 *Field Descriptions - BEEP*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	E6h	1 Byte	Identifies this Opcode type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission **Bit 1: Continuation** 0 = Last packet of a multipacket message 1 = Intermediate packet **Bit 2: Reserved** Always 0 **Bit 3: Parameter Change Type (for parameters)** 0 = Temporary change 1 = Permanent change
Beep Code	See Table 2-12.	1 Byte	Number that identifies a beep sequence.
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

This Opcode instructs the receiver to sound the beep sequence indicated by the *Beep Code* field.

For Table 2-12, *Duration* is the length of a sound, *Pitch* is the pitch of the sound, and *Number of Beeps* indicates the number of times a beep pitch is repeated at the specified duration.

Table 2-12 *Beep Code Definitions*

Beep Code	Duration	Pitch	Number of Beeps
00h	Short	High	1
01h	Short	High	2
02h	Short	High	3
03h	Short	High	4
04h	Short	High	5
05h	Short	Low	1
06h	Short	Low	2
07h	Short	Low	3
08h	Short	Low	4
09h	Short	Low	5
0Ah	Long	High	1
0Bh	Long	High	2
0Ch	Long	High	3
0Dh	Long	High	4
0Eh	Long	High	5
0Fh	Long	Low	1
10h	Long	Low	2
11h	Long	Low	3
12h	Long	Low	4
13h	Long	Low	5
14h	Fast Warble	High-Low-High-Low	4
15h	Slow Warble	High-Low-High-Low	4
16h	Mix 1	High-Low	2
17h	Mix 2	Low-High	2
18h	Mix 3	High-Low-High	3
19h	Mix 4	Low-High-Low	3
1Ah	Long	High-High-Low-Low	4

Table 2-12 *Beep Code Definitions (Continued)*

Beep Code	Duration	Pitch	Number of Beeps
1Bh	Short	High-High-High	13
1Ch	High Click	High	1
1Dh	Low Click	Low Click	1

Host Requirements

The host sends this command to cause the decoder to beep. The host may also send these beep codes as part of the PARAM_SEND directive.

Decoder Requirements

When the decoder receives this command, it beeps the sequence provided in the BEEP directive. If ACK/NAK handshaking is enabled, the decoder ACKs if a valid beep code is requested. Otherwise it sends CMD_NAK, host directive denied.

CAPABILITIES_REQUEST

Description

Requests the decoder’s serial capabilities.

Table 2-13 *Packet Format - CAPABILITIES_REQUEST*

Length	Opcode	Message Source	Status	Checksum
04h	D3h			

Table 2-14 *Field Descriptions - CAPABILITIES_REQUEST*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	D3h	1 Byte	Identifies this Opcode type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission **Bit 1: Continuation** 0 = Last packet of a multipacket message 1 = Intermediate packet **Bit 2: Reserved** Always 0 **Bit 3: Parameter Change Type** (for parameters) 0 = Temporary change 1 = Permanent change
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

Host Requirements

The host transmits this message to request the serial capabilities of the decoder system.

Decoder Requirements

Upon receipt of this command, the decoder responds with the CAPABILITIES_REPLY message.

CAPABILITIES_REPLY

Description

Decoder details the serial capabilities.

Table 2-15 *Packet Format - CAPABILITIES_REPLY*

Length	Opcode	Message Source	Status	Data	Checksum
04h	D4h				

Table 2-16 *Field Descriptions - CAPABILITIES_REPLY*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	D4h	1 Byte	Identifies this Opcode type.
Message Source	0 = Decoder	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission **Bit 1: Continuation** 0 = Last packet of a multipacket message 1 = Intermediate packet **Bit 2: Reserved** Always 0 **Bit 3: Parameter Change Type** (for parameters) 0 = Temporary change 1 = Permanent change
Data			*Table 2-17 on page 2-15*.
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

Host Requirements

The host must not CMD_ACK or CMD_NAK this message, as this is a natural response to the CAPABILITIES_REQUEST message.

Decoder Requirements

The decoder sends this message upon receipt of the CAPABILITIES_REQUEST message.

Table 2-17 *Data Fields*

Field	Size	Description		Supported
Baud Rates Supported	2 Bytes Bit mapped			1 = Supported 0 = Not Supported
		0	300 Baud	
		1	600 Baud	
		2	1200 Baud	
		3	2400 Baud	
		4	4800 Baud	
		5	9600 Baud	
		6	19200 Baud	
		7	28800 Baud	
		8	38400 Baud	
		9	57600 Baud	
		10	115200 Baud	
		11	230400 Baud	
		12	460800 Baud	
		13	921600 Baud	
		14	Reserved	
		15	Reserved	
Misc Serial Parameters	1 Byte Bit Mapped			1 = Supported 0 = Not Supported
		0	Odd Parity	
		1	Even Parity	
		2	Parity None	
		3	Check Parity	
		4	Do Not Check Parity	
		5	One Stop Bit	
		6	Two Stop Bits	

Table 2-17 *Data Fields (Continued)*

Field	Size	Description		Supported
Multi Packet Options	1 Byte Bit Mapped			1 = Supported 0 = Not Supported
		0	Option 1	
		1	Option 2	
		2	Option 3	
Command List	1 Byte per Command	In this sequential list, the decoder details the commands it supports. For example, imagers support video commands, while laser-based decoders do not. Commands associated with video mode will not appear in the list for laser-based decoders, but will for imagers.		

BATCH_DATA

Description

Transmits stored decode data as a reply to the BATCH_REQUEST command. Scanners that can not store scans send a NAK DENIED or NAK BAD CONTEXT response.

Table 2-18 *Packet Format - BATCH_DATA*

Length	Opcode	Message Source	Status	Bar Code String(s)	Checksum
	D6h	00h			

Table 2-19 *Field Descriptions - BATCH_DATA*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	D6h	1 Byte	Identifies this Opcode type.
Message Source	0 = Decoder	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission **Bit 1: Continuation** 0 = Last packet of a multipacket message 1 = Intermediate packet **Bit 2: Reserved** Always 0 **Bit 3: Parameter Change Type** (for parameters) 0 = Temporary change 1 = Permanent change
Bar Code String(s)		Variable	Data from a bar code scan in the bar code string format. Multiple instances of this field may be repeated in one message. For multipacket messages, a partial string may be sent, continued in the next packet.
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

Bar Code String

Each string is stored in this message in three components: Size, Type, and Scan Data. To specify a bar code string these components are combined in the order specified.

- Size: One byte value that contains the length of the Scan Data component
- Type: One byte value that indicates the bar code type of the data scanned:
  - A = UPC/EAN
  - B = Code 39
  - D = EAN 128
  - F = Interleaved 2 of 5
  - G = Discrete 2 of 5
  - K = Code 128
  - N = Coupon code
  - W = Web Code
- Scan Data: One or more bytes of the scanner bar code data in ASCII.

BATCH_REQUEST

Description

Requests stored decode data from the scanner. The scanner responds with the BATCH_DATA command. Scanners that can not store scans respond with a NAK DENIED or NAK BAD CONTEXT.

Table 2-20 *Packet Format - BATCH_REQUEST*

Length	Opcode	Message Source	Status	Bar Code String(s)	Checksum
	D5h	04h			

Table 2-21 *Field Descriptions - BATCH REQUEST*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	D5h	1 Byte	Identifies this Opcode type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission **Bit 1: Continuation** 0 = Last packet of a multipacket message 1 = Intermediate packet **Bit 2: Reserved** Always 0 **Bit 3: Parameter Change Type** (for parameters) 0 = Temporary change 1 = Permanent change
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

CHANGE_ALL_CODE_TYPES

Description

This command enables and disables all code types.

Table 2-22 *Packet Format - BATCH_REQUEST*

Length	Opcode	Message Source	Status	Change Value	Bar Code String(s)	Checksum
05h	C9h	04h				

Table 2-23 *Field Descriptions - BATCH REQUEST*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	C9h	1 Byte	Identifies this Opcode type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission **Bit 3: Parameter Change Type** (for parameters) 0 = Temporary change 1 = Permanent change
Change Value		1 Byte	0 = Disable All Code Types 1 = Enable All Code Types
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

CMD_ACK

Description

Positive acknowledgment of received packet.

Table 2-24 *Packet Format - CMD_ACK*

Length	Opcode	Message Source	Status	Checksum
04h	D0h			

Table 2-25 *Field Descriptions - CMD_ACK*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	D0h	1 Byte	Identifies this Opcode type.
Message Source	0 = Decoder 4 = Host	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission **Bit 1: Continuation** 0 = Last packet of a multipacket message 1 = Intermediate packet **Bit 2: Reserved** Always 0 **Bit 3: Parameter Change Type** (for parameters) 0 = Temporary change 1 = Permanent change
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

This message is sent to the SSI packet transmitter when the received packet passes the checksum check and no negative acknowledgment conditions apply (see *CMD_NAK on page 2-24*). If the data is in response to a command (e.g., PARAM_REQUEST, REQUEST_REVISION, etc.), no ACK is sent.

✓ ***NOTE*** ACK/NAK handshaking can be disabled, although we recommend it remain enabled.

✓ ***NOTE*** DO NOT respond to a valid ACK or NAK message.

Host Requirements

A CMD_ACK or response data must be sent by the decoder within the programmable Serial Response Time-out to acknowledge receipt of all messages, unless noted otherwise in the message description section. If the host sends data and does not receive a response within the programmable serial response time-out, it should resend the message (with the retransmit status bit set) before declaring a failure. The host should limit the number of retries.

Decoder Requirements

A CMD_ACK or response data must be sent by the decoder within the programmable Serial Response Time-out to acknowledge receipt of all messages, unless noted otherwise in the message description section. If the decoder does not receive an ACK within this time period, it sends the previous message again (retry). The decoder retries two more times (with the retransmit status bit set) before declaring a transmit error.

CMD_ACK_ACTION

Description

This is the positive acknowledgment of a received packet. This command can be used in place of the standard SSI CMD_ACK to control the beeper, pager motor and LEDs.

✓ ***NOTE*** This command in not supported by all scanners.

Table 2-26 *Packet Format - CMD_ACK_ACTION*

Length	Opcode	Message Source	Status	Beep Command	Pager Motor	LED On	LED Duration	Checksum
08h	D8h	04h						

Table 2-27 *Field Descriptions - CMD_ACK_ACTION*

Field Name	Format	Size	Description
Length	Length of message not including the checksum.	1 Byte	Length of field.
Opcode	D8h	1 Byte	Identifies this Opcode type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission **Bit 1: Continuation** 0 = Last packet of a multipacket message 1 = Intermediate packet **Bit 2: Reserved** Always 0 **Bit 3: Parameter Change Type** (for parameters) 0 = Temporary change 1 = Permanent change
Beep Command	0xFF = Do nothing	1 Byte	Beep code. See *Beep Code Definitions on page 2-11*.
Pager Motor (PAGER_MOTOR_ACTIVATION)	0 = Do nothing	1 Byte	Pager Motor. See *PAGER_MOTOR_ACTIVATION on page 2-52*. Integer number from 0 to FEh (i.e., 0 to 254 decimal) of 10 ms increments to vibrate the pager motor. For example, 01h = motor vibrates for 10 ms, 02h motor vibrates for 20 ms, etc.

Table 2-27 *Field Descriptions - CMD_ACK_ACTION (Continued)*

Field Name	Format	Size	Description
LED_ON Selection	0 = Do nothing	1 Byte	**Bits 0 - 7** correspond to different LEDs on the product. Set each bit to '1' to turn on the corresponding LED; set *LED_ON Duration* to the amount of time LEDs should remain on. Example of LEDs on the product: • **Bit 0 =** Decode LED. • **Bit 1 =** Red LED. See *LED_ON on page 2-51* for more information. Also refer to the Product Reference Guide (PRG) for further information about the LEDs supported via SSI on the device.
LED_ON Duration		1 Byte	This byte field is an integer number (0 - 254 decimal, 00h to FEh) used in conjunction with the *LED_ON Selection* byte to control the LED On duration. The duration is controlled in increments of 10 ms (i.e., 1 - 10 ms, 2 - 20 ms etc.). **Note:** If this field is 0, and any of the LED bits are set to '1' in the LED_ON *Selection* field, then the LEDs remain on until an LED_OFF command is sent.
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

This message is sent to the SSI packet transmitter when the received packet passes the checksum check, and no negative acknowledgment conditions apply (see *CMD_NAK on page 2-24*). If the data is in response to a command (e.g., PARAM_REQUEST, REQUEST_REVISION, etc.), no ACK is sent.

✓ ***NOTES*** 1. ACK/NAK handshaking can be disabled, although it is recommended it remain enabled.

2.DO NOT respond to a valid ACK or NAK message.

CMD_NAK

Description

Negative acknowledgment of received packet.

Table 2-28 *Packet Format - CMD_NAK*

Length	Opcode	Message Source	Status	Cause	Checksum
05	D1h				

Table 2-29 *Field Descriptions - CMD_NAK*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	D1h	1 Byte	Identifies this Opcode type.
Message Source	0 = Decoder 4 = Host	1 Byte	Identifies where the message is coming from.

Table 2-29 *Field Descriptions - CMD_NAK (Continued)*

Field Name	Format	Size	Description
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission **Bit 1: Continuation** 0 = Last packet of a multipacket message 1 = Intermediate packet **Bit 2: Reserved** Always 0 **Bit 3: Parameter Change Type** (for parameters) 0 = Temporary change 1 = Permanent change
Cause	Reason code	1 Byte	Identifies the reason the NAK occurred: 0 = Reserved 1 = (RESEND) Checksum failure 2 = (BAD_CONTEXT) Unexpected or Unknown message 3 = Reserved 4 = Reserved 5 = Reserved 6 = (DENIED) Host Directive Denied 7 = Reserved 8 = Reserved 9 = Reserved 10 = (CANCEL) Undesired Message
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

This message is sent when the received packet fails the checksum verification or some error occurred while handling the message.

✓ ***NOTE*** ACK/NAK handshaking can be disabled, although we recommend it remain enabled.

✓ ***NOTE*** DO NOT respond to a valid ACK or NAK message.

NAK types supported by the decoder are listed in Table 2-30.

Table 2-30 *Decoder-Supported NAK Types*

NAK Type	Meaning	Receiver Action
BAD_CONTEXT	Host does not recognize the command.	
CANCEL	Host does not want the message in progress.	Decoder discards the current message.
DENIED	Host is unable to comply with the requested message (e.g., beep code is out of range).	Do not send data with this message again. Developer should check values with specified values. Developer should ensure the proper character is sent, if using wake-up character.
RESEND	Checksum incorrect.	Ensure checksum is correct. Limit number of resends. Send packet again with resend bit set.

The decoder only resends a message twice. If the message has not been sent successfully at that time, the decoder declares a transmit error, and issues transmit error beeps (LOW-LOW-LOW-LOW).

CMD_NAK, cancel is a special message used when the decoder is sending a message the host does not want, for example a very large image message. The message is discarded by the decoder upon receipt of the CMD_NAK, cancel. This only affects the first queued message. Subsequent messages are not touched. If the host wants the decoder to discard all messages, the host must send a FLUSH_QUEUE message.

CUSTOM_DEFAULTS

Description

Writes or restores parameters to custom defaults.

Table 2-31 *Packet Format - CUSTOM_DEFAULTS*

Length	Opcode	Message Source	Status	Action	Checksum
05h	12h	04h			

Table 2-32 *Field Descriptions - CUSTOM_DEFAULTS*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	12h	1 Byte	Identifies this Opcode type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission **Bit 1: Continuation** 0 = Last packet of a multipacket message 1 = Intermediate packet **Bit 3: Parameter Change Type** (for parameters) 0 = Temporary change 1 = Permanent change
Action		1 Byte	0 = Write to Custom Defaults 1 = Restore Custom Defaults
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

This command writes or restores parameters to their custom default settings.

Host Requirements

The host sends this command to program or restore the product's custom default values.

Decoder Requirements

If supported by the scanner, upon receiving this command, the scanner will write the current parameter settings to the custom defaults buffer. If the restore action is requested, then the parameters are restored to their previously stored custom defaults. CMD_ACK / CMD_NAK is transmitted if handshaking is enabled.

DECODE_DATA

Description

Decode data in SSI packet format.

Table 2-33 *Packet Format - DECODE_DATA*

Length	Opcode	Message Source	Status	Bar code Type	Decode Data	Checksum
	F3h	00h				

Table 2-34 *Field Descriptions - DECODE_DATA*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	F3h	1 Byte	Identifies this Opcode type.
Message Source	0 = Decoder	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission **Bit 1: Continuation** 0 = Last packet of a multipacket message 1 = Intermediate packet **Bit 2: Reserved** Always 0 **Bit 3: Parameter Change Type** (for parameters) 0 = Temporary change 1 = Permanent change
Bar Code Type	See Table 2-37	1 Byte	Identifies the scanned data code type. 0 = Not Applicable
Decode Data	<data>	Variable	Data is decoded data including prefix and suffix sent in ASCII format.
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

This Opcode is used by the decoder when packeted data is selected to send decoded bar code data to the host. The decoded message is contained in the *Decode Data* field.

If the decoded data contains more structure than can be presented in the standard format, the Bar Code Type field is set to 0x99 to indicate the Decode Data message contains multiple packets. The format of the Decode Data field contains the actual Bar Code Type and a packeted form of decode data. For example, a packeted Decode Data message for Micro PDF417 would look like:

Table 2-35 *Packeted Decode Data Message for Micro PDF417*

Length	Opcode	Message Source	Status	Bar code Type	Decode Data	Checksum
12	F3h	00h	0	99	see below	

where the Decode Data field is broken out as follows:

Table 2-36 *Decode Data*

Actual Bar Code Type	# of Packets	Spare Byte	Byte Length of Packet #1	Data	Spare Byte	Byte Length of Packet #2	Data
1A	2	0	00 03	ABC	0	00 04	DEFG

Note that the *Packet Length* subfields consist of two bytes, where the first byte represents the high value of length x 256.

Structured Append

Structured append data for PDF417 and Micro PDF417 can be transmitted in either an unstructured format which adheres to the PDF417 specification, or a structured "smart format" using the multipacketed format above. The *Bar Code Type* field contains 0x99 and data is sent from a single structured append symbol in two Decode Data packets. The first packet contains the main bar code data, and the second contains any bar code identification enabled for transmission (e.g., the control block, optional fields, symbol terminator). Each field begins with its identifying marker codeword (e.g., \928 for control blocks, \923 for optional fields, and \922 for the symbol terminator).

Table 2-37 and Table 2-38 lists all supported code types, by code name and hex value (SSI ID). The associated hex value for each code (as required) is entered in the *Code Type* field.

✓ ***NOTE*** For multipacketed data, this code type appears in every packet.

Table 2-37 *Code Types and Identifiers*

Symbology	SSI ID	Code ID	AIM ID Letter	AIM ID Modifier
Aztec Code	0x2D	z	z	0
Aztec Rune Code	0x2E	z	z	C
Bookland	0x16	L	X	0
Chinese 2 of 5	0x72	U	X	0

Notes:
1. **E+C denotes 2 AIM IDs are transmitted: one for the UPC/EAN block; the second prefixes the extended GS1-128 data.**
2. **E+E denotes 2 AIM IDs are transmitted: the first prefixes the main UPC/EAN block; the second prefixes the supplemental block.**
3. **UPC-E, UPC-E1, and UPC-A are converted to EAN-13 for AIM ID.**

Table 2-37 *Code Types and Identifiers (Continued)*

Symbology	SSI ID	Code ID	AIM ID Letter	AIM ID Modifier
Codabar	0x02	C	F	0 (1) - standard (ABC)
Code 11	0x0C	H	H	0 (1) [2] - 1 (2) [0] check digits included
Code 128	0x03	D	C	0 (also see GS1-128)
Code 16K	0x12	X	X	0
Code 32	0x20	B	A	Same rules as for Code 39
Code 39	0x01	B	A	0 - no check digit 1 (3) - check digit included (excluded)
Code 39 Full ASCII	0x13	B	A	4 - no check digit 5 (7) - check digit included (excluded)
Code 49	0x0D	X	X	0
Code 93	0x07	E	G	0
Composite (CC-A + GS1-128)	0x51	T	See Table 2-39	
Composite (CC-A + EAN-13)	0x52	T	See Table 2-39	
Composite (CC-A + EAN-8)	0x53	T	See Table 2-39	
Composite (CC-A + GS1 DataBar Expanded)	0x54	T	See Table 2-39	
Composite (CC-A + GS1 DataBar Limited)	0x55	T	See Table 2-39	
Composite (CC-A + GS1 DataBar-14)	0x56	T	See Table 2-39	
Composite (CC-A + UPC-A)	0x57	T	See Table 2-39	
Composite (CC-A + UPC-E)	0x58	T	See Table 2-39	
Composite (CC-B + GS1-128)	0x61	T	See Table 2-39	
Composite (CC-B + EAN-13)	0x62	T	See Table 2-39	

Notes:
1. **E+C denotes 2 AIM IDs are transmitted: one for the UPC/EAN block; the second prefixes the extended GS1-128 data.**
2. **E+E denotes 2 AIM IDs are transmitted: the first prefixes the main UPC/EAN block; the second prefixes the supplemental block.**
3. **UPC-E, UPC-E1, and UPC-A are converted to EAN-13 for AIM ID.**

Table 2-37 *Code Types and Identifiers (Continued)*

Symbology	SSI ID	Code ID	AIM ID Letter	AIM ID Modifier
Composite (CC-B + EAN-8)	0x63	T	See Table 2-39	
Composite (CC-B + GS1 DataBar Expanded)	0x64	T	See Table 2-39	
Composite (CC-B + GS1 DataBar Limited)	0x65	T	See Table 2-39	
Composite (CC-B + GS1 DataBar-14)	0x66	T	See Table 2-39	
Composite (CC-B + UPC-A)	0x67	T	See Table 2-39	
Composite (CC-B + UPC-E)	0x68	T	See Table 2-39	
Composite (CC-C + GS1-128)	0x59	T	See Table 2-39	
Coupon Code	0x17	N	E+C [1]	0+1
Cue CAT Code	0x38	Q	X	0
Discrete 2 of 5	0x04	G	S	0
Data Matrix	0x1B	P00	d	4 (1) - ECC 200 with (w/o) ECI
Dotcode	0xC4	P0E		
GS1-128	0x0F	K	C	1 (2) - character 1 (2) is Function 1 (F1)
GS1 QR	0xC2	P0Q		
EAN-13	0x0B	A	E	0
EAN-13 + 2	0x4B	A	E + E[2]	0 for main block; 1 for supplemental
EAN-13 + 5	0x8B	A	E + E[2]	0 for main block; 2 for supplemental
EAN-8	0x0A	A	E	4
EAN-8 + 2	0x4A	A	E + E[2]	4 for main block; 1 for supplemental
EAN-8 + 5	0x8A	A	E + E[2]	4 for main block; 2 for supplemental
French Lottery	0x2F	X	X	0
Grid Matrix	0xC8	P0D		

Notes:
1. **E+C denotes 2 AIM IDs are transmitted: one for the UPC/EAN block; the second prefixes the extended GS1-128 data.**
2. **E+E denotes 2 AIM IDs are transmitted: the first prefixes the main UPC/EAN block; the second prefixes the supplemental block.**
3. **UPC-E, UPC-E1, and UPC-A are converted to EAN-13 for AIM ID.**

Table 2-37 *Code Types and Identifiers (Continued)*

Symbology	SSI ID	Code ID	AIM ID Letter	AIM ID Modifier
GS1 DataBar Expanded	0x32	R		
GS1 DataBar Limited	0x31	R		
GS1 DataBar-14	0x30	R		
GS1 Datamatrix	0xC1	P0G	d	2
Han Xin	0xB7	P0H	X	0
IATA	0x05	G	S	0
ISBT-128	0x19	D	C	0
ISBT-128 Concat.	0x21	D	C	4
ISSN	0x36	X	X	0
Interleaved 2 of 5	0x06	F	I	Same rules as for Code 39
Korean 2 of 5	0x73	V	X	0
Macro Micro PDF	0x9A	X	L	Same rules as for Micro PDF-417
Macro PDF-417	0x28	X	L	Same rules as for PDF-417
Macro QR Code	0x29	X	X	0
Mailmark	0xC3	P0C	X0	
Matrix 2 of 5	0x39	S	X	0
Maxicode	0x25	P02	U	1 - Mode 0, 2 or 3, without ECI 3 (1) - Extended EC with (w/o) ECI
Micro PDF	0x1A	X	L	3 - Code 128 emul: implied F1 in 1st position 4 - Code 128 emul: F1 after 1st letter/digits 5 - Code 128 emul: no implied F1
Micro PDF CCA	0x1d	X	X	0
Micro QR Code	0x2C	P01	Q	1
MSI	0x0E	J	M	0 - Modulo 10 symbol check character validated and transmitted 1 - Modulo 10 symbol check character validated but not transmitted
Multicode	0xC6	P0M		

Notes:
1. E+C denotes 2 AIM IDs are transmitted: one for the UPC/EAN block; the second prefixes the extended GS1-128 data.
2. E+E denotes 2 AIM IDs are transmitted: the first prefixes the main UPC/EAN block; the second prefixes the supplemental block.
3. UPC-E, UPC-E1, and UPC-A are converted to EAN-13 for AIM ID.

Table 2-37 *Code Types and Identifiers (Continued)*

Symbology	SSI ID	Code ID	AIM ID Letter	AIM ID Modifier
Multipacket Format	0x99	N/A	N/A	Data is packeted; SSI ID is embedded in decode data.
NW7	0x18	X	X	0
OCRB	0xA0	X	X	0
PDF-417	0x11	X	L	0 - Conforms with 1994 PDF-417 spec 1 - Backslash characters doubled 2 - Backslash characters not doubled
Planet (US)	0x1F	P04	X	
Postal (Australia)	0x23	P09	X	0
Postal (Dutch)	0x24	P08	X	0
Postal (Japan)	0x22	P05	X	0
Postal (UK)	0x27	P06	X	0
Postbar (CA)	0x26	P07	X	0
Postnet (US)	0x1E	P03	X	0
QR Code	0x1C	P01	Q	0
RFID Raw	0xE0	X	X	0
RFID URI	0xE1	X	X	0
RSS (GS1 Databar) Expanded Coupon	0xB4	R	X	0
Scanlet Webcode	0x37	W	X	0
Signature	0x69	P0X	X	0
Telepen	0xCA			
TLC-39	0x5A	T	See Table 2-39	
Trioptic	0x15	M	X	0
UDI Parsed Code	0xCC			
UK Plessey	0xC7			
UPC-A	0x08	A	E	0
UPC-A + 2	0x48	A	E + E[2]	0 for main block; 1 for supplemental

Notes:
1. **E+C denotes 2 AIM IDs are transmitted: one for the UPC/EAN block; the second prefixes the extended GS1-128 data.**
2. **E+E denotes 2 AIM IDs are transmitted: the first prefixes the main UPC/EAN block; the second prefixes the supplemental block.**
3. **UPC-E, UPC-E1, and UPC-A are converted to EAN-13 for AIM ID.**

Table 2-37 *Code Types and Identifiers (Continued)*

Symbology	SSI ID	Code ID	AIM ID Letter	AIM ID Modifier
UPC-A + 5	0x88	A	E + E[2]	0 for main block; 2 for supplemental
UPC-E [3]	0x09	A	E	0
UPC-E + 2	0x49	A	E + E[2]	0 for main block; 1 for supplemental
UPC-E + 5	0x89	A	E + E[2]	0 for main block; 2 for supplemental
UPC-E1	0x10	A	E	0
UPC-E1 + 2	0x50	A	E + E[2]	0 for main block; 1 for supplemental
UPC-E1 + 5	0x90	A	E + E[2]	0 for main block; 2 for supplemental
4State US	0x34	P0A	X	0
4State US4	0x35	P0B	X	0

Notes:
1. **E+C denotes 2 AIM IDs are transmitted: one for the UPC/EAN block; the second prefixes the extended GS1-128 data.**
2. **E+E denotes 2 AIM IDs are transmitted: the first prefixes the main UPC/EAN block; the second prefixes the supplemental block.**
3. **UPC-E, UPC-E1, and UPC-A are converted to EAN-13 for AIM ID.**

Table 2-38 *Code Types by SSI ID*

Symbology	SSI ID	Code ID	AIM ID Letter	AIM ID Modifier
Code 39	0x01	B	A	0 - no check digit 1 (3) - check digit included (excluded)
Codabar	0x02	C	F	0 (1) - standard (ABC)
Code 128	0x03	D	C	0 (also see GS1-128)
Discrete 2 of 5	0x04	G	S	0
IATA	0x05	G	S	0
Interleaved 2 of 5	0x06	F	I	Same rules as for Code 39
Code 93	0x07	E	G	0
UPC-A	0x08	A	E	0
UPC-E [3]	0x09	A	E	0

Notes:
1. **E+C denotes 2 AIM IDs are transmitted: one for the UPC/EAN block; the second prefixes the extended GS1-128 data.**
2. **E+E denotes 2 AIM IDs are transmitted: the first prefixes the main UPC/EAN block; the second prefixes the supplemental block.**
3. **UPC-E, UPC-E1, and UPC-A are converted to EAN-13 for AIM ID.**

Table 2-38 *Code Types by SSI ID (Continued)*

Symbology	SSI ID	Code ID	AIM ID Letter	AIM ID Modifier
EAN-8	0x0A	A	E	4
EAN-13	0x0B	A	E	0
Code 11	0x0C	H	H	0 (1) [2] - 1 (2) [0] check digits included
Code 49	0x0D	X	X	0
MSI	0x0E	J	M	0 - Modulo 10 symbol check character validated and transmitted 1 - Modulo 10 symbol check character validated but not transmitted
GS1-128	0x0F	K	C	1 (2) - character 1 (2) is Function 1 (F1)
UPC-E1	0x10	A	E	0
PDF-417	0x11	X	L	0 - Conforms with 1994 PDF-417 spec 1 - Backslash characters doubled 2 - Backslash characters not doubled
Code 16K	0x12			
Code 39 Full ASCII	0x13	B	A	4 - no check digit 5 (7) - check digit included (excluded)
Trioptic	0x15	M	X	0
Bookland	0x16	L	X	0
Coupon Code	0x17	N	E+C[1]	0+1
NW7	0x18	X	X	0
ISBT-128	0x19	D	C	0
Micro PDF	0x1A	X	L	3 - Code 128 emul: implied F1 in 1st position 4 - Code 128 emul: F1 after 1st letter/digits 5 - Code 128 emul: no implied F1
Data Matrix	0x1B	P00	d	4 (1) - ECC 200 with (w/o) ECI
QR Code	0x1C	P01	Q	0
Micro PDF CCA	0x1d	X	X	0
Postnet (US)	0x1E	P03	X	0

Notes:
1. **E+C denotes 2 AIM IDs are transmitted: one for the UPC/EAN block; the second prefixes the extended GS1-128 data.**
2. **E+E denotes 2 AIM IDs are transmitted: the first prefixes the main UPC/EAN block; the second prefixes the supplemental block.**
3. **UPC-E, UPC-E1, and UPC-A are converted to EAN-13 for AIM ID.**

Table 2-38 *Code Types by SSI ID (Continued)*

Symbology	SSI ID	Code ID	AIM ID Letter	AIM ID Modifier
Planet (US)	0x1F	P04	X	
Code 32	0x20	B	A	Same rules as for Code 39
ISBT-128 Concat.	0x21	D	C	4
Postal (Japan)	0x22	P05	X	0
Postal (Australia)	0x23	P09	X	0
Postal (Dutch)	0x24	P08	X	0
Maxicode	0x25	P02	U	1 - Mode 0, 2 or 3, without ECI 3 (1) - Extended EC with (w/o) ECI
Postbar (CA)	0x26	P07	X	0
Postal (UK)	0x27	P06	X	0
Macro PDF-417	0x28	X	L	Same rules as for PDF-417
Macro QR Code	0x29	X	X	0
Micro QR Code	0x2C	P01	Q	1
Aztec Code	0x2D	z	z	0
Aztec Rune Code	0x2E	z	z	C
French Lottery	0x2F	X	X	0
GS1 DataBar-14	0x30	R		
GS1 DataBar Limited	0x31	R		
GS1 DataBar Expanded	0x32	R		
4State US	0x34	P0A	X	0
4State US4	0x35	P0B	X	0
Scanlet Webcode	0x37	W	X	0
Cue CAT Code	0x38	Q	X	0
UPC-A + 2	0x48	A	E + E [2]	0 for main block; 1 for supplemental
UPC-E + 2	0x49	A	E + E[2]	0 for main block; 1 for supplemental

Notes:
1. **E+C denotes 2 AIM IDs are transmitted: one for the UPC/EAN block; the second prefixes the extended GS1-128 data.**
2. **E+E denotes 2 AIM IDs are transmitted: the first prefixes the main UPC/EAN block; the second prefixes the supplemental block.**
3. **UPC-E, UPC-E1, and UPC-A are converted to EAN-13 for AIM ID.**

Table 2-38 *Code Types by SSI ID (Continued)*

Symbology	SSI ID	Code ID	AIM ID Letter	AIM ID Modifier
EAN-8 + 2	0x4A	A	E + E[2]	4 for main block; 1 for supplemental
EAN-13 + 2	0x4B	A	E + E[2]	0 for main block; 1 for supplemental
UPC-E1 + 2	0x50	A	E + E[2]	0 for main block; 1 for supplemental
Composite (CC-A + GS1-128)	0x51	T	See Table 2-39	
Composite (CC-A + EAN-13)	0x52	T	See Table 2-39	
Composite (CC-A + EAN-8)	0x53	T	See Table 2-39	
Composite (CC-A + GS1 DataBar Expanded)	0x54	T	See Table 2-39	
Composite (CC-A + GS1 DataBar Limited)	0x55	T	See Table 2-39	
Composite (CC-A + GS1 DataBar-14)	0x56	T	See Table 2-39	
Composite (CC-A + UPC-A)	0x57	T	See Table 2-39	
Composite (CC-A + UPC-E)	0x58	T	See Table 2-39	
Composite (CC-C + GS1-128)	0x59	T	See Table 2-39	
TLC-39	0x5A	T	See Table 2-39	
Composite (CC-B + GS1-128)	0x61	T	See Table 2-39	
Composite (CC-B + EAN-13)	0x62	T	See Table 2-39	
Composite (CC-B + EAN-8)	0x63	T	See Table 2-39	
Composite (CC-B + GS1 DataBar Expanded)	0x64	T	See Table 2-39	

Notes:
1. **E+C denotes 2 AIM IDs are transmitted: one for the UPC/EAN block; the second prefixes the extended GS1-128 data.**
2. **E+E denotes 2 AIM IDs are transmitted: the first prefixes the main UPC/EAN block; the second prefixes the supplemental block.**
3. **UPC-E, UPC-E1, and UPC-A are converted to EAN-13 for AIM ID.**

Table 2-38 *Code Types by SSI ID (Continued)*

Symbology	SSI ID	Code ID	AIM ID Letter	AIM ID Modifier
Composite (CC-B + GS1 DataBar Limited)	0x65	T	See Table 2-39	
Composite (CC-B + GS1 DataBar-14)	0x66	T	See Table 2-39	
Composite (CC-B + UPC-A)	0x67	T	See Table 2-39	
Composite (CC-B + UPC-E)	0x68	T	See Table 2-39	
Signature	0x69	P0X	X	0
Matrix 2 of 5	0x71	S	X	0
Chinese 2 of 5	0x72	U	X	0
Korean 3 of 5	0x73	V	X	0
UPC-A + 5	0x88	A	E + E^2	0 for main block; 2 for supplemental
UPC-E + 5	0x89	A	E + E^2	0 for main block; 2 for supplemental
EAN-8 + 5	0x8A	A	E + E^2	4 for main block; 2 for supplemental
EAN-13 + 5	0x8B	A	E + E^2	0 for main block; 2 for supplemental
UPC-E1 + 5	0x90	A	E + E^2	0 for main block; 2 for supplemental
Multipacket Format	0x99	N/A	N/A	Data is packeted; SSI ID is embedded in decode data.
Macro Micro PDF	0x9A	X	L	Same rules as for Micro PDF-417
OCRB	0xA0			
RSS (GS1 Databar) Expanded Coupon	0xB4	R	X	0
Han Xin	0xB7	P0H	X	0
GS1 Datamatrix	0xC1	P0G	d	2
GS1 QR	0xC2	P0Q		

Notes:
1. **E+C denotes 2 AIM IDs are transmitted: one for the UPC/EAN block; the second prefixes the extended GS1-128 data.**
2. **E+E denotes 2 AIM IDs are transmitted: the first prefixes the main UPC/EAN block; the second prefixes the supplemental block.**
3. **UPC-E, UPC-E1, and UPC-A are converted to EAN-13 for AIM ID.**

Table 2-38 *Code Types by SSI ID (Continued)*

Symbology	SSI ID	Code ID	AIM ID Letter	AIM ID Modifier
Mailmark	0xC3	P0C	X0	
Dotcode	0xC4	P0E		
Multicode	0xC6	P0M		
UK Plessey	0xC7			
Grid Matrix	0xC8	P0D		
Telepen	0xCA			
UDI Parsed Code	0xCC			
RFID Raw	0xE0	X	0	0
RFID URI	0xE1	X	0	0

Notes:
1. **E+C denotes 2 AIM IDs are transmitted: one for the UPC/EAN block; the second prefixes the extended GS1-128 data.**
2. **E+E denotes 2 AIM IDs are transmitted: the first prefixes the main UPC/EAN block; the second prefixes the supplemental block.**
3. **UPC-E, UPC-E1, and UPC-A are converted to EAN-13 for AIM ID.**

Table 2-39 *Composite Code Data Formats*

1D Component	Data Format	
	Standard Mode	GS1-128 Emulation Mode
EAN-13, UPC-A, UPC-E	1D:]E0 2D:]e0 See note 5 below.	1D:]E0 2D:]C1 before each GS1-128 split transmission See notes 3 -5 below.
EAN-8	1D:]E4 2D:]e0 See note 5 below.	1D:]E4 2D:]C1 before each GS1-128 split transmission See notes 3 -5 below.

Notes:
1. **All Function 1 characters in the 1D and 2D are sent as $^{G}{}_{S}$ (29_{10}); the first Function 1 in the GS1-128 is not transmitted.**
2. **In standard mode, the data following symbol separator begins with AIM ID "]e1". The data following the composite component escape mechanism begins with AIM ID "]e2" if ECI interpretation is enabled, "]e3" if ECI interpretation is not enabled.**
3. **In GS1-128 emulation mode, each packet is split on an AI boundary and limited to less than 48 characters.**
4. **In GS1-128 emulation mode, data is discarded after the first symbol separator or escape mechanism.**
5. **If the UPC/EAN component has a supplemental ,]E1 precedes a 2-digit supplemental and]E2 precedes the 5-digit supplemental**
6. **RS is character 30_{10} and EOT is character 04. The transmitted format (05 or 06) is data dependent.**

Table 2-39 *Composite Code Data Formats (Continued)*

1D Component	Data Format	
	Standard Mode	GS1-128 Emulation Mode
GS1 DataBar-14 **GS1 DataBar Limited**	1D:]e0 2D:]e1 See note 2 below.	]C1 before each GS1-128 split transmission See notes 3 -5 below.
Code 39 (TLC39)	ANSI MH10.8.3M syntax: 06 Format: [)>$^{R}_{S}$06 $^{G}_{S}$ 6P 1D $^{G}_{S}$ S 2D $^{R}_{S}$ EOT 05 Format: [)>$^{R}_{S}$05 $^{G}_{S}$ 906P 1D $^{G}_{S}$ 8004 2D $^{R}_{S}$ EOT See note 6 below.	
GS1-128 **GS1 DataBar Expanded**	If the last AI in the GS1-128 is a predefined, fixed length:]e0 Otherwise,]e0 GS See note 2 below.	]C1 before each GS1-128 split transmission See notes 3 and 4 below.

Notes:
1. **All Function 1 characters in the 1D and 2D are sent as $^{G}_{S}$ (29_{10}); the first Function 1 in the GS1-128 is not transmitted.**
2. **In standard mode, the data following symbol separator begins with AIM ID "]e1". The data following the composite component escape mechanism begins with AIM ID "]e2" if ECI interpretation is enabled, "]e3" if ECI interpretation is not enabled.**
3. **In GS1-128 emulation mode, each packet is split on an AI boundary and limited to less than 48 characters.**
4. **In GS1-128 emulation mode, data is discarded after the first symbol separator or escape mechanism.**
5. **If the UPC/EAN component has a supplemental ,]E1 precedes a 2-digit supplemental and]E2 precedes the 5-digit supplemental**
6. **RS is character 30_{10} and EOT is character 04. The transmitted format (05 or 06) is data dependent.**

Host Requirements

If DECODE_EVENT reporting is enabled, the decode event message is received before the DECODE_DATA message. If ACK/NAK handshaking is enabled, the host responds to each of these messages.

Decoder Requirements

Decode data is sent in this format if packeted decode data is selected via parameter. The host responds to this message with a CMD_ACK, if ACK/NAK handshaking is enabled.

EVENT

Description

Indicates selected events occurred.

Table 2-40 *Packet Format - EVENT*

Length	Opcode	Message Source	Status	Event Code	Checksum
05h	F6h	00h			

Table 2-41 *Field Descriptions - EVENT*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	F6h	1 Byte	Identifies this Opcode type.
Message Source	0 = Decoder	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission **Bit 1: Continuation** 0 = Last packet of a multipacket message 1 = Intermediate packet **Bit 2: Reserved** Always 0 **Bit 3: Parameter Change Type** (for parameters) 0 = Temporary change 1 = Permanent change
Event Code	Type of Event Code.	1 Byte	See *Table 2-42 on page 2-42*.
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

This message is sent by the decoder when an enabled event occurs. Use Table 2-42 and parameters F0h 00h through F0h 07h to determine which events you would like to be reported.

Host Requirements

The host receives this message when a selected event occurs.

Decoder Requirements

Generate this message when a selected event occurs. Events may vary by decoder type.

Table 2-42 *Event Codes*

Event	Code
Boot Event	03h
Decode Event	01h
Parameter Defaults	0Ah
Parameter Entry Error	07h
Parameter Num Expected	0Fh
Parameter Stored	08h
Trigger Pull Event	02h
Parameter Entry Cancel	09h
MPDF Incorrect Symbol	11h
MPDF File ID Error	12h
MPDF Out of Memory Error	13h
MPDF Bad Symbology Error	14h
MPDF Flush Buffer	15h
MPDF Data Xmitted	17h
MPDF Flush No Data	18h
MPDF Abort	19h
Buffer Code 39 Add	1Ah
Buffer Code 39 Empty	1Bh
Buffer Code 39 Full	1Ch
Buffer Code 39 Clear	1Dh
Buffer Code 39 Xmit	1Eh
System Fault: Laser Safety	2h

FLUSH_MACRO_PDF

Description

Terminates MacroPDF sequence and sends all captured segments.

Table 2-43 *Packet Format - FLUSH_MACRO_PDF*

Length	Opcode	Message Source	Status	Checksum
04h	10h	04h		

Table 2-44 *Field Descriptions - FLUSH_MACRO_PDF*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	10h	1 Byte	Identifies this Opcode type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission **Bit 1: Continuation** 0 = Last packet of a multipacket message 1 = Intermediate packet **Bit 2: Reserved** Always 0 **Bit 3: Parameter Change Type (for parameters)** 0 = Temporary change 1 = Permanent change
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

Host Requirements

None.

Decoder Requirements

The decoder terminates the current MacroPDF sequence and transmits the captured MacroPDF segments.

FLUSH_QUEUE

Description

Eliminates content of decoder's transmission queue.

Table 2-45 *Packet Format - FLUSH_QUEUE*

Length	Opcode	Message Source	Status	Checksum
04h	D2h	04h		

Table 2-46 *Field Descriptions - FLUSH_QUEUE*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	D2h	1 Byte	Identifies this Opcode type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission **Bit 1: Continuation** 0 = Last packet of a multipacket message 1 = Intermediate packet **Bit 2: Reserved** Always 0 **Bit 3: Parameter Change Type** (for parameters) 0 = Temporary change 1 = Permanent change
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

This message is sent by the host to instruct the decoder to discard or flush the transmission queue. This is useful when the decoder is attempting to send a lengthy multipacket message. If the host does not want the message, the host can interrupt the decoder (by asserting RTS) and send a FLUSH_QUEUE message.

The decoder ACK/NAKs the FLUSH_QUEUE message. No further packets in the transmission queue are sent. Note that this does not abort decoder actions that cause packets to be added to the transmission queue.

We recommend issuing a SCAN_DISABLE prior to issuing a FLUSH_QUEUE so that new elements are not added to the queue just after it is emptied. Also, paradoxical cases may arise if a SCAN_DISABLE is not issued first.

ILLUMINATION_OFF

Description

Turns off Illumination pattern.

Table 2-47 *Packet Format - ILLUMINATION_OFF*

Length	Opcode	Message Source	Status	Data	Checksum
04h	C0h	04h			

Table 2-48 *Field Descriptions - ILLUMINATION_OFF*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	C0h	1 Byte	Identifies this Opcode type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission
Data Content		Up to 251 Bytes	Image Data records.
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

Decoder Requirements

The decoder turns off the Illumination, and responds with a CMD_ACK (if ACK/NAK handshaking is enabled).

ILLUMINATION_ON

Description

Turns off Illumination pattern.

Table 2-49 *Packet Format - ILLUMINATION_ON*

Length	Opcode	Message Source	Status	Data	Checksum
04h	C1h	04h			

Table 2-50 *Field Descriptions - ILLUMINATION_ON*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	C0h	1 Byte	Identifies this Opcode type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission
Data Content		Up to 251 Bytes	Image Data records.
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

Decoder Requirements

The decoder turns on the Illumination, and responds with a CMD_ACK (if ACK/NAK handshaking is enabled).

Table 2-51 *Aim Mode*

Command Sequence	Action Performed
ILLUMINATION_ON	Turns on the Illumination.
ILLUMINATION_OFF	Turns off the Illumination.

IMAGE_DATA

Description

A JPEG, BMP, or TIFF image.

Table 2-52 *Packet Format - IMAGE_DATA*

Length	Opcode	Message Source	Status	Data	Checksum
	B1h	01h			

Table 2-53 *Field Descriptions - IMAGE_DATA*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	B1h	1 Byte	Identifies this Opcode type.
Message Source	0 = Decoder	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission **Bit 1: Continuation** 0 = Last packet of a multipacket message 1 = Intermediate packet **Bit 2: Reserved** Always 0 **Bit 3: Parameter Change Type** (for parameters) 0 = Temporary change 1 = Permanent change
Data Content		Up to 251 Bytes	Image Data records.
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

This packet contains image information. Images sent from the decoder to the host are described by the image preamble contained in the first 10 bytes of the first packet of the image. The details of the image preamble follow. Due to the small packet size of SSI, multiple packets of image data should be received by the host and re-assembled in the order given by the decoder. The packets describe, for example, a JPEG image when re-assembled.

The image preamble consists of the following fields:

Table 2-54 *Image Preamble Fields*

Field	Field Size	Description
File size	4 byte field	Number of bytes in the overall image.
Image Width	2 byte field	Image width in pixels
Image Height	2 byte field	Image height in pixels
Image Type	1 byte field	0x31 = JPEG Image File 0x33 = BMP Windows Bit Map File 0x34 = TIFF File Note: These values are ASCII.
Bits per Pixel	1 byte field	Number of bits per pixel in image 0 = 1 bit/pixel Black White Image 1 = 4 bit/pixel 16 Gray Scale Image 2 = 8 bit/pixel 256 Gray Scale Image

Note: The preamble only appears in the first packet of a multipacket message.

In a multipacketed environment, one image frame is spread over several packets in the following format:

Packet 1

Header	Preamble	Image Data, Part 1	Checksum

Packet 2

Header	Image Data, Part 2	Checksum

.

.

.

Packet N

Header	Last of Image Data	Checksum

This is re-assembled by the host into:

Preamble	Image Frame

IMAGER_MODE

Description

Commands Imager into Operational Modes.

- 0 = Decode Mode
- 1 = Image Capture Mode
- 2 = Video Mode.

Table 2-55 *Packet Format - IMAGER_MODE*

Length	Opcode	Message Source	Status	Data	Checksum
05h	F7h	00h			

Table 2-56 *Field Descriptions - IMAGER_MODE*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	F7h	1 Byte	Identifies this Opcode type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission **Bit 1: Continuation** 0 = Last packet of a multipacket message 1 = Intermediate packet **Bit 2: Reserved** Always 0 **Bit 3: Parameter Change Type** (for parameters) 0 = Temporary change 1 = Permanent change
Data Content		1 Byte	Value 0, 1, or 2 decimal
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

Host Requirements

This command is supported by the imager only. The host sends this command with the data field set to 0 for decode mode, 1 for image capture mode, and 2 for video mode.

Decoder Requirements

The decoder (imager) sends a CMD_ACK if the mode is valid, and CMD_NAK if not.

LED_OFF

Description

De-activates LED output.

Table 2-57 *Packet Format - LED_OFF*

Length	Opcode	Message Source	Status	LED Selection	Checksum
05h	E8h	04h			

Table 2-58 *Field Descriptions - LED_OFF*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	E8h	1 Byte	Identifies this Opcode type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission **Bit 1: Continuation** 0 = Last packet of a multipacket message 1 = Intermediate packet **Bit 2: Reserved** Always 0 **Bit 3: Parameter Change Type** (for parameters) 0 = Temporary change 1 = Permanent change
LED Selection	Bit 0 - 7: LED bit numbers to turn off.	1 Byte	Bit 0 = Decode LED See your product's Product Reference Guide for further bit information.
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

The host sends this message to turn off the specified decoder LEDs.

Host Requirements

None.

Decoder Requirements

The decode LED is turned off by the decoder.

LED_ON

Description

Activates LED output.

Table 2-59 *Packet Format - LED_ON*

Length	Opcode	Message Source	Status	LED Selection	Checksum
05h	E7h	04h			

Table 2-60 *Field Descriptions - LED_ON*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	E7h	1 Byte	Identifies this Opcode type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission **Bit 1: Continuation** 0 = Last packet of a multipacket message 1 = Intermediate packet **Bit 2: Reserved** Always 0 **Bit 3: Parameter Change Type** (for parameters) 0 = Temporary change 1 = Permanent change
LED Selection	Bit 0 - 7: LED bit numbers to turn on.	1 Byte	Bit 0 = Decode LED See your product's Product Reference Guide for further bit information.
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

The host sends this message to turn on the specified decoder LEDs.

Host Requirements

None.

Decoder Requirements

The decode LED is turned on by the decoder.

PAGER_MOTOR_ACTIVATION

Description

Actuates the vibration feedback device in the target device (e.g., the pager motor). Example: A value of 15 causes the scanner to vibrate for 150 ms.

Table 2-61 *Packet Format - PAGER_MOTOR_ACTIVATION*

Length	Opcode	Message Source	Status	Vibration Feedback Duration	Checksum
05h	CAh	04h			

Table 2-62 *Field Descriptions - PAGER_MOTOR_ACTIVATION*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	CAh	1 Byte	Identifies this Opcode type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission
Vibration Duration		1 Byte	Number of 10 ms increments to vibrate. 0 = Use the system parameter vibration duration. Example: A value of 15 causes the scanner to vibrate for 150 ms.
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

This Opcode instructs the receiver to actuate the vibration feedback device (e.g., the pager motor) for the amount of 10 ms increments specified in the Vibration Duration field. If the Vibrations Duration field is set to 0, then the vibration feedback duration will be that which is defined in the system parameter for vibration duration.

Host Requirements

The host sends this command to cause the decoder to actuate its vibration feedback mechanism (e.g., its pager motor) for the specified amount of time.

Decoder Requirements

If the decoder has a Pager Motor and handshaking is enabled, it sends a CMD_ACK and activates the PAGER_MOTOR for the appropriate duration. If the decoder does not have a Pager Motor, it sends a CMD_NAK with type NAK_DENIED.

PARAM_DEFAULTS

Description

Sets the parameters to their default values.

Table 2-63 *Packet Format - PARAM_DEFAULTS*

Length	Opcode	Message Source	Status	Checksum
04h	C8h	04h		

Table 2-64 *Field Descriptions - PARAM_DEFAULTS*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	C8h	1 Byte	Identifies this Opcode type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission **Bit 1: Continuation** 0 = Last packet of a multipacket message 1 = Intermediate packet **Bit 2: Reserved** Always 0 **Bit 3: Parameter Change Type** (for parameters) 0 = Temporary change 1 = Permanent change
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

This command returns all parameters to their default settings.

Host Requirements

The host sends this command to reset the decoder’s parameter settings to the default values.

Decoder Requirements

Upon receiving this command, the decoder resets all its parameters to the default values. This is equivalent to scanning a SET DEFAULTS bar code.

PARAM_REQUEST

Description

Requests values of selected parameters.

Table 2-65 *Packet Format - PARAM_REQUEST*

Length	Opcode	Message Source	Status	Request Data	Checksum
	C7h	04h			

Table 2-66 *Field Descriptions - PARAM_REQUEST*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	C7h	1 Byte	Identifies this Opcode type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission **Bit 1: Continuation** 0 = Last packet of a multipacket message 1 = Intermediate packet **Bit 2: Reserved** Always 0 **Bit 3: Parameter Change Type** (for parameters) 0 = Temporary change 1 = Permanent change
Request Data	<Param_num><Param_num> <Param_num>...	Variable	
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

The host uses this message to request selected parameters from the decoder.

Host Requirements

The host requests the decoder's current values for specific parameters by listing the parameter numbers in the Request_Data field. If the host asks for a parameter value not supported by the decoder, the decoder does not send a value for this unsupported param_num. If none of the requested values is supported, an empty

PARAM_SEND message is transmitted. If the host requests the value of all the parameters, it sends a special param_num called ALL_PARAMS (FEh) in the first position of the Request_Data field.

✓ ***NOTE*** The decoder's response to this command is PARAM_SEND, not ACK. Depending on the time-out set, and the number of parameters requested, this reply may fall outside the programmable Serial Response Timeout. It should not be considered an error if the time-out is exceeded. To compensate, increase the time-out.

Decoder Requirements

When the decoder receives this message, it processes the information by formatting a PARAM_SEND message containing all requested parameters that are supported, and their values. The programmable Serial Response Time-out may be exceeded when processing this message, depending on the time-out set, and the number of parameters requested.

Hints for Requesting Parameter Values

Before forming a PARAM_REQUEST, be sure you are requesting parameters supported by the decoder (Table 2-67). To find out what parameters are supported, send an FEh (request all parameters). The decoder responds with a PARAM_SEND which contains all the supported parameters and their values. This response may be multipacketed; ACK responses are not necessary.

Table 2-67 *Parameter Numbers Format*

Parameter Number	Encoding
0 to 239	<param_num>
256 to 495	F0<param_num - 256>
512 to 751	F1<param_num - 512>
768 to 1007	F2<param_num - 768>
1024 or higher	F8<param_num_high_byte><param_num_low_byte>
Additionally, the following special codes are provided:	
All Parameters	FE
All Defaults	FD

When using the FEh, it must be in the first position of the Request_Data field, or it is treated as an unsupported parameter.

Unsupported parameters are not listed in the PARAM_SEND response. Requesting unsupported parameters has no effect, but can cause delays in responding to requests for valid parameters. See Table 2-68 for example requests and responses.

Table 2-68 *Example Requests and Replies*

PARAM_REQUEST Message		Response PARAM_SEND Message
#ALL	05 C7 04 00 FE FE 32	0D C6 00 00 FF 01 00 02 01 9C 07 E6 63 FC 3E
#1, 9C	06 C7 04 00 01 9C FE 92	09 C6 00 00 FF 01 00 9C 07 FD 8E
#All, 1, 9C	07 C7 04 00 FE 01 9C FD 93	0D C6 00 00 FF 01 00 02 01 9C 07 E6 63 FC 3E

Table 2-68 *Example Requests and Replies (Continued)*

PARAM_REQUEST Message		Response PARAM_SEND Message
#1, 9C, ALL	07 C7 04 00 01 9C FE FD 93	09 C6 00 00 FF 01 00 9C 07 FD 8E
#4	05 C7 04 00 04 FF 2C	05 C6 00 00 FF FE 36
#ALL - 3 times	07 C7 04 00 FE FE FE FC 34	0D C6 00 00 FF 01 00 02 01 9C 07 E6 63 FC 3E
#1 -3 times	07 C7 04 00 01 01 01 FF 2B	0B C6 00 00 FF 01 00 01 00 01 00 FE 2D
533 (F1 15) Example of buffer parameter above 512.	06 C7 04 80 F1 15 FD	1D C6 00 00 FF **F7 F1 15** 12 00 00 44 53 34 33 30 38 2D 53 52 30 30 30 30 37 5A 5A 57 57 F7 7E Where: **F7** = Multipacket array **F1h 15h / 533**=SSI number / parameter number Value= "DS4308-SR00007ZZ"
318 (F0, 3E) Example of Word parameter above 256.	06 C7 04 80 F0 3E FD 81	0A C6 00 00 FF **F4 F0 3E 04 FF** FB 0C Where: **F4** = Word parameter **F0 3E / 318**=SSI number / parameter number **04 FF**= Value 1279
1118 (F8 04 5E) Example of a Word parameter with a parameter number above 1024.	07 C7 04 80 F8 04 5E FD 54	0B C6 00 00 FF F4 F8 04 5E 00 00 FB E2 Where: F4 = Word Parameter F8 04 5E / 1118=SSI number / parameter number 00 00= Value

PARAM_SEND

Description

Responds to a PARAM_REQUEST, changes particular parameter values.

Table 2-69 *Packet Format - PARAM_SEND*

Length	Opcode	Message Source	Status	Beep Code	Param Data	Checksum
	C6h					

Table 2-70 *Field Descriptions - PARAM_SEND*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	C6h	1 Byte	Identifies this Opcode type.
Message Source	0 = Decoder 4 = Host	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission **Bit 1: Continuation** 0 = Last packet of a multipacket message 1 = Intermediate packet **Bit 2: Reserved** Always 0 **Bit 3: Parameter Change Type** (for parameters) 0 = Temporary change 1 = Permanent change
Beep code	See *Table 2-12 on page 2-11*.	1 Byte	If no beep is required, set this field to FF.
Param_Data	See *Table 2-71 on page 2-58*.		The parameter numbers and data to be sent to the requester.
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

This message is sent by the decoder in response to the PARAM_REQUEST message, or by the host to change the decoder's parameter values.

Parameter numbers F0h (+256), F1h (+512), F2h (+768) access parameters whose numbers are 256 and higher. For example, to access the first parameter in the 256-511 range, use F0h and 00h.

The PARAM_SEND message encodes parameter plus data as shown in *Table 2-71*.

Table 2-71 *Param Data Format*

Parameter Number	Encoding
0 to 239	<param_num>
256 to 495	F0<param_num - 256>
512 to 751	F1<param_num - 512>
768 to 1007	F2<param_num - 768>
1024 or higher	F8<param_num_high_byte><param_num_low_byte>

Additionally, there are modifiers to allow data other than byte values.

Table 2-72 *Data Types*

Data Type	Format
String	F3 <param num><len of data><val1><val2>...
Word	F4<param num><high byte><low byte>
Array	F6<param num><len of array><byte0><byte1>...
Multi-Packet	F7<param num><packet len><2 byte offset><byte0><byte1>...

Host Requirements

✓ ***NOTE*** Due to the processing time of interpreting and storing parameters contained in the message, it may not be possible for the decoder to send an ACK within the programmable Serial Response Timeout. It should not be considered an error if the time-out is exceeded. To compensate, increase the time-out.

The host transmits this message to change the decoder's parameters. Be sure the Change Type bit in the Status byte is set as desired. If no beep is required, the beep code must be set to FFh, or the decoder beeps as defined in Table 2-12.

Decoder Requirements

When the decoder receives a PARAM_SEND, it interprets and stores the parameters, then ACKs the command (if ACK/NAK handshaking is enabled). These parameters are stored permanently only if the Change Type (bit 3 of the Status byte) is set to 1. If bit 3 is set to 0 the changes are temporary, and are lost when the decoder is powered down.

If the PARAM_SEND sent by the host contains a valid beep code, the decoder issues the requested beep sequence, and changes the requested parameter values.

The decoder issues a PARAM_SEND in response to a PARAM_REQUEST from the host. It sends the values for all the supported parameter values requested in the PARAM_REQUEST message. No value is sent for any unsupported param_num. If none of the requested values is supported, the PARAM_SEND message is transmitted with no parameters. When sending this command, the Change Type bit (bit 3 of Status byte) can be ignored.

✓ ***NOTE*** For multipacketed PARAM_SEND, the beep code appears in every packet.

REPLY_REVISION

Description

Replies to REQUEST_REVISION command with software revision string.

Table 2-73 *Packet Format - REPLY_REVISION*

Length	Opcode	Message Source	Status	Revision	Checksum
	A4h	00h		S/W_REVISION <space> BOARD_TYPE <space> ENGINE_CODE <space>	

Table 2-74 *Field Descriptions - REPLY_REVISION*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	A4h	1 Byte	Identifies this Opcode type.
Message Source	0 = Decoder	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission **Bit 1: Continuation** 0 = Last packet of a multipacket message 1 = Intermediate packet **Bit 2: Reserved** Always 0 **Bit 3: Parameter Change Type** (for parameters) 0 = Temporary change 1 = Permanent change
Revision	ASCII data	variable	Revision String fields indicate: **S/W_REVISION** is the release name of the software **BOARD_TYPE** is N for non-flash decoder board, F for flash **ENGINE_CODE** indicates the type of scan engine paired with the decoder (see the scan engine's Integration Guide for the engine code value)
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

Host Requirements

None.

Decoder Requirements

The decoder sends its revision string to the host. The revision string is decoder-dependent.

REQUEST_REVISION

Description

Requests the software revision string from the decoder.

Table 2-75 *Packet Format - REQUEST_REVISION*

Length	Opcode	Message Source	Status	Checksum
04h	A3h	04h		

Table 2-76 *Field Descriptions - REQUEST_REVISION*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	A3h	1 Byte	Identifies this Opcode type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission **Bit 1: Continuation** 0 = Last packet of a multipacket message 1 = Intermediate packet **Bit 2: Reserved** Always 0 **Bit 3: Parameter Change Type** (for parameters) 0 = Temporary change 1 = Permanent change
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

Host Requirements

The host sends this message to request revision information from the decoder. The decoder responds with REPLY_REVISION.

Decoder Requirements

The decoder sends its revision string to the host. See *REPLY_REVISION on page 2-59* for format.

SCAN_DISABLE

Description

Prevents the decoder from scanning bar codes.

Table 2-77 *Packet Format - SCAN_DISABLE*

Length	Opcode	Message Source	Status	Checksum
04h	EAh	04h		

Table 2-78 *Field Descriptions - SCAN_DISABLE*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	EAh	1 Byte	Identifies this Opcode type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission **Bit 1: Continuation** 0 = Last packet of a multipacket message 1 = Intermediate packet **Bit 2: Reserved** Always 0 **Bit 3: Parameter Change Type** (for parameters) 0 = Temporary change 1 = Permanent change
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

Host Requirements

All scan attempts are disabled by this command until either a SCAN_ENABLE is sent, or the decoder is reset.

Decoder Requirements

When the decoder receives this command, it ignores all trigger/START_SESSION requests until a SCAN_ENABLE command is received.

SCAN_ENABLE

Description

Permits the decoder to scan bar codes.

Table 2-79 *Packet Format - SCAN_ENABLE*

Length	Opcode	Message Source	Status	Checksum
04h	E9h	04h		

Table 2-80 *Field Descriptions - SCAN_ENABLE*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	E9h	1 Byte	Identifies this Opcode type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission **Bit 1: Continuation** 0 = Last packet of a multipacket message 1 = Intermediate packet **Bit 2: Reserved** Always 0 **Bit 3: Parameter Change Type** (for parameters) 0 = Temporary change 1 = Permanent change
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

Host Requirements

The host sends the SCAN_ENABLE command to tell the decoder to allow scanning. Scanning is enabled upon power-up, so this command need only be send if a prior SCAN_DISABLE command has been sent.

Decoder Requirements

The decoder allows scanning and decoding upon receipt of this command.

✓ ***NOTE*** At initial power-up, the decoder should assume SCAN_ENABLED.

SLEEP

Description

Requests to place the decoder into low power mode.

Table 2-81 *Packet Format - SLEEP*

Length	Opcode	Message Source	Status	Checksum
04h	EBh	04h		

Table 2-82 *Field Descriptions - SLEEP*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	EBh	1 Byte	Identifies this Opcode type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission **Bit 1: Continuation** 0 = Last packet of a multipacket message 1 = Intermediate packet **Bit 2: Reserved** Always 0 **Bit 3: Parameter Change Type** (for parameters) 0 = Temporary change 1 = Permanent change
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

Host Requirements

The host sends this command to place the decoder into low power mode. If the low power mode parameter is enabled, the scanner goes into low power mode automatically, and the SLEEP command is not necessary.

✓ ***NOTE*** The decoder may not sleep immediately upon acknowledging the command, as it may be busy processing data at the time.

Decoder Requirements

None.

SSI_MGMT_COMMAND

Description

The SSI protocol allows the host to send a command that is variable in length up to 255 bytes. Although there is a provision in the protocol to multi-packet commands from the host, it is not supported in the scanner. It is required that the host fragment packets using the provisions supplied in the Remote Scanner Management (RSM) protocol (ATTRIBUTE_SET_OFFSET, ATTRIBUTE_GET_OFFSET).

RSM command is encapsulated in SSI packet as follows.

Table 2-83 *Packet Format - SSI_MGMT_COMMAND*

Length	Opcode	Message Source	Status	Management Payload	Checksum
	80h	04h			

Table 2-84 *Field Descriptions - SSI_MGMT_COMMAND*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	80h	1 Byte	Identifies this Opcode type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission **Bit 1: Continuation** 0 = Last packet of a multipacket message 1 = Intermediate packet **Bit 3: Parameter Change Type** (for parameters) 0 = Temporary change 1 = Permanent change
Management Payload	Data	Variable	RSM command.
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

The expected response in the positive case is SSI_MGMT_COMMAND that may be a multi-packet response. For devices that do not support the SSI_MGMT_COMMAND, the response will be the standard SSI_NAK (NAK_BADCONTEXT).

Host Requirements

None.

Decoder Requirements

Decoder reply the RSM command in the format below.

Table 2-85 *Response Packet Format - SSI_MGMT_COMMAND*

Length	Opcode	Message Source	Status	Management Payload	Checksum
	80h	04h			

START_SESSION

Description

Tells decoder to attempt to obtain the requested data.

Table 2-86 *Packet Format - START_SESSION*

Length	Opcode	Message Source	Status	Checksum
04h	E4h	04h		

Table 2-87 *Field Descriptions - START_SESSION*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	E4h	1 Byte	Identifies this Opcode type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission **Bit 1: Continuation** 0 = Last packet of a multipacket message 1 = Intermediate packet **Bit 2: Reserved** Always 0 **Bit 3: Parameter Change Type** (for parameters) 0 = Temporary change 1 = Permanent change
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

This command tells the decoder to start a scan session. See Table 2-88 for the decoder's reactions to this command in each operational mode.

Table 2-88 *START_SESSION Actions*

Operational Mode	Actions Upon Receipt of Command	End Result of Session
Decode Mode	The decoder attempts to decode a bar code	Successful decode, or STOP_SESSION command
Image Capture	The decoder clicks the shutter	An image is captured
Video Mode	The decoder continuously produces a video stream	STOP_SESSION command

Decoder Requirements

Trigger Mode must be set to Host or a CMD_NAK DENIED response is issued.

STOP_SESSION

Description

Tells decoder to abort a decode attempt or video transmission.

Table 2-89 *Packet Format - STOP_SESSION*

Length	Opcode	Message Source	Status	Checksum
04h	E5h	04h		

Table 2-90 *Field Descriptions - STOP_SESSION*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	E5h	1 Byte	Identifies this Opcode type.
Message Source	4 = Host	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission **Bit 1: Continuation** 0 = Last packet of a multipacket message 1 = Intermediate packet **Bit 2: Reserved** Always 0 **Bit 3: Parameter Change Type** (for parameters) 0 = Temporary change 1 = Permanent change
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

This command tells the decoder to stop a scan and decode attempt.

Host Requirements

None.

Decoder Requirements

None.

VIDEO_DATA

Description

Imager transmission of a video frame in JPEG format.

Table 2-91 *Packet Format - VIDEO_DATA*

Length	Opcode	Message Source	Status	Data	Checksum
	B4h	00h			

Table 2-92 *Field Descriptions - VIDEO_DATA*

Field Name	Format	Size	Description
Length	Length of message (not including checksum).	1 Byte	Length Field
Opcode	B4h	1 Byte	Identifies this Opcode type.
Message Source	00 = Decoder	1 Byte	Identifies where the message is coming from.
Status		1 Byte	**Bit 0: Retransmit** 0 = First transmission 1 = Subsequent transmission **Bit 1: Continuation** 0 = Last packet of a multipacket message 1 = Intermediate packet **Bit 2: Reserved** Always 0 **Bit 3: Parameter Change Type** (for parameters) 0 = Temporary change 1 = Permanent change
Data		Up to 251 Bytes	Image data.
Checksum	2's complement sum of message contents excluding checksum.	2 Bytes	Checksum of message.

The first packet of a video frame contains the video preamble, described below. The first packet also contains the JPEG data comprising the video frame. Multipacketing is expected in video mode.

The video preamble consists of the following fields:

Table 2-93 *Video Preamble Fields*

Field	Field Size	Description
File size	4 byte field	Number of bytes in the overall image.
Image Width	2 byte field	Image width in pixels
Image Height	2 byte field	Image height in pixels
Image Type	1 byte field	0x31 = JPEG Image File 0x33 = BMP Windows Bit Map File 0x34 = TIFF File Note: These values are ASCII.
Bits per Pixel	1 byte field	Number of bits per pixel in image 0 = 1 bit/pixel Black White Image 1 = 4 bit/pixel 16 Gray Scale Image 2 = 8 bit/pixel 256 Gray Scale Image

In a multipacketed environment, one video frame is spread over several packets in the following format:

Packet 1

Header	Preamble	Video Data, Part 1	Checksum

Packet 2

Header	Video Data, Part 2	Checksum

.

.

.

Packet N

Header	Last of Video Data	Checksum

This is re-assembled by the host into:

Preamble	Video Frame

WAKEUP

Description

Wakes up decoder after it was put into low power operation.

If the decoder is in low power mode, sending the single character **NULL** (00) wakes up the decoder. This character is only needed when hardware handshaking is not being used or is bypassed.

Host Requirements

Once the WAKEUP character is sent, the host must wait a period of time to permit the decoder to wake up. The decoder remains awake for a fixed period of time after wake up. These time periods vary by decoder.

Decoder Requirements

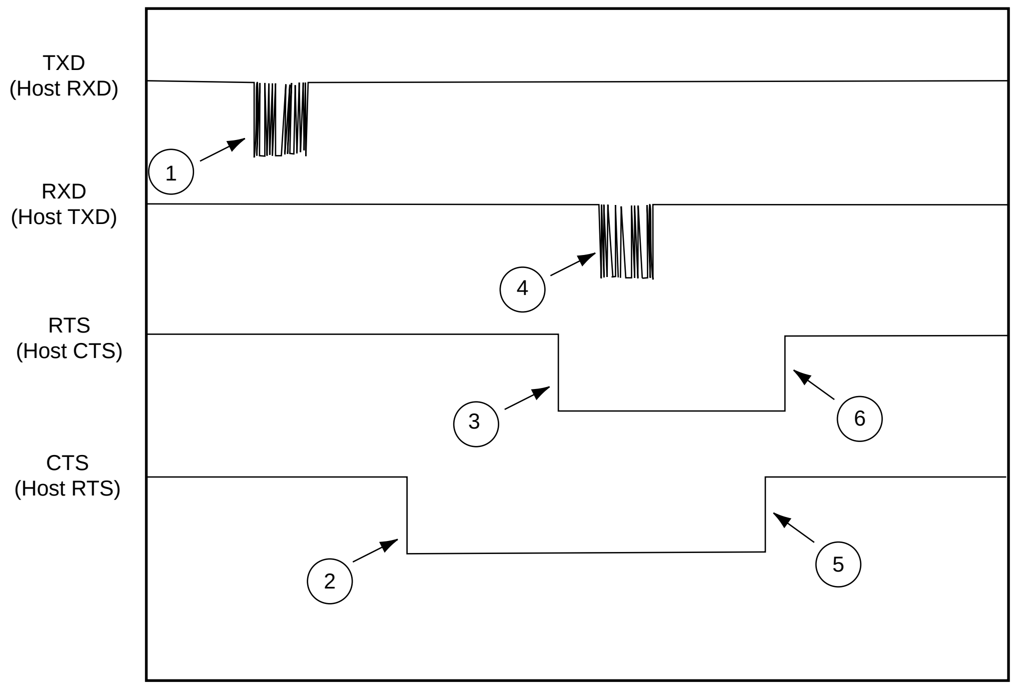
The decoder must not go back into low power mode for a decoder-dependent time period after waking up.

✓ ***NOTE*** The mechanism to wake up a decoder in this manner also works if characters other than WAKEUP are sent to the decoder. There is, however, no guarantee that these commands are interpreted correctly upon power-up. Therefore, it is not recommended that characters other than WAKEUP be used to awaken the decoder.

The WAKEUP character has no effect if sent when the scanner is awake. If the host is unsure of the scanner state, it should send the wakeup character when it wants to communicate with the scanner.

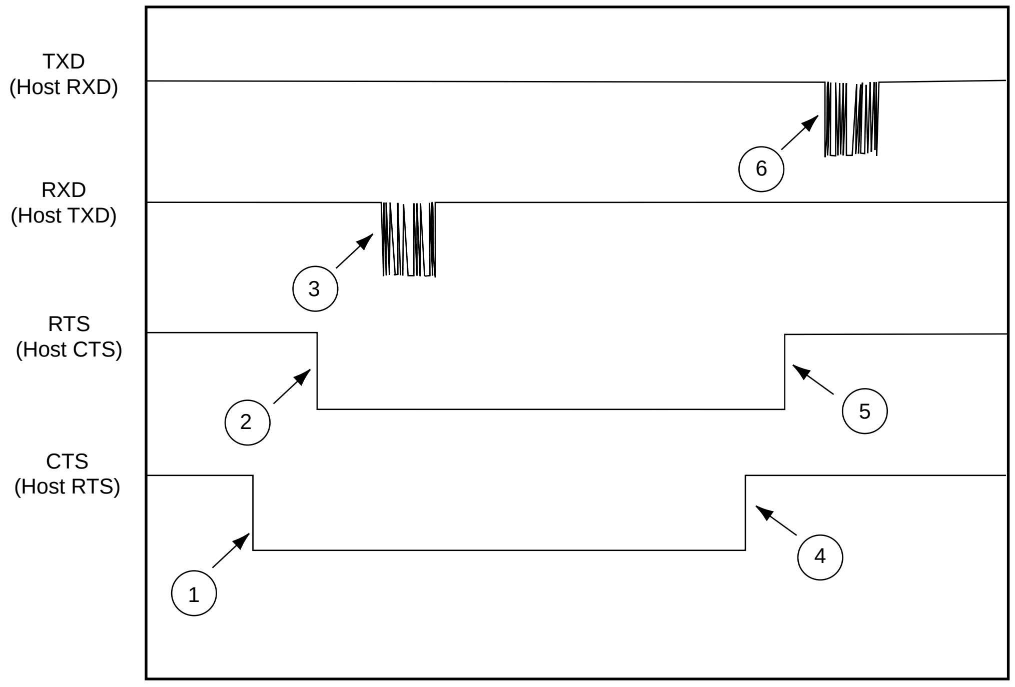
Appendix A Transaction Examples

Various transaction examples are shown in *Figure A-1* through *Figure A-8*.



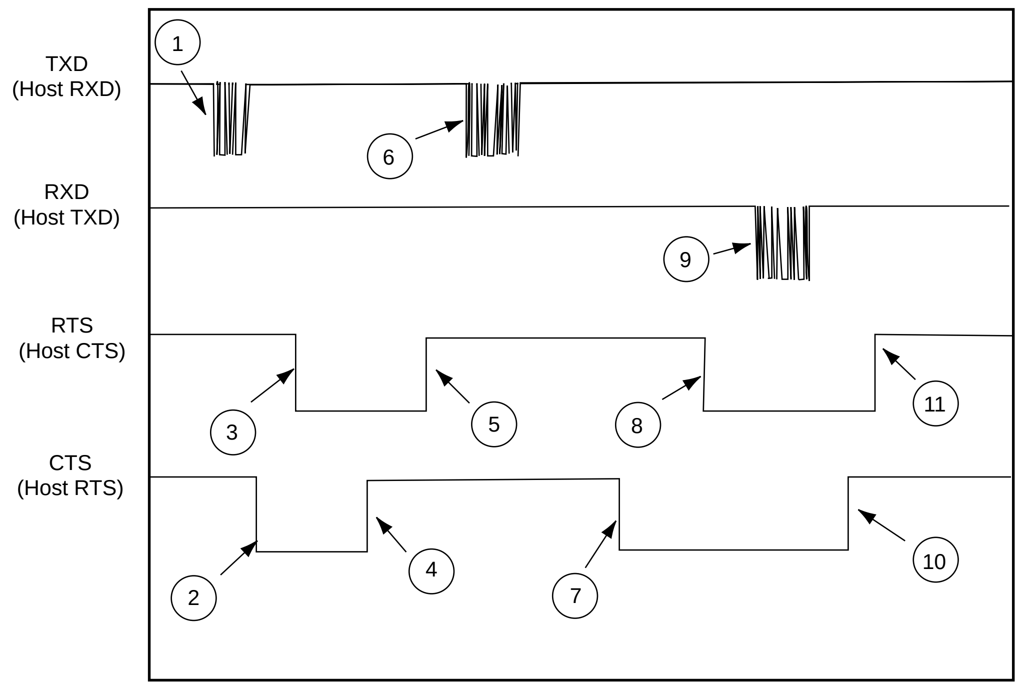
1. Decoder data
2. Host requests to send
3. Decoder grants permission
4. ACK response
5. Host removes request
6. Decoder removes permission

Figure A-1 *Basic Decoder Initiated Transaction*



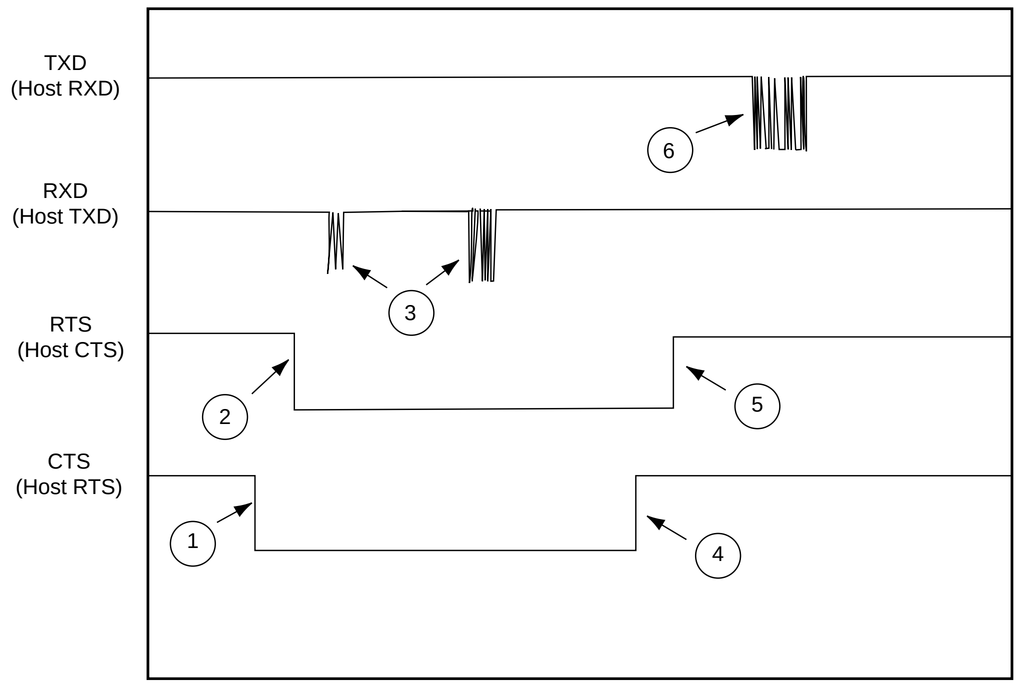
1. Host requests to send
2. Decoder grants permission
3. BEEP command sent
4. Host removes request
5. Decoder removes permission
6. Decoder ACKs

Figure A-2 *Basic Host Initiated Transaction*



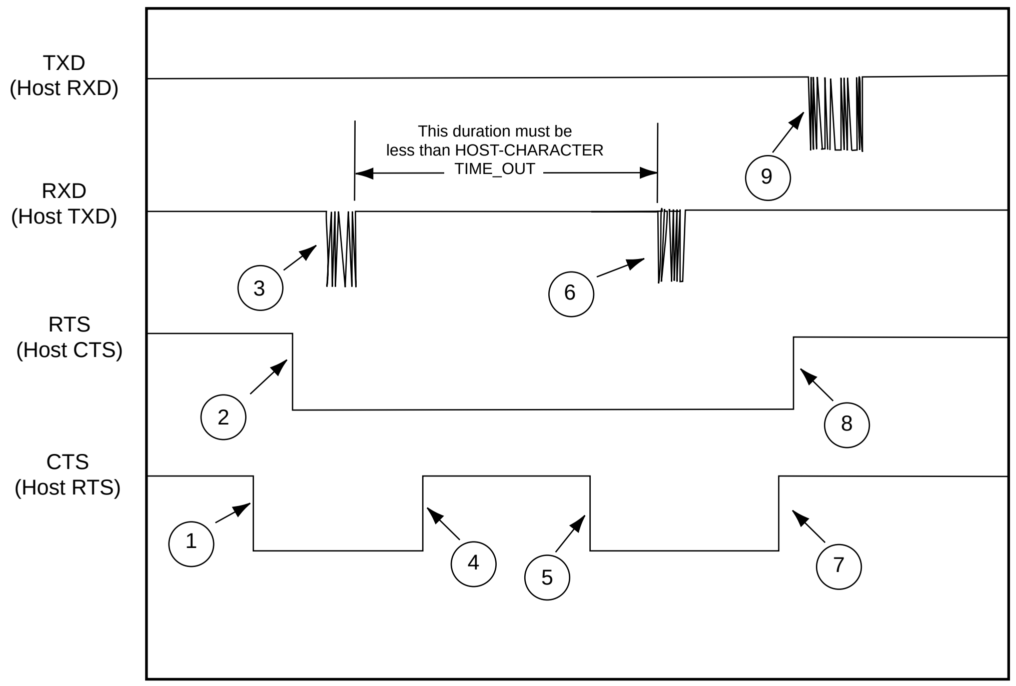
1. Decoder starts to transmit
2. Host asserts RTS causing transmission pause
3. Decoder grants permission for host to send
4. Host removes request without sending
5. Decoder removes permission
6. Decoder resumes transmission
7. Host requests permission to send ACK
8. Decoder grants permission
9. Host sends ACK
10. Host removes request when finished sending
11. Decoder removes permission

Figure A-3 *Host Interrupting Decoder's Transmission*



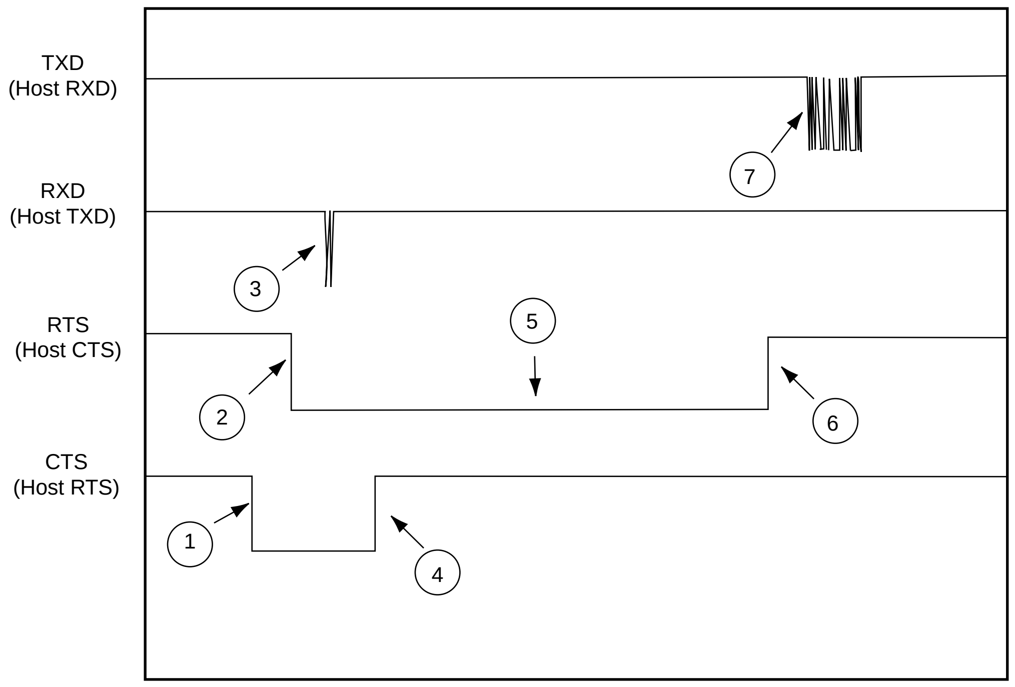
1. Host requests permission to send
2. Decoder grants permission
3. Host sends 3 nulls, then BEEP command
4. Host removes request when finished sending
5. Decoder removes permission
6. Decoder ACKs

Figure A-4 *Host Initiated Transmission with Leading Nulls (Decoder in Continuous Power Mode)*



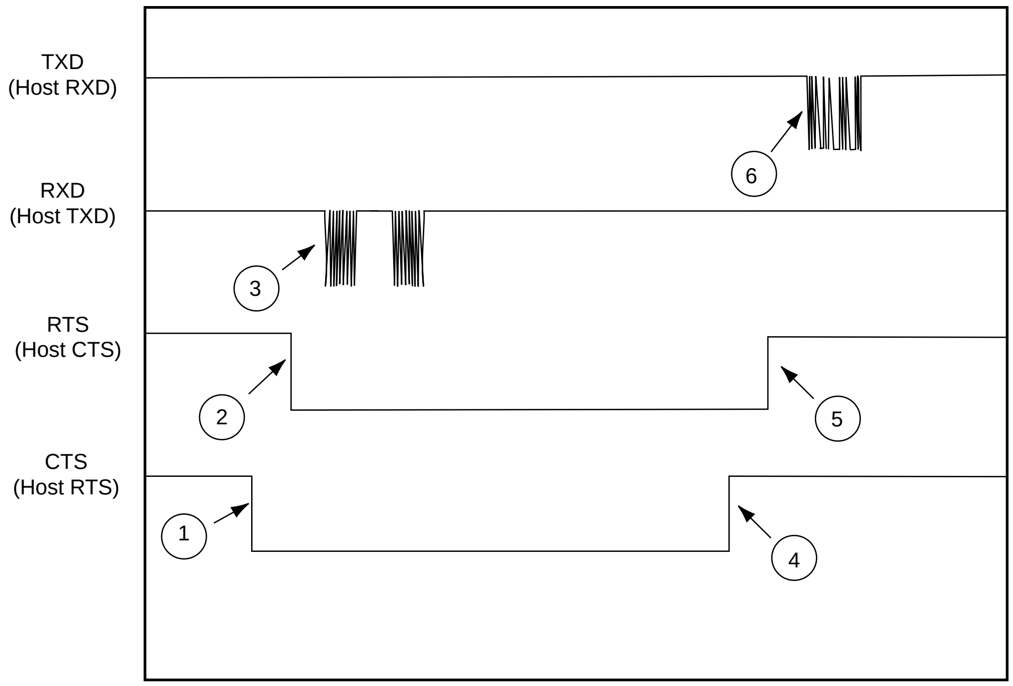
1. Host requests permission to send
2. Decoder grants permission
3. Host sends 1/2 BEEP command
4. Host removes request (ignored by decoder until transmit complete or timed out)
5. Host requests again (ignored by decoder until transmit complete or timed out)
6. Host sends remainder of BEEP command
7. Host removes request
8. Decoder removes permission
9. Decoder ACKs

Figure A-5 *Host Initiated Transaction with Host Pausing and Releasing RTS During Transmission*



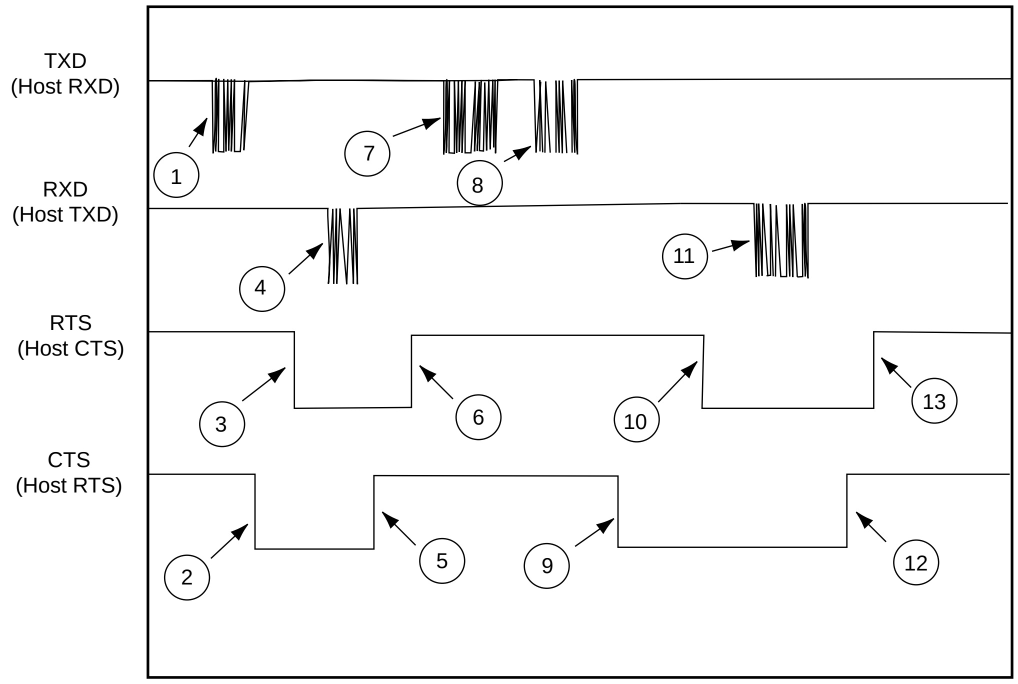
1. Host requests permission to send
2. Decoder grants permission
3. Host sends 2 characters of message
4. Host removes request
5. RTS remains low because decoder is still expecting data
6. Decoder times out waiting for a character and removes permission
7. Decoder sends a NAK resend

Figure A-6 *Error Transmission: Host Sends Only First 2 Characters of 6 Character Message*



1. Host requests permission to send
2. Decoder grants permission
3. Host sends 2 BEEP commands instead of 1
4. Host removes request
5. Decoder removes permission
6. Decoder ACKs first BEEP command

Figure A-7 *Error Condition: Host Sends 2 Valid BEEP Commands Back to Back*



1. Decoder starts to transmit
2. Host requests permission
3. Decoder grants permission
4. Host causes abort by sending BEEP
5. Host removes request
6. Decoder removes permission
7. Decoder ACKs
8. Decoder resends data
9. Host requests permission
10. Decoder grants permission
11. Host ACKs
12. Host removes request
13. Decoder removes permission

Figure A-8 *Host Causes Decoder to Abort Transmission*

Appendix B Mandatory Parameter

The Parameter Scanning option is required for each product using SSI. This parameter enables and disables parameter bar code scanning. The default value for this parameter must be 1, Enable.

When SSI hosts establish communication, they typically set this option to 0 (disable), which disables parameter scanning. The hosts should query this parameter periodically. If the host detects the value is 1, it infers the user scanned either the Set Defaults bar code or Enable Parameter Scanning bar code. The host may then take remedial action, which may include determining and resetting all parameters via the SSI interface.

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ZEBRA

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