YAMAR
Operation Manual

DC-BUS Test Program Manual

1. General

The DC-BUS Test Program tests and configures Yamar's new generation of devices. The program tests the communication performance of SIG10x, DCB1M, DCAN500, and DMX250 devices over the powerline. The PC operates as a host through the EVB Tester's USB port. The Program exclusively operates with Yamar's EVB Tester board. Otherwise, the Test Program is in Demo mode.

This manual describes the PC Test program operation. The Test environment is described in Figure 1.

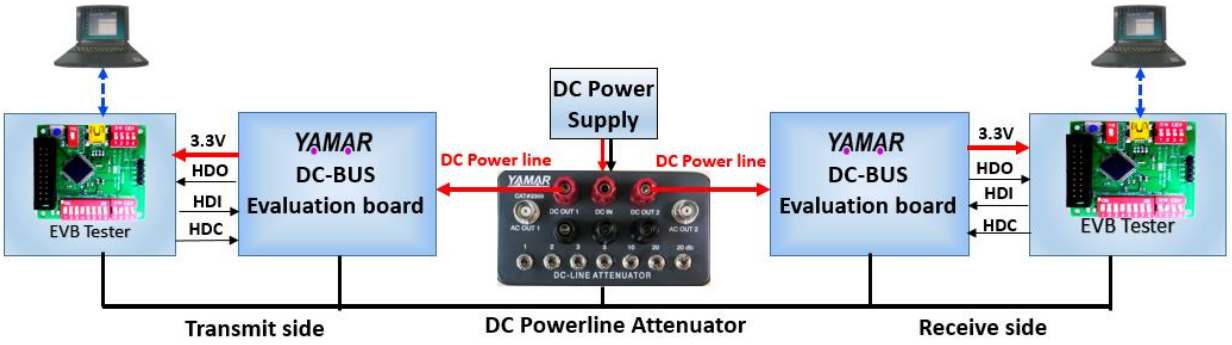


Figure 1 - DC-BUS Test environment

Test Program Main features:

- Automatic EVB type detection.
- BER Mode - Transmit and receive test pattern and perform BER measurements over a fixed carrier frequency.
- BER Sweep Mode - Transmit and receive Test pattern and perform BER measurements over a total of 251-carrier frequencies selection.
- DATA Mode - Transmit and receive data in Hex or ASCII formats.
- File Mode - Transmit and receive a File.
- Logging of BER statistics and data.
- Internal register configurations (read and write operations).

17 Shimon Hatarsi Tel Aviv, Israel. Tel (972) 3 5445294 Fax (972) 3 5445279 www.yamar.com

17 Shimon Hatarsi Tel Aviv, Israel. Tel (972) 3 5445294 Fax (972) 3 5445279 www.yamar.com

2. PC Test Program

2.1 Installation

The Test Program is a single executable file operating under Microsoft .NET Framework 4. The .NET Framework 4 can be downloaded directly from Microsoft at:
https://dotnet.microsoft.com/download/dotnet-framework/net40

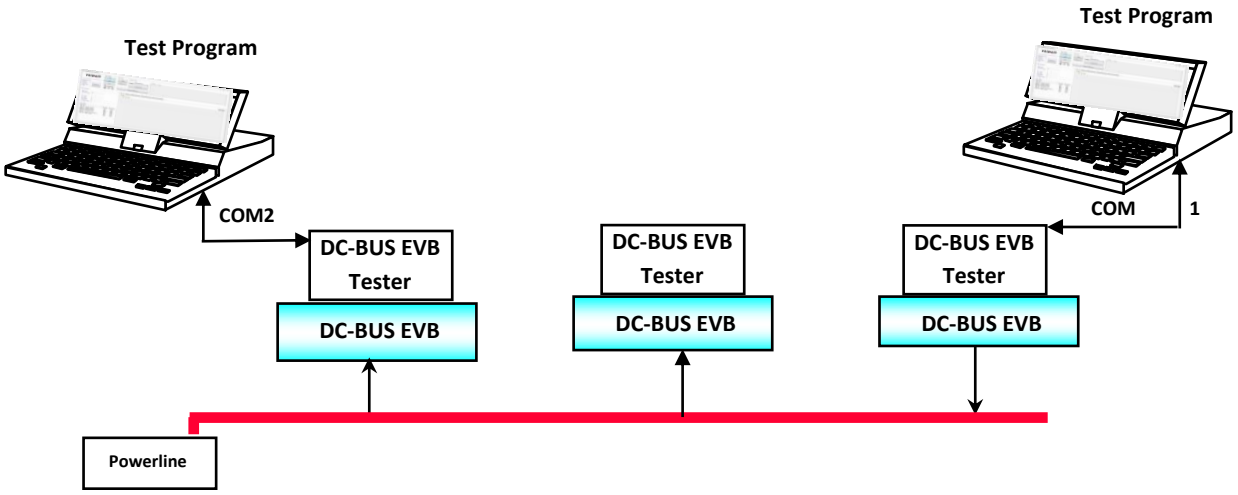


Figure 2 - Test system setup example

The test environment consists of one EVB operating as a transmitter and one or more EVBs operating as receivers on the DC-BUS network.

The interface between the DC-BUS EVB to its PC is performed using the EVB Tester board.

2.1.1 Quick set-up process (BER mode example)

- ✓ Connect the EVB Tester board to the DC-BUS EVB.
- ✓ Connect the DC-BUS EVB to powerline [1].
- ✓ Connect the USB cable to the EVB Tester board. Make sure that the USB drivers are installed (See 0Annex 1).
- ✓ Connect the USB cable to the PC.
- ✓ Run the provided “DC-BUS-Tester.exe” program in the PCs used for the testing (at both TX and RX sides). The PC Test Program automatically detects the attached EVB device type, reads the EVB Tester switches status, and updates the program GUI accordingly.
- ✓ At the program, GUI selects the appropriate COM Port. Press the "Open Port" button [2].
- ✓ At the RX side select the "BER" Mode button.
- ✓ At the TX side select the "BER" Mode and the "Continuous Tx" buttons as shown in Figure 3.

[1] The USB connector provides the voltage for the USB interface only. The attached DC-BUS EVB must be connected to the powerline for the

EVB-Tester board to be supplied with 3.3V properly.

[2] When the EVB-Tester board is connected to the DC-BUS PC SW (Comm. Port is opened), all switches state is forward once to the PC SW GUI, which takes control of the DC-BUS EVB configuration. The EVB Tester board switches state will not be read while the PC SW GUI is active.

Figure 3 - Quick TX BER Mode

The program will start to send "ABCDEFGHIJKLMNOPQRSTUVWXYZ" with CRLF data messages to the TX device. At the RX side, the PC Test Program will receive the data and perform BER analysis.

** Please note that application bitrate is subject to windows threading timing, etc. To test a full utilization of powerline bitrate it is recommended using the following set-up:

TX test messages transmission from the EVB tester to a PC with a test program via the powerline.

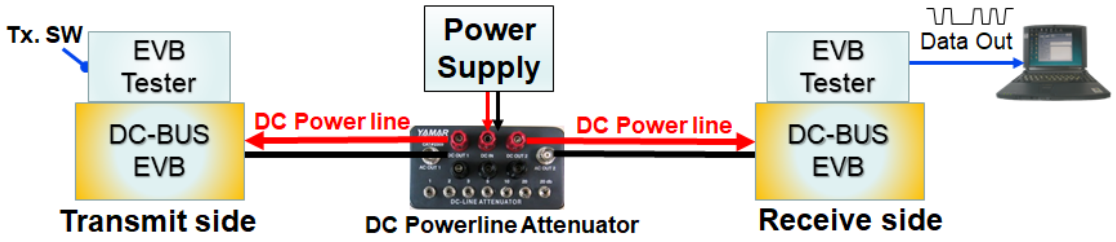


Figure 4 – EVB Tester (Tx mode) to PC (RX mode) testing

1. TX side is in stand-alone mode (Not connected to a PC).
2. RX side is connected to the DC-BUS PC SW.
3. On the TX side, turn ON TX. switch. A2Z test pattern is continuously sent over the powerline to the RX side.
4. On the RX side, set BER mode, and observe the received A2Z test pattern including BER statistics analysis. The powerline bitrate is shown in the real-time graph.
   For the DCB1M, the user can change on-the-fly the codec selection pins using Mode SW[1:2] (see Table 3 in EVB-Tester Manual) on the TX side and observe the corresponding powerline bitrate changing in RX

side real-time graph.

2.2 Configuration

2.2.1 Set the COM port

The PC Test Program automatically detects the available COM port in the computer and displays it in the COM Port list.

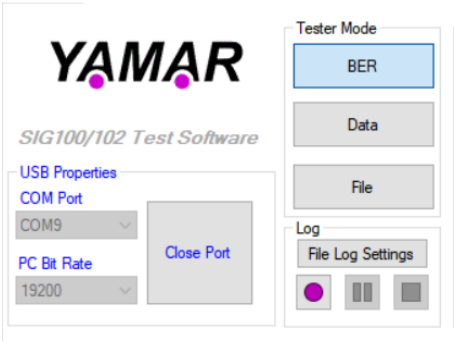


Figure 5- SIG10X COM port setting

- **COM Port** - Select the COM port that the EVB Tester is connected to.
- **PC Bit Rate** - Choose the Host UART bit rate for the device's operation. The Program will configure the device automatically to work at the selected bit rate however; it is the user's responsibility to make sure that the PC bit rate settings are valid.

  For the SIG10x device:

  - The maximum bit rate is 115.2 Kbit/s

  For the DCB1M device:

  - The maximum allowed bit rate is 921.6 Kbit/s when using the PC PROGRAM in TX mode.
  - When using the PC PROGRAM in RX BER mode, set the bit rate to at least 1.843 Mbit/s.

  For the DMX250 device / or DCB1M in DMX interface mode:

  - PC bitrate is fixed 250 Kbit/s.

  For the DCAN500 device:

  - Select DCAN500 CAN bit rate as shown in Figure 6.

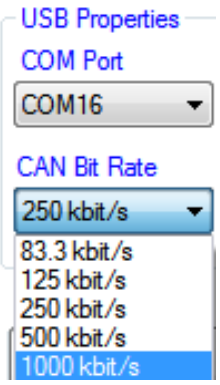


Figure 6- DCAN500 COM port and bit rate setting

- **Open/Close Port button** - Open or close the selected COM port. If there is no device connected to the selected COM port, the Program will switch to DEMO mode and will remain in DEMO mode until the COM port is closed.

After clicking on the 'Open Port' button, the EVB's device internal registers values are displayed in the *REGs Status* window, as shown in Figure 7.

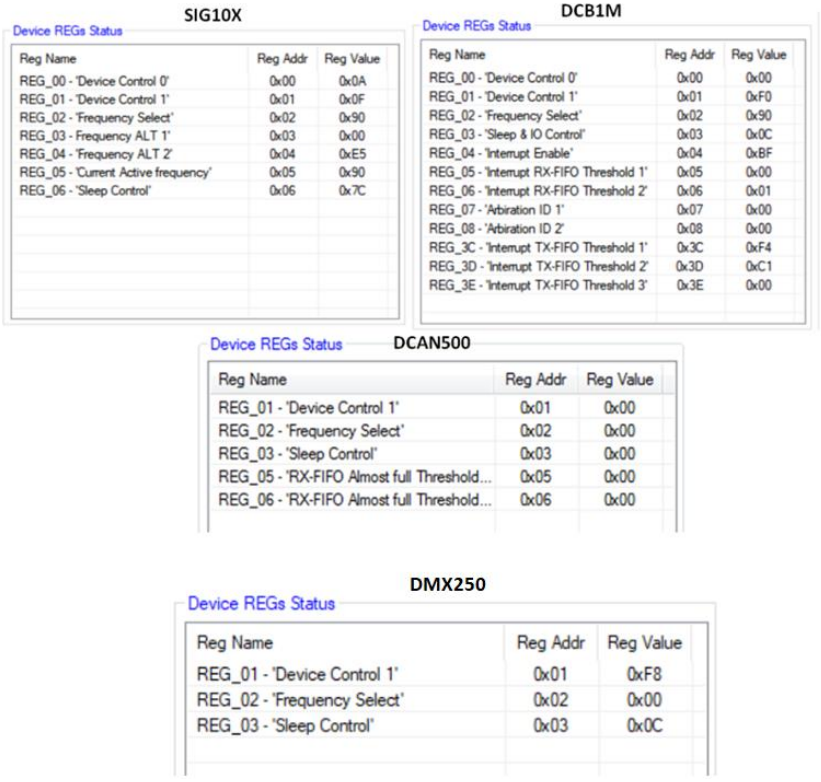


Figure 7 - SIG10X, DCB1M, DCAN500, and DMX250 REGs status window

17 Shimon Hatarsi Tel Aviv, Israel. Tel (972) 3 5445294 Fax (972) 3 5445279 www.yamar.com

2.2.2 Device Registers Settings

By clicking on the device-setting button, the user can configure the EVB's device internal registers. The configuration is kept until the next reset or power-up events. Refer to the devices' datasheet for detailed registers information.

Figure 8, Figure 9, and Figure 10 show the SIG10X, DCB1M, DCAN500, and DMX250 device settings window.

By clicking the READ button, the settings are updated with the current internal register value.

By clicking the APPLY / OK button, the device is configured according to the settings configuration (the OK button will also close the setting window).

By clicking the CANCEL button, no action is taken place and the settings window is closed.

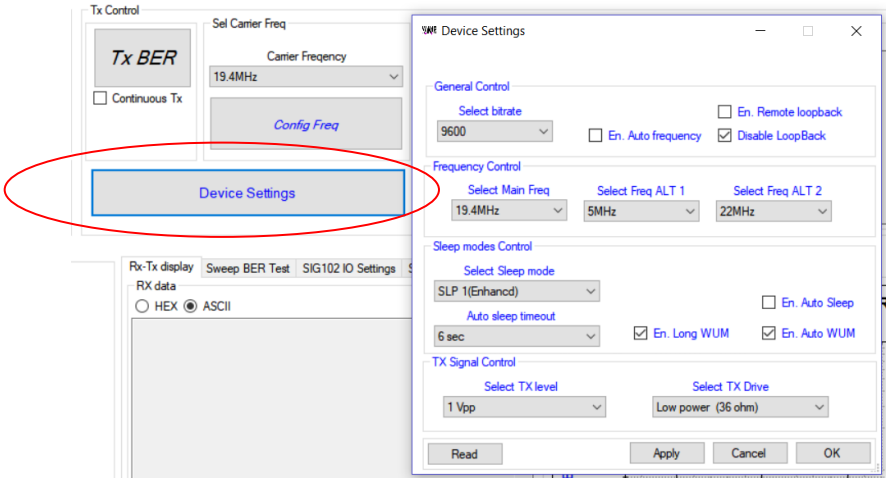


Figure 8–SIG10X Setting window

17 Shimon Hatarsi Tel Aviv, Israel. Tel (972) 3 5445294 Fax (972) 3 5445279 www.yamar.com

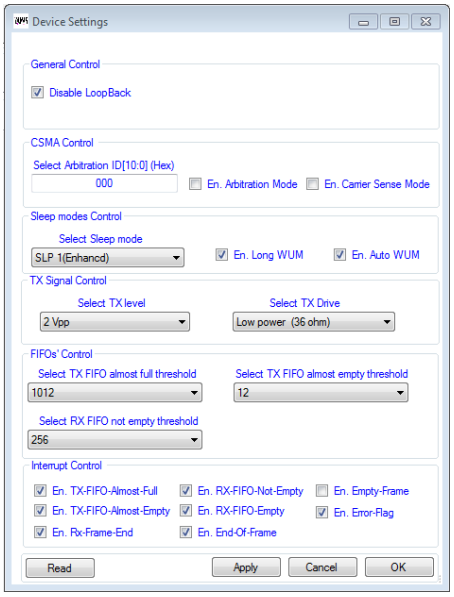


Figure 9–DCB1M Setting window

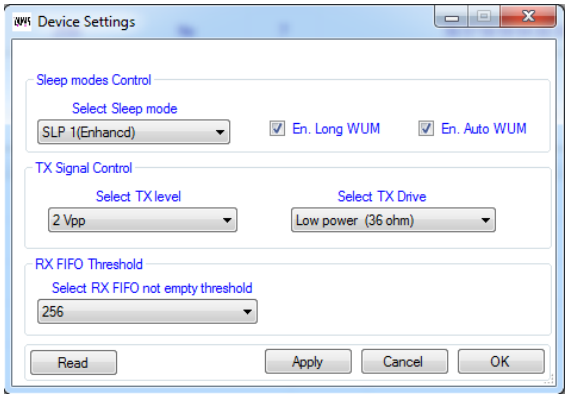


Figure 10–DCAN500 Setting window

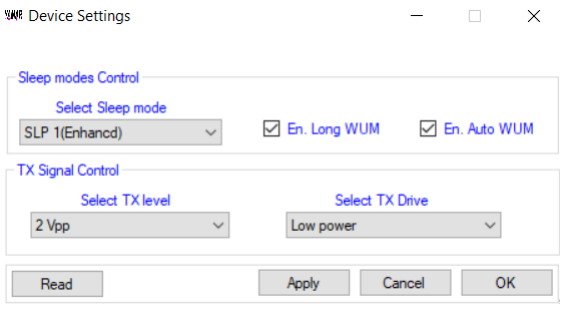


Figure 11–DMX250 Setting window

2.2.3 Carrier Frequency Selection

Users can set the EVB device carrier frequency.

Click on the 'Config Freq' button for configuration.

The DC-BUS EVB will then operate according to the selected carrier frequency [MHz].

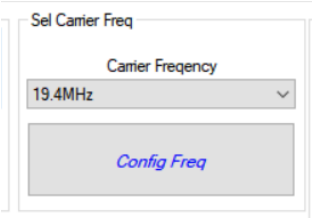


Figure 12 – Carrier frequency configuration

2.3 Testing

The Test program performs tests as described hereby.

2.3.1 BER Testing

To operate the BER Test, at the TX side select the **"BER"** mode button, and "Continuous Tx" button and press the "**Tx BER**" button. The Program will send "***ABCDEFGHIJKLMNOPQRSTUVWXYZ***" test data messages to the TX EVB.

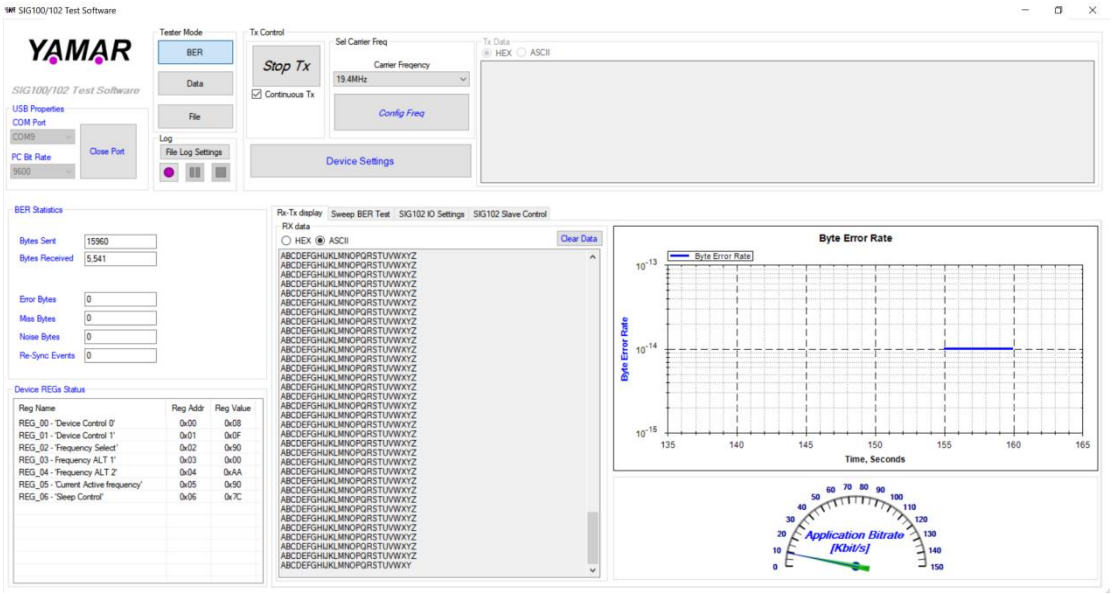


Figure 13- SIG10XBER Mode at TX Side

17 Shimon Hatarsi Tel Aviv, Israel. Tel (972) 3 5445294 Fax (972) 3 5445279 www.yamar.com

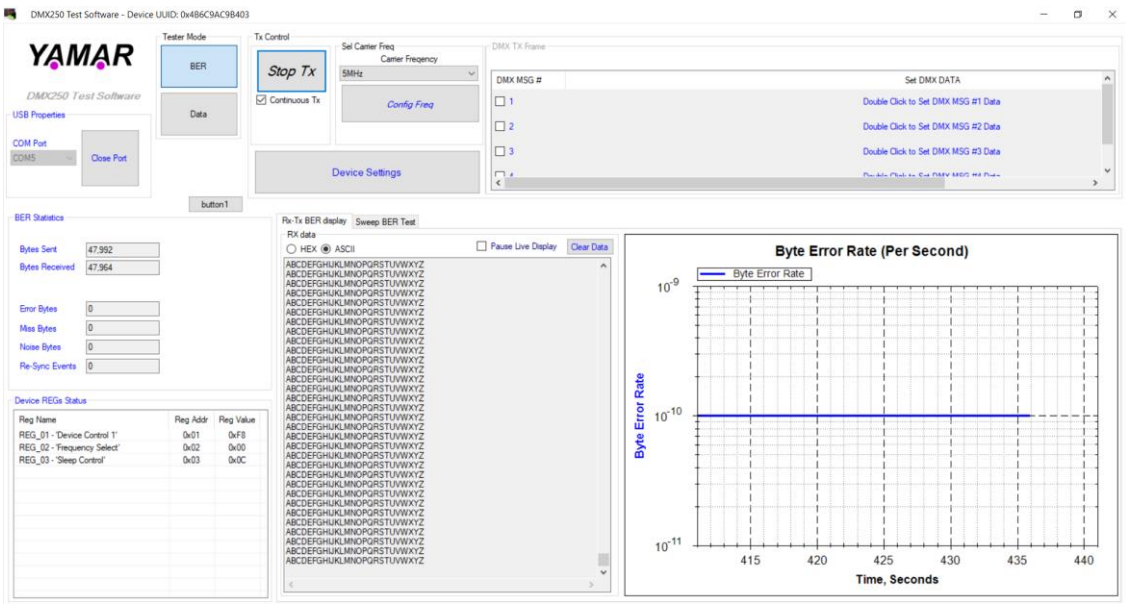


Figure 14- DMX250 Mode at TX Side

For the **DCB1M**, the user can set the powerline bit rate using the TX Bit rate control box as shown in **Figure 15**.

TX Bit rate Control Panel- Select the transmitting max powerline bit rate over the DC-BUS according to

Table 1.

Table 1 – TX powerline bit rate selection

Full Rate	1.4Mbit/s
3/4 Rate	1Mbit/s
1/2 Rate	0.5Mbit/s
1/3 Rate	0.225Mbit/s

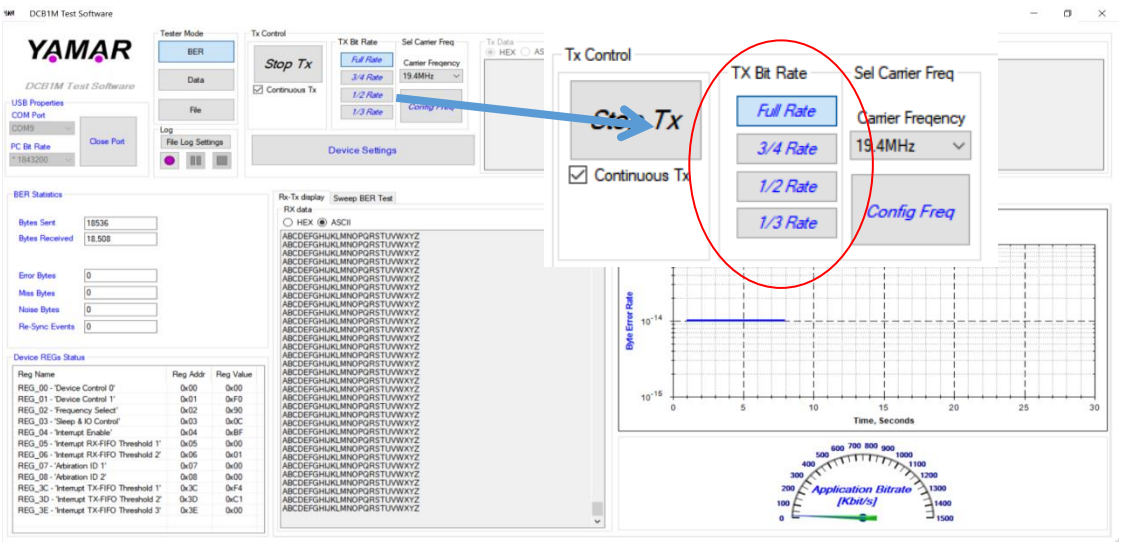


Figure 15- DCB1M BER Mode at TX Side

For the DCAN500, four pre-defined CAN message are constructed and sent over the powerline as shows in Figure 16.

IMPORTANT - The PC SW for DCAN500, allows peer to peer CAN communication only. That is When the CAN TX message is active; the CAN RX mode is disabled, with no displaying of any CAN message received from the powerline.

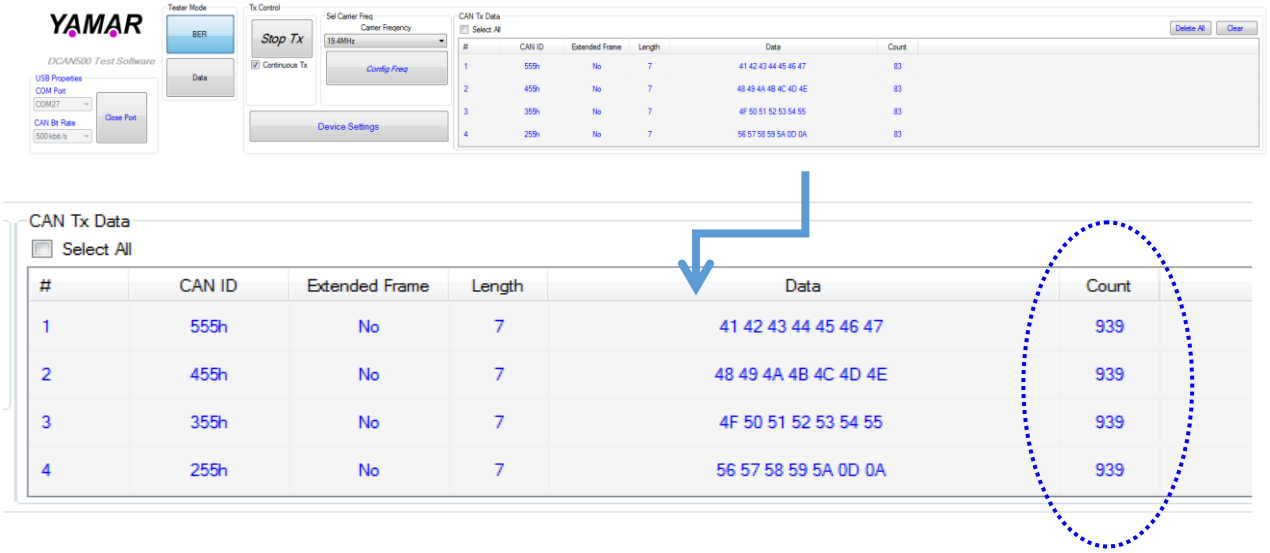


Figure 16- DCAN500 BER Mode at TX Side

For the DMX250 "**Tx BER**" button. The Program will send "***ABCDEFGHIJKLMNOPQRSTUVWXYZ***" test data messages to the TX EVB.

On the RX side select the **"BER"** mode button. The Program will start to analyze the received data messages and display the results in the BER Statistics window.

The TX pattern can be transmitted over the powerline either by the PC PROGRAM or by enabling the stand-along mode on the DC-BUS EVB tester board.

2.3.1.1 BER Test Results

- **Bytes Sent** - Amount of bytes sent to the DC-BUS EVB.
- **Bytes Received** - Amount of bytes received from the DC-BUS EVB.
- **Error Bytes** - Number of error bytes received. Example: ***'ABC$EFG...'*** has one error byte
- **Miss Bytes** - Number of missed bytes. Example: ***'ABCEFG...'*** has one miss byte
- **Noise Bytes** - Number of noise bytes received. Example: ***'ABC%DEFG...***' has one noise byte
- **Re-Sync Events** - Number of Re-Sync events. Three consecutive errors are causing a Re-Sync event. Example: ***'ABCXXX...LMNOP...'*** is a Re-Sync event.

By clicking the TX-RX display tab, an RX data window, along with Byte Error Rate and application bit rate real-time graphs are displayed, as shown in Figure 17, Figu

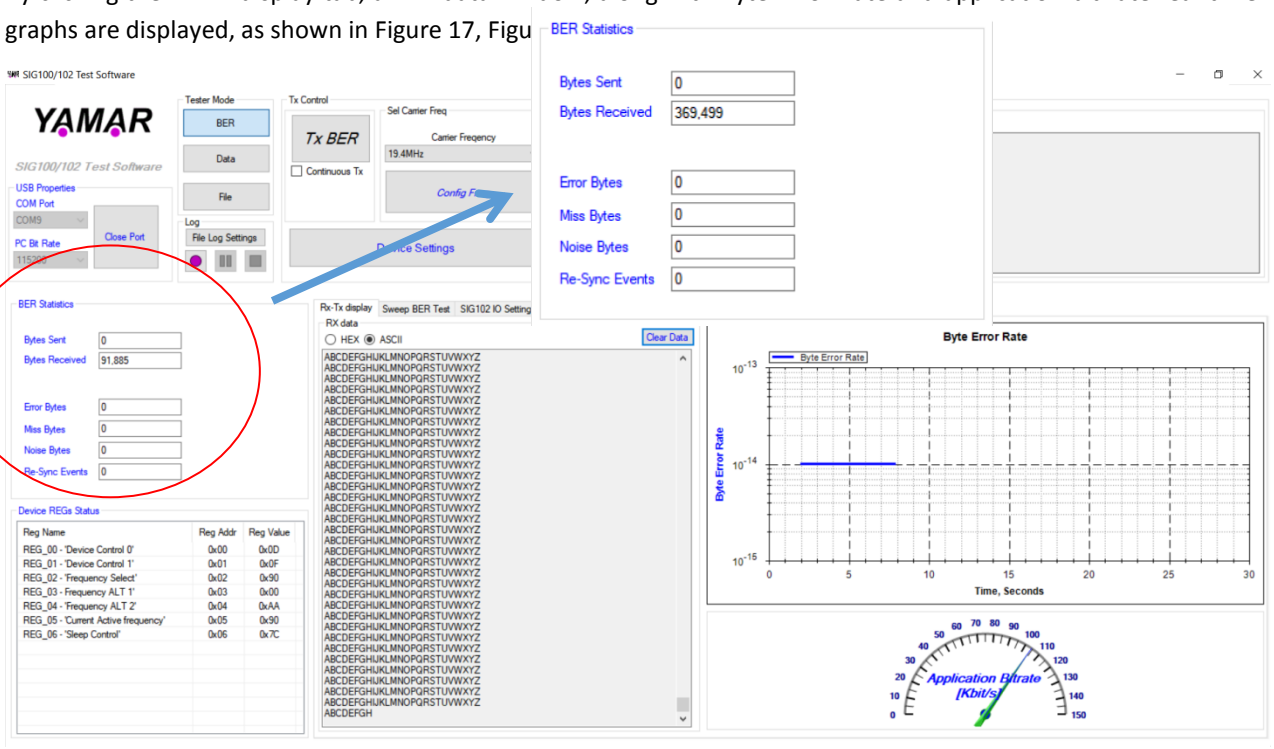


Figure 17- SIG10XBER Mode at RX Side

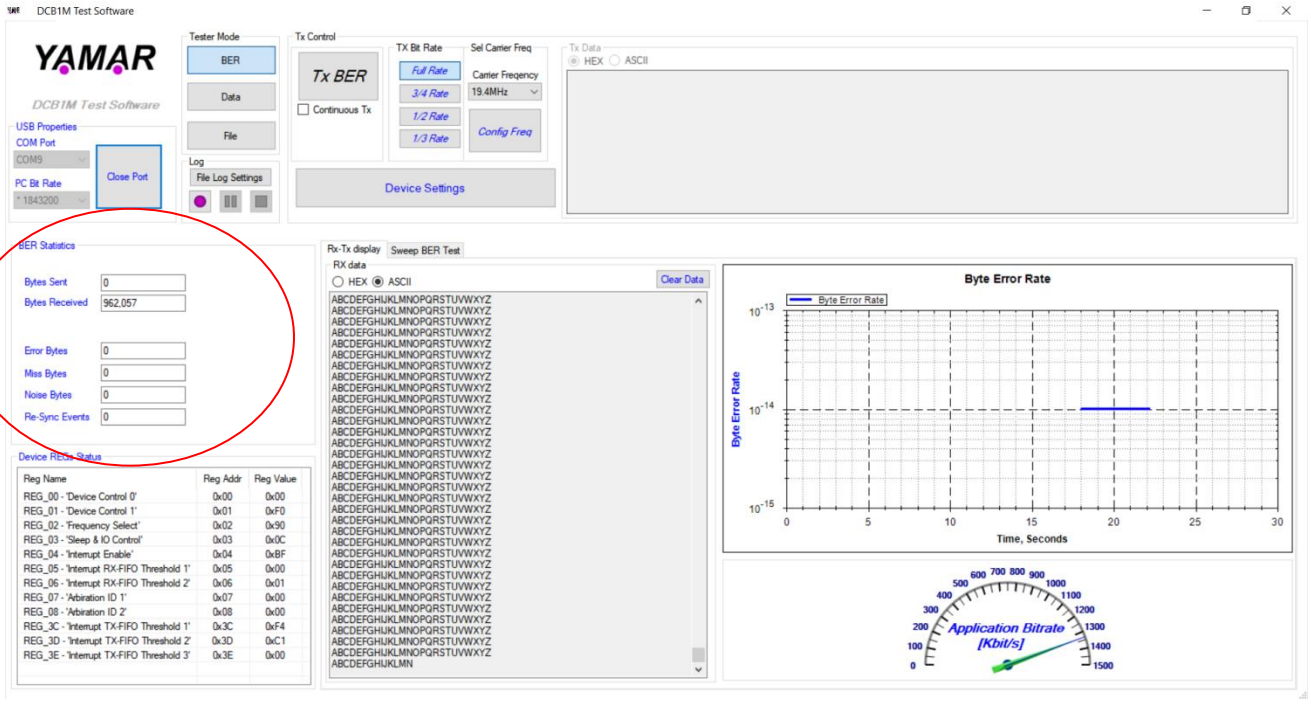


Figure 18- DCB1M BER Mode at RX Side

**** Note – For the DCB1M, in case the A2Z TX pattern is sent from the DC-BUS EVB Tester (stand-alone mode using the Tx. Switch), the user must set the PC bit rate to be at least 1.843Mbit/s.**

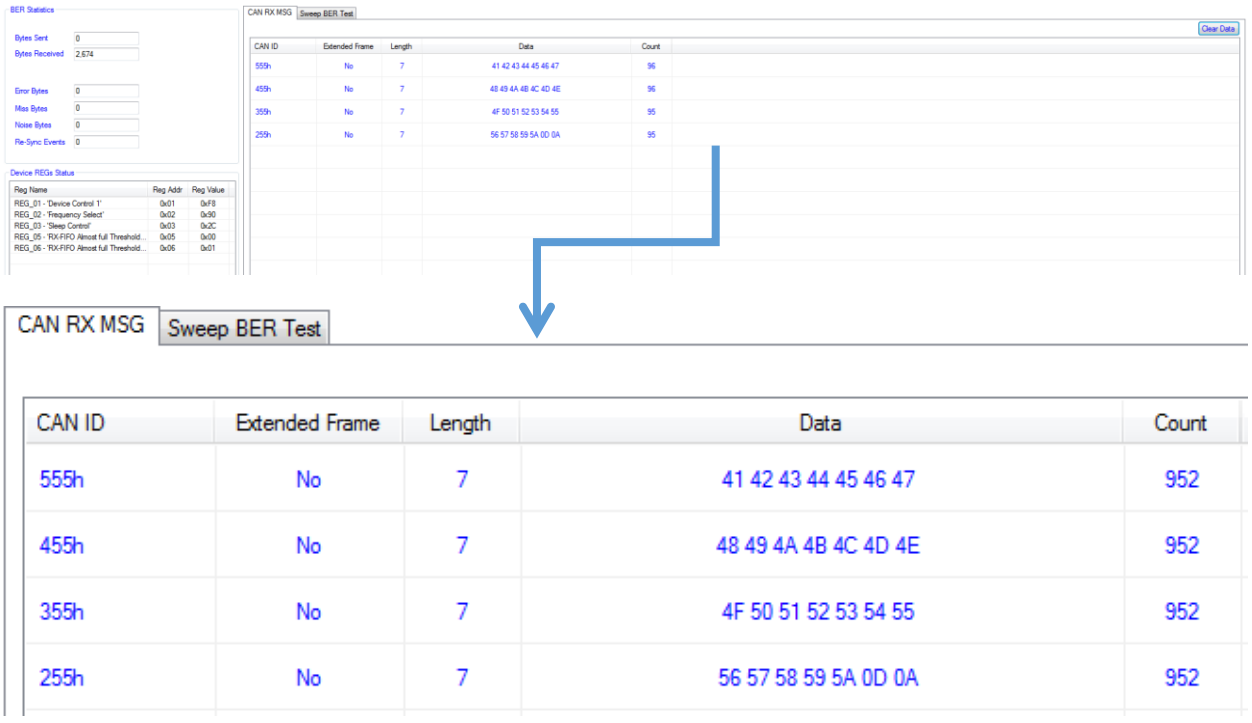


Figure 19 - DCAN500 BER Mode at RX Side

17 Shimon Hatarsi Tel Aviv, Israel. Tel (972) 3 5445294 Fax (972) 3 5445279 www.yamar.com

2.3.2 Sweep BER Testing

This mode allows a full Sweep BER measurement that is performed over the powerline. This automatic test requires one DC-BUS EVB as a TX device connected to the PC PROGRAM, and one DC-BUS EVB as an RX device that is not connected to the PC PROGRAM. The RX EVB Tester responds to test messages from the TX EVB Tester with data errors information for each carrier frequency between 5MHz to 30MHz, 100kHz spacing.

2.3.2.1 Sweep BER test settings step by step

1. Before the start of the Sweep-BER test, the user must set the BASE TEST FREQUENCY. The BASE TEST FREQUENCY is defined as a carrier frequency which was tested to be flawless communication channel over the powerline.
2. For instance, assuming 19.4MHz is the BASE TEST FREQUENCY; the user must set this frequency using the frequency switch with the value of 0x90 (SW1 and SW4 ON, the reset are OFF).
3. Click the reset button on the TX and RX EVB Tester boards as shown in Figure 20.

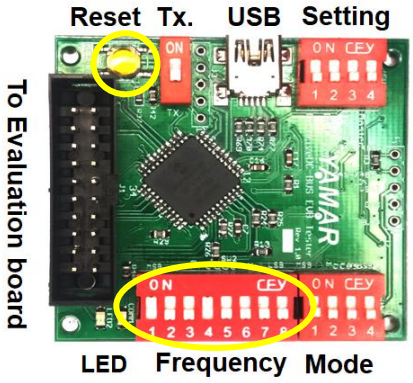


Figure 20 – EVB Tester board 19.4MHz carrier frequency setting example

4. At this point, both TX and RX EVB Tester are set to the BASE TEST FREQUENCY.

5. At the RX side, set the Frequency switch to **0xFE** (all switches are ON, aside from SW 8).
6. Click the **Reset** button again. The RX EVB Tester automatically enters the Sweep BER Mode.
7. At the TX side (which is connected to the PC PROGRAM), click on the Sweeper BER Test Tab. The TX device automatically enters the Sweep BER Mode.

8. The Sweep BER Test tab includes a real-time updated BER measurement table per carrier frequency, and a test frequency range settings as shown in Figure 21. Set the Sweeper Start Freq. and End Freq., and then click on the Start Sweep Test button.

9. The Sweep BER Test starts with transmitting the ABCD…Z pattern @ Start Freq. retrieves from the RX device the number of received bytes, error bytes, and miss bytes, then it will move to Start Freq. + 0.1MHz spacing, retrieve the BER results, and so on… until reaching the End Freq. The Test will continue a cyclic transmission from Start Freq. to End Freq. until the user stops the Test by clicking the Stop Sweep Test button as shown in Figure 21.
10. Click on the 'Clear Data' button to clear the Table content.
11. Set the test description under the 'Test Name' text box.
12. Click on the 'Save Sweep Log' button to save the current test into the .csv file.
13. Check the 'Append Tests' check box to append current tests to open log CSV. file.

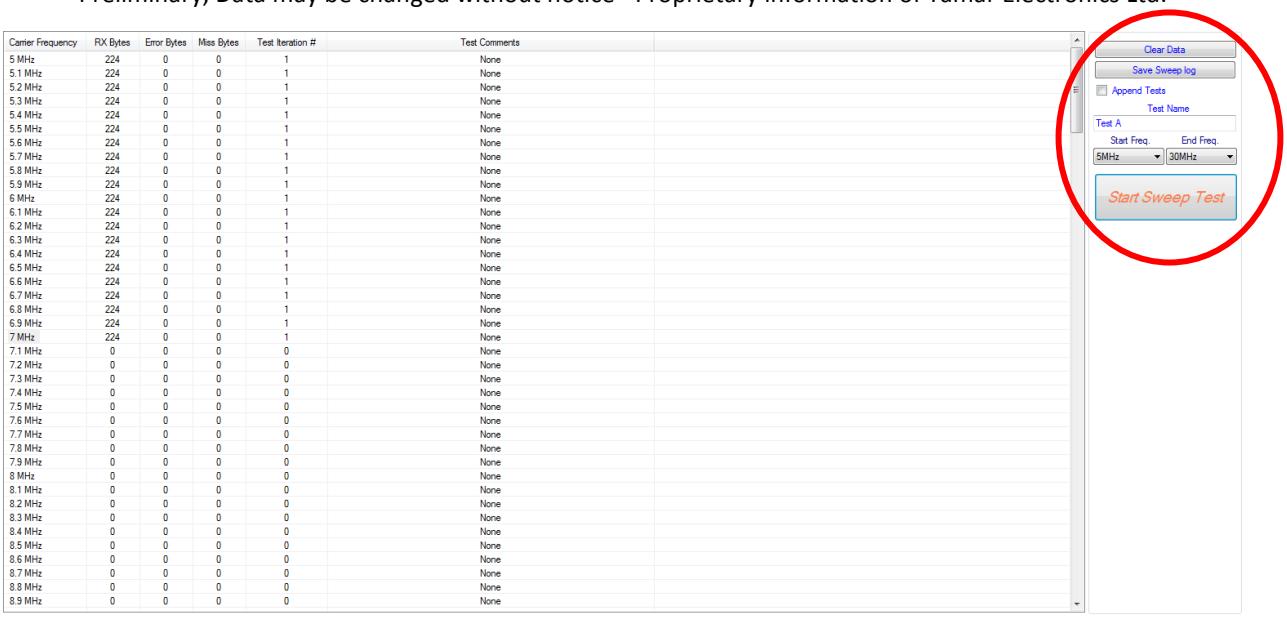


Figure 21–Sweeper BER Test TAB in the process

2.3.3 Data transfer testing

Data mode allows the user to transmit any data (Hex or ASCII format) in the Tx Databox for DCB1M and SIG10X or Custom CAN A/B message in DCAN500.
The Data mode is enabled by clicking the 'Data' button.

- **Tx/Stop Tx button** - Start or stop the data transfer to the EVB.
- **Continuous Tx** - When checked, the Program will send the data continuously until the "**Stop Tx**" button is pressed or the **"**Continuous Tx**"** button is unchecked.

<u>For DCB1M and SIG10X</u>:

To transmit custom data, at the transmitting (Tx) side, enter in the "**Tx Data**" section a data message to be transmitted.
Press the "**Tx Data"** button. The message will be transmitted once. For continuous transmission of the same message click on "**Continuous Tx**".
At the receiving (Rx) EVB side the program will receive the data messages from its EVB and display them in the Rx-Tx Data window. The data can be viewed either in ASCII or Hex format. No BER analysis will be done.

17 Shimon Hatarsi Tel Aviv, Israel. Tel (972) 3 5445294 Fax (972) 3 5445279 www.yamar.com

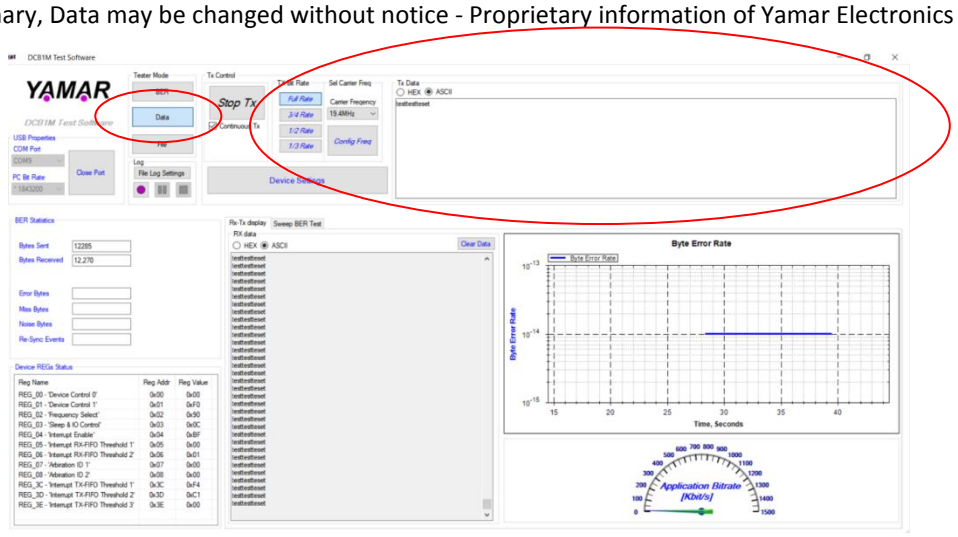


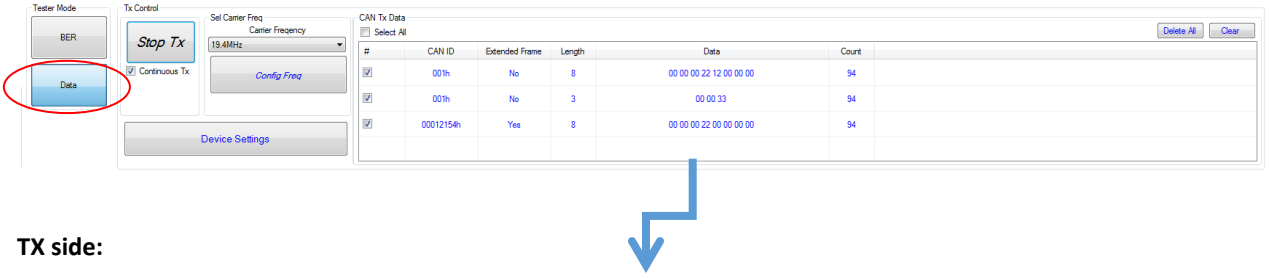
Figure 22 – DCB1M /SIG10X TX and Rx in Data mode

For DCAN500:

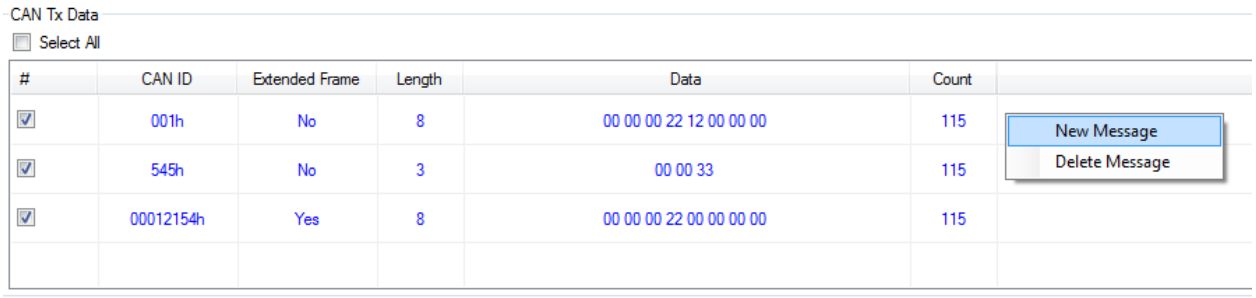
Users can customize CAN A/B messages using the DATA mode.

IMPORTANT - The PC SW for DCAN500, allows peer-to-peer CAN communication only. That is When the CAN TX message is active; the CAN RX mode is disabled, with no displaying of any CAN message received from the powerline.

- Press the Data button to enter the Data mode.
- To set a new message, right mouse clicks on the CAN Tx window and then click on 'New Message'.
- To delete a message, click on the message and then right mouse click and 'Delete Message'.
- To edit a message, simply left-click mouse on the appropriate field allows on-the-fly edit.
- Press the "**Tx Data"** button. The message will be transmitted once. For continuous transmission of the same message click on "**Continuous Tx**".
- At the receiving (Rx) EVB side the program will receive the data messages from its EVB and display them in the CAN RX MSG window. No BER analysis will be done.



TX side:



RX side:

CAN RX MSG | Sweep BER Test

CAN ID	Extended Frame	Length	Data	Count
001h	No	8	00 00 00 22 12 00 00 00	115
545h	No	3	00 00 33	115
00012154h	Yes	8	00 00 00 22 00 00 00 00	115

Figure 23 – DCAN500 TX and Rx in Data mode

<u>For DMX250 / or DCB1M in DMX interface mode</u>:

Users can customize up to four DMX fixed 513 slots messages.

- Press the Data button to enter the Data mode.
- To edit a DMX message, double click on the specific message line in the Table, and the DMX MSGs windows will pop-up (see Figure **24**).
- In the DMX TX frame window, select using the ComboBox the DMX MSG #1 to #4 for editing. Mouse click on each slot# cell will pop-up a Bar for on-the-fly slot value update.
- Press the **"Clear Buffer"** button to set the current DMX MSG to all zeros.
- Press the **"Tx Data"** button. All checked messages will be transmitted sequentially once. For continuous transmission of the message/s click on "**Continuous Tx**".
- At the receiving (Rx) EVB side the program will receive the data messages from its EVB and display them in the DMX RX Frames window. No BER analysis will be done.

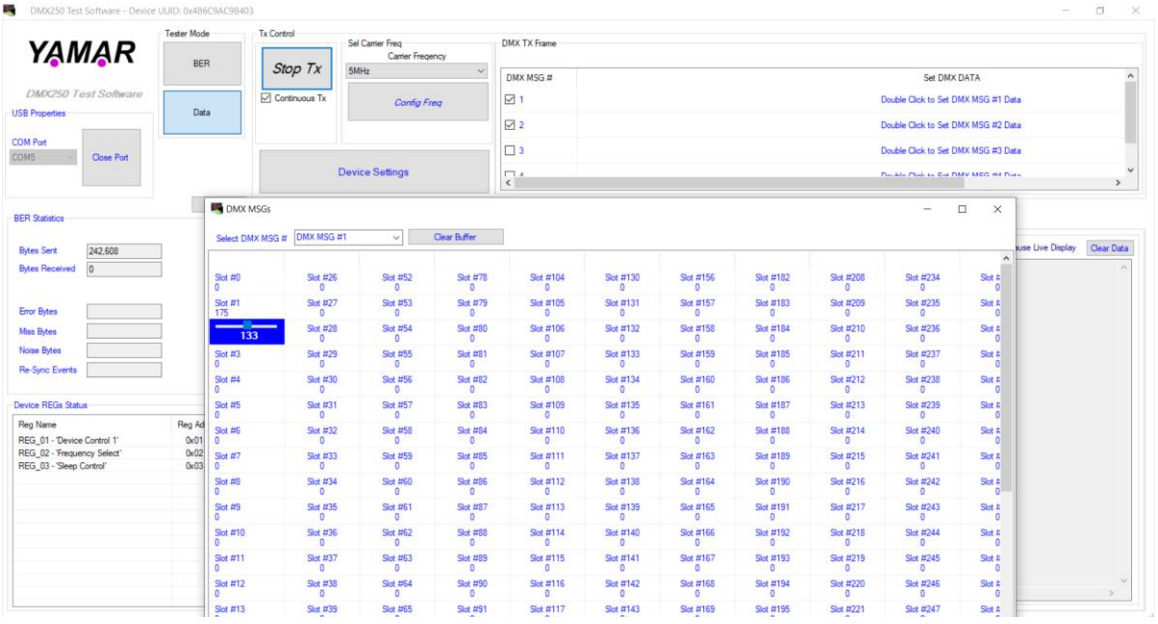


Figure 24 – DMX250 TX in action in Data mode

2.3.4 File transfer testing (DCB1M and SIG10X Only)

The file transfer feature allows users to upload a file and send it over the powerline to a remote device. There is no restriction on the file size.

- Select the 'File' button both at the RX and TX PC Program sides.

- At the TX Device Side, Click on the 'Send File' button. File Select windows will popup.

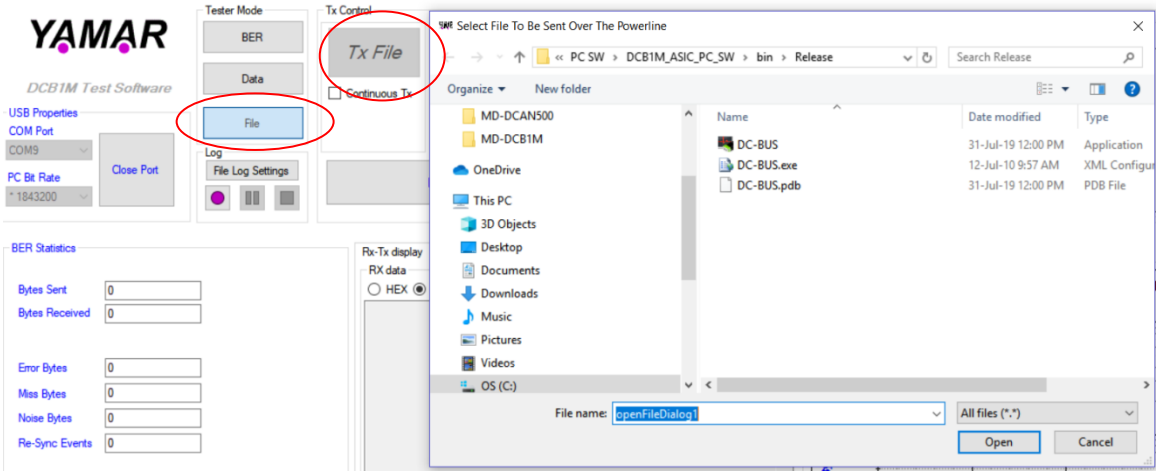


Figure 25- Select File to Send

- After selecting a file, a 'File Transfer Request' is sent over the powerline to the RX device. TX device will wait up to ~15 sec for 'File Request ACK' massage from RX device.

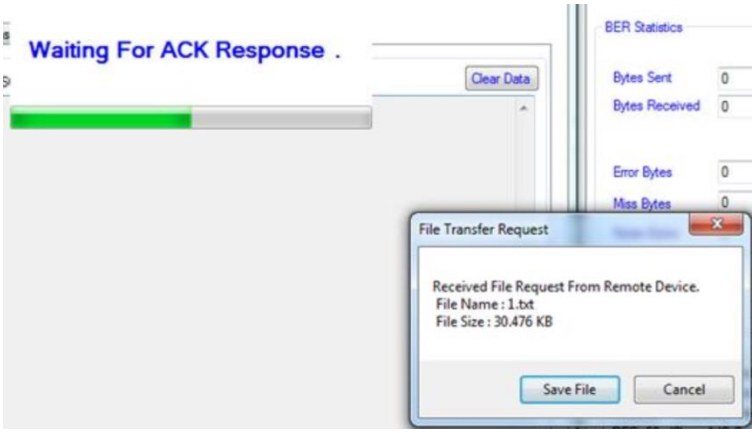


Figure 26- TX Device Waits for ACK Response and File transfer request

- On the RX side, to acknowledge the 'File Transfer Request', click on the 'Save File' button. A save file window will popup. After setting the 'Save File' location, the file transmission starts.

Figure 27- File Transmission In Action.

File Transmission can be canceled by the user at the TX Side by clicking the 'Cancel' button.

➢ After the File is fully received or time out event occurs[1] at the RX side, a notify message is displayed with info of the total bytes received and receiving elapsed time in seconds.

[1] Time-out event defined as not receiving bytes for more than ~1 sec.

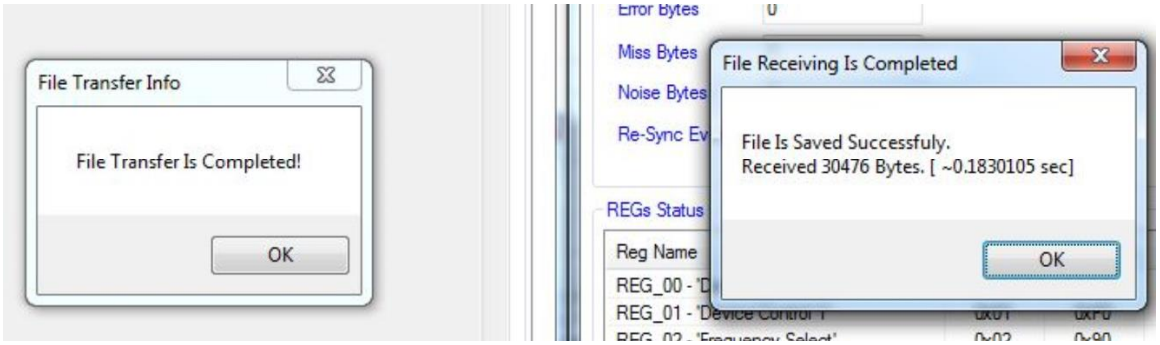


Figure 28- File Transmission Is Completed

2.3.5 Data Logging (DCB1M and SIG10X Only)

The log feature allows the user to save the received data bytes and the BER statistics.

The received data bytes are continuously saved into a .txt file.

The BER statistics are sampled periodically according to the user interval time setting. For each BER sample, the difference between the current sample's and the previous sample's statistics is saved into a .CSV file. (BER statistics is valid only when the Program is in BER mode at the RX side and the Transmitter sending the ABCD…Z pattern).

Clicking on the 'File Log Setting' button will open the log setting window.

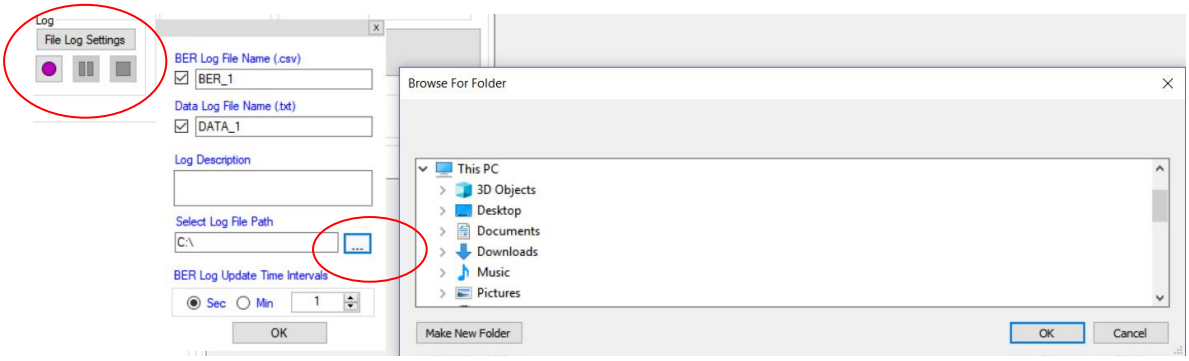


Figure 29-Log Setting

- **BER Log File Name -** Enter the name of the BER log file**.**

- **Data Log File Name -** Enter the name of the Datalog file**.**
- **Log Description-** Enter a Log description. The description is saved to the first line of each log file.
- **Select Log File Path -** Select the save log file path for both log files.
- **BER Log Update Time Interval -** Select the interval time in Sec / Minutes for the BER log file to sample current BER statistics.

To start data logging, click on the 'Start Record' button.

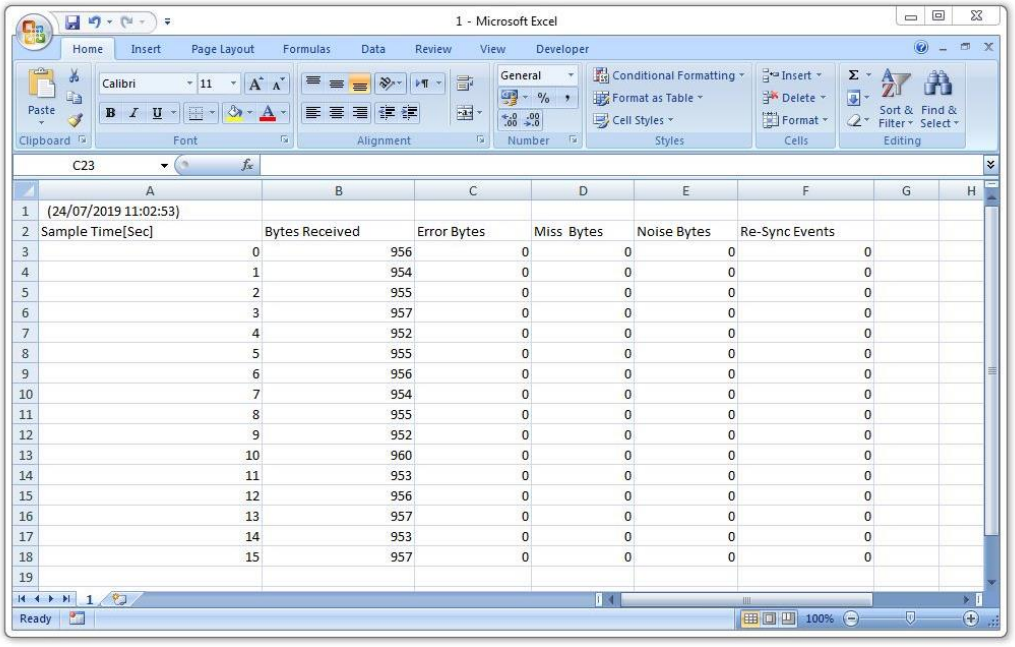
The log files are automatically created and saving data according to the log setting.

In case of log files are already created, the user will be notified and can select to override or append file(s).

To pause file data logging click on the 'Pause Record' Button. Logging data is paused. By clicking the 'Start Record' Button, the data logging is resumed appending the logs files automatically.

To stop file data logging, click on the 'Stop Record' Button. Data Logging is stopped and files are saved.

Figure 30-Log Setting Control buttons



1 - Microsoft Excel

	A	B	C	D	E	F
1	(24/07/2019 11:02:53)					
2	Sample Time[Sec]	Bytes Received	Error Bytes	Miss Bytes	Noise Bytes	Re-Sync Events
3	0	956	0	0	0	0
4	1	954	0	0	0	0
5	2	955	0	0	0	0
6	3	957	0	0	0	0
7	4	952	0	0	0	0
8	5	955	0	0	0	0
9	6	956	0	0	0	0
10	7	954	0	0	0	0
11	8	955	0	0	0	0
12	9	952	0	0	0	0
13	10	960	0	0	0	0
14	11	953	0	0	0	0
15	12	956	0	0	0	0
16	13	957	0	0	0	0
17	14	953	0	0	0	0
18	15	957	0	0	0	0
19						

Figure 31-BER Log File Example

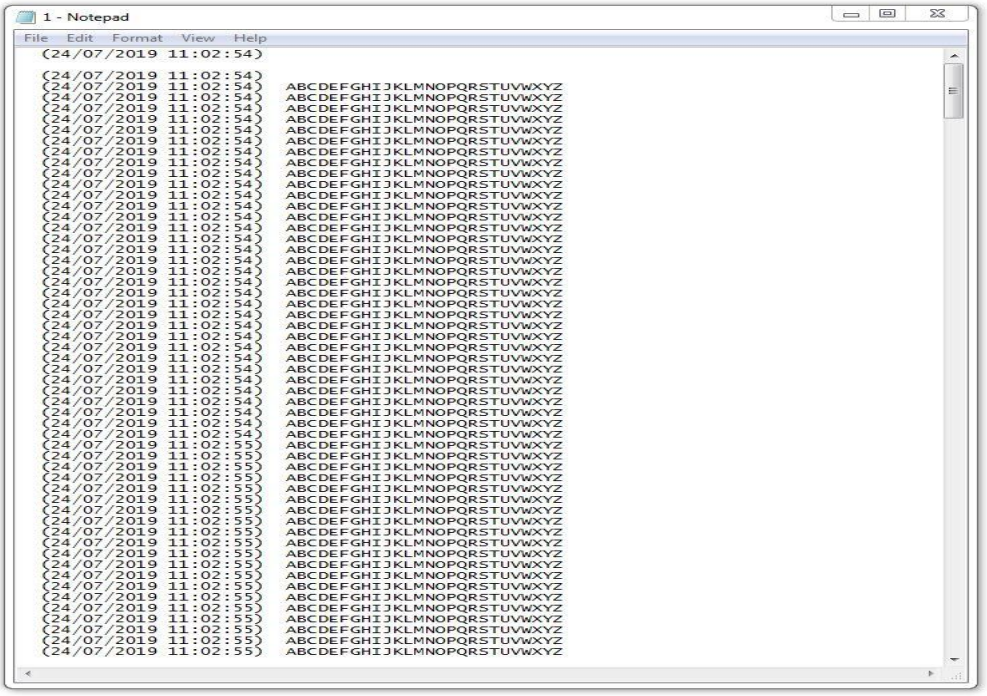


Figure 32 - Data Log File Example

3. Advanced menu options

By clicking the mouse **right** button a floating advanced menu is displayed.

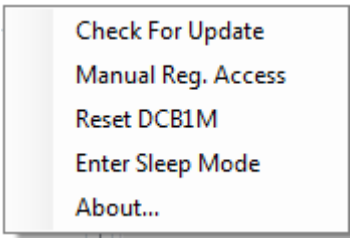


Figure 33- Advanced menu options

3.1 Check for update

Click the 'Check For Update' button, to search for a new PC PROGRAM revision available.
A corresponding message is then displayed. After updating the new revision, the PC PROGRAM re-starts automatically.

3.2 Manual registers access (DCB1M/SIG10x/DCAN500 only)

Click 'Manual Reg. Access' button to manually control the device HDC pin (Command Mode). Users can then, manually perform WRITE-REG and READ-REG operation on DC-BUS internal registers (see datasheet for more info),

using the TX Databox.

Please note that writing improper values can lead to bad or even no communication. This mode is for advanced users only (It is recommended using the Settings window instead, see 2.2.2).

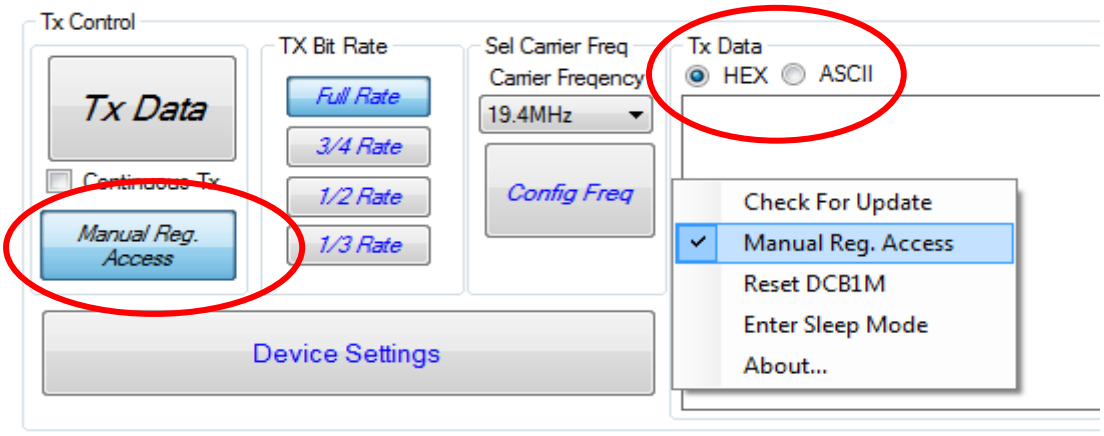


Figure 34– Manual register access (HDC pin manual control)

3.3 Reset the device

Click the 'Reset DCB1M/SIG10x/ DCAN500' button to hard reset the DC-BUS chip. After reset, the PC PROGRAM re-starts automatically.

3.4 Sleep Mode

Click 'Enter Sleep Mode' to activate the DC-BUS device Sleep mode (direct control on NSLEEP pin).
Click again to deactivate Sleep mode.

4. SIG102 Control

The SIG102 has eight IO ports. Each port can be set as an analog input, digital input, PWM output, or digital output. The device can be configured locally and the device can remotely configure other SIG102 devices. This chapter describes the control of these IO ports (locally and remotely).

4.1 SIG102 IOs and Slave Control

When the EVB Tester is connected to a SIG102 device, an additional two tabs are displayed;

4.1.1 SIG102 IO setting Tab

The SIG102 IO setting tab allows the user to configure SIG102 IO settings (locally and remote SIG102 slave devices).

Click on the SIG102 IO setting tab.

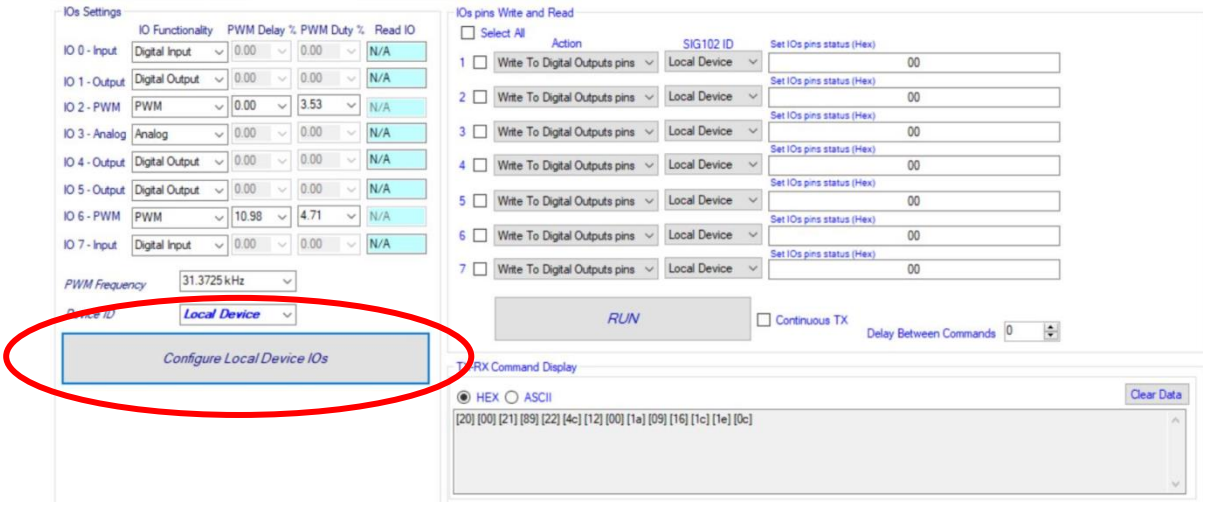


Figure 35–SIG102 IO Setting Tab

- ✓ Set Each IO to as Digital Input/ Digital Output / PWM output / Analog Input.
- ✓ Set PWM delay and PWM Duty cycle (%) for each configured PWM IO.
- ✓ Set General PWM frequency for all configured PWM IO/s.
- ✓ Set the Device ID - Either the locally attached device or a remote SIG102 slave connected to the powerline.
- ✓ Click on the Configure device IOs button.
- ✓ TX-RX Command window shows the commands IOs configuration commands send to the SIG102 device.
- ✓ The IO of the designated device is configured according to user IOs settings.

After setting the IOs, the user can run a cyclic Write and Read IOs commands (locally or to a remote SIG102 salve) using the right window tab control.

- ✓ **Set action:**
  - **'Write to Digital Output pins'** – Set the status (logical '1' or logical '0') of the configured digital output IOs according to the data set in the data box (hex).
  - **Read Digital Input pins** – Read the status (logical '1' or logical '0') of the configured digital Input IOs.
  - **'Read Analog pins** – Read 12-bit analog results of the configured analog inputs IOs.

- ✓ **Set SIG102 ID:** set the SIG102 Slave ID or local device.
- ✓ **Set/Get IOs pins status box:** Set the data to write to digital outputs, or get the digital Input status or analog input analog to digital 12-bit conversion results.
- ✓ **Run Write and Read IOs commands** – Click on the RUN button to run the selected SIG102 commands. To make a cyclic continuous run, check the continuous TX box.
- ✓ **Delay between commands**: Set the delay between commands transmission using the delay between command box (Value * 10ms delay).

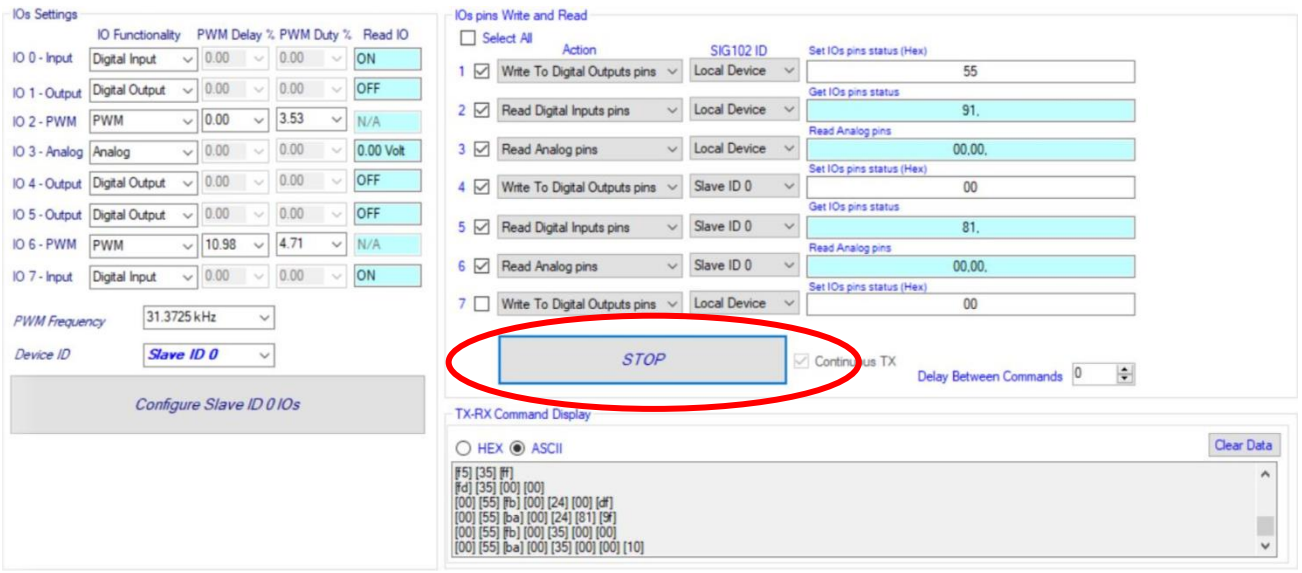


Figure 36–SIG102 IOs Control Example

Figure 36above demonstrates an example of setting and controlling a local device and Slave ID 0 IOs as follows:

- IO 0 as digital Input
- IO 1 as Digital Output
- IO 2 as PWM Output, with 0% PWM delay and 3.53% PWM Duty cycle.
- IO 3 as Analog Input
- IO 4 as Digital Output
- IO 5 as Digital Output
- IO 6 as PWM Output, with 10.98% PWM delay and 4.71% PWM Duty cycle.
- IO 7 as Analog Input

Then, cyclic executes six Write/Read IOs commands are set for the local device and remote SIG102 ID 0 device as follows:

1. **'Write to Digital Output pins'** of the local device with value **0x55**.
   Only the IOs are configured as Digital Output will be written with appropriate logical state bit, that is, bit 1 (IO 1), bit 4 (IO 4), and bit 5 (IO 5) as described in Table 2.

Table 2 – Write 0x55 to Digital Output example

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
IO 7	IO 6	IO 5	IO 4	IO 3	IO 2	IO 1	IO 0
X	X	0 (OFF)	1 (ON)	X	X	0 (OFF)	X

2. **'Read digital Input pins'** from a local device. Read value is **0x91** as shown in Figure 36.
   Read digital input command return values for PWM or Analog pins will always return logical '0'.
   Read digital input command return value for of output pins is the current status of the output pin.

Table 3 – Read Digital Input example

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
IO 7	IO 6	IO 5	IO 4	IO 3	IO 2	IO 1	IO 0
Dig. Input	PWM	Dig. Output	Dig. Output	Analog	PWM	Dig. Output	Dig. Input
1	0	0	1	0	0	0	1

3. **'Read Analog pins'** from a local device. Read value is two bytes of IO 3. The first byte is ADC [12:4], and the second byte bit [7:4] is ADC [3:0].

4. **'Write to Digital Output pins'** of the Slave ID 0 device with value **0x00**.
   Only the IOs are configured as Digital Output will be written with appropriate logical state bit, that is, bit 1 (IO 1), bit 4 (IO 4), and bit 5 (IO 5) as described in Table 4.

Table 4 – Write 0x00 to Digital Output example

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
IO 7	IO 6	IO 5	IO 4	IO 3	IO 2	IO 1	IO 0
X	X	0 (OFF)	0 (OFF)	X	0	0 (OFF)	X

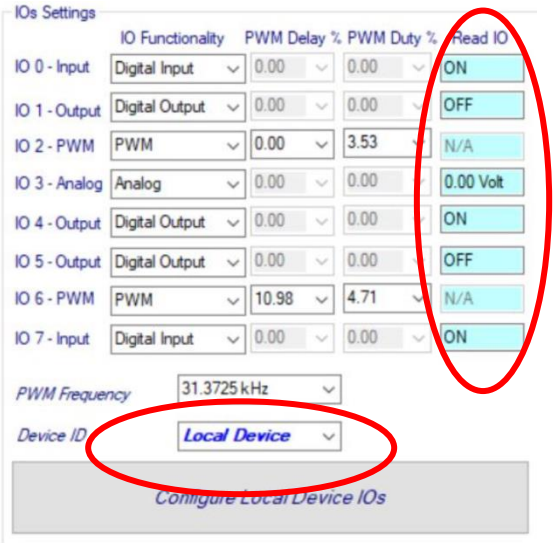
5. **'Read digital Input pins'** from the Slave ID 0 device. Read value is **0x81** as shown in Figure 36.
   Read digital input command return values for PWM or Analog pins will always return logical '0'.
   Read digital input command return value for of output pins is the current status of the output pin.

Table 5 – Read Digital Input example

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
IO 7	IO 6	IO 5	IO 4	IO 3	IO 2	IO 1	IO 0
Dig. Input	PWM	Dig. Output	Dig. Output	Analog	PWM	Dig. Output	Dig. Input
1	0	0	0	0	0	0	1

6. **'Read Analog pins'** from the Slave ID 0 device. Read value is two bytes of IO 3. The first byte is ADC [12:4], and the second byte bit [7:4] is ADC [3:0].

The IO read state (digital and analog in Volts) is also displayed in the Read IO box correspondingly to the Device ID selection box, as shown in Figure 37.



17 Shimon Hatarsi Tel Aviv, Israel. Tel (972) 3 5445294 Fax (972) 3 5445279 www.yamar.com

Figure 37–SIG102 Live Read IO

The local (Command mode) and remote PLC command are displayed at the TX-RX Command Window, as shown in Figure 38.

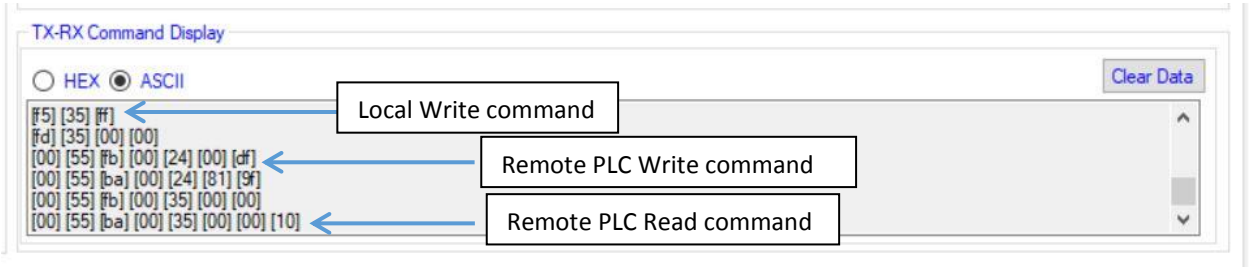


Figure 38 – Live Commands set window

4.1.2 SIG102 Slave Control Tab

The SIG102 Slave control tab allows the user to control any SIG102 Slave device connected to the powerline using the PLC SIG102 commands as specified in the SIG102 datasheet. Click on the SIG102 Slave Control tab.

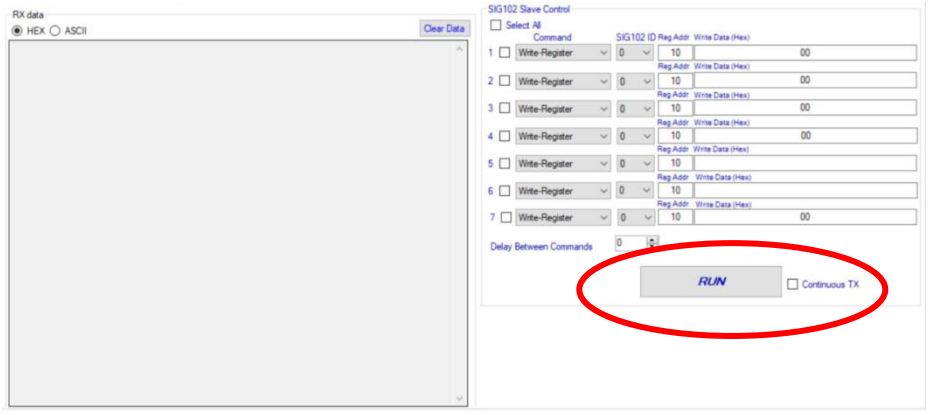


Figure 39 – SIG102 Slave Control Tab

The SIG102 Slave control allows the user to run cyclic up to seven PLC commands to a remote SIG102 slave.

Click on the RUN button for single command transmission, and check the 'continuous TX' box for cyclic PLC command transmission.

Each PLC command can be set to one of the followings:

- **'Write-Register'** - Write to SIG102 Slave internal register. Select the SIG102 ID, enter the register address to write to, and data to be written (Hex).
- **'Read-Register'** - Read from SIG102 Slave internal register. Select the SIG102 ID, and enter the register address to read from (Hex). The Read value is then displayed in the read data box.
- **'Sleep'** - Activate SIG102 Slave SLEEP mode.
- **'Freq–Change Main'** – Change SIG102 active carrier frequency to MAIN frequency[1]

- **'Freq–Change ALT1'** – Change SIG102 active carrier frequency to ALT1 frequency[1]
- **'Freq–Change ALT2'** – Change SIG102 active carrier frequency to ALT2 frequency[1]

[1] After sending the command, the PC TEST PROGRAM automatically configures the local device's active frequency correspondingly.

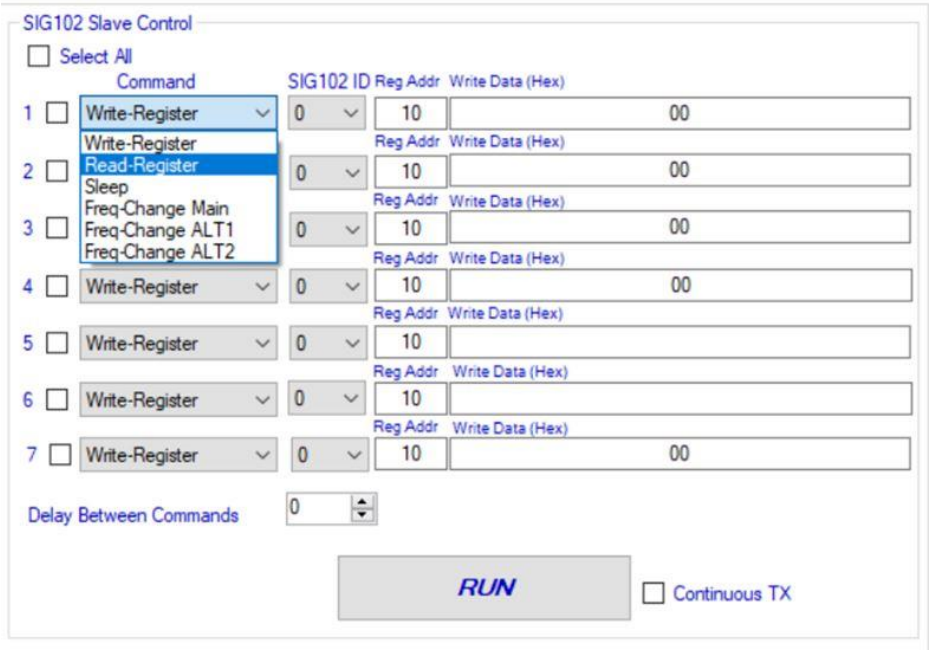


Figure 40–SIG102 Slave Control Commands selection

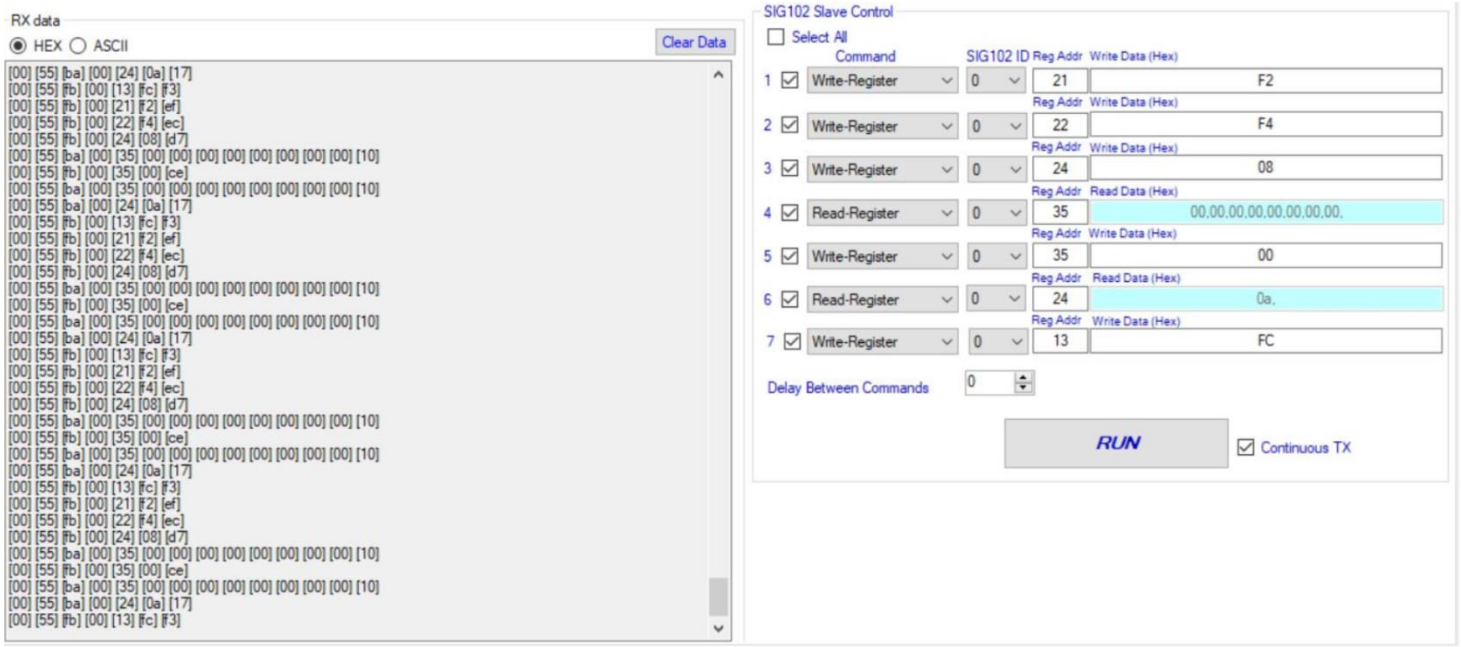


Figure 41–SIG102 Slave Control Example

Table 6 - SIG102 Remote IO configuration example

Register Address	Register Description	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
		IO 7	IO 6	IO 5	IO 4	IO 3	IO 2	IO 1	IO 0
		Analog	Analog	Analog	Analog	Dig. Output	PWM	Dig. input	Dig. Output
0x21	IO Direction	1	1	1	1	0	0	1	0
0x22	IO Functionality	1	1	1	1	0	1	0	0
0x24	Write to Digital Out or read from Digital IN	0	0	0	0	1	0	0	0
0x13	PWM delay of IO 3	1	1	1	1	1	1	0	0
0x35	Write and Read to/from all Analog pins [1]	X	X	X	X	X	X	X	X

Figure 41above demonstrates an example of SIG102 ID 0 IOs setting and write and read operation as described in Table 6 (See SIG102 datasheet for IOs register specification).

[1]When performing Write-register to ADC ALL address 0x35, the data to write can be any data (Don't-care).

The read value of the 0x35 register is four pairs of bytes of the four active analog IOs pins. The first two bytes (on the left) are IO 4 analog read results and the last pair bytes are IO 7 analog read results.

In this example, we are writing firstly to register the 0x24 value of 0x08. Meaning set Dig. Output on IO 3 is set to logical '1' and output on IO 0 is set to logical '0'.

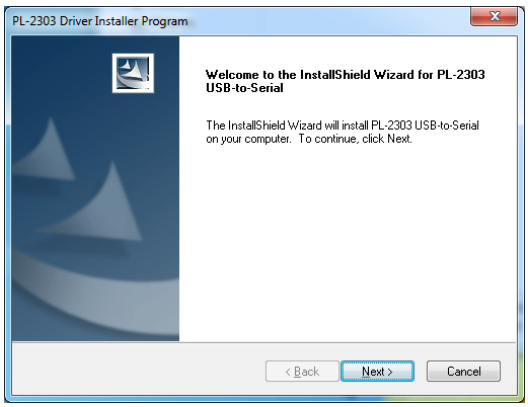
The read value of 0x24 reflects the Input and output logical state. Register 0x24 read value bit[7:4] will always return zero as they are set as analog input. Read value bit[3:0] is 0xa, reflecting:

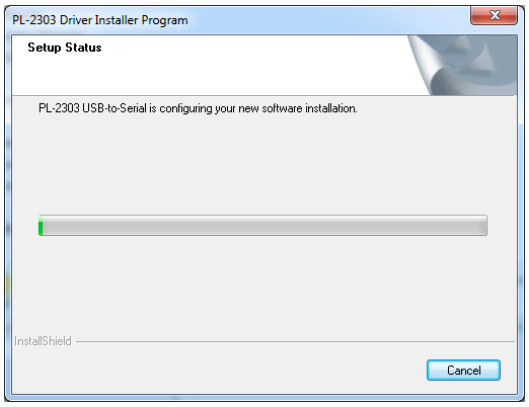
[IO 3 output '1'] [IO 2PWM – always read as '0'][IO 2 Input – '1'][IO 0 output '0'].

The RX data box displays the command bytes set sent over the powerline.

Annex 1 - EVB Tester USB Driver installation

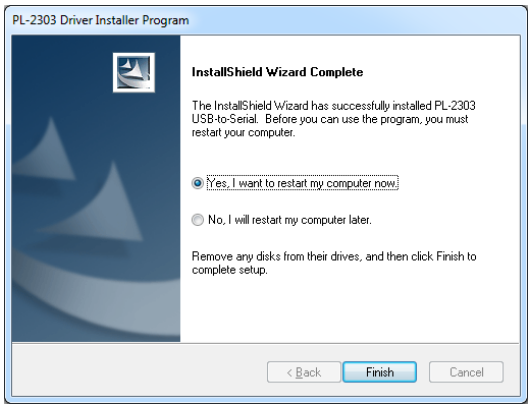
Got to driver_download and download the PL2303 prolific latest driver setup.





Click Next,

The driver is installed automatically.



Click Finish.