User Guide

Using Telegesis Terminal with ETRX3 IPD and Mock Meter Firmware

IPD firmware version r300

Mock Meter firmware version r301

Table of Contents

1 Introduction

Telegesis have launched the SEP1.1 compliant ZigBee AT Command layer on the EM357 Ember platform. The ZigBee SEP AT commands allow developers to build a ZigBee Smart Energy compliant In-Premise Display without the need for any in-depth knowledge of the ZigBee PRO stack. To assist user in practising with the IPD AT command set, a Mock Meter has been developed, which can be used with the IPD for further development purpose.

Although a description of the supported AT command set has been included in the provided IPD AT command manual (TG-PM-0500 ETRX3 IPDDVK IPD Manual), and the AT command set can work with a serial port communication tool (such as HyperTerminal), Telegesis Terminal provides an easy way to start practising with the IPD and Mock Meter. A pre-configured panel is provided as shown in Figure 1-1, which contains multiple buttons. It can be observed that each button has a specific name on it, for example Info, Bootloader, help and so on. The user can easily click one of the buttons to issue an AT command.

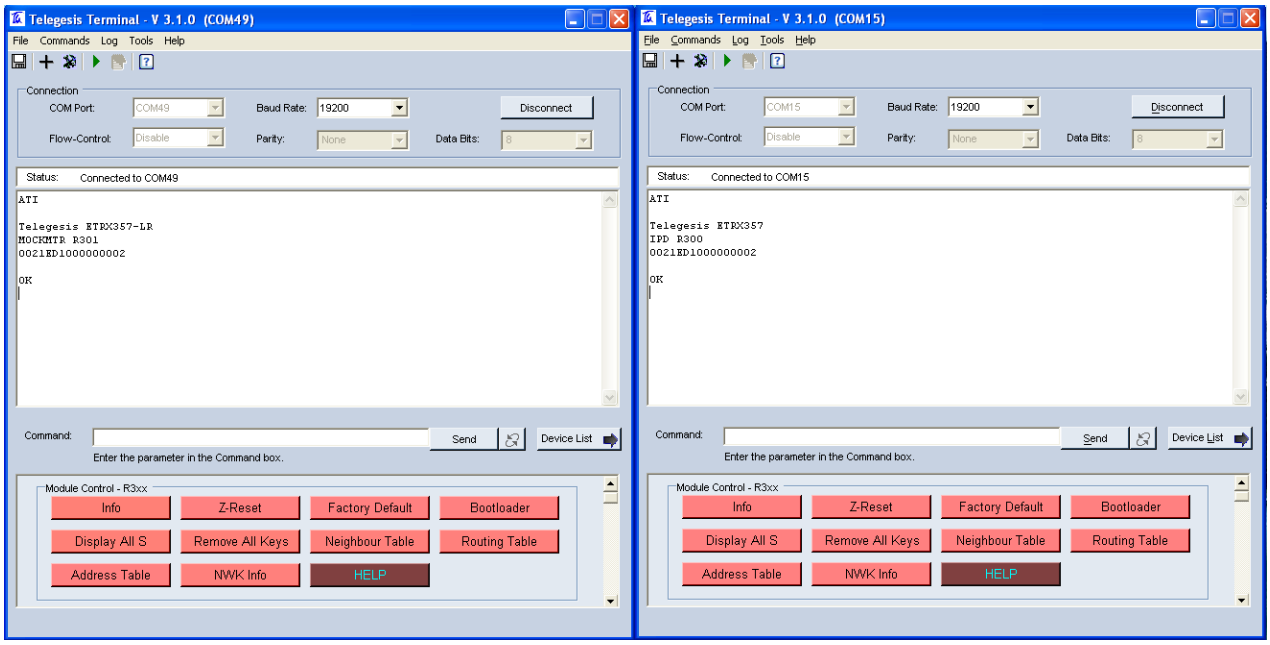


Figure 1. Telegesis Terminal for IPD and Mock Meter

This document provides a user guide to use the Telegesis Terminal. Following sections will introduce the preconfigured panels for both IPD and Mock Meter, then give several examples of using the Telegesis Terminal to implement applications, for example network form and join, publish price and so on.

2 Telegesis Terminal Panel

This section introduces the pre-configured Telegesis Terminal panels of both IPD and Mock Meter.

2.1 Mock Meter Panel

Typically, the Mock Meter should be a coordinator and trust centre in a network, it supports multiple SE server clusters, including Message, Price, Metering, Load Control and Demand Response. More information can be found in the Mock Meter manual.

The Mock Meter panel can be used to control the Mock Meter module and issue server-related commands as well as display local information or response from the IPD. Figure 2-1 shows the buttons. It can be observed that the buttons are categorized into five groups: Module control, Network Management, ZDO, Binding, and Mock Meter. The function of the buttons will be introduced in a later section.

Figure 2. Button layout of the Mock meter panel

2.2 IPD Panel

In a typical scenario, the IPD is a router device and joins a network formed by other devices (such as the Mock meter). It supports multiple SE client clusters, such as Message, Price, Metering, Load Control and Demand Response and so on. More information can be found in the IPD manual.

The IPD panel, as shown in Figure 2-2, can be used to control the IPD module and issue client commands as well as display local information or response from the Mock Meter. The panel contains buttons which are categorized into five groups: Module control, Network form and leave, ZDO, Binding, and Mock Meter. The function of the buttons will be introduced in a later section.

Figure 3. Button layout of the IPD panel

2.3 Function of the Buttons

The following table maps the buttons with their linked AT commands and a brief description is also given. More information about a specific command and its prompt has been included in the IPD or Mock Meter manual.

Button Name	Linked AT Command	Description
Module Control-R3xx (includes the buttons on both Mock Meter and IPD panels)		
Info	ATI	Display Product Identification Information
Z-Reset	ATZ	Software Reset (this will not change the previous S-register settings such as link key and so on)
Factory Default	AT&F	Restore Factory Defaults (Clear all S-Register setting)
Bootloader	AT+BLOAD	Enter The Bootloader Menu (will used to update firmware)
Display All S	AT+TOKDUMP	Display All S-Register Settings
Remove All Keys	AT+RMALLKEYS	Clear local key table
Neighbour Table	AT+NTABLE	Display Neighbour Table
Routing Table	AT+RTABLE	Display Routing Table
Address Table	AT+ATABLE	Display Address Table
NWK Info	AT+N	Display Network Information
Help	AT+HELP	Display All Available Commands
Network Management		
Energy Scan	AT+ESCAN	Scan the background energy of all channels
Scan for Pan	AT+PANSCAN	Scan for active PANs
Security Mode	ATS0A	Set security mode to establish network or join network (please refer to S-Register section in TG-PM-0500 ETRX3 IPDDVK IPD Manual r1)
Set Link Key	ATS09	Set preconfigured link key for establishing or joining a network
Set NWK Key	ATS08	Set network key for establishing a network
Form A Network	AT+EN	Establish a Personal Area Network
PJOIN	AT+PJOIN	Switch on “Permit Joining” Flag
Disas Local	AT+DASSL	Disassociate Local Node from PAN
Disas Remote	AT+DASSR	Disassociate Remote Node from PAN
Join any PAN	AT+JN	Join an open network with matched preconfigured link key
Join a Spec PAN	AT+JPAN	Join specific PAN
CBKE	AT+CBKE	Initiate CBKE with ESI or a partner device

ZDO		
ID Request	AT+IDREQ	Request node's NodeID
EUI request	AT+EUIREQ	Request node's EUI
Node Descriptor	AT+NODEDESC	Request node's descriptor
Power Des	AT+POWERDESC	Request node's power descriptor
ACT EP	AT+ACTEPDESC	Request node's active endpoint list
Simple Des	AT+SIMPLEDESC	Request endpoint's simple descriptor
Match Des	AT+MATCHREQ	Find nodes which match a specific descriptor
ANNCE	AT+ANNCE	Announce local device in the network
Binding		
Local BTable	AT+LBTABLE	Display local binding table
BSET	AT+BSET	Set local binding table entry
Remote BTable	AT+BTABLE	Display remote binding table
DEI BTable	AT+BCLR	Clear local binding table entry
Bind to Remote	AT+BIND	Create binding on remote device
Del Remote B	AT+UNBIND	Delete binding on remote device
BindMtr	AT+BINDMTR	Bind the IPD to the mock meter
UnbindMtr	AT+UNBINDMTR	Unbind the IPD to the mock meter
MockMeter Functions		
Get Time	AT+SETTIME	Set the local time on the mock meter
Set Time	AT+GETTIME	Get the local time on the mock meter
Get Attribute	AT+GETATR	Get value of a local ZCL attribute
Set Attribute	AT+SETATR	Set value of a local ZCL attribute
Print Price	AT+PRINTPRC	Get and print price from local price table
Clear PrcTabl	AT+CPRCTABLE	Clear local price table
Set Price	AT+SETPRICE	Set a price entry in local price table
Valid Price	AT+PRCVALID	Store the temporary price in the Price plug-in
Publish Price	AT+PUBLISHPRC	Publish price
Display MSG	AT+DISPLAYMSG	Send a display message command
Cancel MSG	AT+CANCELMSG	Send a cancel message command
Set MSG	AT+SETMSG	Set a local message
LC Event	AT+LCEVENT	Set and send a Load Control event
Cancel Event	AT+CEVENT	Cancel a Load Control event
IPD Functions		
Get Time	AT+SETTIME	Set the local time on the IPD
Set Time	AT+GETTIME	Get the local time on the IPD

Get Attribute	AT+GETATR	Get value of a local ZCL attribute
Set Attribute	AT+SETATR	Set value of a local ZCL attribute
Synctime	AT+SYNCTIME	Sync the IPD's clock with ESI
Discover Device	AT+DISCOVER	Discover SE device on the HAN
Find Cluster	AT+CLUSDISC	Discover all supported clusters on a remote device
Discover Attrs	AT+ATTRDISC	Discover supported attributes on a remote device
Read Attribute	AT+READATR	Gets an attribute from a remote device which supports a specified cluster
Write Attribute	AT+WRITEATR	Writes an attribute to a remote device which supports a specified cluster
Scheduled Event	AT+GSE	Get Scheduled Events from Mock Meter
OPT In/Out Event	AT+OPT	Opt In or Out Event
Current price	AT+CURPRICE	Gets the Current Pricing from the Mock Meter
Scheduled Price	AT+SCHPRICE	Gets all the Scheduled Pricing from the Mock Meter
Price Label	AT+PRICELBL	Gets the label assigned to the Price Tier 1 to 6 from the price cluster
Get last MSG	AT+LASTMSG	Gets the last message from the Mock Meter
ACKMSG	AT+ACKMSG	Used to acknowledge a message

3 Application Examples

This section gives several examples of utilizing Telegesis Terminal to test some SE applications upon the IPD and Mock Meter. These applications are simple. The user can practice them to gain further understanding of the IPD supported AT command sets and propose a marketing competitive IPD device.

3.1 Network formation

The objective of this test is to test that the Mock Meter can form a SE network and the IPD can join the formed network with proper security settings.

3.1.1 Initial Condition

Set up the Mock Meter and the IPD (e.g. plug each into a PC)

Run Telegesis Terminal; choose the serial ports for both the Mock Meter and IPD

3.1.2 Implementation Procedure

Item	Test Step	Note
1.	Click the buttons in the Mock Meter panel following the order: 1. Security Mode 2. Set NWK Key 3. Set Link Key	This is to set security of the Mock Meter before forming a network
2.	Then click the button in the Mock Meter panel: Form A Network	The MockMeter will form a network with the security settings set in step 1. In the Mock Meter panel, there will be some prompt to show a network is formed, for example: JPAN:11,1789,9EF383A7AFA5BD61 FORM:0x00 OK REGCOMPLETE:00 This means a network is formed on channel 11, the PANID is 0x1789, and network power is 3. Also the Smart Energy registration progress is completed.
Network formation progress completed.		
3.	In the terminal for the Mock Meter, click PJOIN	Open the network for 102 seconds to permit join
4.	Click the buttons in the IPD panel following the order: 1. Security Mode 2. Set Link Key	Set the security mode and link key for the IPD. If the key does not match with the Mock Meter's Link key the IPD cannot join the Mock Meter's network.
5.	Click the buttons in the IPD panel: Join any PAN	Scan and join a network. The IPD will show a prompt to indicate it has join a network or an error code indicating the reason for failure to join. For example: with a successful join the prompt includes: JPAN:11,1789,9EF383A7AFA5BD61 KESTARTED KECOMPLETE REGSTARTED REGCOMPLETE:00 Note: When the terminal of IPD shows REGCOMPLETE:00, it means that joining and

		registration progress has been successfully completed. If an error code occurs, please check the manual section 4. Please make sure the security setting is correct. If the IPD leaves the network and wants to join again, please use the button  in Mock meter panel before permit join. This will clear the previously registered key of the IPD.
The IPD joins the Mock meter's network and completes SE registration progress. Then the user can practise communication between the IPD and Mock Meter.		

3.2 Read Server Attributes

The objective of this test is to test that the IPD can send proper Read Attributes Request to the Mock Meter and the Mock Meter will then send a Read Attribute Response to the IPD. In addition, the IPD should properly display the response.

3.2.1 Initial Condition

Set up the Mock Meter and the IPD

Run Telegesis Terminal; choose the serial ports for both the Mock Meter and IPD

Mock Meter has formed a network

IPD has joined the Mock Meter's network and completed registration

3.2.2 Implementation Procedure

Item	Test Step	Note
1.	Click the button in the terminal for the IPD  (In the IPD Function part)	The command line will show AT+READATR:0000,01,<Enter Parameter here> Please input cluster ID and Attribute ID (use "," between them) For example: 0000,0000 Then click "Send" button The IPD will send a *Read Attribute Request* command to the Mock Meter to request the Basic Cluster's attribute (Attribute ID: 0000)
2.	When the Mock Meter sends a response, the IPD panel will display it.	The IPD panel display a response for example: RESPATTR:0000,0000,00,01 The four parameters are: Cluster ID, Attribute ID, Status, Attribute Value Note: if the status is not 00, it will be an error code. In such a case, the Attribute value will not be displayed.
3.	Click the button in the terminal for the IPD  (In the IPD Function part)	The command line will show AT+READATR:0000,01,<Enter Parameter here> Please change 01 to 0A and input cluster ID and Attribute ID (use "," between them) For example: AT+READATR:0000,0A,0702,0000 Then click "Send" button The IPD will send a *Read Attribute Request* command to the Mock Meter to request the Metering Cluster's attribute (Attribute ID: 0000) Please note: the end point must be changed to 0A to read meter cluster attributes, as Meter server cluster is supported on Endpoint 0A of the Mock Meter.

4.	When the Mock Meter sends a response, the IPD panel will display it.	The IPD panel displays a response, for example: RESPATTR:0702,0000,00,000000000000 The four parameters are: Cluster ID, Attribute ID, Status, Attribute Value Note: if the status is not 00, it will be an error code. In such a case, the Attribute value will not be displayed.
5.	Use the button in the Mock Meter terminal  (In the Mock Meter part)	The command line shows: AT+SETATR: <ClusterID>,<AttributeID>,<AttrValue> Please input the three parameters, for example: 0702,0000, 000000000001 This will change the metering cluster attribute (0x0000 CurrentSummationDelivered)
6.	Click the button in the terminal for the IPD  (In the IPD Function part)	The command line will show AT+READATR:0000,01,<Enter Parameter here> Please change 01 to 0A and input cluster ID and Attribute ID : 0702,0000 Then click “Send” button The IPD will send a *Read Attribute Request* command to the Mock Meter to request the Metering Cluster’s attribute (Attribute ID:0000 CurrentSummationDelivered)

7.	When the Mock Meter sends a response, the IPD panel will display it.	The IPD panel display a response for example: RESPATTR:0702,0000,00,000000000001 The four parameters are: Cluster ID, Attribute ID, Status, Attribute Value The last parameter is CurrentSummationDelivered. The user can manually change the value of CurrentSummationDelivered on the Mock Meter This scenario could be used in practise to get meter reading. Please note: in a real scenario, multiple meter attributes are required to calculate the meter reading, for example: 0x0300 UnitofMeasure 0x0301 Multiplier 0x0302 Divisor 0x0303 SummationFormatting 0x0304 DemandFormatting 0x0305 HistoricalConsumptionFormatting

3.3 Publish price command

This test is to test that the Mock Meter publishes the price and the IPD can display the received price information properly.

3.3.1 Initial Condition

Set up the Mock Meter and the IPD

Run Telegesis Terminal; choose the serial ports for both the Mock Meter and IPD

Mock Meter has formed a network

IPD has joined the MockMeter's network and completed registration

3.3.2 Implementation Procedure

Item	Test Step	Note
1.	Click the buttons in the terminal for the Mock Meter following the order: 1. Set Price 2. Valid Price (In the Mock Meter part)	The "Set Price" buttons is used for the Mock Meter to set local price information. After set price, the user must set an entry for it using "Valid Price" button. Note: Print Price can be used to check the set price. Currently the entry 1 is used to store the user configured price. Entry 0 is used to store default price information.
2.	Click the buttons in the terminal for the Mock Meter Publish Price (In the Mock Meter part)	In the command line, it should show: AT+PUBLISHPRC:1<Enter Parameter here> Please just delete <Enter Parameter here>, then click "Send" button. The Mock Meter will send the price information in local price table entry 1 Alternatively, the user can change the 1 to 0, and then click "Send" button. Price information of entry 0 will be sent.
3.	The terminal of the IPD will display the received price information, for example: PRICE:00000001,NORMAL,00000003,00,0840,10,40,00000000,003C,00000012,FF,FFFFFFFF,FF,FFFFFFFF,FF,FF,1	

Note: please be advised that according to SE 1.1 specification, the event id (the third parameter in above command) should be increased, if the user wants to publish new price entry. If the Mock Meter terminal displays a response: DFTREP:0700,00,8A,it means duplicated price information has been received.

The user can use the manual and construct a new price entry on the Mock meter then send it to the IPD

In addition, the user can specify the target node and endpoint in this command. In above example, node ID and End point are not used. In that case, the MockMeter will use a binding table to send message. This assumes that a binding entry has been added automatically during registration progress (if the user has seen "REGCOMPLETE:00" prompt in the terminal for IPD).

3.4 Get current price

Apart from receiving published price from the Mock Meter, the IPD can request the current available price. This test is to verify that the IPD can request Price information stored in the Mock Meter.

3.4.1 Initial Condition

Set up the Mock Meter and the IPD

Run Telegesis Terminal; choose the serial ports for both the Mock Meter and IPD

Mock Meter has formed a network

IPD has joined the Mock Meter's network and completed registration

3.4.2 Implement Procedure

Item	Test Step	Note
1.	Click the buttons in the terminal for the Mock Meter following the order: 1.  2.  (In the Mock Meter part)	The "Set Price" buttons is used for the Mock Meter to set local price information. After set price, the user must set an entry for it using "Valid Price" button. Note:  can be used to check the set price. Currently the entry 1 is used to store the user configured price. Entry 0 is used to store default price information.
2.	In the terminal for the IPD use:  (In the IPD Function part)	The user can use IPD to request price information from the Mock meter
3.	The terminal of the IPD will display the received price information, for example: PRICE:00000001,BASE,00000004,00,0840,10,40,00000000,003C,00000015,FF,FFFFFFFF,FF,FFFFFFFF,FF,FF,1	

3.5 Display and Cancel message command

3.5.1 Initial Condition

Set up the Mock Meter and the IPD

Run Telegesis Terminal; choose the serial ports for both the Mock Meter and IPD

Mock Meter has formed a network

IPD has joined the MockMeter's network and completed registration

3.5.2 Test Procedure

Item	Test Step	Note
1.	In the terminal for the Mock Meter use the button:  (In the Mock Meter part)	This button will trigger a display message command to be sent from the Mock Meter to the IPD for display
2.	The terminal of the IPD will display the received price information, for example: MESSAGE: 00000001,00,00000000,0001,Hi Telegesis	The displayed message includes: <MessageID>,<MessageControl>,<StartTime>,<DurationinMinutes>,<Message>
If the user does not take any action, after about a minute the IPD terminal will show:		

MSGCANCEL:00000001,00 because the message validation time is set to 1 minute in step 1. If MSGCANCEL:00000001,00 has not disappeared after step 1, the user can test Cancel Message command by following the next two steps:		
3.	In the terminal for the Mock Meter use the button:  (In the Mock Meter part)	This command is to use for the Mock Meter to send a message to the IPD for cancel message
4.	The terminal of the IPD will display: MSGCANCEL:00000001,00	Note: when the period for display message expired, the prompt will also be shown, even if the user does not send a AT+CANCELMSG for cancellation

Note: the user can specify the target node and endpoint in this command. In above example, node ID and End point are not used. In that case, the MockMeter will use a binding table to send message, assuming that a binding entry has been added automatically during registration progress (if the user has seen "REGCOMPLETE:00" prompt in the terminal for IPD).

3.6 Get last message

Apart from receiving a message sent by the Mock Meter, the IPD can request the last available message for local display. This test is to test that the IPD can request a message stored in the Mock Meter.

3.6.1 Initial Condition

Set up the Mock Meter and the IPD

Run Telegesis Terminal; choose the serial ports for both the Mock Meter and IPD

Mock Meter has formed a network

IPD has joined the MockMeter's network and completed registration

3.6.2 Test Procedure

Item	Test Step	Note
1.	In the terminal for the Mock Meter use the button:  (In the Mock Meter part)	This button is to use for the Mock Meter set a local message. But it will not send the message to the IPD until the IPD requests it.
2.	In the terminal for the IPD use the button:  (In the IPD Function part)	
3.	In the IPD terminal, it shows: MESSAGE:00000001,00,0002A34E,0001,HELLO WORLD!	
If the user does not take any action, after about a minute, the IPD terminal will show:		

MSGCANCEL:00000001,00

because the message validation time is set to 1 minute in step 1.

3.7 Issue Load Control Event

This test is to test that the Mock Meter sends a Load Control Event to the IPD and that the IPD takes proper actions after receiving the Event.

3.7.1 Initial Condition

Set up the Mock Meter and the IPD

Open Telegesis Terminal; choose the serial ports for both the Mock Meter and IPD

Mock Meter has formed a network

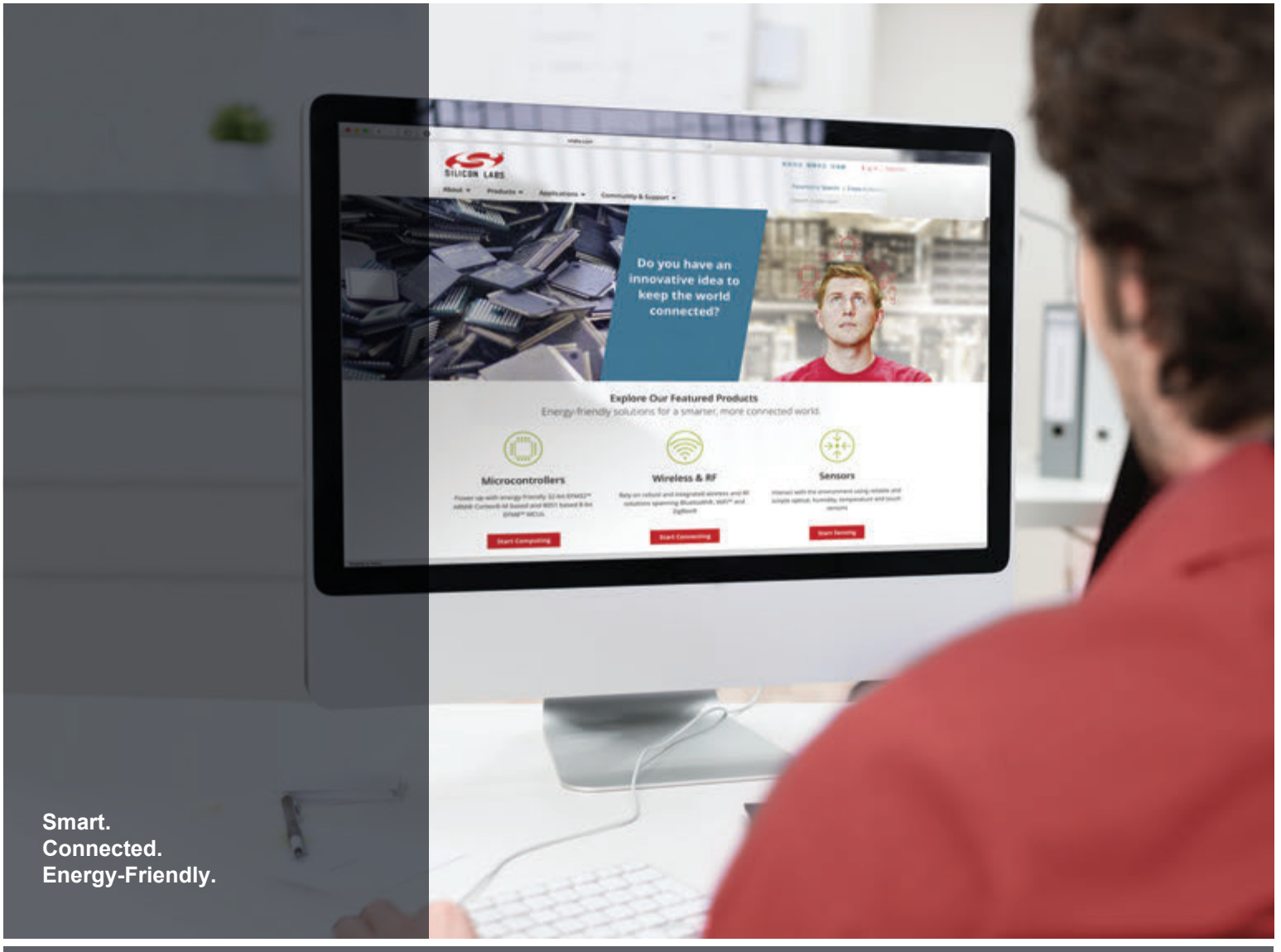
IPD has joined the Mock Meter's network and completed registration

3.7.2 Test Procedure

Item	Test Step	Note
1.	In the terminal for the Mock Meter use the button:  (In the Mock Meter part)	This button is to use for the Mock Meter to send a Load Control Event to the IPD
2.	In the terminal for the IPD, it will shows: DRLCRECEIVED:00000001,0002A7F3,001C,0FFF,00,01,00,00,1A09,1A09,0A,00,00 DRLCSTART:00000001,0002A7F3,001C,0FFF,00,01,00,00,1A09,1A09,0A,00,00	This means the IPD has received a load control event, and the event has been started.
3.	In the terminal for the Mock Meter use the button: 	
4.	In the terminal for the IPD, it will shows: DRLCCANCELED:00000001,00000000,001C,0FFF,00,01,00,00,1A09,1A09,0A,00,00	This means the IPD has been instructed to cancel the load control event, and the event has been cancelled.

Please note:

This document only gives some typical examples of the SE applications, which can be built using the IPD and Mock Meter. In fact, the IPD AT command set has more functions that can be utilized with a properly-selected series of AT commands. For more information about the AT commands, please check the provided manual.



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