STAR ★ Modem™

Reference Manual

DATALOGIC

STAR★Modem™

REFERENCE MANUAL

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STAR★Modem™

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This manual refers to software version 1.0 and later

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CONTENTS

HOW TO USE THIS MANUAL

Your modem is supplied with its own Quick Reference Manual which provides connection diagrams, basic application parameter settings using configuration strings, default values, and specific technical features. You can see either your modem's Quick Reference Manual or this manual for initial configuration.
Initial configuration must be performed through the RS232 interface.

To use this manual for initial setup see chapter 3**.**

If you need to change the default settings for your specific application, see chapter 4 and the Examples in appendix A.

DL Sm@rtSet

DL Sm@rtSet program, available on the installation CD-ROM, is a Windows-based utility program providing a quick and user-friendly configuration method via RS232.
It allows defining the desired parameter values and sending the complete configuration directly to the connected STAR★Modem™ via serial interface.
In addition, it also transmits software upgrades to the connected device.

Sending Configuration Strings from Host

This configuration method may be used for initial and complete configuration by sending the desired strings provided in Chapter 4 through the RS232 interface. Batch files containing the desired parameter settings can be prepared to configure the modem quickly and easily.
Reference notes describing the operation of more complex parameters are given in chapter 5.

Reading Configuration Barcodes

This configuration method allows setting STAR★Modem™ by reading configuration barcodes with a Datalogic RF device and sending the commands to the modem via radio.
Initial configuration cannot be performed using this method. However, this method is particularly useful in changing configuration parameters of a STAR★Modem™ working in Wedge or Pen Emulation interfaces (except radio parameters, which must be configured in RS232).
All barcodes are provided in the “STAR★Modem™ Configuration Using Barcodes” document available on the CD-ROM.

1 INTRODUCTION

STAR★Modem™ is a radio modem developed to provide wireless 433 MHz RF (European models) / 910 MHz (USA model) communication between any serial device (Host) and Datalogic RF devices or base stations, such as:

-  Gryphon™ M Readers
-  Dragon™ M Laser Scanners
-  STAR★Modem™ Radio Modems
-  Formula Basic Line RF Terminals (F734-E/RF, F725-E/RF, F660-E/RF)*
-  STARGATE™ Base Stations

* *not compatible with STAR ★Modem™ USA model.*

STAR★Modem™ can be configured to communicate either in Stand Alone Mode (see par. 2.1.1) or STAR-System™ mode (see par. 2.1.2).

1.1 LED INDICATORS

STAR★Modem™ has three LEDs as displayed in the following figure:

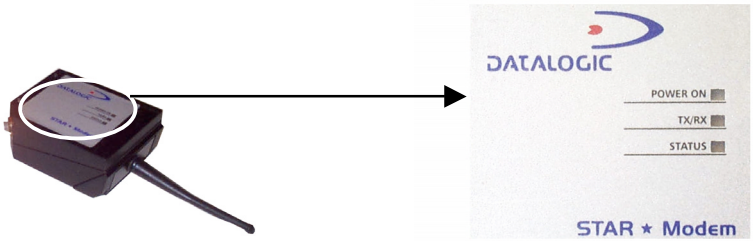


Figure 1 - STAR★Modem™ LED Side

Each LED signals a different modem functioning as reported in the table below:

LED	DESCRIPTION	
Power On	Green constant	STAR★Modem™ is powered.
TX/RX	Yellow blinking	STAR★Modem™ is receiving or transmitting data.
Status	Off	STAR★Modem™ is working correctly.
	Red constant	- at startup, after firmware download, it indicates that the system is working with default configuration. - during normal functioning it signals a wrong connection to the Host.
	Red blinking	- it blinks during a programming command execution. In case of wrong command, it will blink faster; - it blinks once when STAR★Modem™ radio transaction fails.

Software Upgrade

It is possible to upgrade the software of STAR★Modem™ by using the DL Sm@rtSet program or the Downloader program provided on the installation CD-ROM.
During this procedure the Power On LED is off while the TX/RX and Status LEDs blink alternatively.
Once the software upgrade has been completed, the Status LED stays on and STAR★Modem™ starts working with its default configuration.

NOTE

The software upgrade can be performed only when the Frame Packing parameter is set to "Frame + [CR]" value (see par. 5.2.5 for details).

In case of software upgrade failure, follow the given steps:

1) *turn off STAR★Modem™;*
2) *connect STAR★Modem™ to the Host;*
3) *start the Downloader program until it asks for the device reset;*
4) *turn on STAR★Modem™.*

The modem software will be upgraded successfully.

2 MOUNTING AND CONNECTIONS

2.1 BASIC SYSTEM LAYOUTS

There are two basic system layouts that can be employed: stand alone and STAR-System™ (for other layouts refer to the examples given in appendix A).

2.1.1 Stand Alone Mode

In Stand Alone mode, STAR★Modem™ can be setup in uni-directional communication to either receive data via radio from Datalogic RF devices, or transmit data via radio to Datalogic RF devices. Currently supported devices are RF hand-held readers, another STAR★Modem™ or RF terminals loading STAR&Play™ software (not compatible with STAR★Modem™ USA model).
When receiving data, STAR★Modem™ as a Server works like a Datalogic OM-cradle (refer to STAR★Modem™ 1 in the figure below); therefore, the received data will only be sent to the connected Host.
Since STAR★Modem™ functions as a cradle in this configuration, all the multistandard interface selections are valid (RS232, Wedge, Pen Emulation).
STAR★Modem™ in transmission (refer to STAR★Modem™ 2 in the figure below) as Client works like a data collection RF Device (ex. DRAGON™ M) transmitting the collected data via radio to the destination Stand Alone device (STAR★Modem™ or cradle).
In Stand Alone mode, the system implements a different RF Narrow Band radio protocol than STAR-System™.

NOTE

For communicating with STAR★Modem™ in Stand Alone mode, configure all Datalogic RF devices by using the commands of the Stand Alone Mode procedure available in the "RF Device Setup For STAR★Modem™" document on the CD-ROM.

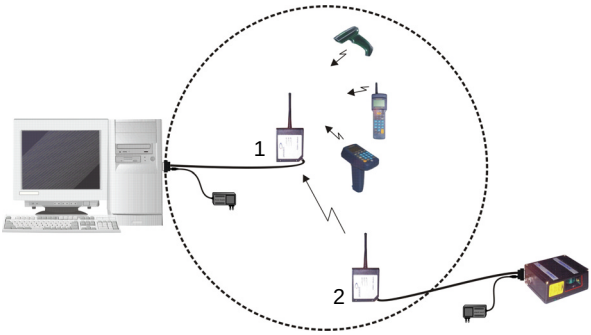


Figure 2 - Stand Alone Mode

To configure the modem for operating in this mode refer to par. 3.2.

2.1.2 STAR-System™ Mode

In STAR-System™ mode, STAR★Modem™ uniquely provides a wireless bi-directional communication between the Host and the RF devices. STAR★Modem™ 1 in the figure below is a Server (receiver) to the RF Devices and also a Client (transmitter) to STAR★Modem™ 2, which receives data for the printer.
This mode is only for RS232 communication.
STAR-System™ uses the Narrow Band RF radio and Datalogic CSMA/CA protocol to automatically link and manage all the RF devices in the system. This protocol manages the data transmission using a 16-bit CRC checksum. **All RF devices** in the system **must implement** the CSMA/CA **protocol** and therefore be configured using the STAR-System™ setup procedure (refer to STAR★Modem™ and the RF devices in the figure below).

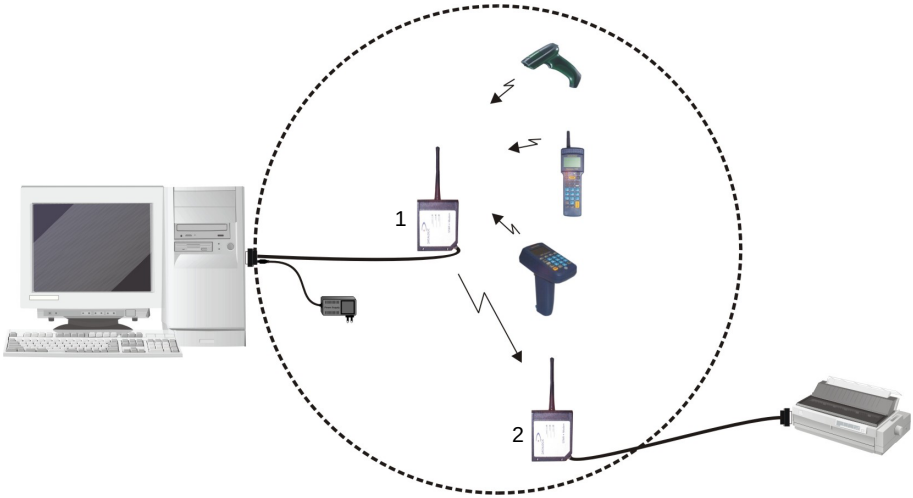


Figure 3 – STAR-System™ Mode

To configure the modem for operating in this mode refer to par. 3.3.

2.2 STAR★Modem™ INSTALLATION

STAR★Modem™ can be installed to operate in different positions by means of two different mounting brackets and an adjustable antenna.
The four screw holes (M4 x 5) on the body of the modem are for mechanical fixture.
The diagram below gives the overall dimensions of the modem and may be used for its installation.

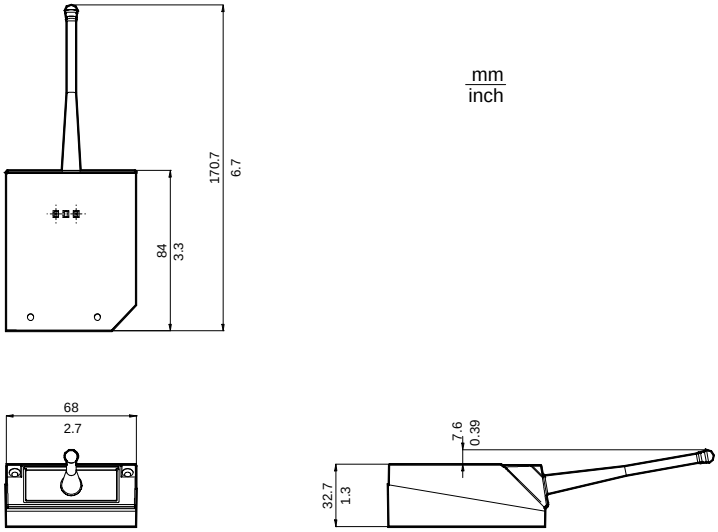


Figure 4 - STAR★Modem™ Overall Dimensions

2.2.1 Mounting Brackets

Two different mounting brackets are provided to guarantee the best positioning according to your application.
The following figures display two possible mounting positions and give the overall dimensions of each bracket which may be used for their installation.

Figure 5 - STAR★Modem™ Standard Positions Using Mounting Brackets

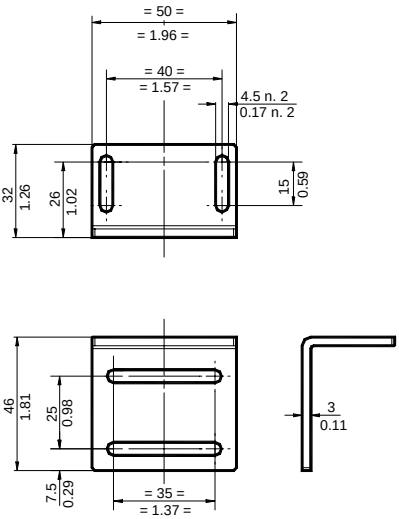


Figure 6 - ST-217

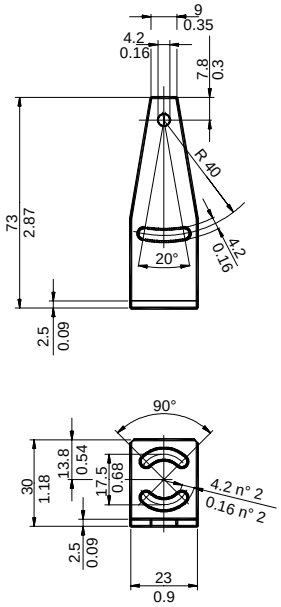


Figure 7 - ST-133

2.2.2 Antenna

WARNING

Before proceeding with this operation ensure that the modem is not powered.

An adjustable antenna on top of the modem can be rotated allowing STAR★Modem™ installation even in the most critical positions.
In standard position, the antenna is parallel to the modem body as displayed in the following figure:

Figure 8 - Antenna Standard Position

To change the antenna position:

1) unscrew the antenna support;
2) rotate the support until the antenna is perpendicular to the modem body, being careful not to damage the cable connected to the antenna (see figure below);
3) remount the antenna support by means of the two screws.

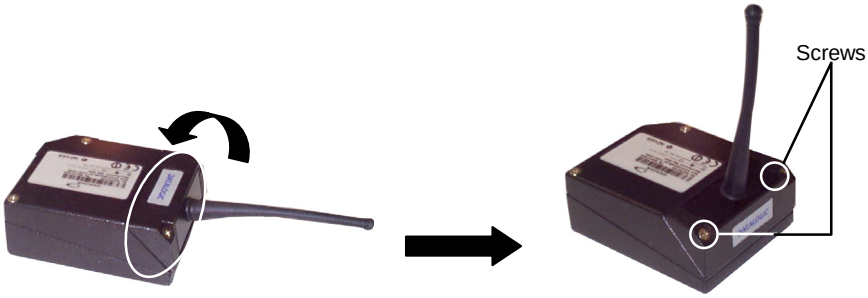


Figure 9 - Antenna Perpendicular to STAR★Modem™

2.3 SYSTEM CONNECTIONS

CAUTION

Connections should always be made with power off!

STAR★Modem™ has a dedicated 9-pin female cable connector allowing direct connection to an Host through the RS232 serial interface. For Wedge and Pen Emulation interface connections you must use an adapter and the Datalogic standard cable corresponding to the desired interface.

The modem must also be supplied by connecting an external power supply to the power jack provided on the same 9-pin cable connector.

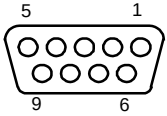


Figure 10 - STAR★Modem™ 9-pin Female Connector

The cable pinout is reported in the following tables:

Pin	RS232	Wedge	Pen
1		PC_DATA	
2	TX232		
3	RX232	KB_DATA	KB_DATA
4		+5 Vdc (Keyboard Supply Voltage)	PWR
5	GND	GND	GND
6		PC_CLK	
7	CTS232	KB_CLK	
8	RTS232		

Power Supply

Pin	Name
5	GND
9	VDC+ (Modem Supply Voltage)

NOTE

By inserting the power supply connector into the power jack, pin 9 is automatically disconnected.

5 Vdc **or** 10 - 30 Vdc 200 mA

Figure 11 – Power Jack Polarity

2.3.1 RS232 Interface Connection

This connection can be activated by simply inserting the 9-pin STAR★Modem™ cable in the PC COM port.

Figure 12 - RS232 Interface Connection

2.3.2 Pen Emulation Interface Connection

CAUTION

Before proceeding with this connection, configure STAR ★Modem™ software parameters through the RS232 interface and then set the hardware jumper position (see Chapter 3).

For Pen Emulation interface connection, it is necessary to use the adapter as shown in the following figure.

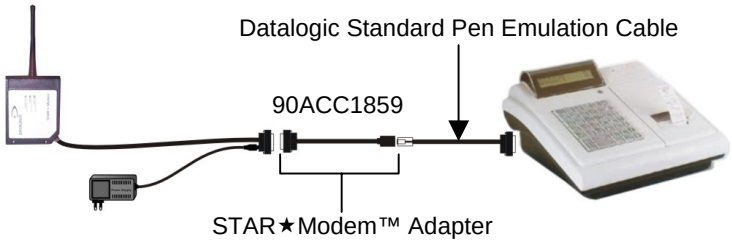


Figure 13 - Pen Emulation Interface Connection

2.3.3 Wedge Interface Connection

CAUTION

Before proceeding with this connection, configure STAR ★Modem™ software parameters through the RS232 interface and then set the hardware jumper position (see Chapter 3).

For Wedge interface connection, it is necessary to use the adapter as shown in the following figure.

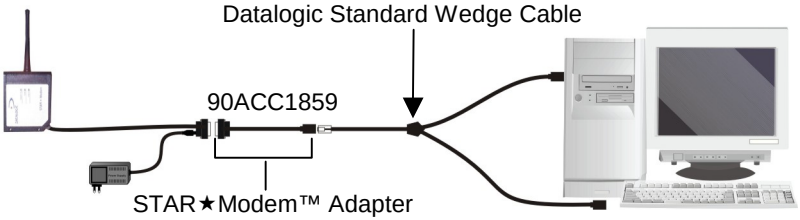


Figure 14 - Wedge Interface Connection

3 INITIAL SETUP

For a correct STAR★Modem™ configuration keep in mind the following guidelines:

- when using the modem for the first time, set the desired STAR★Modem™ address via RS232 serial interface, since its factory default address is "Undefined";

- for Wedge/Pen Emulation interface connections, set all parameters via RS232 interface either using DL Sm@rtSet or sending configuration strings to STAR★Modem™. Then, set the correct hardware jumper position as indicated in the table given in par. 3.2.1 under "Interface Selection".
  For changing any configuration parameter in Wedge/Pen Emulation interface connections, send the new configuration commands via radio using Datalogic RF devices (refer to “STAR★Modem™ Configuration Using Barcodes” document provided on the CD-ROM). Otherwise, set the jumper in the RS232 position (RS232 communication parameters are set to default values) to send the configuration strings to STAR★Modem™ via serial interface and set the jumper back in Wedge/Pen Emulation position to enable this kind of connection.
  For jumper setting, open the antenna support by means of the 2 screws as shown in the following figure:

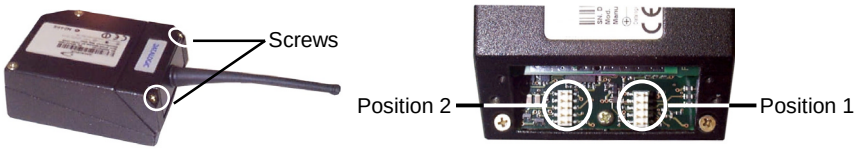


Figure 15 - Jumper Positioning

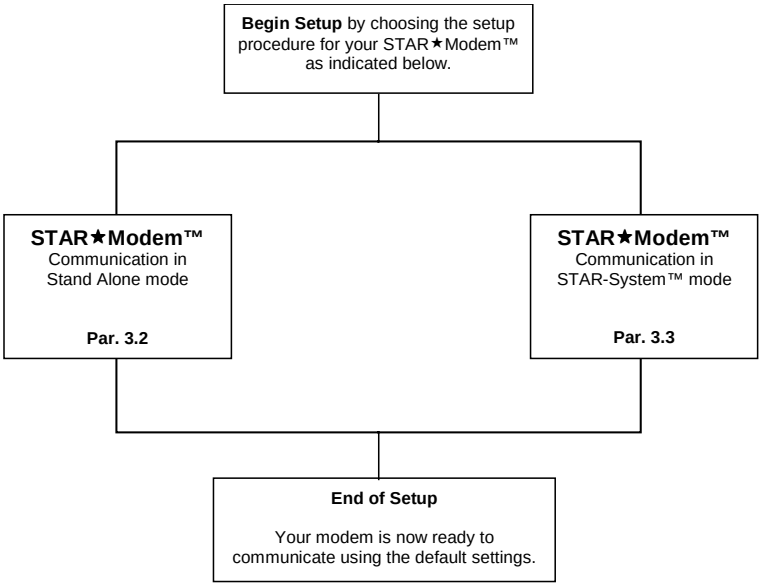
Position 1 = RS232/Digital interface

Position 2 = Wedge/Pen Emulation interface

3.1 DEFINING THE SETUP

For STAR★Modem™ two different setups are provided to select communication either in Stand Alone mode or in STAR-System™ mode.

Proceed as shown in the following diagram:



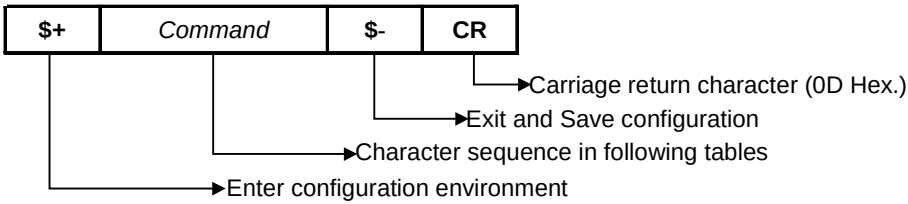
3.1.1 Configuration Strings

STAR★Modem™ initial setup must be performed via serial interface by sending the configuration strings to the modem using any terminal emulation program, for example Hyper Terminal.

NOTE

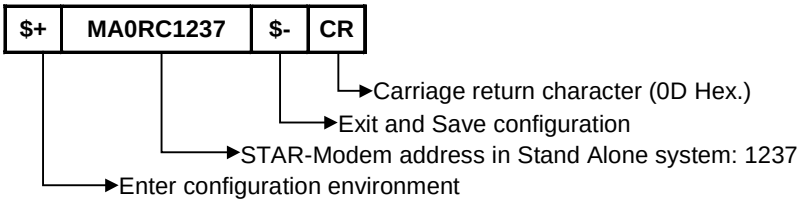
Ensure that your PC COM port is set as follows:
9600 baud, no parity, 8 data bits, 1 stop bit, handshaking disabled.

The programming sequence is the following:



Example

Command programming sequence:



3.2 SETUP FOR STAND ALONE MODE

3.2.1 STAR★Modem™ Receiver (Server)

RESTORE DEFAULT

Whenever necessary, send the following string to STAR★Modem™ via RS232 to restore its default values. Otherwise skip to step **2**:

1.	**Restore STAR★Modem™ Default**	**$+$*CR**

This command does not change the STAR★Modem™ address nor the RF Baud Rate parameters.

SET RADIO ADDRESS

Follow the procedure below to set the STAR★Modem™ radio address and prepare it to receive data from the RF devices of the system.

2.	**Enter Configuration**	**$+**
3.	**Set STAR★Modem™ Radio Address** xxxx = four digits for the STAR★Modem™ address (from **0000** to **1999**). **This address must be unique.**	**MA0RCxxxx**
4.	**Set RF Baud Rate (not for USA model)** x = **0** defines 9600 baud **1** defines 19200 baud	**MFx**
5.	**Exit and Save Configuration**	**$-CR**

INTERFACE SELECTION

6.	Select the desired interface string for your application, then set the correct hardware jumper position. Among the following interface selection strings, **send only the string that suits your application**:		
			Jumper Position
	RS232 Interface	**$+CP0$-CR**	1
	Pen Emulation Interface	**$+CP6$-CR**	2

Wedge Interface		
IBM AT or PS/2 PCs	**$+CP500$-CR**	2
IBM XT	**$+CP503$-CR**	2
PC Notebook	**$+CP505$-CR**	2
IBM SURE1	**$+CP506$-CR**	2
IBM Terminal 3153	**$+CP504$-CR**	2
IBM Terminals 31xx, 32xx, 34xx, 37xx To select the interface for these IBM Terminals, send the correct KEY TRANSMISSION string. Select the KEYBOARD TYPE if necessary (default = advanced keyboard).		
Make-only keyboard	**$+CP502$-CR**	2
Make-break keyboard	**$+CP501$-CR**	2
Advanced keyboard	**$+FK1$-CR**	2
Typewriter keyboard	**$+FK0$-CR**	2
ALT MODE The ALT-mode selection allows barcodes sent to the PC to be interpreted correctly independently from the Keyboard Nationality used. You do not need to make a Keyboard Nationality selection. (default = Num Lock Unchanged). Make sure the Num Lock key on your keyboard is ON.		
IBM AT- ALT mode	**$+CP507$-CR**	2
PC Notebook - ALT mode	**$+CP508$-CR**	2
Wyse Terminal - ANSI Keyboard	**$+CP509$-CR**	2
Wyse Terminal - PC Keyboard	**$+CP510$-CR**	2
Wyse Terminal - ASCII Keyboard	**$+CP511$-CR**	2
Wyse Terminal - VT2200 style Keyboard	**$+CP514$-CR**	2
APPLE ADB Bus	**$+CP513$-CR**	2
Digital Terminal VT2xx/3xx/4xx	**$+CP512$-CR**	1

CAUTION

For changing the configuration parameters when using the Digital terminal interface, send the new values via radio through Datalogic RF devices. Otherwise, send the $+CP0$-CR string via radio to set the RS232 interface and define the parameters via serial interface. This operation sets the RS232 parameters to default values and erases the current header and terminator selection. Thus, after configuration setting, you must restore the Digital Terminal interface, Header and Terminator selection by sending a command string similar to the one given in the following example:
$+CP512EA0141EA1102$-CR.

3.2.2 STAR★Modem™ Transmitter (Client)

RESTORE DEFAULT

Whenever necessary, send the following string to STAR★Modem™ via RS232 to restore its default values. Otherwise skip to step **2**:

1.	**Restore STAR★Modem™ Default**	**$+$*CR**

This command does not change the STAR★Modem™ address nor the Stand Alone destination device address, nor the RF Baud Rate parameters.

SET RADIO ADDRESS

Follow the procedure below to set the STAR★Modem™ radio address and prepare it to transmit data to the destination device of the system.

2.	**Enter Configuration**	**$+**
3.	**Set STAR★Modem™ Radio Address** xxxx = four digits for the STAR★Modem™ address (from **0000** to **1999**). **This address must be unique.**	**MA0RCxxxx**
4.	**Address of the Stand Alone Destination Device** xxxx = four digits for the address of the Stand Alone Destination Device (from **0000** to **1999**). **This address must be unique.**	**MSxxxx**
5.	**Set RF Baud Rate (not for USA model)** x = **0** defines 9600 baud **1** defines 19200 baud	**MFx**
6.	**Exit and Save Configuration**	**$-CR**

No interface selection is required, since STAR★Modem™ can transmit data only if connected to the Host via its RS232 serial interface.

3.3 SETUP FOR STAR-SYSTEM™ MODE

RESTORE DEFAULT

Whenever necessary, send the following string to STAR★Modem™ via RS232 to restore its default values. Otherwise skip to step **2**:

1.	**Restore STAR★Modem™ Default**	**$+$*CR**

This command does not change the STAR★Modem™ address nor the STAR-System™ destination device addresses, nor the RF Baud Rate parameters.

SET RADIO ADDRESSES

Follow the procedure below to set the STAR★Modem™ radio address and prepare it to receive and transmit data to all devices included in the range from the First to the Last STAR-System™ destination device.

2.	**Enter Configuration**	**$+**
3.	**Set STAR★Modem™ Radio Address** xxxx = four digits for the STAR★Modem™ address (from **0000** to **1999**). **This address must be unique.**	**MA1RCxxxx**
4.	**First STAR-System™ Destination Device Address** xxxx = four digits for the Destination Device address (from **0000** to **1999**).	**MSxxxx**
5.	**Last STAR-System™ Destination Device Address** xxxx = four digits for the Destination Device address (from **0000** to **1999**). If transmitting to one Destination device only, this selection is not required.	**MTxxxx**
6.	**Set RF Baud Rate (not for USA model)** x = **0** defines 9600 baud **1** defines 19200 baud	**MFx**
7.	**Exit and Save Configuration**	**$-CR**

When defining a range of destination device addresses, STAR★Modem™ activates roaming towards all the devices included within this range.

No interface selection is required, since all STAR-System™ transactions occur via serial interface.

4 CONFIGURATION

Once the modem is setup, you can change the default parameters to meet your application needs by sending the desired strings to the modem via serial interface.

Refer to chapter 3 for initial configuration in order to set the default values and if necessary select the interface for your application.

The following table lists all configuration commands which do not require the $- character:

Description	String
Enter Configuration	**$+**
Exit and Save Configuration	**$-**
Restore Default	**$+$*CR**
Transmit Software Release	**$+$!CR**
Transmit Configuration	**$+$&CR**

NOTE

It is always possible to activate the modem in temporary mode by pressing the "s" (lower case) key on the keyboard and connecting simultaneously an external power supply to the power jack provided on the modem 9-pin cable connector. When working in temporary mode, you can get the modem current configuration and its software release. Furthermore, it is possible to send a command string starting with the $+ characters and terminating with the $- characters. To exit the temporary mode simply reset STAR ★Modem™.
The communication parameters must be set to 9600 baud, no parity, 8 data bits, 1 stop bit, handshaking disabled.

In this manual, the configuration parameters are divided into logical groups making it easy to find the desired function based on its reference group.

The first three groups are for Standard Interface parameter configuration:

- **RS232**
- **WEDGE**
- **PEN EMULATION**

The following parameter groups are common to all interface applications:

DATA FORMAT parameters regard the messages sent to the Host system for all interfaces except Pen Emulation.

RADIO PARAMETERS allow configuration of radio protocol parameters.

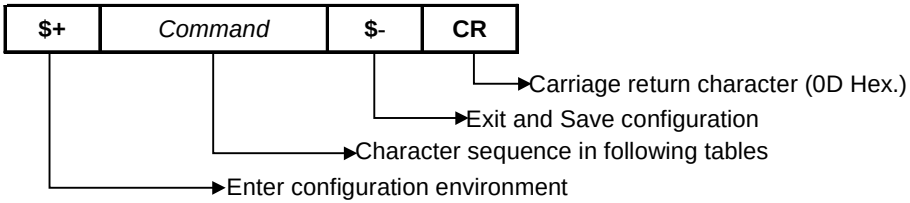
NOTE

It is strongly recommended to read par. 5.1 in Radio and Serial Communication controls and the example applications in appendix A for correct parameter settings.

RS232 PARAMETERS

- ***BAUD RATE***
- ***PARITY***
- ***DATA BITS***
- ***STOP BITS***
- ***HANDSHAKING***
- ***ACK/NACK PROTOCOL***
- ***FIFO***
- ***INTER-CHARACTER DELAY***
- ***RX TIMEOUT***
- ***FRAME PACKING***

The programming sequence is the following:



RS232

Description	String
BAUD RATE	
150 baud	**CD0**
300 baud	**CD1**
600 baud	**CD2**
1200 baud	**CD3**
2400 baud	**CD4**
4800 baud	**CD5**
9600 baud	**CD6**
19200 baud	**CD7**
38400 baud	**CD8**
57600 baud	**CD9**

PARITY	
None	**CC0**
Even parity	**CC1**
Odd parity	**CC2**

DATA BITS	
7 bits	**CA0**
8 bits	**CA1**
9 bits	**CA2**

STOP BITS	
1 bit	**CB0**
2 bits	**CB1**

Description	String
HANDSHAKING *see par. 5.2.1*	
Disable	**CE0**
Hardware (RTS/CTS)	**CE1**
Software (XON/XOFF)	**CE2**
RTS always ON	**CE3**
Modem (RTS/CTS)	**CE4**

ACK/NACK PROTOCOL *see par. 5.2.2*	
Disabled	**ER0**
Enable ACK/NACK	**ER1**
Enable DATA/NACK	**ER2**

FIFO *see par. 5.2.4*	
Disable	**ME1**
Enable	**ME0**

INTER-CHARACTER DELAY	
Inter-character delay (ms)	**CK00 – CK99**

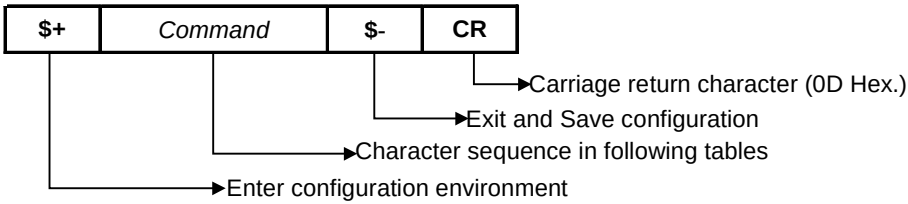
RX TIMEOUT *see par. 5.2.3 and par. 5.2.5*	
RX Timeout (sec)	**CL00 – CL99**

FRAME PACKING *see par. 5.2.5*	
Frame + [CR]	**ML0**
[STX] + Len + frame + [CR]	**ML1**
Frame after timeout	**ML2**

WEDGE PARAMETERS

- ***KEYBOARD NATIONALITY***
- ***CAPS LOCK***
- ***NUM LOCK***
- ***STOP BITS***
- ***INTER-CHARACTER DELAY***
- ***INTER-CODE DELAY***
- ***KEYBOARD SETTING***
- ***WEDGE CONTROL CHARACTER EMULATION***

The programming sequence is the following:



Description	String
KEYBOARD NATIONALITY	
Belgian	**FJ7**
English	**FJ4**
French	**FJ2**
German	**FJ3**
Italian	**FJ1**
Spanish	**FJ6**
Swedish	**FJ5**
USA	**FJ0**

CAPS LOCK	
Caps lock ON	**FE1**
Caps Lock OFF	**FE0**

Select the appropriate code to match your keyboard caps lock status.

Note: For **PC Notebook** interface selections, the caps lock status is automatically recognized, therefore this command is not necessary.

NUM LOCK	
Toggle Num Lock	**FL1**
Num Lock Unchanged	**FL0**

This selection is used together with the Alt Mode interface selection for AT or Notebook PCs. It changes the way the Alt Mode procedure is executed, therefore it should be set as follows:

- if your keyboard Num Lock is normally on use **num lock unchanged**
- if your keyboard Num Lock is normally off use **toggle num lock**

In this way the device will execute the Alt Mode procedure correctly for your application.

INTER-CHARACTER DELAY	
Inter-character delay (ms)	**CK00 – CK99**

KEYBOARD SETTING

ALPHANUMERIC KEYBOARD SETTING

The reader can be used with terminals or PCs with various keyboard types and nationalities through a simple keyboard setting procedure.

The type of computer or terminal must be selected before activating the keyboard setting command.
Keyboard setting consists of communicating to the reader how to send data corresponding to the keyboard used in the application. The keys must be set in a specific order.

Press and release a key to set it.

Some characters may require more than one key pressed simultaneously during normal use (refer to the manual of your PC or terminal for keyboard use). The exact sequence must be indicated to the reader in this case pressing and releasing the different keys.

Example:

If one has to press the "Shift" and "4" keys simultaneously on the keyboard to transmit the character "$" to the video, to set the "$", press and release "Shift" then press and release "4".

Each pressed and released key generate a yellow LED on the device, otherwise repress the key. Never press more than one key at the same time, even if this corresponds to the normal use of your keyboard.

Press "Backspace" to correct a wrong key entry.

Note: "CAPS LOCK" and "NUM LOCK" must be off before starting the keyboard setting procedure. "SHIFT" must be repressed for each character and cannot be substituted by "CAPS LOCK".

setting the alphanumeric keyboard

Read the code above with one of the RF devices compatible with STAR★Modem™ and send it to the modem via radio.
press the keys shown in the following table according to their numerical order.

Some ASCII characters may be missing as this depends on the type of keyboard: these are generally particular characters relative to the various national symbologies. In this case:

- **The first 4 characters (Shift, Alt, Ctrl, and Backspace) can only be substituted with keys not used, or substituted with each other.**
- characters can be substituted with other single symbols (e.g. "SPACE") even if not included in the string set used.
- characters can be substituted with others corresponding to your keyboard.

WEDGE

01 : **Shift**		
02 : **Alt**		
03 : **Ctrl**		
04 : **Backspace**		
05 : **SPACE**	28 : **7**	51 : **N**
06 : **!**	29 : **8**	52 : **O**
07 : **"**	30 : **9**	53 : **P**
08 : **#**	31 : **:**	54 : **Q**
09 : **$**	32 : **;**	55 : **R**
10 : **%**	33 : **<**	56 : **S**
11 : **&**	34 : **=**	57 : **T**
12 : **'**	35 : **>**	58 : **U**
13 : **(**	36 : **?**	59 : **V**
14 : **)**	37 : @	60 : **W**
15 : *****	38 : **A**	61 : **X**
16 : **+**	39 : **B**	62 : **Y**
17 : **,**	40 : **C**	63 : **Z**
18 : **-**	41 : **D**	64 : **[**
19 : **.**	42 : **E**	65 : ****
20 : **/**	43 : **F**	66 : **]**
21 : **0**	44 : **G**	67 : **^**
22 : **1**	45 : **H**	68 : _ (underscore)
23 : **2**	46 : **I**	69 : `
24 : **3**	47 : **J**	70 : **{**
25 : **4**	48 : **K**	71 : **|**
26 : **5**	49 : **L**	72 : **}**
27 : **6**	50 : **M**	73 : **~**
		74 : **DEL**

During the keyboard setting the red LED on the modem always blinks, the yellow LED stays on and blinks off only each time a key is pressed, while the green LED stays on and blinks off only each time the Backspace key is pressed. Once the last key has been pressed, the yellow LED stays off indicating the keys have been registered, while the green LED stays on again. Read the code below and send it to the modem via radio to end the procedure.

ending the procedure

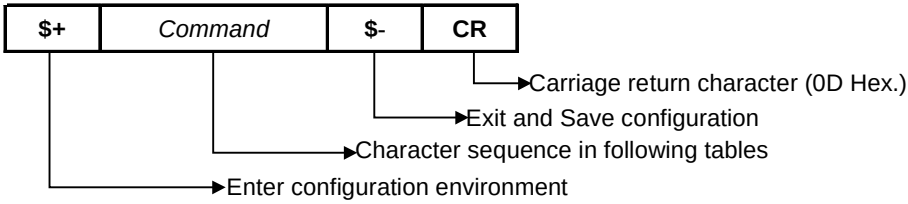
Description	**String**
INTER-CODE DELAY	
Inter-code delay (ms)	**FG00 – FG99**

CONTROL CHARACTER EMULATION	
Ctrl + Shift + Key	**FO0**
Ctrl + Key	**FO1**

PEN EMULATION

- ***OPERATING MODE***
- ***MINIMUM OUTPUT PULSE***
- ***CONVERSION TO CODE 39 AND CODE 128***
- ***OVERFLOW***
- ***OUTPUT LEVEL***
- ***IDLE LEVEL***
- ***INTER-BLOCK DELAY***

The programming sequence is the following:



PEN EMULATION

Description	String
OPERATING MODE	
Interpret mode (does not require **$**+ or **$-**)	**$]**
Transparent mode (does not require **$**+ or **$-**)	**$[**

Interpret mode: interprets commands without sending them to the decoder.
Transparent mode: sends commands to the decoder without interpreting them.

MINIMUM OUTPUT PULSE *see par. 5.3.1*	
200 µs	**DG0**
400 µs	**DG1**
600 µs	**DG2**
800 µs	**DG3**
1 ms	**DG4**
1.2 ms	**DG5**

A higher parameter value corresponds to a lower code resolution emulation.

CONVERSION TO CODE 39 AND CODE 128 *see par. 5.3.3*	
Enable conversion to Code 39	**DA1**
Enable conversion to Code 128	**DA2**

OVERFLOW *see par. 5.3.2*	
Narrow	**DH0**
Medium	**DH1**
Wide	**DH2**

PEN EMULATION

Description	String
OUTPUT LEVEL *see par. 5.3.4*	
Normal (white = logic level 0)	**DD0**
Inverted (white = logic level 1)	**DD1**

IDLE LEVEL *see par. 5.3.4*	
Normal (black level)	**DE0**
Inverted (white level)	**DE1**

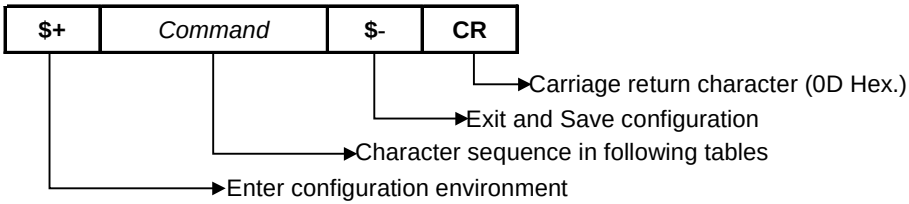
INTER-BLOCK DELAY *see par. 5.3.5*	
Inter-block delay (100 ms)	**CK00 – CK99**

DATA FORMAT

NOT FOR PEN INTERFACES

- ***CODE IDENTIFIER***
- ***CUSTOM CODE IDENTIFIER***
- ***HEADER***
- ***TERMINATOR***
- ***HEADER POSITION***
- ***CODE LENGTH TX***
- ***ADDRESS STAMPING***
- ***ADDRESS DELIMITER***

The programming sequence is the following:



CODE IDENTIFIER TABLE

CODE	AIM STANDARD	DATALOGIC STANDARD	Custom
2/5 interleaved	] I *y*	N	
2/5 industrial	] X y	P	
2/5 normal 5 bars	] S y	O	
2/5 matrix 3 bars	] X y	Q	
EAN 8	] E 4	A	
EAN 13	] E 0	B	
UPC A	] X y	C	
UPC E	] X y	D	
EAN 8 with 2 ADD ON	] E 5	J	
EAN 8 with 5 ADD ON	] E 6	K	
EAN 13 with 2 ADD ON	] E 1	L	
EAN 13 with 5 ADD ON	] E 2	M	
UPC A with 2 ADD ON	] X y	F	
UPC A with 5 ADD ON	] X y	G	
UPC E with 2 ADD ON	] X y	H	
UPC E with 5 ADD ON	] X y	I	
Code 39	] A y	V	
Code 39 Full ASCII	] A y	W	
CODABAR	] F y	R	
ABC CODABAR	] X y	S	
Code 128	] C y	T	
EAN 128	] C y	k	
ISBT 128	] C4	f	
Code 93	] G y	U	
CIP/39	] X y	Y	
CIP/HR	] X y	e	
Code 32	] X y	X	
Codablock-A	] O 6	n	
Codablock-F Std	] O 4	l	
Codablock-F EAN	] O 5	m	
MSI	] M y	Z	
Plessey Standard	] P 0	a	
Plessey Anker	] P 1	o	
Telepen	] X 0	d	
Delta IBM	] X 0	c	
Code 11	] H y	b	
Code 16K	] K 0	p	
Code 49	] T y	q	
PDF417	] L 0	r	

- AIM standard identifiers are not defined for all codes: the X identifier is assigned to the code for which the standard is not defined. The *y* value depends on the selected options (check digit tested or not, check digit tx or not, etc.).

- When customizing the Datalogic Standard code identifiers, 1 or 2 identifier characters can be defined for each code type. If only 1 identifier character is required, the second character must be selected as **FF** (disabled).

- The code identifier can be singly disabled for any code by simply selecting **FF** as the first identifier character.

Write in the Custom character identifiers in the table above for your records.

Description	**String**
CODE IDENTIFIER	
Disable	**EB0**
Datalogic standard	**EB1**
AIM standard	**EB2**
Custom	**EB3**

CUSTOM CODE IDENTIFIER	
Custom code identifier	**EH*abc***

a = ASCII character.
b, ***c*** = HEX values representing an ASCII character.

a = ASCII character of the DATALOGIC STANDARD Code Identifier from the table on previous page.

b = Hex value of the first Custom Code Identifier character from **00** to **FE** in Appendix B;
FF = disable Code Identifier

c = Hex value of the second Custom Code Identifier character from **00** to **FE** in Appendix B;
FF = disable second character of Custom Code Identifier

Example: Code 39 Code Identifier = @

Custom Code Identifier		Code 39		@		Disable second chracter
EH	**+**	**V**	**+**	**40**	**+**	**FF**

DATA FORMAT

Description	String
HEADER	
No header	**EA00**
One character header	**EA01*x***
Two character header	**EA02*xx***
Three character header	**EA03*xxx***
Four character header	**EA04*xxxx***
Five character header	**EA05*xxxxx***
Six character header	**EA06*xxxxxx***
Seven character header	**EA07*xxxxxxx***
Eight character header	**EA08*xxxxxxxx***

TERMINATOR	
No terminator	**EA10**
One terminator header	**EA11*x***
Two terminator header	**EA12*xx***
Three terminator header	**EA13*xxx***
Four terminator header	**EA14*xxxx***
Five terminator header	**EA15*xxxxx***
Six terminator header	**EA16*xxxxxx***
Seven terminator header	**EA17*xxxxxxx***
Eight terminator header	**EA18*xxxxxxxx***

x = HEX values representing an ASCII character.

x = HEX value from **00** to **FE** in Appendix B.

Example: Header = **AB**

Two character header		A		B
EA02	**+**	**41**	**+**	**42**

Example: Terminator = **CR LF**

Two character terminator		CR		LF
EA12	**+**	**0D**	**+**	**0A**

For more details about default and WEDGE Interface Extended Keyboard values, see par. 5.4.1.

DATA FORMAT

Description	String
HEADER POSITION *see par. 0*	
First frame field	**ES0**
Before message field	**ES1**

CODE LENGTH TX	
Code length not transmitted	**EE0**
Code length transmitted in variable-digit length	**EE1**
Code length transmitted in fixed 4-digit format	**EE2**

The code length is transmitted in the message after the Headers and Code Identifier characters.

The code length is calculated after performing any field adjustment operations.

ADDRESS STAMPING *see par. 5.4.2*	
Disable	**RU0**
Enable	**RU1**

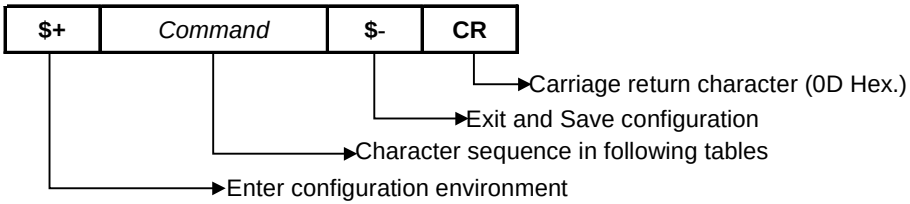
ADDRESS DELIMITER *see par. 5.4.3*	
Disable	**RV0**
Enable	**RV1*a***

a = a Hex value representing the ASCII character in the range from **00** to **FE** in Appendix B.

RADIO PARAMETERS

- ***RF BAUD RATE***
- ***TRANSMISSION MODE***
- ***RADIO PROTOCOL TIMEOUT***
- ***SINGLE STORE***
- ***ACK/NACK FROM REMOTE HOST***
- ***BEACON***

The programming sequence is the following:



RADIO PARAMETERS

Description	String
RF BAUD RATE (not for USA model) *see par. 5.5.1*	
9600 baud	**MF0**
19200 baud	**MF1**

TRANSMISSION MODE (Client only) *see par. 5.5.2*	
1 way mode	**MW0**
2 way mode	**MW1**

RADIO PROTOCOL TIMEOUT (Client only) *see par. 5.5.3*	
Radio protocol timeout (seconds)	**MH01 – MH19**

SINGLE STORE (Client only) *see par. 5.5.4*	
Disable	**MO0**
One attempt	**MO1**
Two attempts	**MO2**
Three attempts	**MO3**
Four attempts	**MO4**
Five attempts	**MO5**
Six attempts	**MO6**
Seven attempts	**MO7**
Eight attempts	**MO8**
Continuous	**MO9**

RADIO PARAMETERS

Description	String
ACK/NACK FROM REMOTE HOST (Client only) *see par. 5.5.5*	
Disabled	**MR0**
Enable ACK/DATA/NACK	**MR1**

BEACON (Client only) *see par. 5.5.6*	
Disabled	**MB0**
Beacon every 2 seconds	**MB1**
Beacon every 3 seconds	**MB2**
Beacon every 4 seconds	**MB3**
Beacon every 5 seconds	**MB4**
Beacon every 6 seconds	**MB5**
Beacon every 8 seconds	**MB6**
Beacon every 10 seconds	**MB7**
Beacon every 20 seconds	**MB8**
Beacon every 30 seconds	**MB9**

5 REFERENCES

5.1 RADIO AND SERIAL COMMUNICATION CONTROLS

STAR★Modem™ communication (both radio and serial) can be controlled by several parameters depending on whether it is a Client or Server. STAR★Modem™ can act as both Client and Server in each of the Stand Alone and STAR-System™ Modes.

In the STAR-System™ Mode, bi-directional communication means that STAR★Modem™ can dynamically switch from being Client to Server and vice versa.

The following table summarizes which parameters are controlled by the Client and which ones are controlled by the Server.

Client (Transmitter) controlled parameters:	**Server (Receiver) controlled parameters**
Transmission Mode	ACK/NACK Protocol
ACK/NACK From Remote Host	Handshaking
FIFO	
Handshaking	
Single Store	

NOTE

To avoid incorrect interpretation of ACK characters, ACK/NACK Protocol and ACK/NACK from Remote Host cannot be simultaneously enabled on the same STAR★Modem™.

To help understand the various communication control possibilities among the different communication modes, we will analyze the communication control parameter settings for the following 4 cases:

1) STAR★Modem™ in Stand Alone Mode acting as Server (like an OM-cradle)
2) STAR★Modem™ in Stand Alone Mode acting as Client (like an RF device)
3) STAR★Modem™ in STAR-System™ Mode
4) STAR★Modem™ in Stand Alone Mode acting as Server (for an intelligent printer)

Case 1 – STAR★Modem™ in Stand Alone Mode as Server (like an OM-cradle)

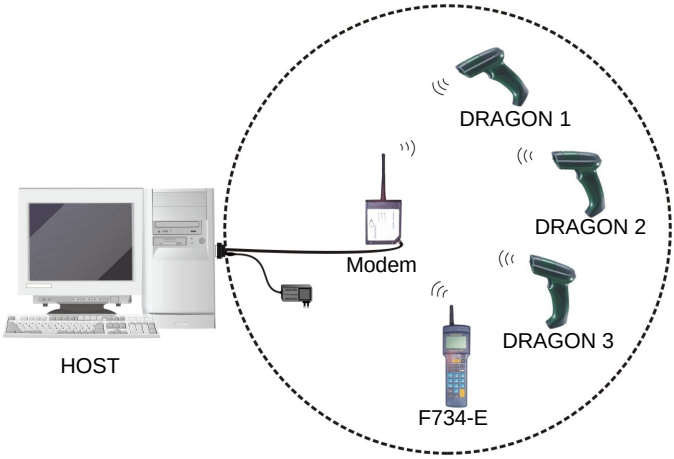


Figure 16 – Stand Alone Mode with STAR★Modem™ Server

STAR★Modem™ is in Stand Alone Mode as a dedicated **Server** receiving (like an OM-cradle). The ACK/NACK Protocol parameter can be set to assure correct communication between STAR★Modem™ and the local Host.

Assuming the RF devices are setup for 2 way transmission we can analyze the following ACK/NACK protocol selections:

RF devices - *Transmission Mode = 2 ways*
The Host must respond to a 2 way transmission

- If Modem - *ACK/NACK = disabled*
  there is no control of the communication between STAR★Modem™ and the Local Host. STAR★Modem™ answers the RF device which initiated the 2 way transaction with DATA received from the Local Host.

- If Modem - *ACK/NACK = enabled*
  when the Local Host receives a message correctly, it answers STAR★Modem™ with the ACK character. Only then does STAR★Modem™ acknowledge the RF device which initiated the 2 way transaction with an Empty Answer.

- Modem - *DATA/NACK = enabled*
  when the Local Host receives a message correctly, it answers STAR★Modem™ with DATA. STAR★Modem™ then answers the RF device which initiated the 2 way transaction with this DATA (i.e. command to RF device display).

Case 2 – STAR★Modem™ in Stand Alone Mode as Client (like an RF device)

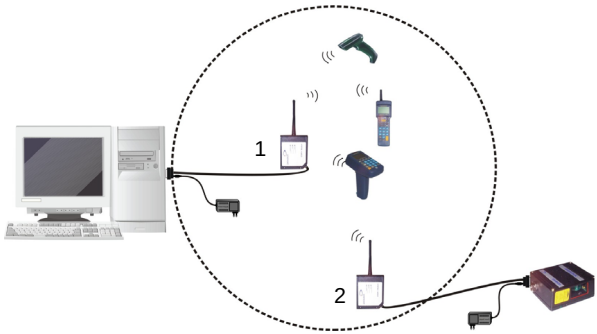


Figure 17 – Stand Alone Mode with STAR★Modem™ 2 Client

In the figure above, STAR★Modem™ 2 is in Stand Alone Mode as a dedicated **Client** (as an RF device). The following parameters may be set depending on the application:

Modem 1 - *ACK/NACK = enabled*
Scanner - *Handshaking= RTS/CTS*

- If Modem 2 - *Transmission Mode = 1 way*
  ACK/NACK from Remote Host = disabled
  FIFO = disabled
  Handshaking = Modem (RTS/CTS)

  In this case, Modem 2 sends data (messages) to the Remote Host. The special case of FIFO disabled blocks transmission of the scanner until an acknowledgement is received from Modem 1. Because ACK/NACK is enabled for Modem 1, only after Modem 1 has received an ACK from the Remote Host does it acknowledge reception (Empty Answer to Modem 2).

Case 3 – STAR★Modem™ in STAR-System™ Mode

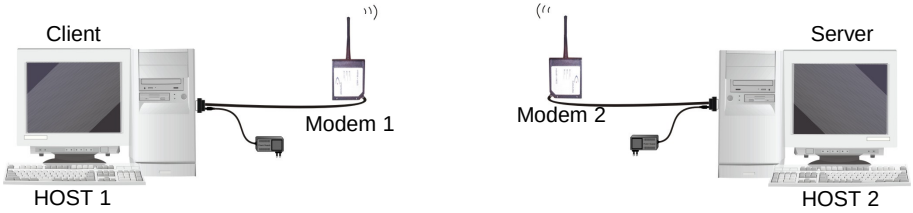


Figure 18 – STAR-System™ Mode

Both STAR★Modems™ are in STAR-System™ Mode and are therefore able to communicate bi-directionally. For analysis purposes only, we assume the situation where Host 1 is Client and Host 2 is Server. It is clear that the situation is analogous in the opposite direction:

- If Modem 1 - *Transmission Mode = 1 way*
  ACK/NACK from Remote Host = disabled
  FIFO = enabled
  Handshaking = any

  The Client, (Host 1) sends a message to the Remote Host (Host 2), but no control exists upon reception and even if ACK/NACK Protocol is implemented on the Server side (Remote Host), no answer is returned from Modem 2 to Modem 1 (except for a single blink from the red LED on Modem 1 if radio transaction has failed). This is not a secure communication.

- If Modem 1 - *Transmission Mode = 1 way*
  ACK/NACK from Remote Host = enabled
  FIFO = enabled
  Handshaking = any

  The Client, (Host 1) sends a message to the Remote Host (Host 2). Modem 2 acknowledges good radio reception but no control is made on Remote Host reception. If Modem 2 acknowledges radio reception within the Radio Protocol Timeout, Modem 1 sends ACK to its local Host, otherwise it sends NACK.

- If Modem 1 - *Transmission Mode = 2 ways*
  ACK/NACK from Remote Host = enabled
  FIFO = enabled
  Handshaking = any
  Single Store = enabled

  The Client, (Host 1) sends a message to the Remote Host (Host 2) and expects an answer from Host 2. Host 2 answers with DATA (a string of up to 238 characters). If Modem 2 sends this DATA answer within the Radio Protocol Timeout, Modem 1 sends it to its local Host (Host 1), otherwise Modem 1 sends NACK. In addition, the Single Store parameter upon Radio Protocol timeout, causes Modem 1 to retry transmission of the same message the defined number of times, before responding to its local Host (Host 1) with NACK.

  Host 1 - *Handshaking = RTS/CTS*

- If Modem 1 - *Transmission Mode = any*
  ACK/NACK from Remote Host = enabled
  FIFO = disabled
  Handshaking = Modem (RTS/CTS)

  The Client, (Host 1) sends a message to the Remote Host (Host 2). Modem 1 after receiving the message, blocks transmission of Host 1 until communication is completed according to the other communication control parameter settings as described above.

NOTE

The most secure settings for bi-directional communication in STAR-System™ Mode is to have ACK/NACK from Remote Host enabled and Two-way transmission at both ends. In addition, in case the first transmission fails, the Single Store parameter automatically repeats transmission of the same data packet up to the number of specified attempts.

NOTE

*When STAR★Modem™ acts as Client and **STARGATE™** acts as Server, FIFO disabled only works if two-way transmission mode is set.*

Case 4 – STAR★Modem™ in Stand Alone Mode as Server (for an intelligent printer)

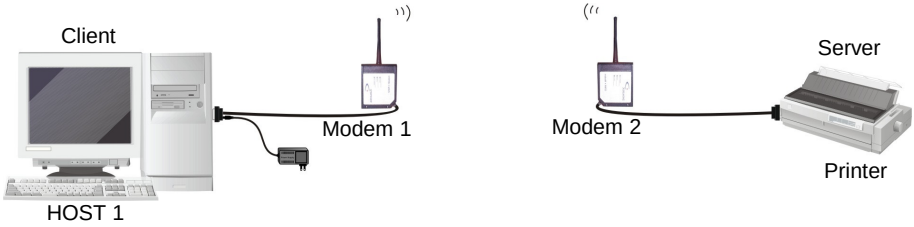


Figure 19 – Stand Alone Mode with STAR★Modem™ 2 Server

The two STAR★Modems™ in this case can be configured in Stand Alone Mode, however this limits one to be the dedicated Client and the other to be the dedicated Server. Bi-directional communication is not possible in Stand Alone modes.

Assuming that Host 1 is Client we can analyze the following transmission parameters from both STAR★Modem™ 1 and STAR★Modem™ 2's point of view :

Modem 1 **Client**
Transmission Mode = 2 way
ACK/NACK from Remote Host = enabled
FIFO = enabled
Handshaking = any

The Client, (Host 1) sends a message to the Remote Host (Printer) and expects an answer from the Printer. If the answer doesn't arrive before Radio Protocol Timeout, Modem 1 sends NACK to the Local Host.

- If Modem 2 **Server**
  ACK/NACK Protocol = enabled as ACK/NACK

  When STAR★Modem™ 2 receives a new message, it sends it to the Printer. The Printer answers with ACK. If Modem 2 acknowledges within the Radio Protocol Timeout, Modem 1 sends an Empty Answer to its Local Host (Host 1), otherwise it sends NACK.

- If Modem 2 **Server**
  ACK/NACK Protocol = enabled as DATA/NACK

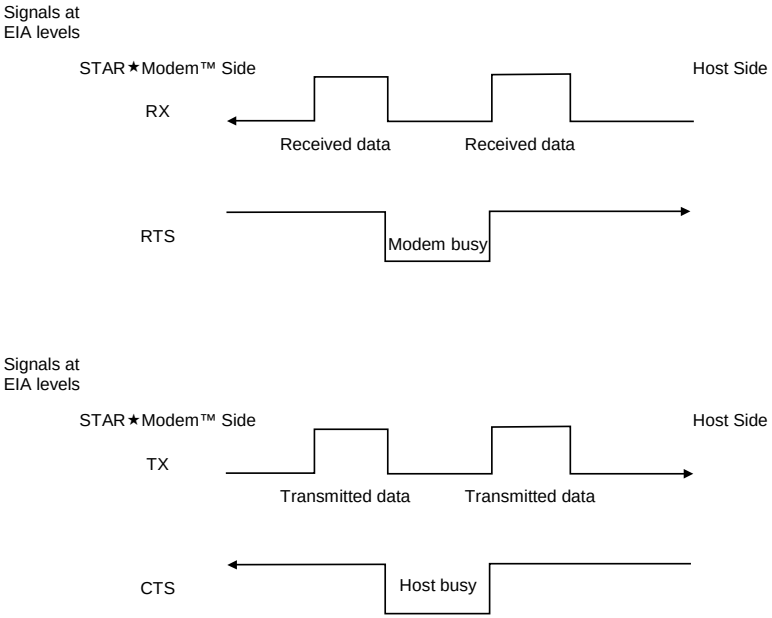
  When STAR★Modem™ 2 receives a new message, it sends it to the Printer. The Printer answers with DATA (a string of up to 238 characters). If Modem 2 sends this DATA answer within the Radio Protocol Timeout, Modem 1 sends it to its local Host (Host 1), otherwise Modem 1 sends NACK.

5.2 RS232 PARAMETERS

5.2.1 Handshaking

Modem: (RTS/CTS)

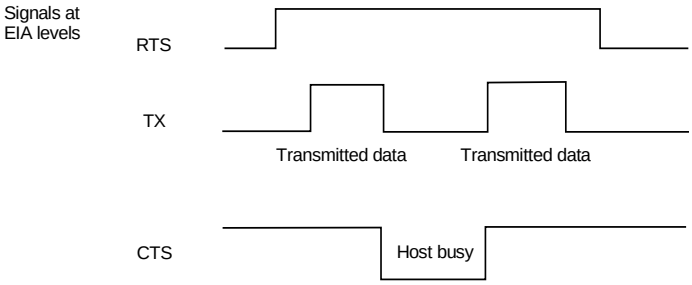
STAR★Modem™ deactivates the RTS line when it cannot receive a character from the Host. STAR★Modem™ can transmit data only if the CTS line (controlled by the Host) is active.



RTS/CTS Modem Handshaking

Hardware handshaking: (RTS/CTS)

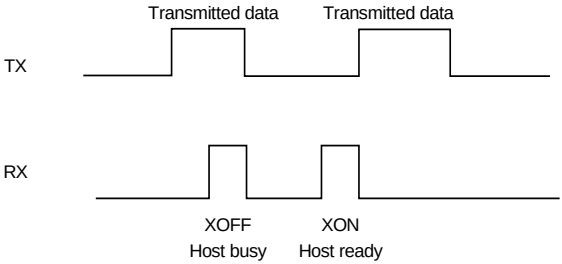
The RTS line is activated by STAR★Modem™ before transmitting a character. Transmission is possible only if the CTS line (controlled by the Host) is active.



RTS/CTS Handshaking

Software handshaking: (XON/XOFF)

During transmission, if the Host sends the XOFF character (13 Hex), the modem interrupts the transmission with a maximum delay of one character and only resumes when the XON character (11 Hex) is received.



XON/XOFF handshaking

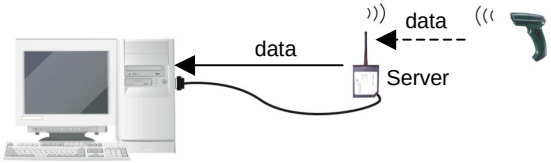
5.2.2 ACK/NACK Protocol

This parameter sets a transmission protocol which takes place between STAR★Modem™ (Server) and Local Host in RS232. An RF device (such as a hand-held reader) passes its data (code read) to the modem which sends it to the Host. The Host sends an ACK character (06 HEX) to the modem in the case of good reception; a NACK character (15 HEX) requesting re-transmission is sent to the modem in case of bad reception.

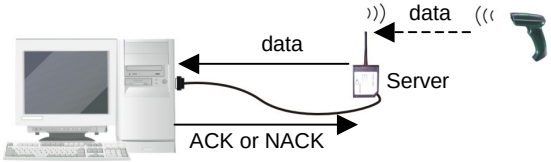
In the particular case where the RF device is configured for 2 way transmission and therefore requires an answer, it is advised to set STAR★Modem™ with the DATA/NACK protocol. The DATA answer from the Local Host is implicitly considered an ACK and is sent to the RF device. If instead ACK/NACK is used, the modem generates an Empty Answer to the RF device.

CAUTION

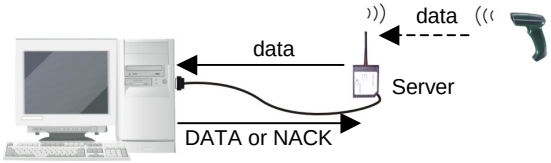
Before selecting this parameter ensure that "ACK/NACK from Remote Host" is disabled (see par. 5.5.5).



ACK/NACK Disabled



ACK/NACK Enabled



DATA/NACK Enabled

If the modem does not receive an ACK, DATA or NACK, transmission is ended after the RX Timeout (see par. 5.2.3). See also Radio Protocol Timeout, par. 5.5.3, for radio transmission to RF devices.

For ACK/NACK selection when STAR★Modem™ as Client, is transmitting to a destination device connected to a Remote Host refer to par. 5.1.

5.2.3 RX Timeout

This parameter can be used to automatically end data reception from the Local Host after the specified period of time.

If no character is received from the Local Host, after the timeout expires, any incomplete string is flushed from the modem buffer.

Refer to par. 5.2.5 for RX Timeout functioning when defining the frame packing.

5.2.4 FIFO

If enabled, the Destination Device collects all messages sent by STAR★Modem™ and sends them in the order of acquisition to the connected Remote Host.

If disabled, STAR★Modem™ blocks the message transmission from the Local Host until an answer signaling the right/wrong message transmission has been received from the Destination Device (1 way) or the Remote Host (2 way). Once the answer has been received, the Local Host is allowed to send a new message.

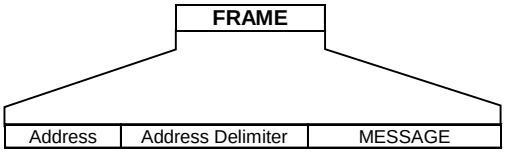
This command requires the Modem (RTS/CTS) handshaking to be enabled.

For more details about the Transmission Mode refer to par. 5.5.2.

5.2.5 Frame Packing

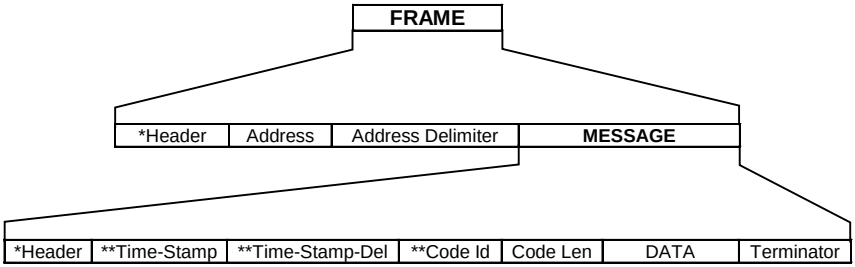
This parameter defines the format of the frame to be transmitted between STAR★Modem™ and the Host.
The frame received by STAR★Modem™ may contain a maximum of 238 characters. All characters not included within this number will be transmitted from the Host in a new frame.

Frame from Host to STAR★Modem™



The Address field has different meanings depending on if the FRAME is sent as a 2 way answer to an RF device, or if it is a new message that the STAR★Modem™ Client sends to a destination device. See par. 5.4.2 for details.

Frame from STAR★Modem™ to Host



* There is only one header whose position can be defined through the related parameter (see par. 0).

** These are optional fields which can be configured depending on the type of RF device used.

The Address field has different meanings depending on if the FRAME is a 2 way answer to a previous 2 way transaction initiated by a STAR★Modem™ Client, or if it is a new message that an RF device sends to the STAR★Modem™ Server. See par. 5.4.2 for details.

Correct FRAME identification is managed by frame packing. Three different types of frame packing can be selected:

- **Frame+ [CR]** ***(default)***: the frame sent to STAR★Modem™ is terminated by [CR]. This means you cannot use the [CR] character within the frame.
  In Frame + [CR] mode, make sure the FRAME does not contain [*CR]*, nor begin with *$+* or #+ characters.

FRAME	**[CR]**

  The frame transmitted by STAR★Modem™ has no additional field. In this case the end of the FRAME is either DATA or Terminator if any.

FRAME

- **[STX]+LEN+Frame+[CR]**: both frames sent to and by STAR★Modem™ are preceded by [STX], LEN and terminated by [CR], where LEN is a field of 4 digits and indicates the FRAME length in number of characters, that is FRAME +CR.

[STX]	**LEN**	FRAME	**[CR]**

  The [STX], [CR] and [ESC] characters contained in the frame must be preceded by the [ESC] character for a correct transmission.

- **Frame after Timeout**: if the delay between two consecutive characters is more than the selected timeout, the modem considers the frame completed. The timeout corresponds to 1/10 of the value defined for RX Timeout (see par. 5.2.3). Therefore, the timeout for frame packing is calculated in ms (from 10 ms to 990 ms).

NOTE

It is <u>not</u> possible to <u>disable</u> this timeout, therefore possible values are in the range 10 - 990 ms. If RX Timeout is disabled, Frame after Timeout is 10 ms.

  Both the frames sent to and by STAR★Modem™ have no additional fields:

FRAME

  All commands to be sent using this frame packing must be preceded by the string below, which substitutes the $+ character:

#+++PROG_REQ+++#

  This string is always transmitted in a single frame preceding the one containing the configuration command, as shown in the following examples:

Example 1

Sending the $+$![CR] command to transmit the modem software release:
1st Frame = #+++PROG_REQ+++#
2nd Frame = $![CR]

Example 2

Sending the $+ML0$-[CR] command to set the default frame packing configuration:
1st Frame = #+++PROG_REQ+++#
2nd Frame = ML0$-[CR]

5.3 PEN EMULATION PARAMETERS

5.3.1 Minimum Output Pulse

This parameter sets the duration of the output pulse corresponding to the narrowest element in the barcode. In this way the code resolution is controlled by the signal sent to the decoder, independently from the physical resolution of the code read.

The shortest pulse (200 µs) corresponds to a high resolution code emulation and therefore a shorter transfer speed to the decoder (for decoders able to work on high resolution codes). Likewise, longer pulses correspond to low resolution code emulation and therefore a longer transfer time to the decoder.

5.3.2 Overflow

This parameter generates a white space before the first bar and after the last bar of the code. The selections are as follows:

narrow = space 10 times the minimum output pulse.

medium = space 20 times the minimum output pulse.

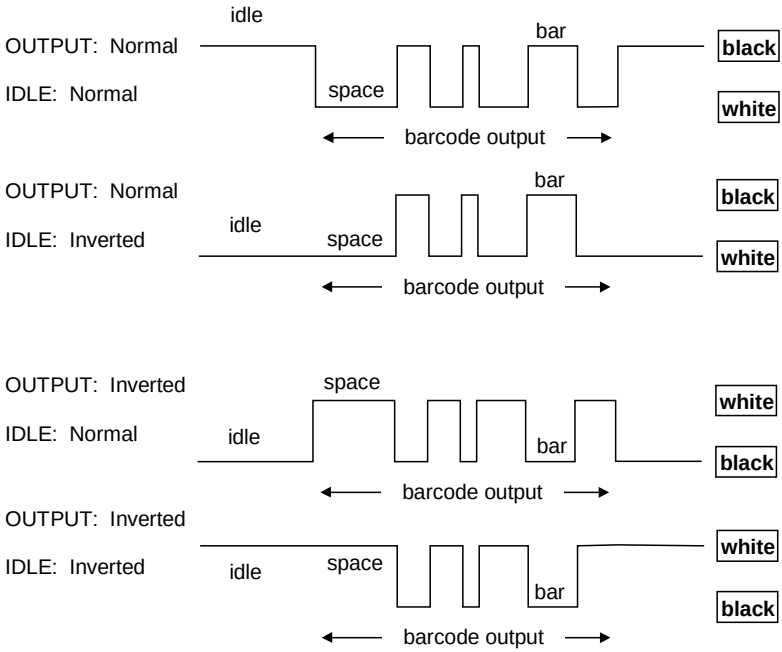
wide = space 30 times the minimum output pulse.

5.3.3 Conversion to Code 39 and Code 128

This parameter allows converting the decoded codes into either Code 39 format or Code 128 format. It is not possible to disable conversion.

5.3.4 Output and Idle Levels

The following state diagrams describe the different output and idle level combinations for Pen emulation:



Output and Idle Levels

5.3.5 Inter-Block Delay

For the PEN Emulation interface, data are sent to the Host in fixed size blocks of 20 characters each. The inter-block delay parameter allows setting a delay between each block sent to the Host.

5.4 DATA FORMAT

5.4.1 Header/Terminator Selection

The header/terminator selection is not effected by restore default command. In fact, header and terminator default values depend on the interface selection:

RS232: no header, terminator CR-LF

WEDGE: no header, terminator ENTER

These default values are always restored by sending the RS232 or WEDGE interface selection string, see par. 3.1.1.

For the WEDGE interface, the following extended keyboard values can also be configured:

EXTENDED KEYBOARD TO HEX CONVERSION TABLE				
	IBM AT IBM 3153 APPLE ADB	**IBM XT**	**IBM 31xx, 32xx, 34xx, 37xx**	**Wyse Digital**
HEX	KEY	KEY	KEY	KEY
83	ENTER	ENTER	FIELD EXIT	RETURN
84	TAB	TAB	TAB	TAB
85	F1	F1	F1	F1
86	F2	F2	F2	F2
87	F3	F3	F3	F3
88	F4	F4	F4	F4
89	F5	F5	F5	F5
8A	F6	F6	F6	F6
8B	F7	F7	F7	F7
8C	F8	F8	F8	F8
8D	F9	F9	F9	F9
8E	F10	F10	F10	F10
8F	F11	ESC	F11	F11
90	F12	BACKSPACE	F12	F12
91	HOME	HOME	ENTER	F13
92	END	END	RESET	F14
93	PG UP	PG UP	INSERT	F15
94	PG DOWN	PG DOWN	DELETE	F16
95	↑	↑	FIELD -	UP
96	↓	↓	FIELD +	DOWN
97	←	←	ENTER (Paddle)	LEFT
98	→	→	PRINT	RIGHT
99	ESC	ESC		ESC
9A	CTRL (Right)	CTRL (Right)		CTRL (Right)
9B	Euro	Space	Space	Space

For all devices using Wedge interface, all values from **9C** to **FE** send the Space character

SET CUSTOM EXTENDED HEADER/TERMINATOR KEYS

The extended Header/Terminator keys for **Wedge Interface users** can be customized by defining them through a simple keyboard setting procedure.

For example, the Numeric Keypad keys can be set for use as Headers or Terminators by substituting the default extended keys using this procedure.

The type of computer or terminal must be selected before activating the keyboard setting command.

Press and release a key to set it.

Some characters may require more than one key pressed simultaneously during normal use (refer to the manual of your PC or terminal for keyboard use). The exact sequence must be indicated to the reader in this case pressing and releasing the different keys.

Example:

If one has to press the "Shift" and "4" keys simultaneously on the keyboard to transmit the character "$" to the video, to set the "$", press and release "Shift" then press and release "4".

Each pressed and released key must generate a yellow LED blinking on the device, otherwise repress the key. Never press more than one key at the same time, even if this corresponds to the normal use of your keyboard.

Press "Back space" to correct a wrong key entry.

Note: "CAPS LOCK" and "NUM LOCK" must be off before starting the keyboard setting procedure. "SHIFT" must be repressed for each character and cannot be substituted by "CAPS LOCK".

Set Custom Extended Header/Terminator Keys

Read the code above with one of the RF devices compatible with STAR★Modem™ and send it to the modem via radio.

- **If the first 4 KEYS (Shift, Alt, Ctrl, and Backspace) are not available on your keyboard, you can only substitute them with keys not used, or substitute them with each other.**
- Keys 5 to 28 must be defined

Press the desired keys in the following order:

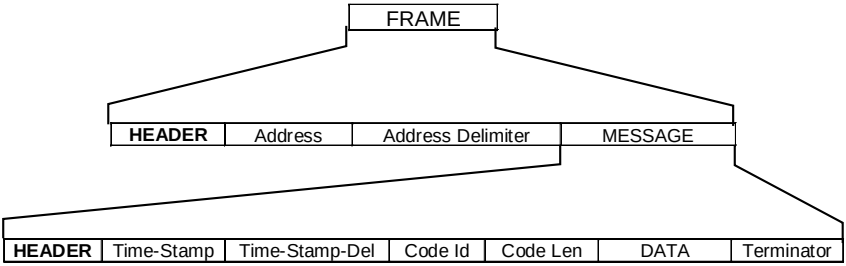
CUSTOM EXTENDED KEYBOARD SETTING TABLE		
		Custom
Order	HEX	KEY
01	**-**	Shift
02	**-**	Alt
03	**-**	Ctrl
04	**-**	Backspace
05	**83**	
06	**84**	
07	**85**	
08	**86**	
09	**87**	
10	**88**	
11	**89**	
12	**8A**	
13	**8B**	
14	**8C**	
15	**8D**	
16	**8E**	
17	**8F**	
18	**90**	
19	**91**	
20	**92**	
21	**93**	
22	**94**	
23	**95**	
24	**96**	
25	**97**	
26	**98**	
27	**99**	
28	**9A**	

During the keyboard setting the red LED on the modem always blinks, the yellow LED stays on and blinks off only each time a key is pressed, while the green LED stays on and blinks off only each time the Backspace key is pressed. Once the last key has been pressed, the yellow LED stays off indicating the keys have been registered, while the green LED lights on again. Read the code below and send it to the modem via radio to end the procedure.

ending the procedure

Header Position

This parameter defines the header position within the frame to be transmitted from STAR★Modem™ to the Host. The header can be positioned in either the first field of the frame or in the field preceding the message:



The Address field has different meanings depending on if the FRAME is a 2 way answer to a previous 2 way transaction initiated by a STAR★Modem™ Client, or if it is a new message that an RF device sends to the STAR★Modem™ Server. See par. 5.4.2 for details.

5.4.2 Address Stamping

If enabled, this command includes the RF device or STAR★Modem™ address in the message/answer transmitted. It is advised to enable this parameter when STAR★Modem™ is a Server for more than one Client in 2 way transmission. In this way the Host knows to which Client the answer must be sent.

If receiving data from an RF device working in 1 way mode, STAR★Modem™ (Server) automatically includes the RF device address in the message to be sent to the Host.

If receiving data from an RF device working in 2 way mode, STAR★Modem™ (Server) automatically includes the RF device address in the message to be sent to the Host. It is required to set the Host application to include the same address in the answer to be transmitted back to the RF device.

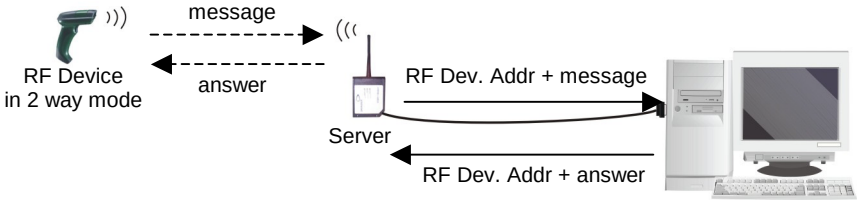


Figure 20 - Receiving a Message from RF device in 2 Way Mode

If STAR★Modem™ as Client, is transmitting to more than one destination device in 1 way mode, it is necessary to set the Host application to include the modem address in the message to be transmitted to the destination devices of the system.

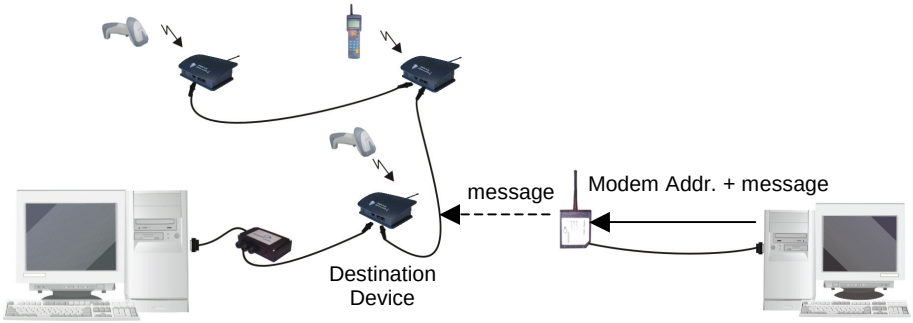


Figure 21 - Transmitting a Message in 1 Way Mode

If STAR★Modem™ as Client, is transmitting to more than one destination device in 2 way mode, it is necessary to set the Host application to include the modem address in the message to be transmitted to the destination devices of the system. STAR★Modem™ will include the same address in the answer which sends back to the Host.

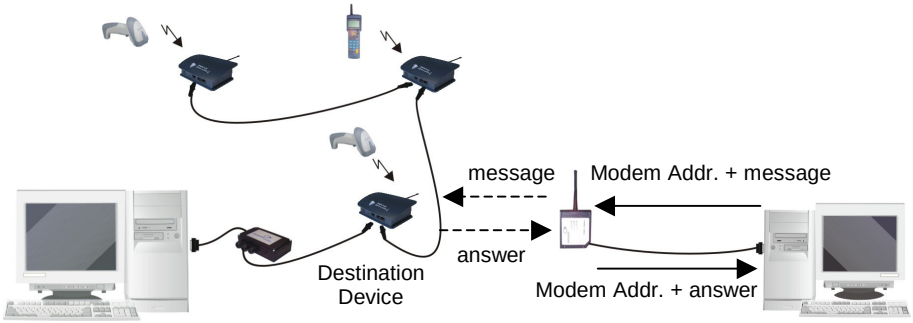


Figure 22 - Transmitting a Message in 2 Way Mode

The Address Stamping parameters consist of a 4-digit number in the range 0000-1999.

NOTE

When the modem receives data in 2 way mode from more than one RF device, it is advised to enable Address Stamping for correct radio transaction management.

NOTE

If communicating with only one RF device in 2 way mode, Address Stamping is not required, since the data/answer generated by the Host is only sent to that device. In this case STAR★Modem™ can receive data (messages) via radio only after sending the 2 way answer.

5.4.3 Address Delimiter

The Address Delimiter allows a character to be included to separate the Address stamping fields from the next fields in the message. Once enabled, it is required to set the Host application to include the Address Delimiter character in the message. Any character can be included in the hexadecimal range from 00 to FE.

5.5 RADIO PARAMETERS

5.5.1 RF Baud Rate (not for USA Model)

This parameter defines the baud rate used for radio communication. For STAR★Modem™ USA model the baud rate value is always set to 36800, while for European models it can be set to 9600 or 19200 according to the device communicating with STAR★Modem™.

5.5.2 Transmission Mode (Client only)

STAR★Modem™ Client can communicate within the system using two different transmission modes:

- 1 way mode: (default) STAR★Modem™ transmits data without requiring an acknowledgement answer from the Remote Host (see par. 5.1 for details).
- 2 way mode: STAR★Modem™ transmits data requiring an acknowledgement answer from the Remote Host (see par. 5.1 and par. 5.5.5 for details). When the destination device is connected to the Remote Host through the Wedge Interface, it considers the transmission successful after data has been sent. Therefore, an Empty Answer is generated and passed back to the modem.

5.5.3 Radio Protocol Timeout (Client only)

This parameter sets the valid time to wait before radio transmission between STAR★Modem™ and a destination device is considered failed.

This parameter should be set taking into consideration the radio traffic (number of devices in the same area).

If the RS232 interface connecting the Remote Host and the destination device is used with ACK/NACK enabled, this parameter should be at least equal to the RX Timeout parameter for low traffic environments. It should be increased if there are many devices in the same area.

5.5.4 Single Store (Client only)

This command is active when STAR★Modem™ (Client) transmits messages/data to a destination device.
It guarantees a secure control to prevent the transmission of duplicated data.
If Single Store is enabled and STAR★Modem™ does not receive any answer of good transmission from the destination device, it enters a special operating mode that stops sending new messages. When such operating mode is entered, the modem retries transmission itself for the number of attempts selected in the configuration. Once the transmission is successful, the modem continues to send new messages. If transmission is not successful after the number of configured attempts, the message is lost.
To be absolutely sure that messages are received by the destination device, set Single Store to continuous. A new message will not be sent unless the previous one is received. If using Single Store as continuous, and the transaction is not received, check that the Server is active and that the STAR★Modem™ configuration is correct.
If your application requires an acknowledgement from the Remote PC, you must define Single Store and enable ACK/NACK From Remote Host (see par. 5.5.5).

5.5.5 ACK/NACK From Remote Host (Client only)

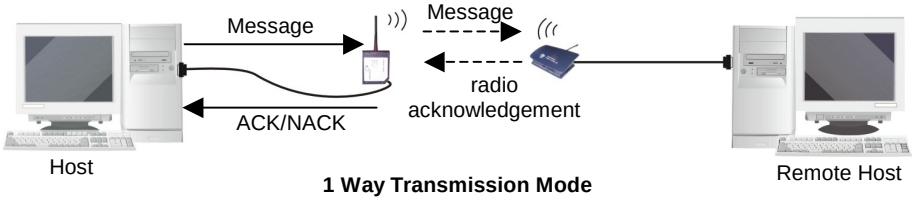
This parameter sets a transmission protocol which takes place between the STAR★Modem™ (Client) Host and the destination device Host (Remote Host). The transmission is influenced by the transmission mode selected (see par. 5.5.2).

CAUTION

Before selecting this parameter ensure that "ACK/NACK Protocol" is disabled (see par. 5.2.2).

One way mode:

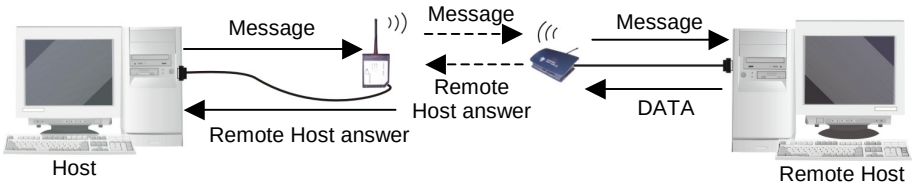
Host sends a message to STAR★Modem™ which passes it to the destination device via radio. In case of good transmission, the destination device transmits a radio acknowledgement back to the modem. If received before the Radio Protocol Timeout expires, STAR★Modem™ sends an ACK character to the Host. If the timeout expires before receiving any acknowledgement, the modem transmits a NACK character.



1 Way Transmission Mode

Two way mode:

Host sends a message to STAR★Modem™ which passes it to the destination device via radio. The destination device transmits the message to the Remote Host which responds with DATA. This answer is sent to STAR★Modem™ through the destination device. Then, the modem transmits it to the Host.
If the Radio Protocol Timeout expires before the answer from Remote Host is received by STAR★Modem™ or in case the Remote Host does not respond, STAR★Modem™ sends a NACK character to the Host.



2 Way Transmission Mode

NOTE

If the Host continues to send new messages before receiving any answer from the Remote Host, it is strongly suggested to enable the handshaking on the Host connected to STAR★Modem™ for a correct functioning.

5.5.6 Beacon (Client only)

This parameter is available only when STAR★Modem™ is used in STAR-System™ applications and is connected to a device (Local Host) without transmitting or responding capability. It is particularly useful when STAR★Modem™ Client transmits data to a STAR-System™ Server (never sending data back to STAR★Modem™ in asynchronous mode). If the modem does not receive any command or data from the Host for the defined period of time (intervals of 2..30 seconds), it starts a 2 way transmission towards the system waiting for data to be sent to the connected Host (refer to the example in par. A.4).
The selection of this parameter does not influence the modem normal radio transaction. This means that it does not modify the transmission of data sent by the Local Host.

6 DEFAULT CONFIGURATION

Configuration Parameter	Default Setting
RS232 Communication	
Baud Rate	9600
Parity, Data Bits, Stop Bits	No parity; 8 Data bits; 1 Stop bit
Handshaking	Disabled
ACK/NACK Protocol	Disabled
FIFO	Enabled
Intercharacter Delay	Disabled
RX Timeout	5 seconds
Frame Packing	Frame +[CR]
WEDGE-Communication	
Keyboard nationality	USA
CapsLock	OFF
NumLock	OFF
Intercharacter Delay	Disabled
Intercode Delay	Disabled
Wedge Control Character Emulation	Ctrl + Shift + key
Pen Emulation	
Operating Mode	Interpret Mode
Minimum Output Pulse	600 µs
Conversion to Code 39 and Code128	Enable Conversion to Code 39
Overflow	Medium
Output Level	Normal
Idle Level	Normal
Inter-Block Delay	Disabled
Data Format	
Code Identifier	Disabled
Custom Code Identifier	Disabled
Header	No headers
Terminator	[CR] and [LF] terminators for RS232 [ENTER] terminator for Wedge
Header Position	First frame field
Code Length TX	Code Length not Transmitted
Address Stamping	Disabled
Address Delimiter	Disabled

Configuration Parameter	Default Setting	
Radio Parameters	**European Models**	**USA Models**
RF Baud Rate	19200 baud	36800 baud
Transmission Mode	1 way mode	
Radio Protocol Timeout	2 sec	
Single Store	Disabled	
ACK/NACK from Remote Host	Disabled	
Beacon	Disabled	

7 TECHNICAL FEATURES

Electrical Features	**5 Volt Models**	**10-30 Volt Models**
Supply voltage	5 Vdc ± 5%	10 to 30 Vdc
Power consumption	2 W	
Indicators	Power On (green) TX/RX (yellow) Status (red)	
Radio Features	**European Models**	**USA Models**
Working frequency	433.92 Mhz	910 Mhz
Bit rate	Up to 19200 baud	36800 baud
Effective Radiated Power	<10 mW	<1 mW
Range (in open air)	50 m / 164 ft	30 m / 98.4 ft
RF Modulation	FSK	
System Configuration		
Maximum number of devices per STAR★Modem™	32	
Environmental Features		
Working temperature	-20° to +50 °C / -4° to +122 °F	
Storage temperature	-20° to +70 °C / -4° to +158 °F	
Humidity	90% non condensing	
Protection class	IP64	
Mechanical Features		
Weight	370 gr / 13.1 oz	
Dimensions (without antenna)	68 x 84 x 34 mm / 2.68 x 3.3 x 1.3 in	

A TYPICAL SYSTEM LAYOUTS

The following examples give a graphical representation of STAR★Modem™ application in 5 typical layouts and provide the software configuration required by each device to communicate within the system (see par. 5.1 for details about the main parameter functioning).

The examples provide different STAR★Modem™ applications:

- **Example 1: Stand Alone - STAR★Modem™ Server**

  STAR★Modem™ works as an OM-cradle receiving data from Datalogic hand-held devices and is connected to an Host PC;

- **Example 2: Stand Alone - STAR★Modem™ Server**

  STAR★Modem™ works as an OM-cradle receiving data from Datalogic hand-held devices and is connected to a DL8700 vehicle mounted terminal;

- **Example 3: STAR-System™ - STAR★Modem™ Client**

  STAR★Modem™ receives data from a Datalogic scanner and transmits data to several STARGATE™ base stations;

- **Example 4: STAR-System™ - Bi-Directional Communication**

  Two STAR★Modems™ are connected via serial interface to two different Hosts and communicate via radio transmitting/receiving data;

- **Example 5: STAR-System™ - STAR★Modem™ Client**

  STAR★Modem™ is connected to a printer and polls the system searching for data to be sent to the printer.

A.1 STAND ALONE MODE - STAR★Modem™ SERVER

STAR★Modem™ is connected to an Host PC via serial interface and receives data from three DRAGON™ M scanners and one F734-E terminal loading STAR&Play™ (not compatible with STAR★Modem™ USA model).

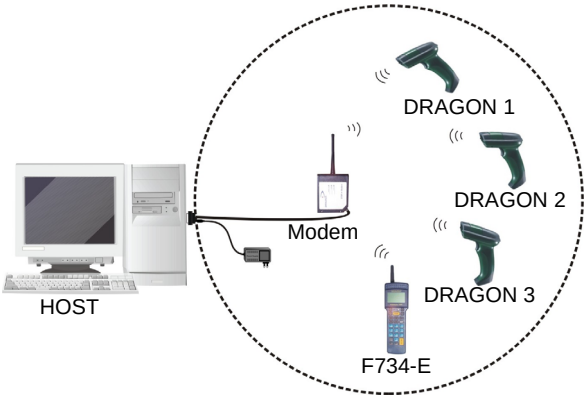


Figure 23 – STAR★Modem™ Server Connected to an Host PC

In this layout it is possible to enable a control of the radio communication, where the transmitting RF device starts a 2 way transmission requiring a data acknowledgement answer from the Host PC. In particular, the address of the RF device transmitting data can be included in the message sent by STAR★Modem™ to the Host PC. The same RF Device address will be also included in the answer sent back to the RF device.
To define this type of communication, the system devices may be configured as follows:

STAR★Modem™
- Setup for Stand Alone Mode - Server
- STAR★Modem™ Radio Address = **0010**
- Address Stamping = enabled

HOST PC
- Run an application including in the answer to be transmitted to the RF device, the address of the scanner itself.

DRAGON 1
- Setup for Stand Alone Mode
- DRAGON™ M Radio Address = 1235
- STAR★Modem™ Address = **0010**
- Transmission Mode = Two ways

DRAGON 2	-	Setup for Stand Alone Mode
	-	DRAGON™ M Radio Address = 1236
	-	STAR★Modem™ Address = **0010**
	-	Transmission Mode = Two ways
DRAGON 3	-	Setup for Stand Alone Mode
	-	DRAGON™ M Radio Address = 1237
	-	STAR★Modem™ Address = **0010**
	-	Transmission Mode = Two ways
F734-E (not compatible with STAR★Modem™ USA model)	-	Setup for Stand Alone Mode
	-	F734-E Radio Address = 1238
	-	STAR★Modem™ Address = **0010**
	-	Transmission Mode = Two ways

A.2 STAND ALONE MODE - STAR★Modem™ SERVER

STAR★Modem™ is connected to a DL8700 vehicle mounted terminal via serial interface and receives data from a DRAGON™ M scanner.

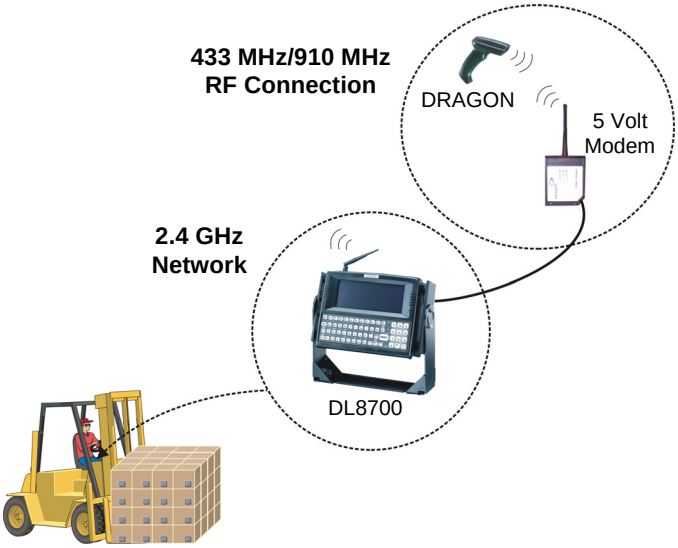


Figure 24 - STAR★Modem™ Server Connected to DL8700

This layout shows the integration of the 433 MHz (European models) / 910 MHz (USA model) and 2.4 GHz networks for data collection.

For connection with the DL8700 terminal, the STAR★Modem™ 5 Volt model is powered directly by the terminal through pin 9 of the modem connector. Therefore an external supply is not necessary.
To define this type of communication, the system devices may be configured as follows:

STAR★Modem™ - Setup for Stand Alone Mode – Server
- STAR★Modem™ Radio Address = **0017**

DL8700 - Run an application managing the data communication between the mobile computer and the host system, for example Terminal Emulation.

DRAGON - Setup for Stand Alone Mode
- DRAGON™ M Radio Address = 1235
- STAR★Modem™ Address = **0017**

A.3 STAR-System™ MODE - STAR★Modem™ CLIENT

STAR★Modem™ receives data from the scanner it is connected to. Then, it transmits data to three STARGATE™ base stations.

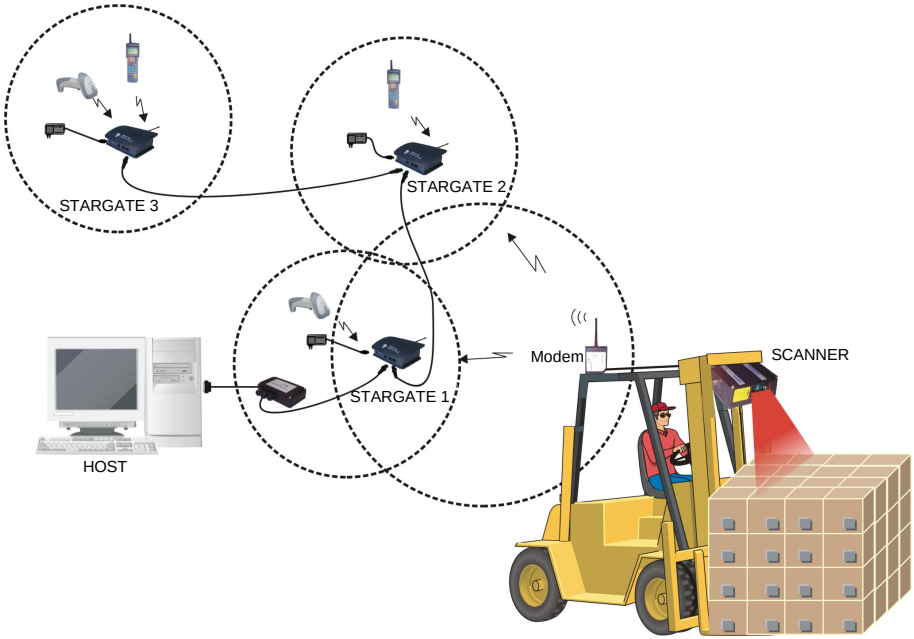


Figure 25 – STAR★Modem™ Client

Each system device may be configured as follows:

STAR★Modem™ - Setup for STAR-System™ mode
- STAR★Modem™ Radio Address = **0502**
- First Destination Device Address = 1301
- Last Destination Device Address = 1303

HOST - Run STAR-Link™ software to set the STARGATE™ network.

STARGATE 1 - Set STARGATE™ Address from STAR-Link™ = 1301

STARGATE 2 - Set STARGATE™ Address from STAR-Link™ = 1302

STARGATE 3 - Set STARGATE™ Address from STAR-Link™ = 1303

A.4 STAR-System™ MODE - BI-DIRECTIONAL COMMUNICATION

Two STAR★Modems™ are connected to the dedicated Host via serial interface. They communicate with each other by transmitting and receiving data.

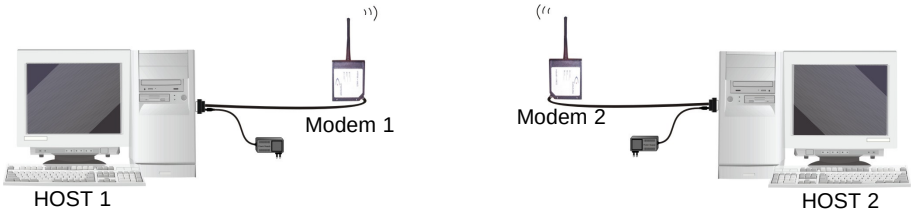


Figure 26 – Bi-directional Communication

Each system device may be configured as follows:

STAR★Modem™ 1
- Setup for STAR-System™ mode
- STAR★Modem™ Radio Address = **0325**
- First Destination Device Address = 0263
- Handshaking = Modem (RTS/CTS)
- Frame Packing = frame after timeout (selection advised for this example for a faster transmission)

HOST 1
- Run the desired application or a terminal emulation program.
- Adjust the Host communication parameters and handshaking according to STAR★Modem™ 1.

STAR★Modem™ 2
- Setup for STAR-System™ mode
- STAR★Modem™ Radio Address = **0263**
- First Destination Device Address = 0325
- Handshaking = Modem (RTS/CTS)
- Frame Packing = frame after timeout

HOST 2
- Run the desired application or a terminal emulation program.
- Adjust the Host communication parameters and handshaking according to STAR★Modem™ 2.

A.5 STAR-System™ MODE - STAR★Modem™ CLIENT

STAR★Modem™ is connected to a printer without transmitting and responding capability and communicates with a STARGATE™ connected to an Host in an RS485 network. The modem starts 2 way transmission and polls the system every 30 seconds by sending an [ENQ] character. The data received (if any) will be passed back to the printer.

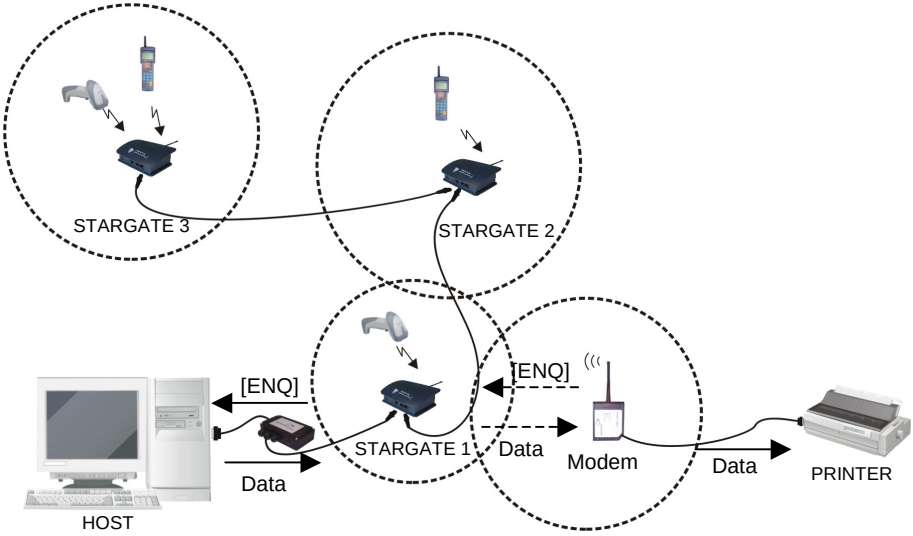


Figure 27 – STAR★Modem™ Client

Each system device must be configured as follows:

STAR★Modem™	-	Setup for STAR-System™ mode
	-	STAR★Modem™ Radio Address = **0682**
	-	First Destination Device Address = 1350
	-	Last Destination Device Address = 1352
	-	Beacon = beacon every 30 seconds
HOST	-	Run STAR-Link™ software to set the STARGATE™ network.
	-	The application developed by using STAR-Link™ ActiveX (see relevant manual for details) generates data as an answer to the 2 way transmission mode, whenever it receives an [ENQ] character from the modem.
STARGATE 1	-	Set STARGATE™ Address from STAR-Link™ = 1350
STARGATE 2	-	Set STARGATE™ Address from STAR-Link™ = 1351
STARGATE 3	-	Set STARGATE™ Address from STAR-Link™ = 1352

B HEX AND NUMERIC TABLE

CHARACTER TO HEX CONVERSION TABLE					
char	**hex**	**char**	**hex**	**char**	**hex**
NUL	**00**	*	**2A**	U	**55**
SOH	**01**	+	**2B**	V	**56**
STX	**02**	,	**2C**	W	**57**
ETX	**03**	-	**2D**	X	**58**
EOT	**04**	.	**2E**	Y	**59**
ENQ	**05**	/	**2F**	Z	**5A**
ACK	**06**	0	**30**	[	**5B**
BEL	**07**	1	**31**	\	**5C**
BS	**08**	2	**32**	]	**5D**
HT	**09**	3	**33**	^	**5E**
LF	**0A**	4	**34**	_	**5F**
VT	**0B**	5	**35**	`	**60**
FF	**0C**	6	**36**	a	**61**
CR	**0D**	7	**37**	b	**62**
SO	**0E**	8	**38**	c	**63**
SI	**0F**	9	**39**	d	**64**
DLE	**10**	:	**3A**	e	**65**
DC1	**11**	;	**3B**	f	**66**
DC2	**12**	<	**3C**	g	**67**
DC3	**13**	=	**3D**	h	**68**
DC4	**14**	>	**3E**	i	**69**
NAK	**15**	?	**3F**	j	**6A**
SYN	**16**	@	**40**	k	**6B**
ETB	**17**	A	**41**	l	**6C**
CAN	**18**	B	**42**	m	**6D**
EM	**19**	C	**43**	n	**6E**
SUB	**1A**	D	**44**	o	**6F**
ESC	**1B**	E	**45**	p	**70**
FS	**1C**	F	**46**	q	**71**
GS	**1D**	G	**47**	r	**72**
RS	**1E**	H	**48**	s	**73**
US	**1F**	I	**49**	t	**74**
SPACE	**20**	J	**4A**	u	**75**
!	**21**	K	**4B**	v	**76**
"	**22**	L	**4C**	w	**77**
#	**23**	M	**4D**	x	**78**
$	**24**	N	**4E**	y	**79**
%	**25**	O	**4F**	z	**7A**
&	**26**	P	**50**	{	**7B**
'	**27**	Q	**51**	|	**7C**
(	**28**	R	**52**	}	**7D**
)	**29**	S	**53**	~	**7E**
		T	**54**	DEL	**7F**

GLOSSARY

1 way transmission	a radio transmission in which STAR★Modem™ transmits data without requiring an acknowledgement answer from the remote Host.
2 way transmission	a radio transmission in which STAR★Modem™ transmits data requiring an acknowledgement answer from the remote Host.
Client	a radio device which can initiate a 1 way or 2 way transmission to a Server. The Client is also defined as Transmitter. STAR★Modem™, RF terminals or RF hand-held readers function as Clients.
Server	a radio device which is continuously waiting for a 1 way or 2 way transmission initiated by a Client. The Server is also defined as Receiver. STAR★Modem™ or OM-cradles function as Servers.
Bi-directional Communication	the ability to both receive radio messages as a Server and to initiate radio transmission as a Client.
Destination Device	the radio device to which a message must be sent or to which an answer to a previously received message must be given.
DATA	a string of up to 238 characters sent as an answer from a Remote Host to a Client.
Empty Answer	a radio acknowledgement containing no information (data) content.
Local Host	the Host to which STAR★Modem™ is physically connected through a cable. This can be a PC, a device such as a scanner, or other peripheral device such as a printer.
Remote Host	the Host to which a transmitting STAR★Modem™ Client sends a message via radio.

STAR-System™

a Datalogic radio communication system that uses a Narrow Band RF radio and Datalogic proprietary CSMA/CA protocol to automatically link and manage all the RF devices in the system. In this system STAR★Modem™ can perform bi-directional communication.

Stand Alone

a system in which STAR★Modem™ acts as a dedicated Server (receiver only - like an OM-cradle) or as a dedicated Client (transmitter only – like an RF hand-held reader). In this system STAR★Modem™ implements a different Narrow Band radio protocol than STAR-System™.