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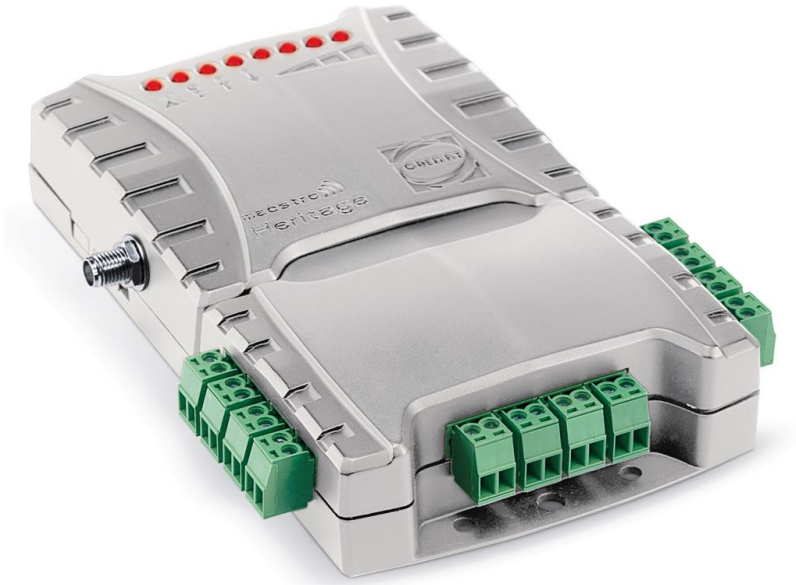

Maestro Heritage Software Tools

USER MANUAL

Rev. 1.1

www.maestro-wireless.com Email: contact@maestro-wireless.com
Tel: 852 2869 0688 Fax: 852 2525 4701
Address: Room 3603-3609, 36/F, 118 Connaught Road West, Sheung Wan, Hong Kong

REVISION HISTORY

Rev.	Date	Details	Originated by
1.0	1 Mar2008	First release	Wallace Lee
1.1	22Sep2008	Update for software ver. 091d	Wallace Lee

This manual is written without any warranty.

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TABLE OF CONTENTS

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CHAPTER 1: Introduction

Heritage Software Tools is a set of software solutions for Maestro Heritage modem. New functions added to increase application range of various industrial and automated applications:

- AT commands specific for individual plug-in boards
- Automatic and self-recovery TCP/UDP socket connection
- AT command driven TCP/UDP socket connection
- Remote AT command (AT command through SMS)
- Call screening (reject call made by unauthorized phone number)
- Modem status check and monitoring
- Remote program updating
- "Command String" programming scripts

Users can configure and use the above features by following this document.

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CHAPTER 2: HERITAGE PLUGIN SETUP AND COMMANDS

Maestro Heriage allows different harware plug-in boards to be conneted to the expansion slot to enhance functionality. In software side there are commands to configure and control different plug-in boards.

1. Selecting Plug-in

AT+HPLUGIN command

Description: This command is used to setup Heritage with individual hardware plug-in board.

Command Syntax: AT+HPLUGIN=<type>
Response Syntax: +HPLUGIN: <type>

Command	**Possible responses:**
AT+ HPLUGIN=?	+HPLUGIN: 1 OK *Note: show current settings*
AT+ HPLUGIN=2	OK *Note: use plug-in #2 (CGPS)*
AT+ HPLUGIN=?	+HPLUGIN: (1-4) OK *Note: possible values*

Defined Values:
<type>
Plug-in type
1 I/O plug-in board (default value)
2 CGPS plug-in board
3 reserved
4 Ethernet plug-in board

Note:
- After changing the <type> value the modem will reset immediately.
- Modem will not detect and check if +HPLUGIN value match with actual plug-in , user should make sure entering is correct

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2. AT commands for I/O Plug-in Board

NOTE: An optional I/O plug-in board is needed to plug to Heritage for using this Service. Contact Maestro Wireless for information. For details please read the I/O Plug-in Board user guide.

a. AT+IOBR command

This command is to read the value of one or all six of Input Pins on the I/O plug-in board.

Command Syntax:

AT+IOBR [(=<pin>)]

Response syntax:

+IOBR: <val><val><val><val><val><val>

+IOBR: <pin>,<val>

Command	Possible responses:
AT+IOBR	+IOBR: 000000 OK *Note : read all six input pins values*
AT+IOBR=1	+IOBR: 1,0 OK *Note : read the value of input pin #1*
AT+IOBR=?	+IOBR[: (1-6)] OK *Note: possible values*

Defined Values:

<pin>

ID of the Input Pin to be read. Valid value is from 1 to 6. If omitted all six Input Pins will be read

<val>

Current value (status) of the Input Pin:

0 input signal not detected

1 input signal detected

Note:

1. If no <pin> argument is entered , then all six Input Pins values will be read and the result is displayed as six '0' or '1', representing the value for input #1 to #6 from left to right.
2. Always read I/O Plug-in Board user manual before wiring to avoid permanent damage to the board

b. AT+IOBW command

This command is to set (write) the value of one or all six of Ouput Pins on the I/O plug-in board.

Command Syntax:

AT+IOBW= <val><val><val><val><val><val>

AT+IOBW= <pin>,<val>

Response syntax:

OK

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Command	Possible responses:
AT+IOBW=111111	OK *Note : set all six ouput pins to value "1"*
AT+IOBW=000001	OK *Note : set Output pins #1 to 5 to "1", #6 to '0'*
AT+IOBW=6,0	OK *Note: set Output pin #6 to '0' (others not changed)*

Defined Values:

<pin>

ID of the Output Pin to be set. Valid value is from 1 to 6.

<val>

Value (output) value of the pin to be set:

0 Output Pin is opened

1 Output Pin is closed (shorted)

Note:

1. You can only set one of six or all six Output Pins at one command.
2. To set all six Output Pins at one time, enter command with a set of six digits, only 0 or 1 is allowed, to set the Output Pin of #1 to #6 respectively.
3. Always read I/O Plug-in Board user manual before wiring to avoid permanent damage to the board.

3. AT commands for CGPS Plug-in Board

Please contact Maestro Wireless for further information of C-GPS plug-in board

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CHAPTER 3: GPRS AND TCP/UDP PARAMETERS SETUP

The Automatic and AT command driven TCP/UDP connection (described in Chapter 5 and 6) requires GPRS connection and TCP / UDP parameters setup. This chapter will describe those required setups.

1. GPRS Network Parameters

User need to enter the following parameters for GPRS connection:

- Access point name (APN)
- User name
- Password

They are to be entered by using **AT+IPGPRS** command. Contact your network operator for these parameters.

a. AT+IPGPRS command

Description:

This command is used to setup GPRS network parameters for the TCP/UDP connection feature.

Command Syntax

AT+IPGPRS=<Cid>,<APN>,<UN>,<PW>

Response Syntax

+IPGPRS: <Cid>,<APN>,<UN>,<PW>

Command	**Possible responses:**
AT+ IPGPRS?	+IPGPRS: 1,"INTERNET","" ,"" OK *Note: show current settings*
AT+ IPGPRS=1,	OK *Note: set Cid value to 1*
AT+ IPGPRS =1,"INTERNET"	OK *Note: set the PDP value to 1 and APN to "INTERNET"*
AT+ IPGPRS=?	+IPGPRS: (1-4),(100),(50),(50) OK *Note: possible values*

Defined Values :

<Cid>

PDP context identifier

Note: to use with TCP/UDP connection feature this value must be set to **1**.

<APN>

Access point name of the GPRS network. Max 100 characters.

<UN>

User name to access the GPRS service. Max 50 characters.

<PW>

Password used to access the GPRS service. Max 50 characters.

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b. AT+IPCONNECT command

This command is to make the modem to activate or deactivate GPRS connection . Once IPCONNECT is success you can perform TCP/UDP connection as described on other chapters. Please read note below on using this command.

Command Syntax

AT+IPCONNECT = <Bearer>,<Connect>

Response Syntax

+IPCONNECT: <Bearer>,<Connect>

Command	Possible responses:
AT+ IPCONNECT=?	+IPCONNECT: (0-1) , (0-1) OK *Note: display possible values*
AT+ IPCONNECT?	+IPCONNECT: 1,0 OK *Note: display current status*
AT+IPCONNECT=1,1	OK OK OK *Note: Activate GPRS connection success*
AT+IPCONNECT=1,1	+CME ERROR: 3 *Note: Activate GPRS connection fail*
AT+ IPCONNECT =1,0	OK *Note: Deactivate GPRS connection success*

Defined Values:

<Bearer>

0: using GSM Bearer (Note: do NOT use this)

1: using GPRS Bearer.

<Connect>

0: to stop connection

1: to start connection.

Note: Before you connect to GPRS by this command make sure you have finished the following first:

1. Entered APN settings by AT+IPGPRS command Chapter 3.1.a)
2. It is suggested after modem power up wait about 20 seconds before making GPRS connection.

2. TCP/UDP Parameters Setup

For using automatic or AT command driven TCP/UDP connection (described in Chapter 5 and 6), you need to first enter the target TCP/UDP peer parameters. There are:

- AT+IPTCP
- AT+IPUDP
- AT+IPBUFF

a. AT+IPTCP command

This command specifies the TCP socket parameters and mode that to be used by automatic or AT command driven TCP connection (described in Chapter 4 and 5).

Command Syntax

AT+IPTCP=<port>,<mode>,<server>,<TCPTxDelay>

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Response Syntax
+ IPTCP: <port>,<mode>,<server>,<TCPTxDelay>

Command	Possible responses:
AT+ IPTCP?	+IPTCP: 0,"S","",0 OK *Note : show current settings*
AT+ IPTCP =23	OK *Note: set the TCP port to 23*
AT+ IPTCP =23,"C",202.144.111.222",0	OK *Note: to set the modem to connect TCP socket Client (caller) mode to target :address 202.144.111.222 and port 23*
AT+ IPTCP =23,"S",255.255.255.255",0	OK *to set the modem to wait for TCP socket connection request (Server (listening) mode) any calling IP address allowed, port 23*
AT+ IPTCP =?	+IPTCP: (0-65535),("C","S"),(120),(0-1) OK *Note : possible argument*

Defined Values:

<port>
The port number has to be used for the TCP socket connection. Default value is 0. Valid range is 0 to 65535.

<mode>
Mode of TCP operation. Default value is "S".
"S" Server (Listening) mode. This configures Maestro Heritage to open a listening TCP connection on the specified <port> . The TCP connection will be active upon getting socket connection request from the allowed remote TCP peer (see <address>)
"C" Client (caller) mode. This configures Maestro Heritage to request opening a TCP connection to the server with the specified <address> and <port> .
Note: This parameter is used by Auto TCP connection (see Chapter 4) only.

<address>
The address of the TCP server (or host). Default value is empty. Legal values could be 32-bit in dotted-decimal notation (i.e. xxx.xxx.xxx.xxx) or alphanumeric ASCII test string up to 120 characters (only if DNS is available on the GPRS network)
Note: In "Server" (Listening) mode the modem will only accept TCP connection request for the caller with address specified in the <address> field. Yet if it is set to "255.255.255.255" the modem will accept request from ANY address.

<TCPTxDelay>
This parameter determines if there is time delay introduced before sending a TCP frame that has not been entirely filled with user data. If it is set to 0 initiates the sending of a TCP frame as soon as possible after the reception of a single character value from the host. If it is set to 1 initiate a delay will be introduced before the sending of a TCP frame
The default value is 0.

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b. AT+IPUDP command

This command specifies the UDP socket parameters and mode that to be used by automatic or AT command driven UDP connection (described in Chapter 4 and 5).

Command Syntax

AT+IPUDP=<port>,<mode>,<server>,<UDPTxDelay>

Response Syntax

+ IPUDP: <port>,<mode>,<server>,<UDPTxDelay>

Command	Possible responses:
AT+ IPUDP?	+IPUDP: 0,"S","",0 OK *Note : show current settings*
AT+ IPUDP =23	OK *Note: set the UDP port to 23*
AT+ IPUDP =23,"C",202.144.111.222",0	OK *Note: to set the modem to connect UDP socket Client (caller) mode to target :address 202.144.111.222 and port 23*
AT+ IPUDP =23,"S",255.255.255.255",0	OK *to set the modem to wait for UDP socket connection request (Server (listening) mode) any calling IP address allowed, port 23*
AT+ IPUDP=?	+IPUDP: (0-65535),("C","S"),(120),(0-1) OK *Note : possible argument*

Defined Values:

<port>

The port number has to be used for the UDP socket connection. Default value is 0. Valid range is 0 to 65535.

<mode>

Mode of UDP operation. Default value is "S".

"S" Server (Listening) mode. This configures Maestro Heritage to open a listening UDP connection on the specified <port> . The UDP connection will be active upon getting socket connection request from the allowed remote UDP peer (see <address>)

"C" Client (caller) mode. This configures Maestro Heritage to request opening a UDP connection to the server with the specified <address> and <port>.

Note: This parameter is used by Auto UDP connection (see Chapter 3) only.

<address>

The address of the UDP server (or host). Default value is empty. Legal values could be 32-bit in dotted-decimal notation (i.e. xxx.xxx.xxx.xxx) or alphanumeric ASCII test string up to 120 characters (only if DNS is available on the GPRS network)

Note: In "Server" (Listening) mode the modem will only accept UDP connection request for the caller with address specified in the <address> field. Yet if it is set to "255.255.255.255" the modem will accept request from ANY address.

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<UDPTxDelay>

This parameter determines if there is time delay introduced before sending a UDP frame that has not been entirely filled with user data. If it is set to 0 initiates the sending of a UDP frame as soon as possible after the reception of a single character value from the host. If it is set to 1 initiate a delay will be introduced before the sending of a UDP frame

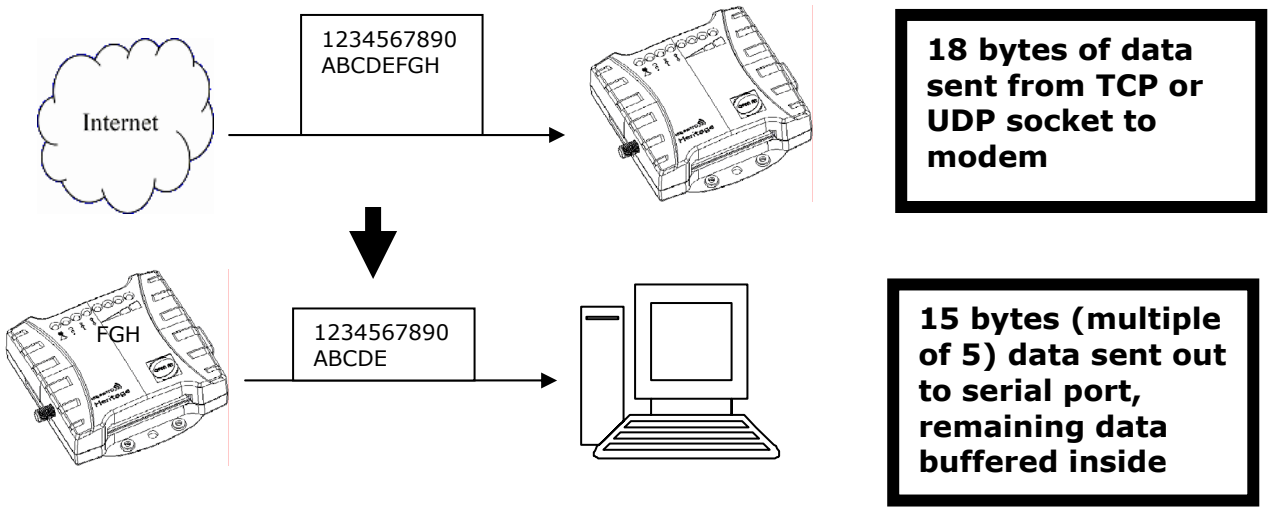
The default value is 0.

c. AT+IPBUFF command

This command specifies the number of bytes of payload data from remote peer buffered inside the modem when automatic or AT command driven TCP / UDP connection is made.

- If the quantity of buffered data reaches this value, the whole buffered data will be sent out to the serial port.
- If the data from remote is large enough at one time, only multiple of this value data will be sent out to the serial port remainder will be kept inside buffer.

Example: **AT+IPBUFF=5**



Command Syntax

AT+IPBUFF = <buff>

Response Syntax

+IPBUFF: <buff>

Command	Possible responses:
AT+ IPBUFF=?	+IPBUFF: 0-100 OK *Note: display possible values*
AT+ IPBUFF?	+IP BUFF: 0 OK *Note: display current status*
AT+IPBUFF = 5	OK *Note: Set IPBUFF value to 5*

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Defined Values:
<buff>
The number of bytes of data to be buffered. Default value is 0 (i.e. no buffering). Valid range is 0 to 100.

Note: If the TCP or UDP socket connection is broken, buffered data will be lost.

3. Extra TCP/UDP Parameters Setup

User can set additional parameters of TCP/UDP connection, including "keep alive" packet, maximum packet size and TTL.

AT+IPOPT command

This command specifies the extra TCP/UDP socket parameters.
Command Syntax
AT+IPOPT=<CMDType>,<parameter>
Response Syntax
+ IPOPT: <CMDType>,<parameter>

Command	Possible responses:
AT+ IPOPT?	+IPOPT: 1, 0 +IPOPT: 2, 536 +IPOPT: 3, 64 OK *Note: display current settings*
AT+ IPOPT =1,100	OK *Note: enable the keep alive packet feature (every 100 seconds)*
AT+IPOPT=2,512	OK *Note: set the size of maximum packet that to be sent to 512 bytes*
AT+ IPOPT=3,128	OK *Note:set TTL to 128*
AT+ IPOPT=?	+IPOPT: (1-3),(0-65535) OK *Note : possible argument*

Defined Values:
<CMDType>
1 setup "keep alive" packet feature:
When <parameter> is 0, the feature is disabled
When <parameter> is n where n is from 1 to 1048575, then upon a TCP socket connected, an empty "keep alive" packet will be sent out from the modem every n seconds to avoid socket being closed because of idle timeout.
2 Specifies the maximum size of the outgoing packet to <parameter>. The size can be set from 1 to 65535(0xFFFF) default value is 65535.
3 Specifies the TTL value of the socket connection to <parameter>. The value can be set from 1 to 255.
Default value is 128.

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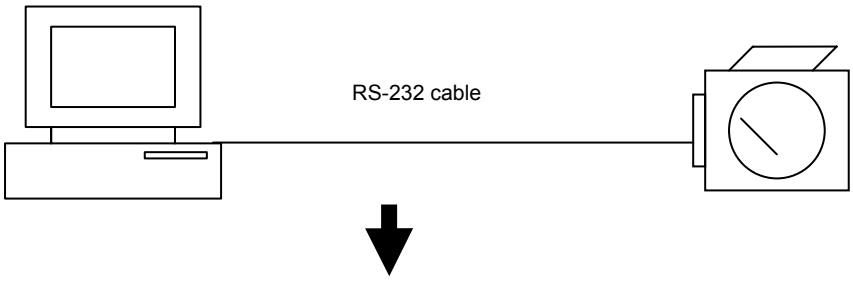
CHAPTER 4: AUTOMATIC AND SELF-RECOVERY TCP/UDP CONNECTION

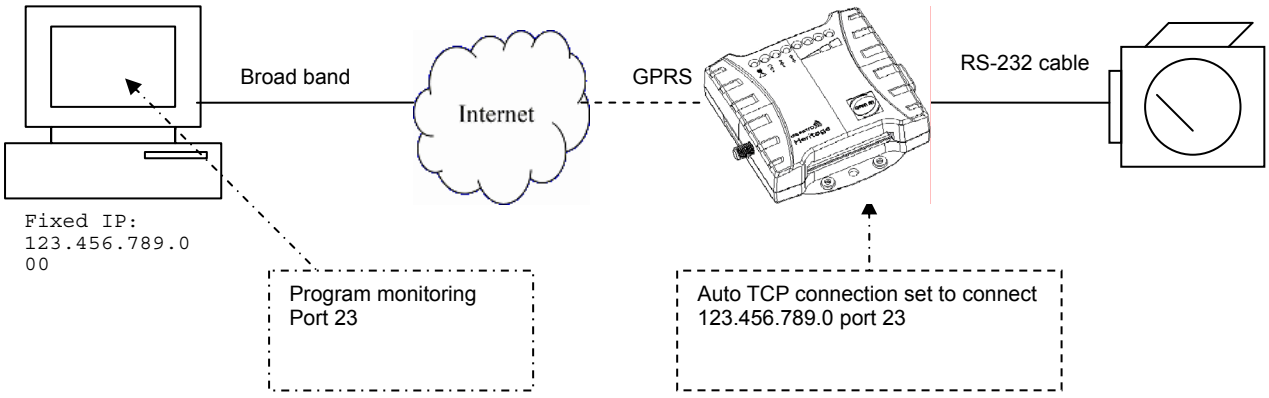
The Auto TCP/UDP connection feature is defined for accessing serial devices over the Internet. Heritage can be configured that after power up it will connect to a remote TCP/UDP socket (client mode) or to wait for the TCP/UDP socket connection request from remote peer (server mode).

If the socket connection is unsuccessful or disconnected it will repeat the connection request and back to waiting stage. This make remote peer can access serial device connected to Maestro Heritage.

Direct serial connection



TCP Socket connection via the Internet /GPRS network



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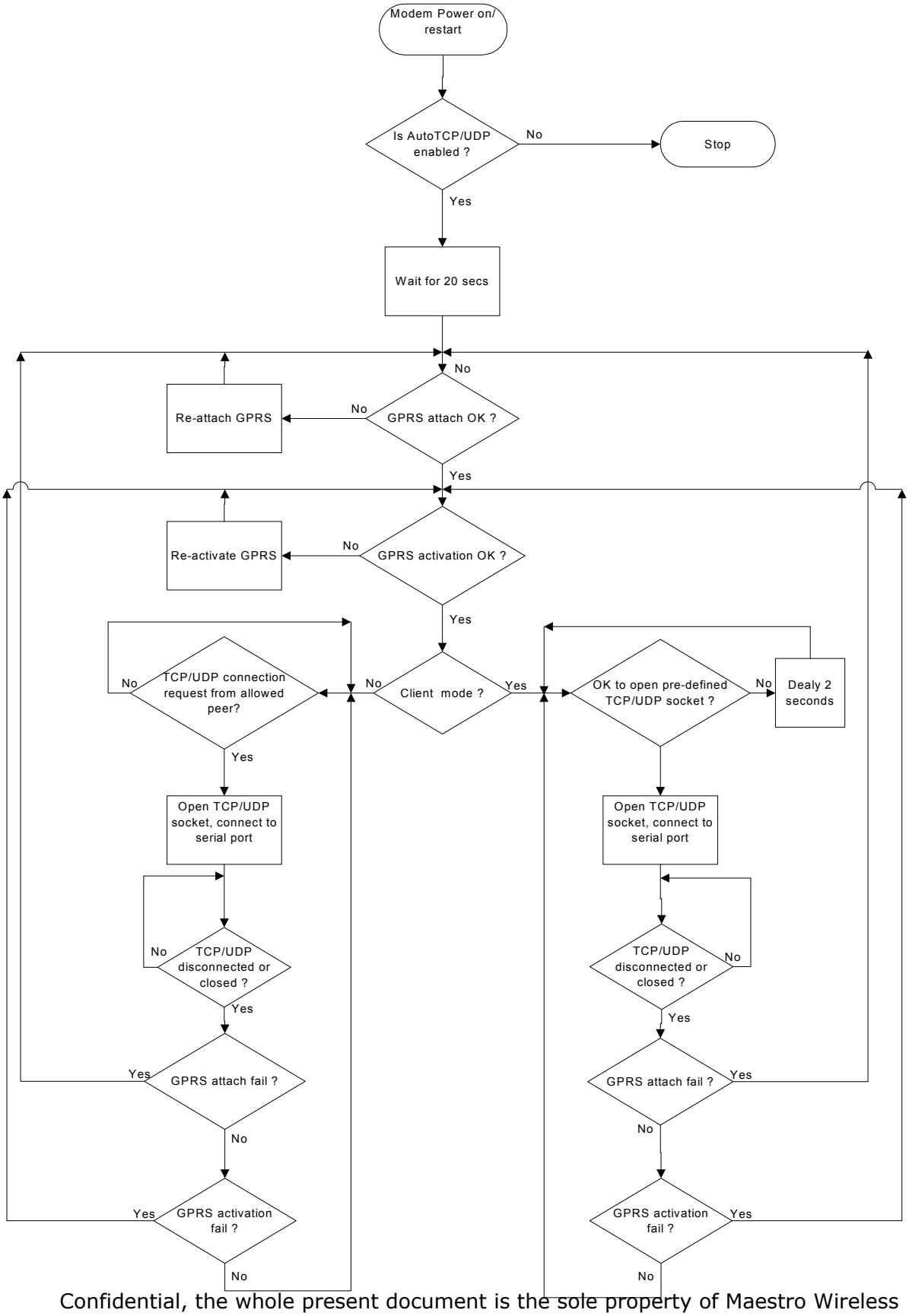
1. Flow diagram of Auto TCP/UDP connection function



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2. AT commands for Auto TCP/UDP connection

a. AT+AUTOTCP command

This command controls the Heritage to start TCP socket connection automatically
Before using **AT+AUTOTCP** TCP and GPRS settings MUST be setup properly using **AT+IPTCP and AT+IPGPRS** command respectively.

Command Syntax
AT+AUTOTCP=<mode>
Response syntax:
+AUTOTCP: <mode>

Command	Possible responses:
AT+AUTOTCP=0	OK *Note : disable AutoTCP*
AT+AUTOTCP=1	OK *Enable AutoTCP*
AT+ AUTOTCP?	+AUTOTCP : 1 OK *Note display current status*
AT+AUTOTCP=?	+AUTOTCP : (0-1) *Note : possible argument*

Defined Values:
<mode>
1 enable auto TCP
0 disable auto TCP
Note:

- Before enabling Auto TCP, it **MUST** be properly set the GPRS settings by **AT+IPGPRS** command and TCP settings by **AT+IPTCP** command (see Chapter 3)
- **ONLY** GPRS PDP context # 1 will be used. So please setup +IPGPRS settings with **<cid>**=1
- Once AutoTCP is enabled, it will start the TCP socket connection automatically after 20 seconds.
- Once the TCP connection is established successfully, the serial port will go to data mode, all data entered to the serial port will be sent to remote TCP peer. No more AT commands will be accepted then.
- In TCP connected data mode, the DSR and DCD signals of the serial port will go to high.
- If the TCP connection is broken the modem will try to reconnect automatically. During re-connection period serial port will go back to command mode, and DSR/DCD signal back to low.
- The setting will be saved, and after power off, the AUTOTCP will be restarted with the 20 seconds delay after power up.
- To stop auto TCP connection, you need to enter the command **AT+AUTOTCP=0** by either 1: within 20 seconds after power up, or 2: during reconnection (serial port back to command mode), or 3: by SMS (see Chapter, SMS AT commands)
- Auto TCP connection is exclusive to other TCP/UDP feature. See Chapter 11 (Q&A)

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b. AT+AUTOUDP command

This command controls the Heritage to start UDPacket connection automatically.
Before using **AT+AUTOUDP** TCP and GPRS settings **MUST** be setup properly using **AT+IPUDP and AT+IPGPRS** command respectively.

Command Syntax
AT+AUTOUDP=<mode>
Response syntax:
+AUTOUDP: <mode>

Command	Possible responses:
AT+AUTOUDP=0	OK *Note : disable AutoUDP*
AT+AUTOUDP=1	OK *Note: Enable AutoUDP*
AT+ AUTOUDP?	+AUTOUDP : 1 *OK* *Note: display current status*
AT+AUTOUDP=?	+AUTOUDP : (0-1) *Note : possible argument*

Defined Values:
<mode>
1 enable auto UDP
0 disable auto UDP

Note:

- Before enabling Auto UDP, it **MUST** be properly set the GPRS settings by **AT+IPGPRS** command and UDP settings by **AT+IPUDP** command
- **ONLY** GPRS PDP context # 1 will be used. So please setup +IPGPRS settings with **<cid>**=1
- Once AutoUDP is enabled, it will start the UDP socket connection automatically after 20 seconds.
- Once the UDP connection is established successfully, the serial port will go to data mode, all data entered to the serial port will be sent to remote UDP peer. No more AT commands will be accepted then.
- In UDP connected data mode, the DSR and DCD signals of the serial port will go to high.
- If the UDP connection is broken the modem will try to reconnect automatically. During re-connection period serial port will go back to command mode, and DSR/DCD signal back to low.
- The setting will be saved, and after power off, the AUTOUDP will be restarted with the 20 seconds delay after power up.
- To stop auto UDP connection, you need to enter the command **AT+AUTOUDP=0** by 1: within 20 seconds after power up, or 2: during reconnection (serial port back to command mode) or 3: by SMS (see Chapter , SMS AT command).
- Auto TCP connection is exclusive to other TCP/UDP feature. See Chapter 10 (Q&A)
- Due to the nature of UDP socket connection, **AT+AUTOUDP=0** may not be able to disconnection. in this case you may send command **AT+IPCONNECT=1,0** to disconnect GPRS connection.

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3. AT commands for tuning Auto TCP/UDP connection

AT+AUFCM command

This command controls the buffering time of TDP/UDP data sent to remote peer. Data coming towards UART will be buffered for a "delay" period before being sent out.

Command Syntax
AT+AUFCM=<delay>
Response syntax:
+AUFCM: <delay>

Command	Possible responses:
AT+AUFCM=1	OK *Note : set the +AUFCM value to 1*
AT+ AUFCM?	+AUFCM : 2 *OK* *Note: display current status*
AT+AUFCM=?	+AUFCM : (1-255) *Note : possible argument*

Defined Values:
<delay>
Default value: 0
Possible value: 1 to 255
Delay units between sending buffered data to TCP/UDP peer. The actual delay time is calculated by the value of **<delay>** times 18.5 ms. So if **<delay>** is equal to 2 that means data will be sent to remote peer every 39ms (or immediately if internal buffer is full) Increasing this value can make the data packet size bigger especially when data flow is slow, thus reducing overhead.

Note:
If the value is set too high the maximum data transfer speed may be decreased.

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CHAPTER 5: AT COMMAND DRIVEN TCP/UDP CONNECTION

This feature let user to make a TCP or UDP connection upon the **AT+OTCP** or **AT+OUDP** command.
This socket connection feature does support DLE/ETX character coding. See 5.1.a
The **AT+OTCP** and **AT+OUDP** operation is similar to AT#OTCP and AT#OUDP function provided original IP Connectivity. See IP connectivity document.
Make sure you have made the GPRS connection by **AT+IPCONNECT** command before making socket connection (see Chapter 17, setup examples).

1. AT commands for Auto TCP/UDP connection

a. AT+DLEMODE command

When performing the AT command driven TCP or UDP socket connection, the attached host has the choice to code or not the ETX character.
When DLEMODE is set to 0, no specific process is needed on ETX characters. It means that it is not possible for a host to request a end of connection or to receive a clear indication of end of connection from the TCP/IP stack.
When DLEMODE is set to 1, the ETX character means a request or an indication of end of connection.
As a consequence, ETX characters that belong to the payload data must be sent by the host on the serial port preceded by a DLE character. Similarly ETX characters received by the TCP/IP stack from the Internet are sent to the host through the serial port preceded by a DLE character "ETX" is character hex 03, "DLE" character is hex 10 (Dec 16)
Default value is 0.

Command Syntax
AT+DLEMODE=<mode>
Response syntax:
+DLEMODE: <mode>

Command	Possible responses:
AT+ DLEMODE =0	OK *Note : disable DLEMODE*
AT+ DLEMODE =1	OK *Note: Enable DLEMODE*
AT+ DLEMODE?	+DLEMODE : 1 *OK* *Note: display current status*
AT+ DLEMODE =?	+DELMODE : (0-1) *Note : possible argument*

Defined Values:
<mode>
1 enable DLEMODE
0 disable DLEMODE

Note:
DLEMODE is not available for Automatic TCP/UDP connection.

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b. AT+AOTCP command

This command is sent by the attached host to open a TCP connection to the TCP server specified by the **AT+IPCTP** command. If socket connection is made successfully it will response CONNECT 115200 and the serial port will go to data mode, all data entered to the serial port will be sent to remote TCP/UDP peer.
If socket connection is unsuccessful or socket is disconnected afterwards the modem will send out NO CARRIER message and back to command mode.

Command Syntax:
AT+OTCP
Response syntax:
CONNECT 115200

Command	Possible responses:
AT+ OTCP	CONNECT 115200 *Note : TCP connection made successfully*
AT+ OTCP	+CME ERROR 3 *Note: fail, either IPCONNECT is not ready or socket service is used already*
AT+ OTCP	NO CARRIER *Note: possibly remote server no response*

Note:
AT+OTCP connection is exclusive to other TCP feature. See Chapter (Q&A)
If TCP connection is unsuccessful or broken after connection the GPRS connection will also be disconnected. (+IPCONNECT: 1,0). So please enter AT+IPCONNECT=1,1 to reconnect GPRS before entering AT+OTCP.

c. AT+OUDP command

This command sent by the attached host to open a UDP connection to the UDP server specified by the **AT+IPUDP** command. If socket connection is made successfully it will response CONNECT 115200 and the serial port will go to data mode, all data entered to the serial port will be sent to remote UDP peer.
If socket connection is unsuccessful or socket is disconnected afterwards the modem will send out NO CARRIER message and back to command mode.

Command Syntax:
AT+OUDP
Response syntax:
CONNECT 115200

Command	Possible responses:
AT+ OUDP	CONNECT 115200 *Note : UDP connection made successfully*
AT+ OUDP	+CME ERROR 3 *Note: fail, either IPCONNECT is not ready or socket service is used already*
AT+ OUDP	NO CARRIER *Note: possibly remote server no response*

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Note:

- AT+OUDP connection is exclusive to other TCP/UDP feature. See Chapter 9 (Q&A)
- If UDP connection is unsuccessful or broken after connection the GPRS connection will also be disconnected. (+IPCONNECT: 1,0). So please enter AT+IPCONNECT=1,1 to reconnect GPRS before entering AT+OUDP.
- Due to the nature of UDP socket connection, sending ETX characters (when DLEMODE is 1) may not be able to make disconnection.

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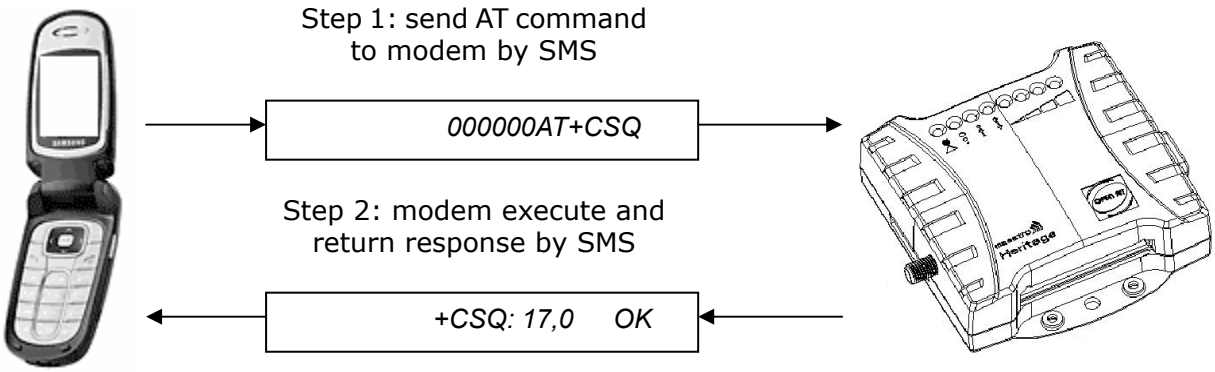
CHAPTER 6: REMOTE AT COMMAND BY SMS

This feature is to control the modem to interpret AT command from incoming SMS, executing it, and return the result to sender by SMS.

The user can enable the modem to receive AT command by incoming SMS. See following about **AT+SMSAT** command.

1. Description of the operation



1. When enabled, **the modem will treat the incoming SMS as a source of AT command only if <u>all</u> of the following conditions (a, b and c) are fulfilled:**
   a. The content of SMS sent to the modem is using standard 7-bit GSM data decoding scheme,
   b. The first 6 characters of the SMS content matches the **<key>** parameter set by **AT+SMSAT** command, (default key is "000000")
   c. The 7th and 8th characters of the SMS content is "AT" (in capital letters)
2. If SMSAT is enabled, the modem will read each incoming SMS, if the conditions mentioned in 1 are matched the message will be executed, even it is an invalid AT command
3. When using SMSAT feature, only +CNMI:x,1,x,x,x setting could be used (i.e. incoming message will be stored in SIM card).
4. The maximum length of the AT command is limited by length of SMS, i.e. 160-6 = 154 characters
5. When the SMS AT command is executed, all intermediate and final responses will be buffered recorded, then return to the sender's phone number in one single SMS.
6. If response(s) of the AT command is (are) more than 160 characters, only the first 160 characters will be returned.
7. In case the modem cannot get terminal response within 26 seconds, the modem will then abort the command, and return intermediate responses (if present).
8. If the SMSAT feature is enabled, all incoming SMS, either with valid AT command or not, will be erased. This is to prevent SIM card memory from fully filled; such the modem will not receive new SMS.

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2. AT command for configuring AT command by SMS

AT+SMSAT command

Command Syntax:
AT+SMSAT=<mode>(,<key>)
Response syntax:
+SMSAT: <mode>,<key>

Command	Possible responses:
AT+SMSAT=0	OK *Note : disable remote AT command by SMS*
AT+ SMSAT =1	OK *Enable remote AT command by SMS*
AT+ SMSAT?	+SMSAT : 1,000000 OK *Note display current status*
AT+SMSAT=2,123456	OK *Note: set the <key> value*
AT+ SMSAT =?	+SMSAT : (0-2),(6) OK *Note : possible argument*

Defined Values:
<mode>
0 disable remote AT command by SMS
1 enable remote AT command by SMS
2 change the value of the <key>
<key>
A 6-digit numeric character key from 000000 to 999999. Only incoming SMS with the first 6 characters matching with this key will be treated as a valid source of remote AT command.

3. Limitation and caution to be taken when using remote AT command

This feature will not 'judge' the result of executing the command, so care has to be taken not to enter improper command that make the modem becoming out of control:
1. Never send 'interactive' AT command by SMS, e.g. AT+CMGS=…. This feature cannot return the prompt to the sender for second input
2. Always wait for the return SMS with AT responses before you send another SMS AT command.
3. It could be in some case (e.g. network failure) the modem cannot return response SMS. The modem will try sending response SMS for three times max. If still not successful it will abort.
4. Always think twice before you send AT command by SMS. For example if you send AT+CPOF it will turn off the modem, and you need to go to access the modem to reset it.
5. Some AT commands can be sent over SMS. See Chapter 16.

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CHAPTER 7: CALL SCREENING

This feature enables Heritage to reject incoming call if the phone number does not match one of the entries of authorized phone number list. Unauthorized incoming call will be hanged up within one ring.
Up to 10 authorized phone numbers can be stored. Each number can be as long as characters
Waiting call can also be rejected.

1. *AT commands for configuring call screening*

a. AT+CSRN command

This command is to enable or disable call screening feature.

Command Syntax:

AT+CSRN=<mode>

Response syntax:

+CSRN: <mode>

Command	Possible responses:
AT+CSRN=0	OK *Note : disable call screening*
AT+CSRN=1	OK *Enable call screening*
AT+CSRN?	+CSRN : 1 *Note display current status*
AT+CSRN=?	+CSRN: (0-1) *Note : possible argument*

Defined Values:

<mode>

0 disable call screening

1 enable call screening

Note:

- To use call screening make sure Caller ID service is enabled otherwise all incoming call will be rejected.
- To apply call screening to waiting call please first enable Call waiting indication by command AT=CCWA=1,1
- Rejected incoming will not be diverted to voice mail.

b. AT+CSNW command

This command is to enter authorized phone number.

Command Syntax:

AT+CSNW=<id>,<num>

Response syntax:

OK

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Command	Possible responses:
AT+CSNW=1,"12345678"	OK *Note : enter authorized number to location 1*
AT+CSNW=11,"12345678"	+CME ERROR: 3 *Note : location out of range*
AT+CSNW=3,"1qaaa"	+CME ERROR: 3 *Note : non-numeric characters not allowed*
AT+CSNW=?	+CSRN: (1-10),(20) *Note : possible argument*

Defined Values:

<id>

Location of the authorized phone number to be stored. Valid range is from 1 to 10

<num>

Authorized phone number. First digit can be "+", others must be numeric digits. Maximum length is 20

Note:

- Enter phone number exactly same as the incoming one, especially if entering International phone number. Use AT+CLIP command to check incoming call number first.
- Enter empty phone number in the <num> field will erase the record of that location.

c. AT+CSNR command

This command is to read authorized phone number entered.

Command Syntax:

AT+CSNR=<id1>(,<id2>)

Response syntax:

+CSNR: <id>,<num>….

Command	Possible responses:
AT+CSNR=1	+CSNR: 1, "12345678" OK *Note : display authorized number in location 1*
AT+CSNR=1,8	+CSNR: 1, "12345678" +CSNR: 3, "123456" +CSNR: 6, "12345678" +CSNR: 8, "12345678" OK *Note : display authorized number in from location 1 to 8*
AT+CSNR=?	+CSNR=(1-10),(1-10) OK *Note: possible argument*

Defined Values:

<id1>

Beginning location of the authorized phone number to be read. Valid range is from 1 to 10.

<id2>

Ending location of the authorized phone number to be read. Valid range is from 1 to 10.

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d. AT+CSND command

This command is to erase authorized phone number entered.

Command Syntax:

AT+CSND=<id1>(,<id2>)

Response syntax:

+CSNR: <id>,<num>….

Command	Possible responses:
AT+CSND=1	OK *Note : erase authorized number in location 1*
AT+CSNR=1,8	OK *Note : erase authorized number in from location 1 to 8*
AT+CSND=?	+CSND=(1-10),(1-10) OK *Note: possible argument*

Defined Values:

<id1>

Beginning location of the authorized phone number to be erased. Valid range is from 1 to 10.

<id2>

Ending location of the authorized phone number to be erased. Valid range is from 1 to 10.AT+CSRN command.

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CHAPTER 8: MODEM STATUS CHECK AND MONITORING

The Modem Status Check and Monitoring feature makes the modem can check the status of the modem in either "one shot" or periodic (per minute) mode. Modem will also report check result by SMS if result is beyond preset limit, and reset automatically if losing network connection.

Following items will be checked:

- network registration (periodic mode only, triggering reset)
- rom test
- signal strength (can trigger reporting)
- IP address of modem (only when GPRS connection activated).

1. AT command for Modem Status Check and Monitoring

a. AT+TMODE command

This command is to perform and setup modem status check and monitoring feature

Command Syntax:

AT+TMODE (=<mode>(,<para>))

Response syntax:

+TMODE: <test1>,<test2>….

Command	**Possible responses:**
AT+TMODE	+TMODE: 1, 15, "10.111.222.33", 3814 OK *Note : execute status check ("one shot" mode)*
AT+TMODE=?	+TMODE: (0-4), (15) *Note : possible argument*
AT+TMODE?	+TMODE: 1, 1234567, 10, 3500 OK *Note: display current setting*
AT+TMODE=0	OK *Note: disable periodic mode check*
AT+TMODE=1	OK *Note: enable periodic mode check*
AT+TMODE=2,"1234567"	OK *Note: set telephone number for periodic mode reporting*
AT+TMODE=3,10	OK *Note: set network signal trigger level for remote reporting*
AT+TMODE=4,3450	OK *Note: set input voltage trigger level for remote reporting*

Defined Values :

<mode>

0 disable periodic mode check

1 enable periodic mode check

2 to set the number in <para> field as telephone number for periodic mode check reporting. See section 7.1.2 for details

3 to set the number in <para> field as network signal trigger level for periodic mode check reporting. See section 1b for details

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b. Operation of Modem Status Check and Monitoring

"One Shot" mode:

When user enters AT+TMODE command the modem will perform a single check and will send back the result like this:

+TMODE: 1, 15, "10.111.222.33", 3814

OK

Meaning of parameters:

Check item	Result field #	Result	Remark
rom data checksum	1	0 fail 1 pass	
network signal strength	2	range from 1-32 (or 99)	same as AT+CSQ
modem IP address	3	In xxx.xxx.xxx.xxx format	Only shown when GPRS session is activated
Input voltage	4	Voltage to the modem's internal module (times 1000)	See * below

* Note. This is not for end customer use.

"Periodic" mode:

When user enters AT+TMODE=1 command the modem will perform periodic check every one minute:

- Firstly it will check if the modem is registered to the network; if the modem is not registered to the network it will increase a counter by one. If the counter reach 5 (i.e. not registered for consecutive 5 minutes) the modem will reset
- If the modem is registered to the network the counter will be reset to 0 and perform check same as "one shot" mode
- If the result of the network signal strength is lower than the setting of AT+TMODE=3,x the test result will be sent over SMS to the telephone number set by AT+TMODE=2,xxxxxxx (max number of digit is 20)
- If the result of the input voltage is lower than the setting of AT+TMODE=4,x the test result will be sent over SMS to the telephone number set by AT+TMODE=2,xxxxxxx
- If 3 consecutive checks fail (i.e. 3 SMS sent) then the periodic mode check will be disabled automatically.

Network signal trigger level range is from 1-31

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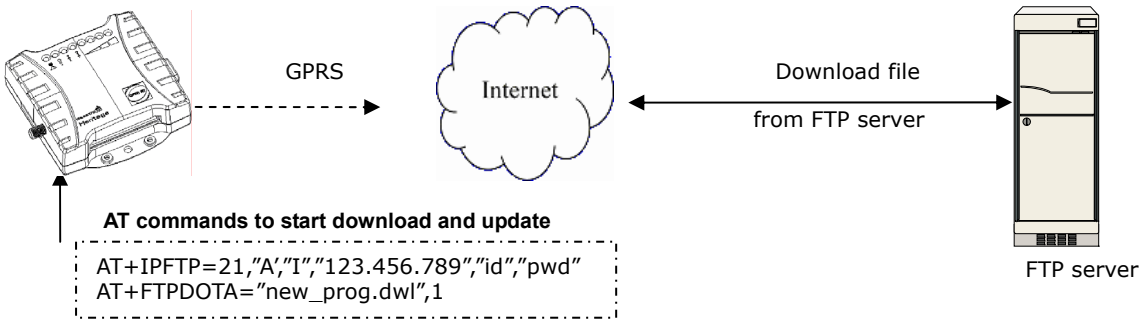
CHAPTER 10: REMOTE PROGRAM UPDATE

By using this feature, user can download the new version of Maestro Heritage program from a FTP server and upgrade the program. By combining Remote AT command by SMS feature user can control the Maestro to complete the program downloading and updating process remotely.



To perform the whole program update process, several AT commands (steps) have to be sent:

1. AT+IPGPRS to set network parameters (APN)
2. AT+IPFTP to set FTP server parameters (name, user id, password)
3. AT+FTPDOTA to set filename and FTP path and start downloading (*)
4. AT+ADINSTALL to install the downloaded new program (*)

(*) Note: by adding one extra parameter after step 3 complete, step 4 will be executed automatically. See following sections for details

1. AT command for remote firmware update

a. AT+IPFTP command

This command is to set FTP server parameters

Command Syntax:

AT+IPFTP =<port>,<type>,<mode>,<server>,<id>,<pwd>

Response syntax:

OK

Command	Possible responses:
AT+IPFTP= 21,"I","A","201.123.222.222", "userid","pssd"	OK *Note : setup FTP parameter*
AT+IPFTP=?	+IPFTP: (0-65535), ("A","I","E"),("P","A"),(120),(64),(64) *Note : possible argument*
AT+IPFTP?	+IPFTP: 21,"I","A","201.222.222.222","userid","pssd" OK *Note: display current setting*

Defined Values :

<port>

Port number of the FTP server. Default value is 21

<type>

Translation of carriage return, valid values are:

I image (no translation, default),

A ASCII

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E EBCDIC

<mode>

Passive or Active mode valid values are:

P passive (default),

A active

<server>

IP address of FTP server (in xxx.xxx.xxx.xxx format) or an alpha numeric string format (e.g. ftp.server.com)

Maximum 120 characters

Note: if alpha numeric string format is used, make sure the GPRS network has proper DNS service available.

<id>

login name of the user. Maximum 64 characters.

<pwd>

Password for the user. Maximum 64 characters.

b. AT+FTPDOTA command

This command is to inform the modem the filename and FTP path. The modem will login to the FTP server; download the update file, and optionally execute the update process.

Command Syntax:

AT+FTPDOTA =<filename>[,<path>],[,<update>]

Response syntax:

+FTPDOTA : 0, <filename>, <filesize>

+FTPDOTA : <result>

+ADINSTALL : <adinstall result>

Command	**Possible responses:**
AT+FTPDOTA=”update.dwl”	+FTPDOTA: 0, update.dwl, 17000 OK *Note : download “update.dwl” file from FTP root directory, file size is 17000 bytes*
AT+FTPDOTA=”update1.dwl,”sub”	+FTPDOTA: 0, update.dwl, 17001 OK *Note : download “update1.dwl” file from FTP “sub” directory, file size is 17001 bytes*
AT+FTPDOTA=”update1.dwl,”sub”,1	+ADINSTALL: 2 M100_VAF_094d_OAT316_32 Nov 11 200718:01:42 *Note : download “update1.dwl” file from FTP “sub” directory, and perform program update successfully*
AT+FTPDOTA?	+FTPDOTA: update.dwl, 17001 OK *Note : check downloaded file ready for update*
AT+FTPDOTA?	+FTPDOTA: OK *Note : no downloaded file*
AT+FTPDOTA=”update1.dwl”	+FTPDOTA: -3 OK *Note : error on downloading file (FTP open fail)*
AT+FTPDOTA=?	+FTPDOTA: (128)[,(128)] *Note : possible argument*

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Defined Values:

<filename>

File name of the file to be downloaded. Maximum 128 characters.

<path>

Path (directory) name where the file is placed. Maximum 128 characters. If <path> is omitted, program will try to download from FTP's root (entry) directory. Maximum 128 characters.

<update>

If a third parameter '1' is entered, the program will execute the AT+ADINSTALL command if the download process is successful. This is useful for sending update commands over SMS, so that one SMS is saved in this case. See next section for the details of AT+ADINSTALL command.

<result>

Result code of the downloading process:

Result code	explanation	Comments / countermeasure
0	Download successful	
-1	SIM card problem	Check SIM card and PIN
-2	Internal memory problem	Try reset modem
-3	FTP connection fail	Check network signal, check FTP status, check FTP address
-4	Reserved	
-5	Download file size not same as FTP reported	Retry downloading
-6	Not enough space for downloading	Contact Maestro Wireless
-7	File format incorrect	Check file for downloading
-8	Error writing flash	Contact Maestro Wireless
4xx – 5xx	FTP protocol return code	Check FTP document (RFC 959) for explanation

c. AT+ADDINSTALL command

This command is perform the program update process. File downloaded by AT+FTPDOTA command will replace the existing Heritage program. Modem will restart and then restart result and version will be displayed.

Command Syntax:

AT+ADINSTALL

Response syntax:

+ADINSTALL: <result>, <ver>

Command	Possible responses:
AT+ADINSTALL	+ADINSTALL: 2 HERITAGE_090b_OAT422a_32 Feb 26 200811:42:36 *Note : update successful, show existing program version*
AT+ADINSTALL	+ADINSTALL: 3 HERITAGE_090a_OAT422a_32 Jan 26 200811:42:36 *Note : update unsuccessful, show existing program version*
AT+ADINSTALL	+CEE ERROR: 3 *Note : update unsuccessful, no update file available*

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Defined Values:

<result>

2 update process successful

3 update process unsuccessful (original program will be loaded)

Note: for other result code please contact Maestro Wireless Solutions

<ver>

Version number of existing running Software Tools.

d. Notes and cautions to be taken

1. **This feature is ONLY for updating new program for Heritage. Do not use it for downloading other things.** Always contact Maestro Wireless or distributor for correct update file and information.
2. If you want to perform update for modem at remote site by AT command over SMS, make sure the feature is enabled by command AT+SMSAT=1 is entered.
3. Make sure you have setup GPRS settings by AT+IPGPRS command. When entering AT+FTPDOTA command the program will make GPRS connection automatically if not connected before.
4. It is recommended to stop other Software Tools such as AutoTCP/UDP connection during program downloading and updating.
5. Depending on the file size and network condition the download time could be a few minutes up to 3o minutes. Be patient to wait for response after entering AT+FTPDOTA command.
6. Do not use "~" character on file path because it cannot be transferred correctly over SMS.
7. No resume function on FTP downloading. The whole file has to be downloaded at one time otherwise the downloaded data will be discarded.

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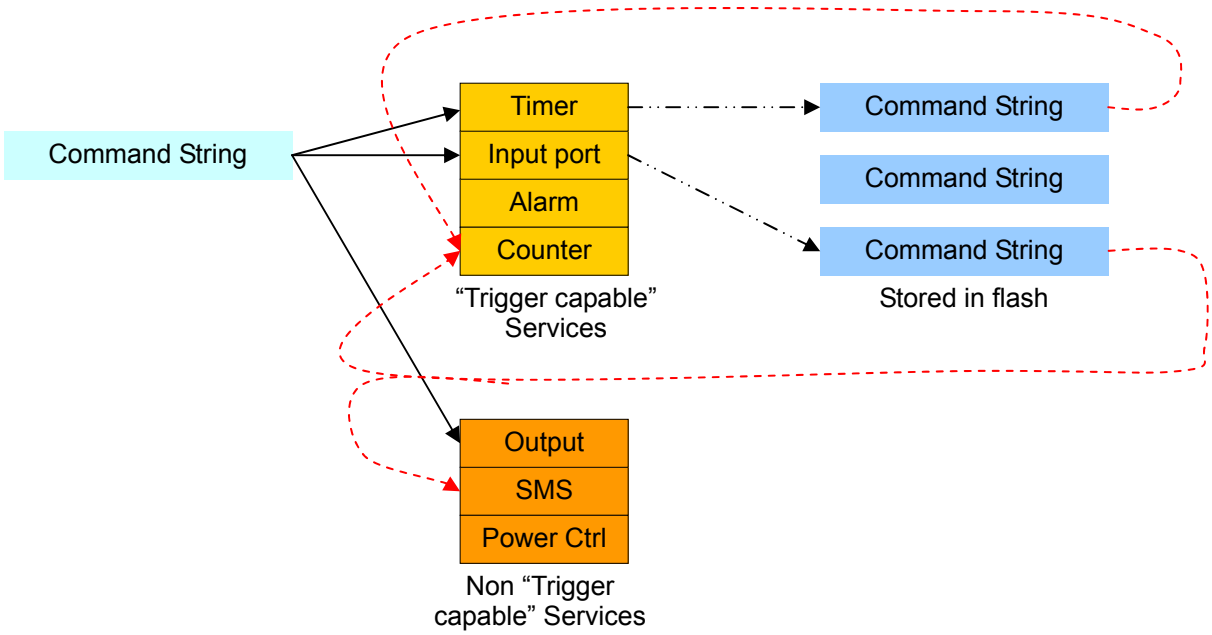
CHAPTER 11: COMMAND STRING - INTRODUCTION

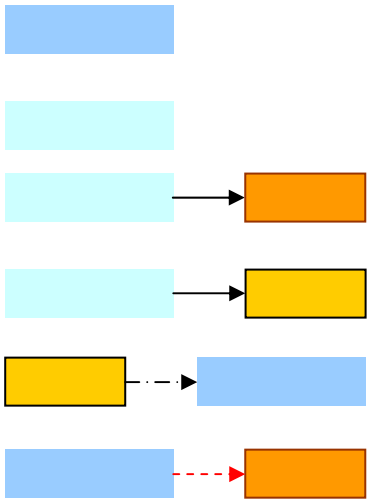
"Command String" is a set of programmable scripts for Maestro Heritage mode. User can input sets of Command Strings to control various kinds of "Service". Unlike AT command, Command strings can be stored inside heritage and can be executed upon output of certain services.

1. *Command String and "Service" Concept*



"Command String" and "Service" operation mechanism

1. Use AT command to enter preset Command Strings
2. Command strings can be executed upon power up or directly by AT commands
3. Executed Command Strings will drive some Services to be done (e.g. sending SMS or setting output pins)
4. Executed Command Strings can also configure and control some Services that have "trigger" capability.
5. These Services, when a certain pre-defined condition is matched (e.g. timer reach zero) can "trigger" a stored Command String.
6. Execute stored Command String to control Services again



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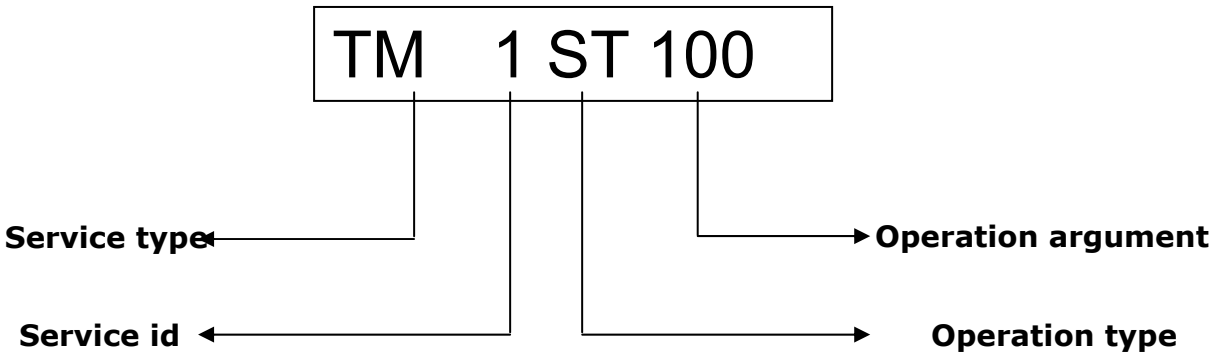
CHAPTER 12: COMMAND STRING – WRITING AND USING

1. Structure of Command String

A single Command String is a text string composed with four fields, for example:



Each field is separated by a space (ascii value 32)

a. Service type

This field has two capital characters indicates the type of Service to be chosen:

Field entry	AL	CT	TM	IP (*)	OP (*)	SM
Service	alarm	Counter	Countdown timer	input ports	output ports	SMS
See Chapter	13.1	13.2	13.3	13.4	13.5	13.6

(*) Services need optional I/O plug-in board
See further chapters for the explanation of each service.

b. Serivce Id

Each type of Service there has more than one unit; e.g. there are 5 counters available so the id range is 1 to 5

c. Operation type and Operation argument

For each type of Service there are few kinds of operations; e.g. “TM 1 ST 100” means to set the value or countdown timer #1 to 100 seconds. See further chapters for the explanation of each service.

2. Concatenating Command String

You can concatenate Command Strings update 128 bytes long totally (including space). They will be executed sequentially. However, if one Command String is incorrect or invalid execution will be stopped and successive Command Stings will not be executed.

For example:

TM 1 ST 100 TM 1	TR 99 TM 1	SW 1

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- First String “TM 1 ST 100” will be executed
- Second String “TM 1 TR 99” will not be executed because “99” is out of range
- Third String “TM 1 SW 1” is correct but will not be executed because execution is stopped on 2nd String

3. Entering and executing Command String

You can use the following AT commands to store and execute Command String

a. AT+CSTR command

Description:
This command is used to execute a Command String directly.
Command Syntax:
AT+CSTR= <string>
Response Syntax:
OK
+CME ERROR : 3

Command	Possible responses:
AT+ CSTR=”TM 1 ST 3”	OK *Note: entire Command String executed successfully*
AT+ CSTR=”TM 1 ST 3 TM 30 ST 4”	+CME ERROR: 3 *Note: one Command String cannot be executed*

Defined Values :
<string>
Command String
Note: When there is error in between concatenated Command String +CME ERROR: 3 will be returned. See 2.2.

b. AT+CSTRSET command

Description:
This command is used to store, read and delete Command String. It can also used to execute stored Command String.
Command Syntax:
AT+CSTRSET= <oper>,<id>[,<string>]
Response Syntax:
OK
+CME ERROR : 3

Command	Possible responses:
AT+ CSTRSET=0,1,”TM 1 ST 3”	OK *Note: store Command String with String id = 1*
AT+ CSTRSET=0,99,”TM 1 ST 3”	+CME ERROR: 3 *Note: id out of range*
AT+CSTRSET=1,1	+CSTRSET : 1, “TM1 ST 3” *Note: read stored Command String id 1*

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AT+CSTRSET=3,1	OK *Note: execute stored Command String id 1*
AT+CSTRSET=2,1	OK *Note: erase Command String id 1 from flash memory*
AT+CSTRSET=3,1	+CME ERROR: 3 *Note: id 1 is empty*

Defined Values :

<oper>

Define type of operation :

0 store Command String to flash

1 read Command String from flash

2 erase Command String from flash

3 execute Command String stored in flash

<id>

Identification number (id) of the Command String. Valid value is 1 to 50, and 80; i.e.

- up to 51 Command Strings can be stored.
- Command String with id = 80 will be executed when modem power up

<string>

Command String

Note:

- Each Command String is limited to 128 bytes.
- The program will NOT check if the input Command String is valid or not.

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CHAPTER 13: COMMAND STRING – SERVICES

"Service" is a kind function or tool that can be made use by Command String. There are two kinds of Services:

- **Trigger capable**

When a certain pre-defined condition is matched (e.g. timer reach zero) "trigger" a stored Command String.
These Services include: Alarm, Counter, Input Port, and Countdown Timer

- **Non-Trigger capable**

Can only perform job when called by Command String.
These Services include: Output Port, SMS

1. Alarm Service

Alarm is used to execute a Command String when the real-time clock of the Heritage meets the set time of the Alarm.
To use Alarm it is required to set the real-time clock of the modem properly, see AT+CCLK in AT command manual. There are total of 5 Alarms can be used

a. Alarm Service Command String Syntax and explanation

1st field Service type	2nd field Service id	3rd field Operation type	4th field Operation argument	Explanation
AL	(1 to 5)	ST	09/10/10,12:00:00	Set alarm date/time yy/mm/dd,hh:mm:ss format
		ST	0	Cancel preset
		TR	(1 to 50) 0	Set Command String to be run, 0 to cancel setting

Example: Set alarm #1 to execute Command String #20 at 01OCT2008, 01:00:00
AL 1 TR 1 AL 1 ST 08/10/01,01:00:00
Example: Cancel #1 Alarm setting
AL 1 ST 0
Example: Cancel #1 Alarm executing Command String
AL 1 TR 0

Note:

- The Alarm date time input MUST to fulfill the following requirements:
  1. In *yy/mm/dd,hh:mm:ss* format, program will also check if input date/time is valid or not
  2. At least 4 minutes later than current modem's real-time clock time (check by AT+CCLK command)
- Do not concatenate after **ST** operation; set time operation should be at the last part of Command String
- After alarm time, the **ST** setting of that Alarm will be lost
- This service will make use of Heritage internal alarm command (AT+CALA) so please avoid using AT+CALA command by yourself when Alarm Service is used.
- If the modem is restarted, date time setting of each Alarm will be checked against real-time clock time. If time is passed the setting will be cancelled.
- Alarm Service is "one-shot" type. There is no periodic alarm like "daily" or "weekly"

b. Reading Alarm Service status

See Chapter 14 for details.

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2. Counter Service

Counter is used to execute a Command String when the Counter value equals a preset value. There are total of 5 Counters.

a. Counter Service Command String Syntax and explanation

1st field Service type	2nd field Service id	3rd field Operation type	4th field Operation argument	Explanation
CT	(1 to 5)	DE	1 TO 255	Decrement the value of Counter with argument value
		IN	1 TO 255	Increment the value of Counter with argument value
		RS	0	Reset the Counter value to zero
		ST	-32768 to 32767	Set the "trigger" value If Counter value equal this value, will execute Command String
		TR	(1 to 50) 0	Set Command String to be run, 0 to cancel setting

Example: Set Counter #1 to execute Command String #10 if Counter value equal 100

CT 1 ST 100 CT 1 TR 10

Example: Increase Counter #1 value by 20

CT 1 IN 20

Example: Reset Counter #1 value to 0

CT 1 RS 0

Note:

- Initial Counter and trigger values are zero.
- The Counter is recorded by a signed 16 bit register, if the Counter value is 32767 and you increase it by 1, the value will change to -32768
- There is no limit on no. of times of triggering. E.g. If you first set trigger value to 2 and reset Counter to 0, then you increment counter by 2, then decrement by 2 and increment by 2 again. Then the associated Command String will be executed twice

b. Reading Counter Service status

See Chapter 14 for details.

3. Countdown Timer Service

Countdown Timer is used execute a Command String when the Timer value reach zero. Counting period is 1 second. There are total of 10 Countdown Timers.

a. Countdown Timer Service Command String Syntax and explanation

1st field Service type	2nd field Service id	3rd field Operation type	4th field Operation argument	Explanation
TM	(1 to 10)	ST	1 TO 2147483647	Initial value of Countdown Timer (in seconds)
		SW	0 TO 1	Start (1) or Stop (0) Timer
		TR	(1 to 50) 0	Set Command String to be run, 0 to cancel setting

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Example: Set Countdown Timer #1 to execute Command String #10 and start 600 seconds countdown

TM 1 ST 600 TM 1 SW 1 TM 1 TR 10

Example: Stop Countdown Timer #1

TM 1 SW 0

Example: Cancel Countdown Timer #1 to trigger Command String

TM 1 TR 0

Note:

- When the Countdown Timer expires (reach 0) it will stop automatically (SW 0).
- If two or more Timers expire at the same timer, Timer with smaller id has higher priority, i.e. Command String related to that Timer will be executed first.
- These are not precision Timers, if the Modem is busy (e.g. with network communication). The execution time may be delayed

b. Reading Countdown Timer status

See Chapter 14 for details.

4. Input Port Service

NOTE: An optional I/O plug-in board is needed to plug to Heritage for using this Service. Contact Maestro Wireless for information.

Input Port Service can use the signal of I/O board's input ports to control the execution of Command String.

You can control the change of single or multiple Input Port signals as a condition to trigger Command String execution.

a. Input port Service Command String Syntax and explanation

1st field Service type	2nd field Service id	3rd field Operation type	4th field Operation argument	Explanation
IP	1 to 6, 101 to 106	DR	0 to 1 if IP# is 1 to 6	Direction of I/P signal change to trigger
			1 TO 63 if IP# is 101 to 106	Binary sum value of mulitiple I/P to trigger
		MS	1 TO 63	"Mask" value to select multiple I/Ps for triggering
		TH	1 to 255	Duration of the I/P state to trigger, unit in 0.1s
		TR	(1 to 50) 0	Set Command String to be run, 0 to cancel setting

Example: Configure Input Port #1 with detection "high to low" and threshold value 0.1s, and trigger Command String #5 if signal condition match:

IP 1 DR 1 IP 1 TH 1 IP 1 TR 5

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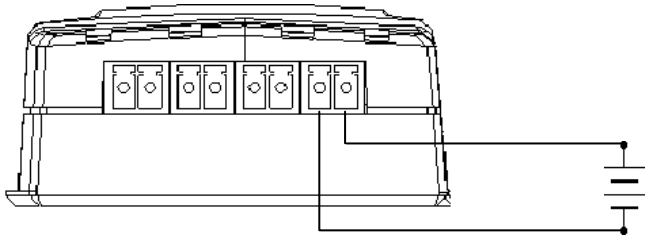
Example: Configure Input Port #4 is high and Port#6 is low and threshold value 0.1s, and trigger Command String #5 if signal condition match:

IP 101 MS40 DR8 IP 101 TH 1 IP 1 TR 5

Example: cancel Input Port#1 to trigger Command String

IP 1 TR 0

b. Input Port operation mechanism (single I/P triggering)



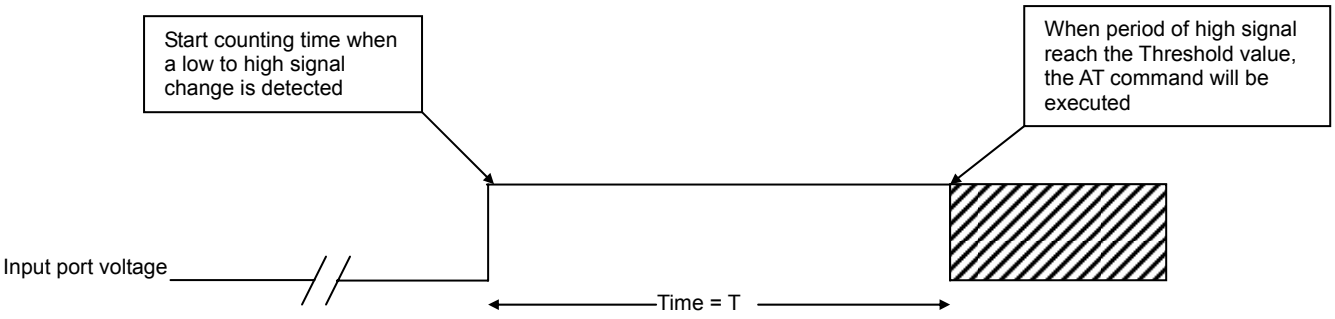
I/O board plug-in

The Input Port will give out a high or low signal depending on the input voltage to the port
The Command String can check the change of Input port Signal (operation "DR"):

IP 1 DR 0 → detect a low-to-high input voltage change
IP 1 DR 1 → detect a high-to-low input voltage change

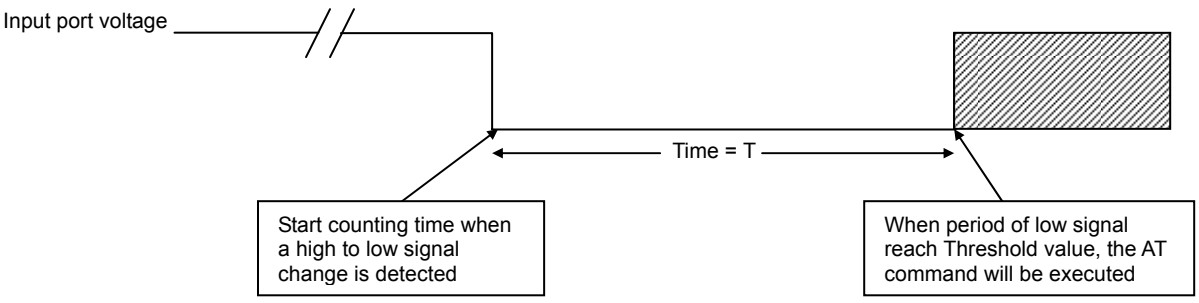
To prevent transient noise signal, a threshold value can be set (operation "TH"). This is the time period required for the detected state to trigger Command String execution. Unit is in 1 millisecond. Valid value from 1 to 50 (0.1 sec to 5 sec)
E.g. TH 10 → Threshold value is 1 sec.

E.g. When set as low-to-high triggering and threshold 1 second: **IP 1 DR 0 IP 1 TH 10 IP 1 TR 5**



When T=1second the Command String #5 will be executed

E.g. when set as high-to-low triggering and threshold 1 sec **IP 1 DR 1 IP 1 TH 10 IP 1 TR 5**



When T=1second the Command String #5 will be executed

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c. Input Port operation mechanism (multiple I/P triggering)

For multiple I/P triggering each I/P port will be assigned with a numerical value:

I/P#	1	2	3	4	5	6
value (decimal)	1	2	4	8	16	32
value (binary)	1	10	100	1000	10000	100000

To select I/P Ports use the "MS" operation with value equal to the sum of values according to the above table, for example:

IP 101 MS 40 → I/P Port #4 and 6 signal is selected for Id 101 (8+32)
IP 102 MS 3 → I/P Port #1 and #2 signals is selected for Id 102 (1+2)

And operation “DR” is now used to determine the state(s) (not driecton) of I/P Ports to trigger. If the I/P is “low” (0) state the value is 0, otherwise the valuing method is same as “MS” operation, for example:

IP 101 DR 32 → both I/P Port #4 and #6 with high '1' signal will trigger (0+32)
IP 102 DR 2 → both I/P Port #1 Is low (0) and #2 is high '1' signal will trigger. (0+2)

"TH" operation is same as single I/P triggering

Note:

- Due to product limitation the modem cannot detect switching action with period less than 100ms. If the input signal change is less than 100ms this feature will not be able to detect accurately.
- Always uses Id#101 to 106 for multiple I/P triggering application.
- If two or more I/P Ports change at the same timer, I/P Port smaller id have higher priority, i.e. Command String related to that I/P Port will be executed first.
- It is possible that a single I/P Port can be included into two or more multiple I/P Port groups.
- In case of multiple I/P triggering it will NOT check the direction of signal change of each included I/P; just check the combined state value against DR value. ion). The execution time may be delayed

d. Reading I/P Port status

See Chapter 14 for details.

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5. Output Port Service

NOTE: An optional I/O plug-in board is needed to plug to Heritage for using this Service. Contact Maestro Wireless for info.

Output Port Service can control the state of I/O board's output ports by Command String.

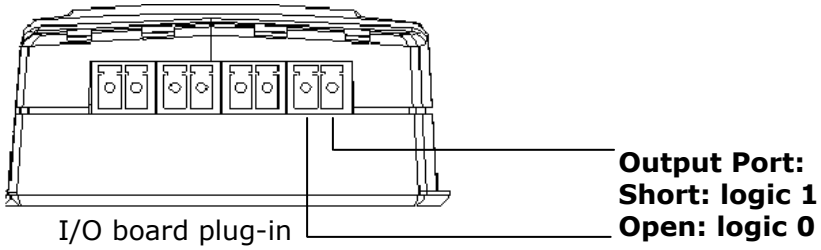
a. Output Port Service Command String Syntax and explanation

1st field Service type	2nd field Service id	3rd field Operation type	4th field Operation argument	Explanation
OP	(1 to 6)	SW	0 TO 1	Set the state of Output Port

Example: Set the Output Port #1 with logic state "ON" (1)

OP 1 SW 1

Input Port operation mechanism:



OP 1 SW 1 → Output Port #1 will short

OP 1 SW 0 → Output Port #1 will open

Note:

Read I/O board plug-in documentation for the connecting and specifications of Output Ports. When power up or reset, ALL Output Ports are set to logic 0 (open). Previous output state will NOT be kept.

6. SMS Service

This service is used to send out a SMS to phone number recorded in the first 10 phonebook records in SIM card.

a. SMS Service Command String Syntax and explanation

1st field Service type	2nd field Service id	3rd field Operation type	4th field Operation argument	Explanation
SM	(1 to 10)	SN	(SMS content)	Send out the SMS to phone number inside SIM card
			%CTn %IP %TMn	"%" to indicate "variable" options in SMS content

Example: Send a message "ALERT" to phone number store in SIM phonebook #1:

SM 1 SN ALERT

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Example: Send a message “Counter#2_value_is_20" to phone number store in SIM phonebook #1:

SM 1 SN Counter#2_value_is_%CT2

b. Using “variable” options within SMS content

In the SMS content field you can use “%” and Service type to insert the current value of Service into the SMS content:

Variable	%CTn	%TMn	%IP
Description	Current value of counter Id#n	Current value of Timer Id#n	Current I/P Ports’ summing value
Range of ‘n’	1 to 5	1 to 10	(See Chap 13.4.c for calculation)

Invalid Service name or Id will be ignored.

Note:

1. Due to modem/SIM initialization it is recommended to send SMS 30 seconds after power up.
2. Only send SMS with “normal” characters. If SMS content has character with ASCII value outside the range between 11 and 127, the SMS may not be sent properly.
3. In case of sending SMS failure (e.g. network problem) the program will delay 0.5 second and try to resend the SMS. If the second time retry (i.e. 3 times total) fails this SMS delivery will be aborted.
4. The maximum length of the SMS content is limited by the maximum length of Command String (128 bytes). The more of Command Strings, the less of SMS length.

7. Device Power Control Service

By using Device Power Control Service user can control on/off state of certain component of the Heritage, in order to save power consumption. A single Service id field can be set to control four parts of the Heritage.

a. Device Power Control Service Command String Syntax and explanation

1st field Service type	2nd field Service id	3rd field Operation type	4th field Operation argument	Explanation
PW	(0 to 15)	(don’t care)	(don’t care)	Service Id to decide componets’ on/off state

Example: Enable low clock mode and disable LEDs :

PW 3 0 0

Example: Enable low clock mode; disable LEDs,UART and deregister from Network

PW 15 0 0

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The value of Service Id is the sum of the values each of which is related to a particular Device Power Control operation :

value	Function	Remark
1	Turn off LEDs	except network status LED
2	Enable power down mode (W32K mode)	Same as **AT+W32K=1** command
4	Deregister from network ("Flight mode")	Same as **AT+COPS=2** command
8	Turn off UART	Com port will not get any data

The larger the id value of PW, the more power saving of the Heritage. For example user can set e.g. the Heritage to register to network only once per day, sending out SMS, then de-register.

Note:

- **BE VERY CAREFUL to use with id #8 (Turn off UART). This will make Heritage Com port switched off and cannot accept AT command. NEVER program the Heritage to enable this once power up**.
- Although "Operation type" and "Operation argument" fields are ignored, "dummy" entries are needed for consistent Command String Syntax. Use may write "PW" Command String like this ("0" as dummy entry) :

  PW 15 0 0

- Refer to AT command manual for the details of power down (W32K) mode.
- It is recommended to use "PW" service some time after power on. So user can have time to change setting.
- Each time when "PW" Command String is exectuted. Refer to AT command manual for the details of power down (W32K) mode.
- Refer to AT command manual for the details of power down (W32K) mode.
- This Device Power Control setting is not saved by itself, so each time when power on the status should be 0 (without any "PW" Command String executed)

b. Reading Device Power Control status

See Chapter 14 for details.

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CHAPTER 14: COMMAND STRING –READING STATUS OF SERVICES

1. Command for reading current information of Services

You can use AT command to read the info of trigger capable Services.

a. AT+CSTRSTAT command

Description:

This command is readf current parameter or status of a particular service_

Command Syntax:

AT+CSTRSTAT=”<type> <id>”

Response Syntax:

OK

+CME ERROR : 3

Command	Possible responses:
AT+ CSTSTAT=”AL 1”	AL 1 : ST 01/01/01,12:00:00 TR 2 OK *Note: read current setting of Alarm #1*
AT+ CSTRSTAT=”TM 10”	TM 10: CV 66 SW 1 TR 20 OK *Note: read current info of countdown timer #10*
AT+CSTRSTAT=”IP 9”	+CME ERROR: 3 *Note: id out of range*

Defined Values:

<type>

Define type of Service:

AL alarm

CT counter

IP Input Port

CT Countdown timer

PW Device Power Control

<id>

Service id

b. Reading Alarm Service

Enter AT+CSTRSTAT = “AL 1” will get Alarm #1 info:

AL 1 : ST 01/01/01,12:00:00 TR 3

a b c

a. Service id

b. datetime set (space if not set)

c. Command String id to be executed if trigger (0 if not to trigger)

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c. Reading Counter Service

Enter AT+CSTRSTAT = "CT 1" will get Counter #1 info:

CT 1	:	ST 300	CV 20	TR 3
a		b	c	d

a. Service id
b. trigger value of the counter
c. current value of the counter
d. Command String id to be executed if trigger (0 if not to trigger)

d. Reading Countdown Timer Service

Enter AT+CSTRSTAT = "TM 1" will get Countdown Timer #1 info:

TM 1	:	CW 90	SW 0	TR 3
a		b	c	d

a. Service id
b. current value of the timer
c. timer is running (1) or stop (0)
d. Command String id to be executed if trigger (0 if not to trigger)

e. Reading Input Pin Service

Reading Enter AT+CSTRSTAT = "IP 1" will get Input Port #1 info:

IP 1	:	MS 1	DR 0	TH 5	TR 3
a		b	c	d	e

a. Service id
b. Mask value (valid for multiple I/P trigger)
c. direction of detection
d. threshold value of the detection
e. Command String id to be executed if trigger (0 if not to trigger)

f. Reading Device Power Control Service

Enter AT+CSTRSTAT = "PW 1" will get Device Power Control info:

PW 0
a

a. Current Service id (mode)

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CHAPTER 15: KNOWN ISSUES

The Heritage Software Tools will affect certain other AT commands operation. Please note.

1. AT +WIND command

AT+WIND command will be disabled

2. Saving of parameters to non-volatile memory

You cannot save the settings of the following AT commands by concatenating the &W command:

AT+CREG
AT+CGREG
AT+CGEREP

To save the above settings please enter AT&W separately.

3. Mutually exclusive TCP/UDP functions

Following functions are exclusive to each other, i.e. if either is enabled others could not be then:

AT+AUTOTCP=1
AT+AUTOUDP=1
AT+OTCP

4. Sending Heritage Software commands over SMS

You can use the remote AT command by SMS feature to send Heritage Software AT commands mentioned in this document **except** the followings:

AT+OTCP
AT+OUDP
AT+IPCONNECT

Also it is not recommended to send **AT+CSTR** command over SMS.

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CHAPTER 16: QUESTIONS AND ANSWERS

1. AutoTCP/UDP

Q. Can I specify **<server>** by URL (e.g. xxxx.com) rather than IP address?

A. Yes, but only if your GPRS network have proper DNS service. You cannot specify your own DNS server

Q. If I enabled AutoTCP or AutoUDP, how can I stop it?

A. you need to enter the command **AT+AUTOTCP=0** or **AUTOUDP=0** by either 1: within 20 seconds after power up, or 2: during reconnection (serial port back to command mode), or 3: by SMS (see Chapter 6)

2. AT command driven TCP/UDP connection

Q. Why I see three "OK" coming after entering **AT+IPCONNECT=1,1** command?

A. The Software Tools program is issuing internal AT command for GPRS setup, so extra "OK" responses will be seen.

Q. After the TCP/UDP connection is stopped I wan to enter **AT+OTCP** or **AT+OUDP** to reconnect but I get message "+CME ERROR: 3". Why?

A. After TCP/UDP socket connection the GPRS connection session will also be disconnected. So please enter **AT+IPCONNECT=1,1** to reconnect GPRS first.

3. Remote AT command by SMS

Q. Can I send any AT command by SMS to control other features described in this document?

A. Yes. Please refer to Chapter 15.

4. Command String Feature

Q. Are the status of Services settings and status will be saved when power is cut?

A. Besides Output Port Services, all Services status will be saved into non-volatile memory, so e.g. like Countdown timer will resume counting when power recover.
But all Output Ports will be set to logic 0 when power up.

Q. Can I check the status out Output Ports?

A. No.

Q. What should be noted with the execution priority of concatenated Command String?

A. During executing concatenated Command String, if the 1st part of the CS leading to another no. of the CS to be triggered, then the triggered CS will be executed first, e.g.

"CT 1 IN 1 CT 1 DE 1"

If the first CS (counter #1 increment by 1) will let the Counter#1 to trigger CS #2, then CS #2 will be executed BEFORE executing "CT 1 DE 1"

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CHAPTER 17: EXAMPLES OF HERITAGE SOFTWARE SETUP AND OPERATION

1. To setup a Automatic TCP connection

To setup Auto connect to TCP server with IP 61.167.60.1 port 23 (client mode)

Commands to be entered	Modem response
AT+IPGPRS=1,"INTERNET" *(APN is INTERNET)*	OK
AT+IPCTP = 23,"C","61.167.60.1",1 *(target TCP is 61.167.60.1, port 23, client mode, TxDelay is enabled)*	OK
AT+AUTOTCP=1 *(open TCP socket connection)*	OK
(TCP connection will start after 20 secs)	

To setup Auto connect to remote TCP client request with any IP address, port 23(server mode)

Commands to be entered	Modem response
AT+IPGPRS=1,"INTERNET" *(APN is INTERNET)*	OK
AT+IPCTP = 23,"C","255.255.255.255", 1 *(to accept TCP connection from any IP address, port 23, client mode, TxDelay is enabled)*	OK
AT+AUTOTCP=1 *(open TCP socket connection)*	OK
(Modem will start to monitor TCP port 23 after 20 secs)	

2. To make a AT command driven TCP connection

IP Connectivity (AT# feature) user can follow the following steps to make OCTP connection

To connect to TCP server with IP 61.167.60.1 port 23

Commands to be entered	Modem response	Corresponding AT# command
AT+IPGPRS=1,"INTERNET" *(APN is INTERNET)*	OK	AT#APNSERV
AT+IPCTP = 23,"C","61.167.60.1",1 *(target TCP is 61.167.60.1, port 23, TxDelay is enabled)*	OK	AT#TCPSERV AT#TCPPORT AT#TCPTXDELAY
AT+DLEMODE=1	OK	AT#DLEMODE
AT+CGATT=1	OK	AT+CGATT=1
AT+IPCONNECT=1,1 *(GPRS connection)*	OK OK OK	AT#CONNECTIONSTART
AT+OCTP *(open TCP socket connection)*	CONNECT 115200	AT#OCTP

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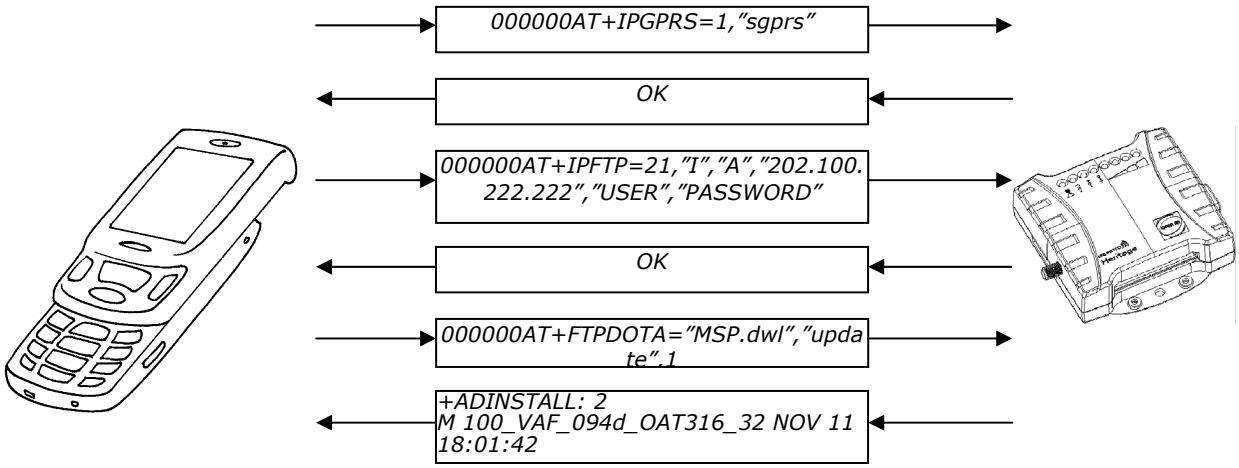
3. Perform Remote program update by sending Command over SMS

To download update file from ftp.maestro.com, directory "update", filename "MSP.dwl", login id : USER, password : PASSWORD

(Remember to enter AT+SMSAT=1 to enable AT command over SMS first, default key = "000000")

SMS Flow and response (min three SMS to be sent):



4. COMMAND STRING PROGRAMMING EXAMPLE –

Output port power-up status settings

To set Output Port #1, #3 and #6 to logic 1 (short) 1 minute after power up:

Command String to be entered	Explanation
AT+CSTRSET=0,80,"TM 1 ST 60 TM 1 TR 1 TM 1 SW 1"	*Set timer #1 60 seconds countdown on power up and set to trigger Command String #1*
AT+CSTRSET=0,1,"OP 1 SW 1 OP 3 SW 1 OP 6 SW 1"	*Command String #1 switch Output Port 1,3 and 6 to logic 1*

5. COMMAND STRING PROGRAMMING EXAMPLE –

Input Port signal counting and triggering

To set if Input Port #1 has a low-to-high signal for three times within 30 seconds, set Output Port #5 to high

Services used: IP #1, CT #1, TM #2, OP #5 ("CS" = Command String)

Command String to be entered	Explanation
AT+CSTRSET=0,6,"OP 5 SW 1 CT 1 RS 0"	*CS6 : OP #5 set to 1, Counter#1 reset 0*
AT+CSTRSET=0,5,"CT 1 RS 0 TM 2 ST 30 TM 2 SW 0"	*CS5: Counter#1 reset 0, set Timer #2 to 30 sec and stops it.*
AT+CSTRSET=0,4,"CT 1 IN 1 TM 2 SW 1"	*CS4: increment Counter #1 by 1, switch Timer#2 on*
AT+CSTR="IP 1 DR 1 IP 1 TH 1 IP 1 TR 4 CT 1 ST 3 CT 1 TR 6 TM 2 ST 30 TM 2 TR 5"	*Set Input#1 low-to-high, 100mS threshold, trigger CS4,* *Set Counter #1 trigger value to 3, trigger CS#6* *Set Timer#2 to 30 secs, trigger CS5*

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CHAPTER 17: COMMAND STRING QUICK REFERENCE

ALARM "AL"

Service Id	Operation Type	Argument and Explanation
1 to 5	ST	yy/mm/dd,hh:mm:ss(Date time, 0 to cancel)
	TR	0 to 50 (CS to trigger, 0 to cancel)

COUNTER "CT"

Service Id	Operation Type	Argument and Explanation
1 to 5	DE	1 to 255 (Decrement)
	IN	1 to 255 (Increment)
	RS	0 (Reset)
	ST	-32768 to 32768 (value to trigger
	TR	0 to 50 (CS to trigger, 0 to cancel)

COUNTDOWN TIMER "TM"

Service Id	Operation Type	Argument and Explanation
1 to 10	ST	1 to 2147483647 (Timer initial value)
	SW	O to 1 (stop or start timer)
	TR	1 to 50 (CS to trigger, 0 to cancel)

INPUT PORT "IP"

Service Id	Operation Type	Argument and Explanation
1 to 6, 101-106	DR	0 to 1,1-63 (trigger direction or I/P sum)
	MS	1 to 63 (CS to trigger, Id 101-106 only)
	TH	1 to 255 (Duration state to trigger unit in 0.1s)
	TR	1 to 50 (CS to trigger, 0 to cancel)

OUTPUT PORT "OP"

Service Id	Operation Type	Argument and Explanation
1 to 6	SW	0 to 1 (state of Output port)

SMS "SM"

Service Id	Operation Type	Argument and Explanation
1 to 10	SN	(SMS CONTENT) (variable : %CTn counter value %IP input port value %TMn countdown timer value)

DEVICE POWER CONTROL "PW"

Service Id	Operation Type	Argument and Explanation
0 to 15	1 (dummy)	1(dummy)

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