USER MANUAL UMAX141840
Version 1.0.1

4 Digital Inputs
Modbus Router with CAN
SAE J1939

USER MANUAL

P/N: AX141840

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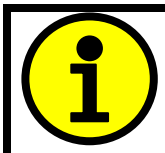
VERSION HISTORY

Version	Date	Author	Modification
1.0.0	May 9, 2024	Antti Keränen	Initial Draft
1.0.1	June 5, 2025	M Ejaz	Marketing review Updated dimensional drawing, block diagram, and technical specifications Removed the mention of RS-485



The default password: '**AX141840**'

ACCRONYMS

ACK	Positive Acknowledgement (from SAE J1939 standard)
BATT +/-	Battery positive (a.k.a. Vps) or Battery Negative (a.k.a. GND)
DM	Diagnostic Message (from SAE J1939 standard)
DTC	Diagnostic Trouble Code (from SAE J1939 standard)
EA	Axiomatic Electronic Assistant (A Service Tool for Axiomatic ECUs)
ECU	Electronic Control Unit (from SAE J1939 standard)
GND	Ground reference (a.k.a. BATT-)
I/O	Inputs and Outputs
IP	Internet Protocol
MAC	Media Access Control
MB	Modbus
NAK	Negative Acknowledgement (from SAE J1939 standard)
PDU1	A format for messages that are to be sent to a destination address, either specific or global (from SAE J1939 standard)
PDU2	A format used to send information that has been labeled using the Group Extension technique and does not contain a destination address.
PGN	Parameter Group Number (from SAE J1939 standard)
PropA	Message that uses the Proprietary A PGN for peer-to-peer communication
PropB	Message that uses a Proprietary B PGN for broadcast communication
PWM	Pulse Width Modulation
SPN	Suspect Parameter Number (from SAE J1939 standard)
TCP/IP	Transmission Control Protocol / Internet Protocol
TP	Transport Protocol
Vps	Voltage Power Supply (a.k.a. BATT+)

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REFERENCES

J1939	Recommended Practice for a Serial Control and Communications Vehicle Network, SAE, February 2010
J1939/21	Data Link Layer, SAE, December 2006
J1939/71	Vehicle Application Layer, SAE, March 2011
J1939/73	Application Layer-Diagnostics, SAE, February 2010
J1939/81	Network Management, SAE, March 2017
TDAX141840	Technical Datasheet, 4 Digital Inputs Modbus Router with CAN, SAE J1939, Axiomatic Technologies
UMAX07050x	User Manual, Axiomatic Electronic Assistant and USB-CAN, Axiomatic Technologies

This document assumes the reader is familiar with the SAE J1939 standard. Terminology from the standard is used but not described in this document.

NOTE: This product is supported by Axiomatic Electronic Assistant V<TBD> and higher

1. OVERVIEW OF CONTROLLER

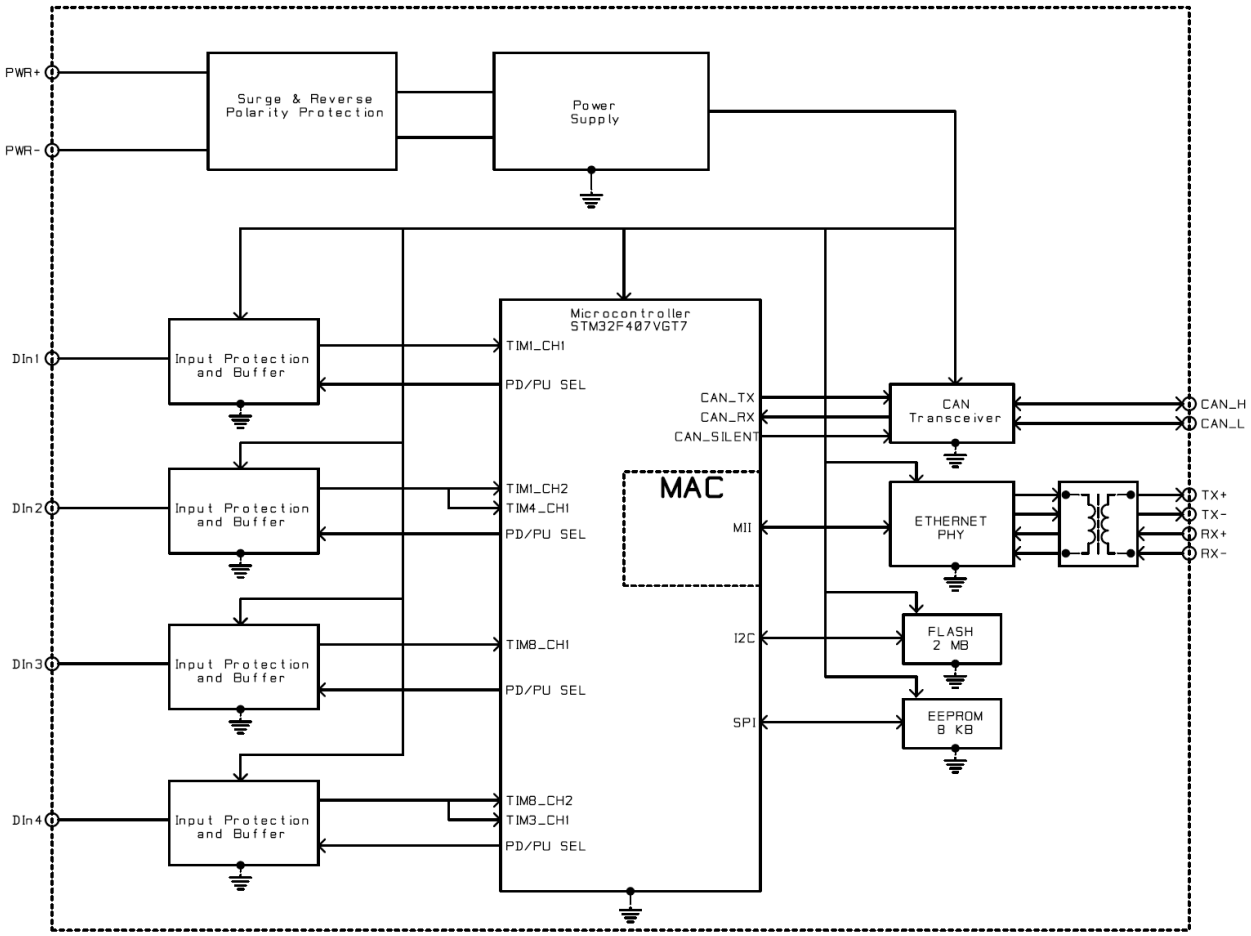


Figure 1 – Block diagram of the 4 Digital Inputs Modbus Router with CAN, SAE J1939

The 4 Digital Inputs Modbus Router with CAN, SAE J1939 (later 4DIN-ENET-CAN) is a device that forwards Modbus data between CAN and Ethernet, based on a custom routing configuration. The status of the four digital inputs is available in user selectable Modbus inputs and/or registers and can be also transmitted to CAN bus.

The configuration is done using the Ethernet interface. The controller has a web server running on port 80 that allows the user to configure all parameters. Throughout this document setpoint names are referred to with bolded text and the setpoint option is referred to in single quotes. For example, **Input Sensor Type** setpoint set to option ‘Digital Input’.

The 4DIN-ENET-CAN supports firmware reflashing and saving and loading configuration to and from a binary file. All these operations can be done using a web browser.

The 4DIN-ENET-CAN ECU has auto-baud-rate detection for CAN.

1.1. Input Function Blocks

The controller has four fully programmable digital inputs that can be set up to read: pwm duty cycle, frequency, on/off digital input and quadrature encoder signals. The **Input Sensor Type** setpoint is used to configure input type. Selecting input type effects on other setpoints and how they are interpreted and should thus be selected first on this block. The input sensor types are listed in Table 1.

0	*Disabled*
40	*Frequency 0.5 to 50 Hz*
41	*Frequency 10 Hz to 1 kHz*
42	*Frequency 100 Hz to 10 kHz*
50	*PWM Low Frequency (<1kHz)*
51	*PWM High Frequency (>100Hz)*
60	*Digital on/off*
61	*Digital on/off, inverted*
62	*Digital on/off, latched*
80	*QuadDec, count*
81	*QuadDec, direction*
82	*QuadDec, speed*

Table 1 – Digital Input Type Options

Input Sensor Type	**Error Threshold units**	**Transmit data resolution**	**Transmit data offset units**
Disabled	N/A	N/A	N/A
Frequency 0.5 to 50 Hz	Hz(RPM)	1 Hz/Bit (RPM/Bit)	HZ(RPM)
Frequency 10 Hz to 1 kHz	Hz(RPM)	1 Hz/Bit (RPM/Bit)	HZ(RPM)
Frequency 100 Hz to 10 kHz	Hz(RPM)	1 Hz/Bit (RPM/Bit)	HZ(RPM)
PWM Low Frequency (<1kHz)	%dc	0.1 %dc/Bit	%dc
PWM High Frequency (>100Hz)	%dc	0.1 %dc/Bit	%dc
Digital (normal, inverted, latched)	N/A	1 State/Bit	State
Quadrature decoder	N/A	1 State/Bit	

Table 2 - Input Sensor types effect on other setpoints

Frequency/RPM or Pulse Width Modulated (PWM) inputs are connected to 16-bit timer pins on the processor. **Debounce Time** setpoint is used to select an input capture filter for the timer pin in question.

0	*None*
1	*111ns*
2	*1.78us*
3	*14.22us*

Table 3 – Debounce Time Options

An additional software debounce filter can be used with Digital Input types for filtering the inputs using longer time constants than with the default debounce filter. The available software implemented debounce times are listed in Table 4.

0	*0ms*
1	*10ms*
2	*20ms*
3	*40ms*
4	*100ms*
5	*200ms*
6	*400ms*
7	*1000ms*

Table 4 - Software Debounce Filter Times

The **Pulses Per Revolution** setpoint is only associated with the frequency input type. If a non-zero Pulse/Rev is selected, then the input data will be reported as in rotations-per-minute (RPM). Otherwise, frequency inputs are measured in Hertz.

There are two digital **Input Sensor Type** options: Normal and Latched. With digital input sensor types the input measurement is given either 1 (ON) or 0 (OFF). Input voltage is measured with 3V threshold.

On Frequency, PWM and digital input modes 10kΩ pull-up or pull-down resistors can be enabled or disabled by setting the value of the **Pullup/Pulldown Resistor** setpoint. Setpoint options are given in Table 5. By default, pull-down resistors are enabled for all inputs.

0	*Pullup/down Off*
1	*10 kΩ Pullup*
2	*10 kΩ Pulldown*

Table 5 – Pullup/Pulldown Resistor Options

Active High/Active Low setpoint is used to configure how signal high and low are interpreted. Setpoint options are given in Table 6. By default, all inputs are selected to be Active High, which means that signal high is interpreted as 1(ON) and signal low as 0(OFF).

0	*Active High*
1	*Active Low*

Table 6 – Active High/Low Options

Table 7 shows the effect of different digital input types on input signal measurement interpretation with recommended **Active High/Low** combinations.

Input Sensor Type		**Active High**	**Active Low**	**Input measured (state)**
60	*Digital (normal)*	High	Low or Open	1 (ON)
		Low or Open	High	0 (OFF)
61	*Digital (inverted)*	High	Low or Open	0 (OFF)
		Low or Open	High	1 (ON)
62	*Digital (latched)*	High to Low	Low to High	0 (no change)
		Low to High	High to Low	1 (state change)

Table 7 – Digital Input Sensor Type versus Input State

The **Minimum Range** and **Maximum Range** setpoints are used to define the range of the signal input outputs as a control source. For example, if **Maximum Range** is set to 900 for a 'Frequency 10…1000Hz', the control signal is saturated at 900 if input signal rises above 900Hz. The **Minimum Range** and **Maximum Range** setpoints are interpreted in input types units, thus they should be re-adjusted after editing **Input Sensor Type**.

To read in position, direction or speed information from a quadrature encoder, two inputs are needed. When configured to 'Quadrature decoder' mode, the Inputs 1 & 2 and 3 & 4 work as pairs. Both input pairs can read their own quadrature encoder device. To configure an input pair to read in signals from a quadrature encoder, both inputs need to be configured to one of the quadrature decoder modes.

Software filters can be applied to the measured input signal. Setpoints **Software Filter Type** and **Software Filter Constant** are used to configure the software filter. By default, no filter is applied to the signal. Software filtering is described in detail in the next section.

1.2. Input filtering

Measured input data from universal inputs can be filtered to form desired CAN message data. Input filters are configured with **Filter Type** and **Filter Constant** setpoints. Filters are configured for each input individually.

Filter Type setpoint defines the type of software filter used. Setpoint options are 'No Filtering', 'Moving Average' and 'Repeating Average'. The 'No Filtering' option applies no filtering to the measured input data. The 'Moving Average' option applies the transfer function below to the measured input data, where $Value_N$ is the current value of the CAN message data, $Value_{N-1}$ is the previous CAN message data and Filter Constant is the value of the **Filter Constant setpoint**.

Equation 1 - Moving Average Transfer Function:

$$Value_N = Value_{N-1} + \frac{(Input - Value_{N-1})}{Filter\ Constant}$$

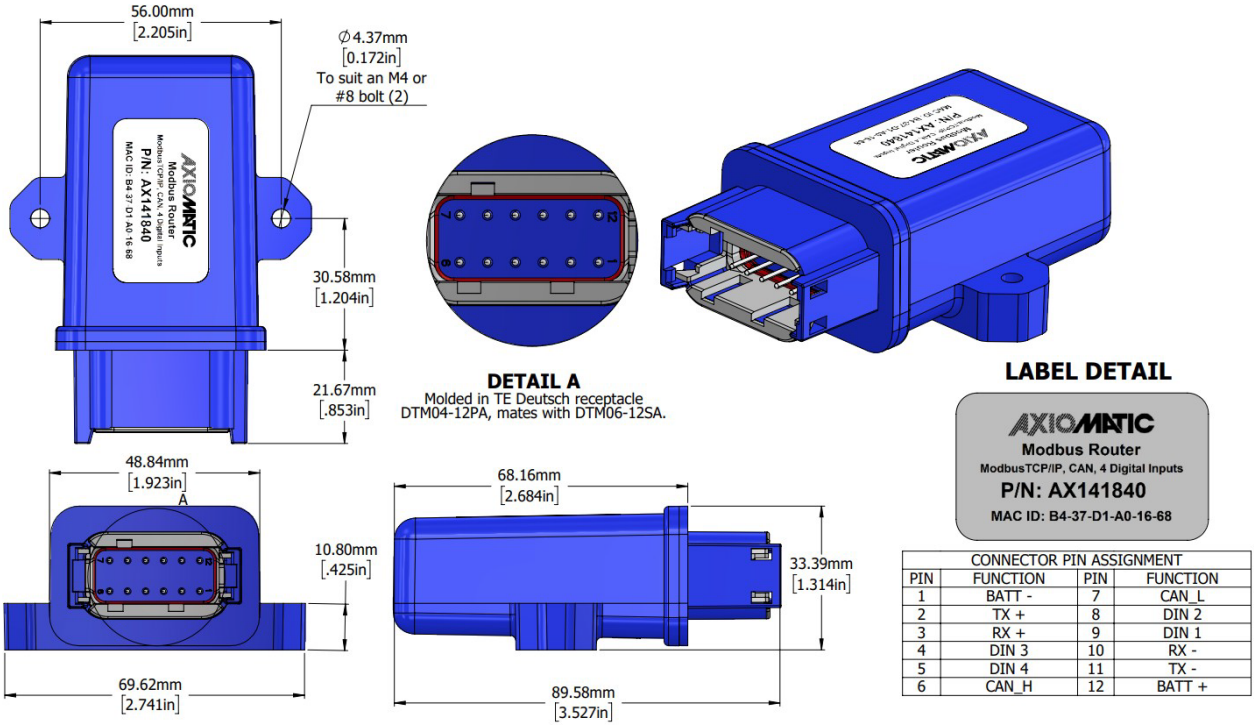
Equation 2 - Repeating Average Transfer Function:

$$Value = \frac{\sum_0^N Input_N}{N}$$

The 'Repeating Average' option applies the transfer function above to the measured input data, where N is value of the **Filter Constant** setpoint. At every reading of the input value, the value is added to the sum. At every N^{th} read, the sum is divided by N, and the result is new CAN message data. The sum is set to zero for the next read and the summing is started again.

2. INSTALLATION INSTRUCTIONS

2.1. Dimensions and Pinout



CONNECTOR PIN ASSIGNMENT			
PIN	FUNCTION	PIN	FUNCTION
1	BATT -	7	CAN_L
2	TX +	8	DIN 2
3	RX +	9	DIN 1
4	DIN 3	10	RX -
5	DIN 4	11	TX -
6	CAN_H	12	BATT +

Figure 2 – Controller Dimensions and Label

(Grey) Connector	
Pin #	**Function**
1	Battery -
2	Ethernet TX +
3	Ethernet RX +
4	Digital Input 3
5	Digital Input 4
6	CAN High
7	CAN Low
8	Digital Input 2
9	Digital Input 1
10	Ethernet RX -
11	Ethernet TX -
12	Battery +

Table 8 – AX141840 Connector Pinout

3. OVERVIEW OF J1939 FEATURES

The software was designed to provide flexibility to the user with respect to messages sent from the ECU by providing:

- Configurable ECU Instance in the NAME (to allow multiple ECUs on the same network)
- Configurable PGN and Data Parameters
- Configurable Diagnostic Messaging Parameters, as required

3.1. Introduction to Supported Messages

The ECU is compliant with the standard SAE J1939 and supports following PGNs from the standard.

From J1939-21 – Data Link Layer

• Request		59904	0x00EA00
• Acknowledgement		59392	0x00E800
• Transport Protocol – Connection Management		60416	0x00EC00
• Transport Protocol – Data Transfer Message		60160	0x00EB00
• Proprietary B	from	65280	0x00FF00
	to	65535	0x00FFFF

From J1939-73 – Diagnostics

• DM1 – Active Diagnostic Trouble Codes	65226	0x00FECA
• DM2 – Previously Active Diagnostic Trouble Codes	65227	0x00FECB
• DM3 – Diagnostic Data Clear/Reset for Previously Active DTCs	65228	0x00FECC
• DM11 – Diagnostic Data Clear/Reset for Active DTCs	65235	0x00FED3

From J1939-81 – Network Management

• Address Claimed/Cannot Claim	60928	0x00EE00
• Commanded Address	65240	0x00FED8

From J1939-71 – Vehicle Application Layer

• ECU Identification Information	64965	0x00FDC5
• Software Identification	65242	0x00FEDA
• Component Identification	65259	0x00FEEB

None of the application layer PGNs are supported as part of the default configurations, but they can be selected as desired for transmit function blocks.

3.2. NAME, Address and Identification Information

The 4DIN-ENET-CAN has the following default for the J1939 NAME. The user should refer to the SAE J1939/81 standard for more information on these parameters and their ranges.

Arbitrary Address Capable	Yes
Industry Group	0, Global
Vehicle System Instance	0
Vehicle System	0, Non-specific system
Function	25, Axiomatic Protocol Converter
Function Instance	24, Axiomatic AX141830
ECU Instance	0, First Instance
Manufacture Code	162, Axiomatic Technologies
Identity Number	Variable, uniquely assigned during factory programming for each ECU

The ECU Instance is a configurable setpoint associated with the NAME. Changing this value will allow multiple ECUs of this type to be distinguishable from one another when they are connected on the same network.

The default value of the “ECU Address” setpoint is 128 (0x80), which is the preferred starting address for self-configurable ECUs as set by the SAE in J1939 tables B3 and B7. The EA will allow the selection of any address between 0 and 253. ***It is the user’s responsibility to select an address that complies with the standard***. The user must also be aware that since the unit is arbitrary address capable, if another ECU with a higher priority NAME contends for the selected address, the 4DIN-ENET-CAN will continue selecting the next highest address until it finds one that it can claim. See J1939/81 for more details about address claiming.

ECU Identification Information

PGN 64965		ECU Identification Information	-ECUID
Transmission Repetition Rate:		On request	
Data Length:		Variable	
Extended Data Page:		0	
Data Page:		0	
PDU Format:		253	
PDU Specific:		197 PGN Supporting Information:	
Default Priority:		6	
Parameter Group Number:		64965 (0x00FDC5)	
Start Position	Length	Parameter Name	SPN
a	Variable	ECU Part Number, Delimiter (ASCII "*")	2901
b	Variable	ECU Serial Number, Delimiter (ASCII "*")	2902
c	Variable	ECU Location, Delimiter (ASCII "*")	2903
d	Variable	ECU Type, Delimiter (ASCII "*")	2904
e	Variable	ECU Manufacturer Name, Delimiter (ASCII "*")	4304
(a)*(b)*(c)*(d)*(e)*			

Software Identifier

PGN 65242		Software Identification	-SOFT
Transmission Repetition Rate:		On request	
Data Length:		Variable	
Extended Data Page:		0	
Data Page:		0	
PDU Format:		254	
PDU Specific:		218 PGN Supporting Information:	
Default Priority:		6	
Parameter Group Number:		65242 (0x00FEDA)	
Start Position	Length	Parameter Name	SPN
1	1 Byte	Number of software identification fields	965
2-n	Variable	Software identification(s), Delimiter (ASCII "*")	234

Byte 1 is set to 5, and the identification fields are as follows.

(Part Number)*(Version)*(Date)*(Owner)*(Description)

The EA shows all this information in its "General ECU Information" page. *Note: The information provided in the Software ID is available for any J1939 service tool which supports the PGN -SOFT*

Component Identification

PGN 65259		Component Identification	-CI
Transmission Repetition Rate:		On request	
Data Length:		Variable	
Extended Data Page:		0	
Data Page:		0	
PDU Format:		254	
PDU Specific:		235 PGN Supporting Information:	
Default Priority:		6	
Parameter Group Number:		65259 (0x00FEEB)	
Start Position	Length	Parameter Name	SPN
a	1-5 Byte	Make, Delimiter (ASCII “*”)	586
b	Variable	Model, Delimiter (ASCII “*”)	587
c	Variable	Serial Number, Delimiter (ASCII “*”)	588
d	Variable	Unit Number (Power Unit), Delimiter (ASCII “*”)	233
(a)*(b)*(c)*(d)*(e)*			

4. WEB BROWSER BASED CONTROLLER CONFIGURATION

The 4DIN-ENET-CAN controller supports configuration of the data routing parameters from Ethernet port using a standard web browser.

The web browser-based configuration requires a password before any of the parameters can be viewed or edited.

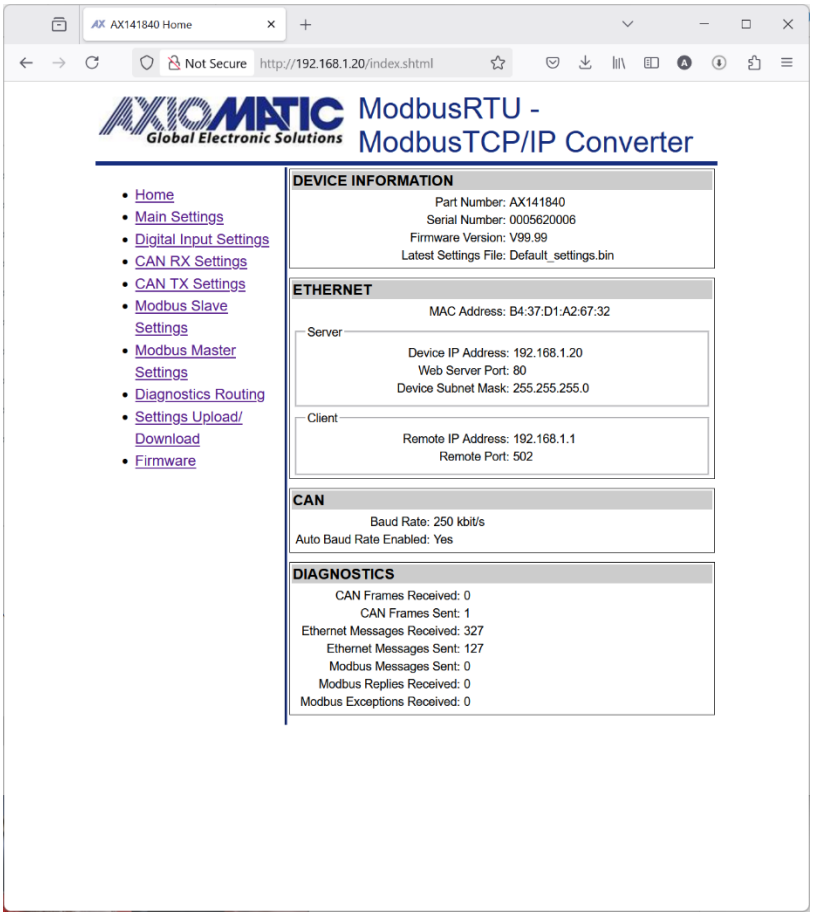
The default password: '**AX141840**'

4.1. Parameter Editing

The 4DIN-ENET-CAN has a web server running on TCP port 80. Please note that the “Save settings” button must be clicked for saving the parameters. If not clicked, the modified parameters are discarded when moving to another configuration page or closing the web browser. The 4DIN-ENET-CAN web server supports the configuration options described on the following pages.

<configured ip>

<configured ip>/index.shtml



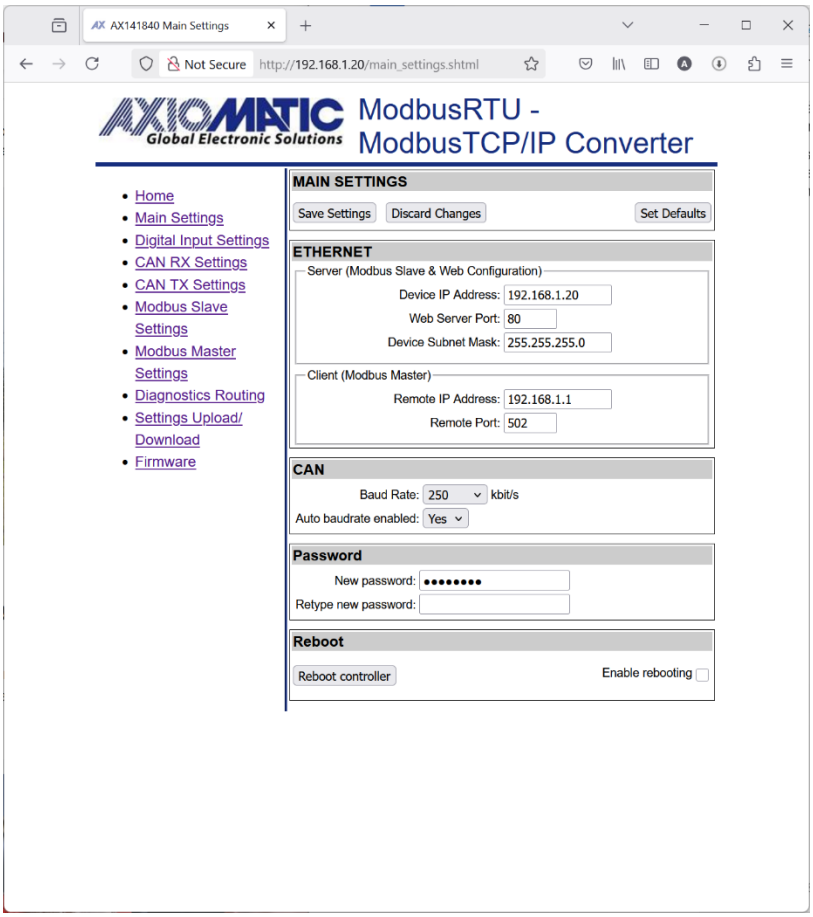
The Home page (index.shtml) shows the main configuration parameters and some communication statistics (number of messages for each interface).

<configured ip>/main_settings.shtml

The Main Settings configuration page allows the user to modify the device's IP address, netmask and the main configuration parameters for the communication interfaces. The CAN configuration parameters include the default baud rate to use and the auto-baud rate capability.

The serial port configuration contains baud rate (freely settable in range 75…256000), number of data, start and stop bits and parity.

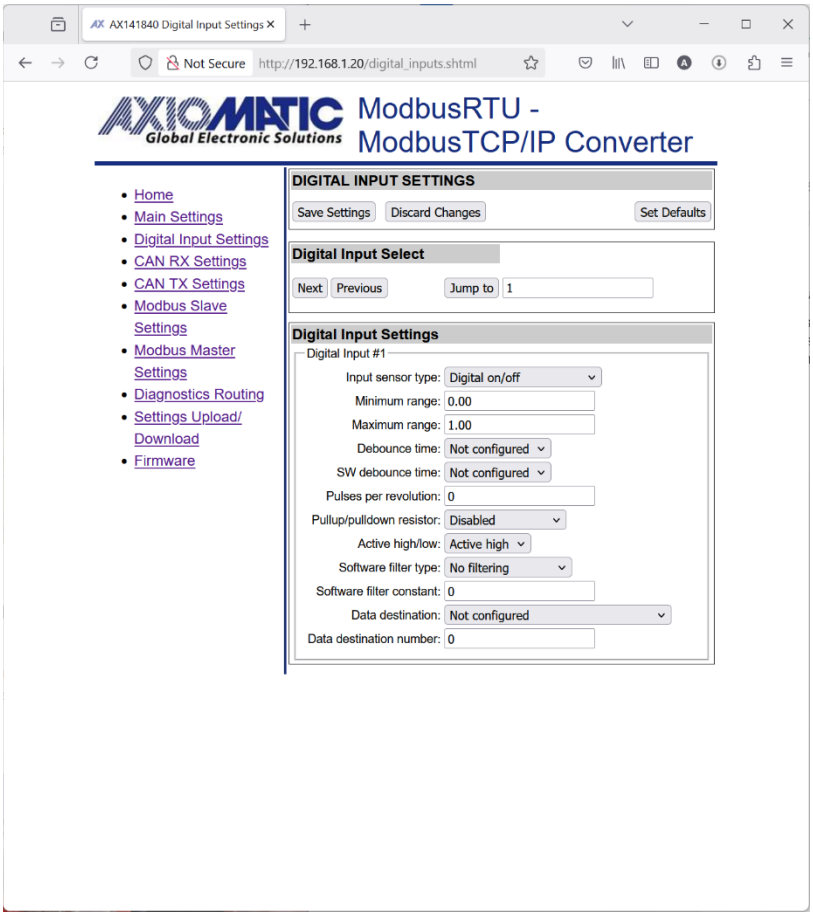
The password can be changed by entering the same password to both **New password** and **Retype new password** entries. In case the **Retype new password** is left empty, or the two passwords don't match, the password is not modified.



<configured ip>/digital_inputs.shtml

The digital inputs support reading frequency, pwm duty cycle, digital on/off and quadrature decoder signals. The data is always stored to a local variable assigned for each input, accessible from Modbus Master Messages and CAN Transmit messages configuration, but the Data destination needs to be specifically configured for forwarding the data to the Modbus server interface.

When **Data destination** is set to one of the Modbus TCP/IP server targets, the **Data destination number** specifies the number of coil/input/register to write the data into.



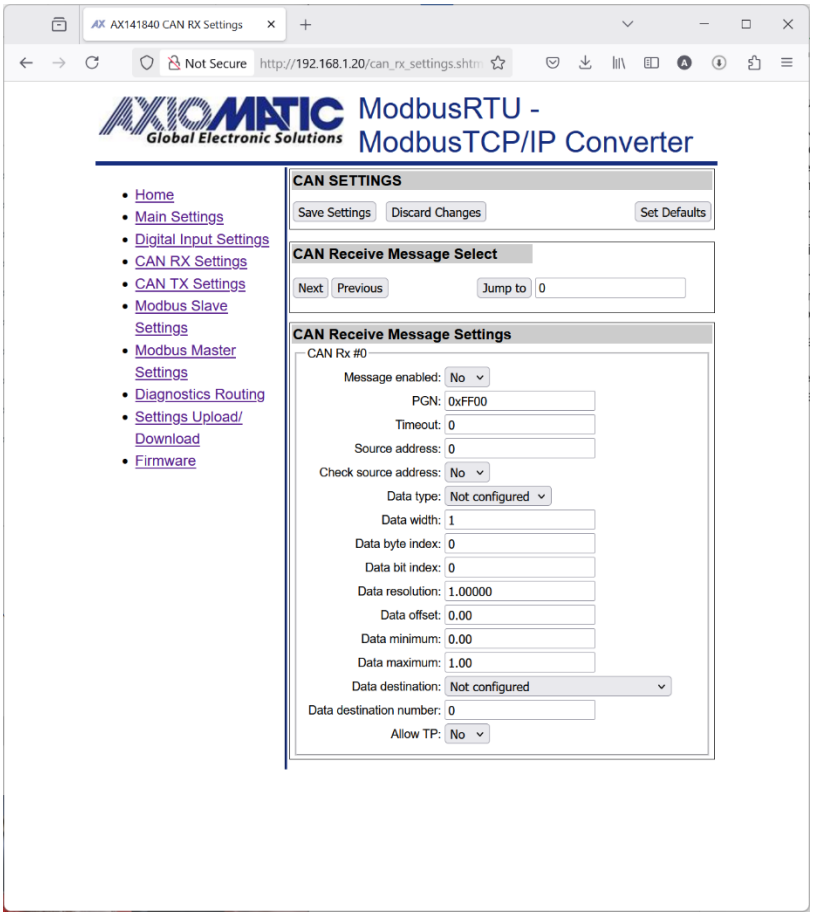
<configured ip>/can_rx_settings.shtml

The CAN receive message parameter settings are displayed one message at time. The message can be selected using the ‘Next’ and ‘Previous’ buttons. The ‘Jump to’ button selects the specified message directly. Please remember to save settings before selecting another CAN receive message to be configured, otherwise the modified settings will be lost.

The ‘Discrete’ data type reads in the CAN data as a number (or bit field data), using the range specified by the configured number of bits (Data width). With discrete data types, the resolution, offset, minimum and maximum are not used.

The ‘Continuous’ data type uses the J1939 data formatting with resolution, offset, minimum and maximum values. With continuous data, the data range is limited for reserving the upper range for J1939 special and error codes.

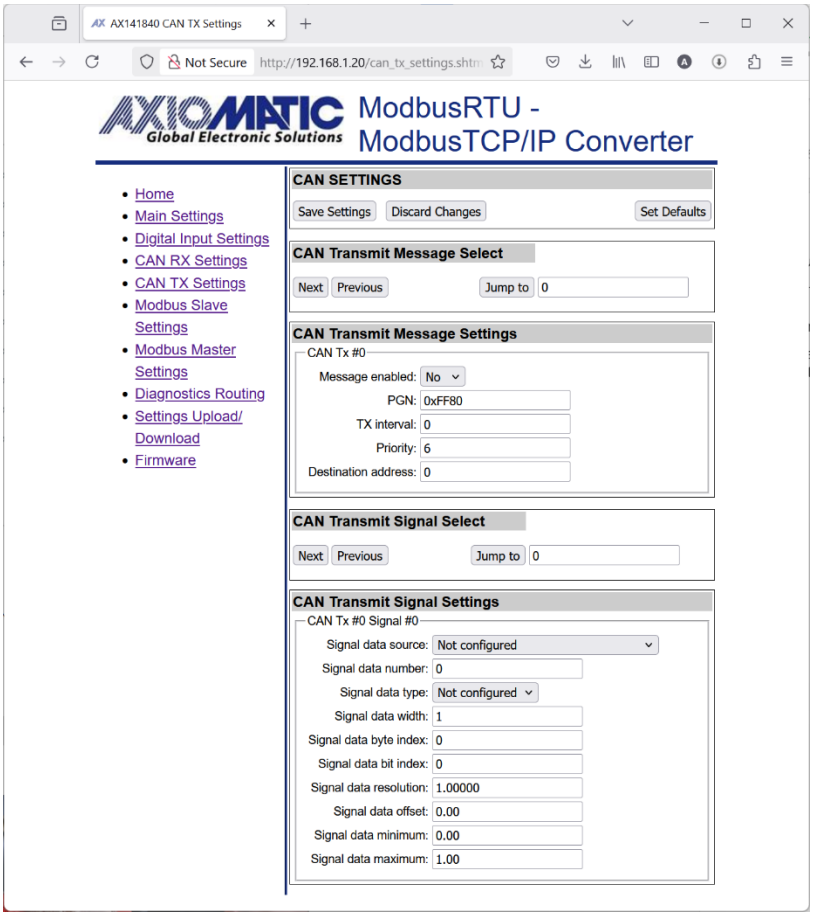
The **Data destination** and **Data destination number** settings specify the target interface for the received data. The received data is always stored to a local variable assigned for each CAN receive message, accessible from Modbus Master Messages and CAN Transmit messages configuration, but the **Data destination** needs to be specifically configured for forwarding the data to the Modbus server interface.



<configured ip>/can_tx_settings.shtml

Each of the CAN transmit messages support several signals for sending out received data. The transmit messages support the same ‘Discrete’ and ‘Continuous’ data types with the same characteristics as the CAN receive messages do.

Please remember to save the settings before selecting a new transmit message or transmit signal. In case the values are not saved, the modifications are lost when a new message or signal is selected.

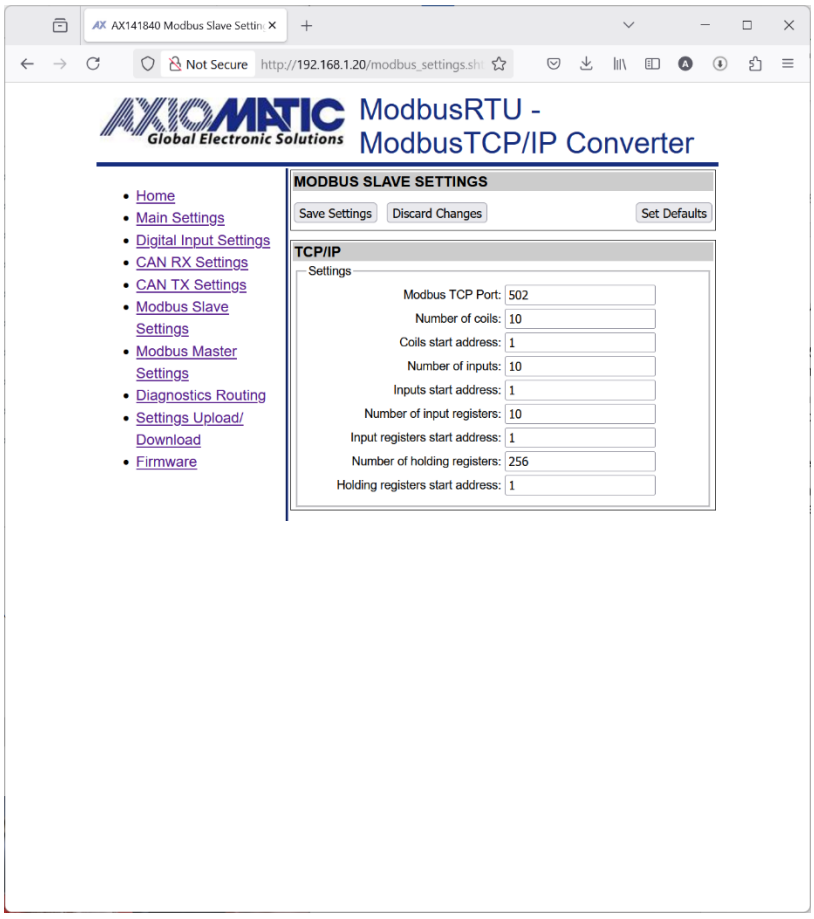


<configured ip>/modbus_settings.shtml

The 4DIN-ENET-CAN device supports Modbus TCP/IP server running on its Ethernet port. The number and start address for each of the Modbus server's inputs, coils and registers can be specified.

Please note that the server interface is enabled only if the Modbus client implementation is not running on that interface.

The Modbus TCP/IP node address is a "don't care". The number of inputs, coils and registers have an upper limit, and the web server will not accept values beyond the maximum built-in limit.



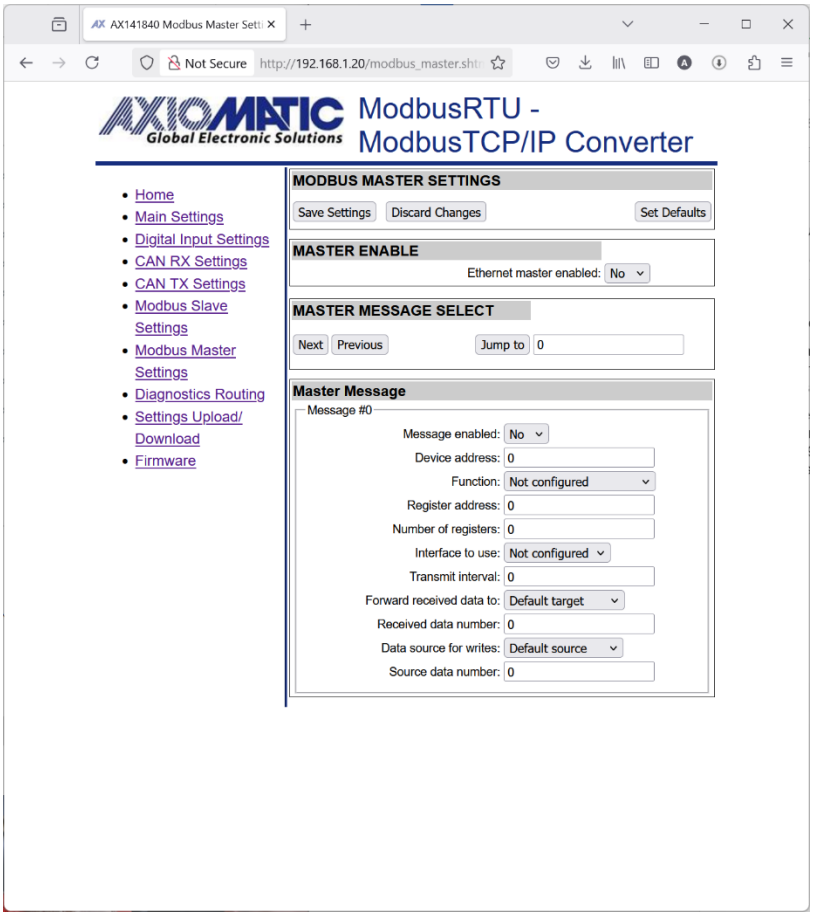
<configured ip>/modbus_master.shtml

The 4DIN-ENET-CAN device supports Modbus TCP/IP client running on its Ethernet port. The **Ethernet master enabled** option needs to be set to 'Yes' for enabling the Modbus client functionality.

Please note that enabling the Modbus master will disable the Modbus server.

The 'Default target' and 'Default source' data routing options are the built-in variables for each Modbus master message definition. The CAN receive message data target configuration can access these variables directly if configured to do so on the CAN receive message configuration page.

The received Modbus data can be also sent directly to CAN bus by selecting the Direct CAN TX option for the Forward received data to setpoint. In this case, the Received data number specifies the J1939 PGN to use (the priority will default to 6 and the 4DIN-ENET-CAN's J1939 address will be used as the source address for the direct transmit messages).



<configured ip>/diagnostics_routing.shtml

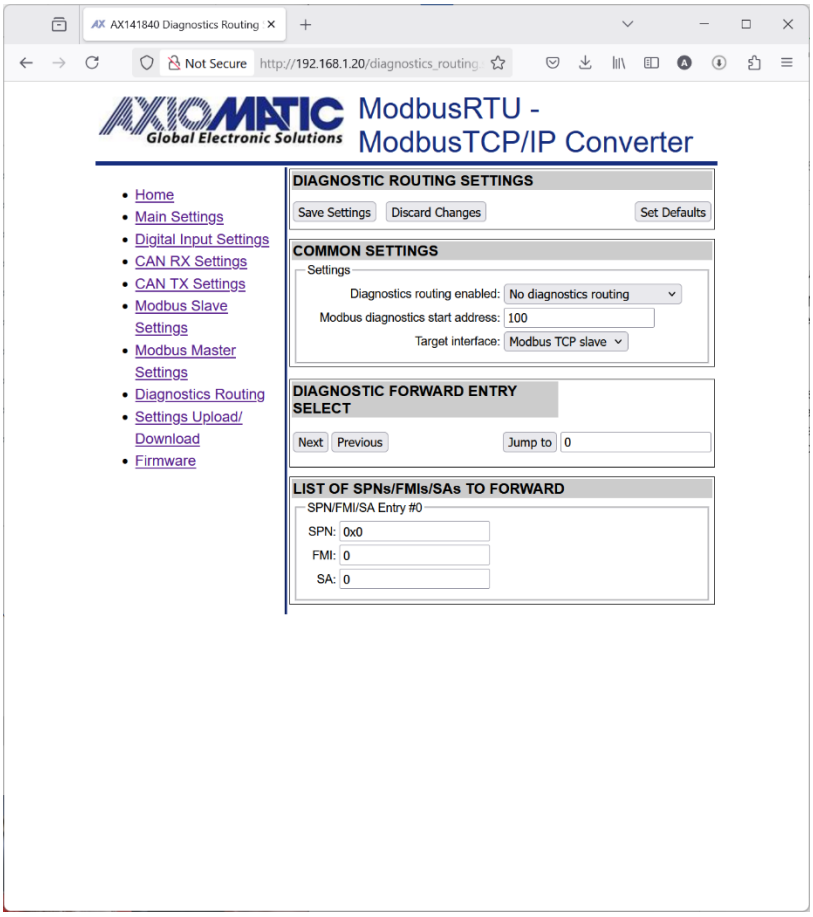
J1939 DM1 diagnostics frames can be routed to Modbus slave interfaces (either RTU or TCP/IP) using the Diagnostics routing configuration.

The routing options include routing all received diagnostics to Modbus or only routing the specified ones.

In case specified diagnostics routing is configured, the SPN is the most important parameter to configure. The diagnostics are filtered mainly using this setting. In case needed, the FMI and SA values can be used for more detailed filtering of the received DM1 frames. The FMI and SA can be set to “don’t care” values (32 for FMI and 255 for SA) for accepting a wider range of SPNs.

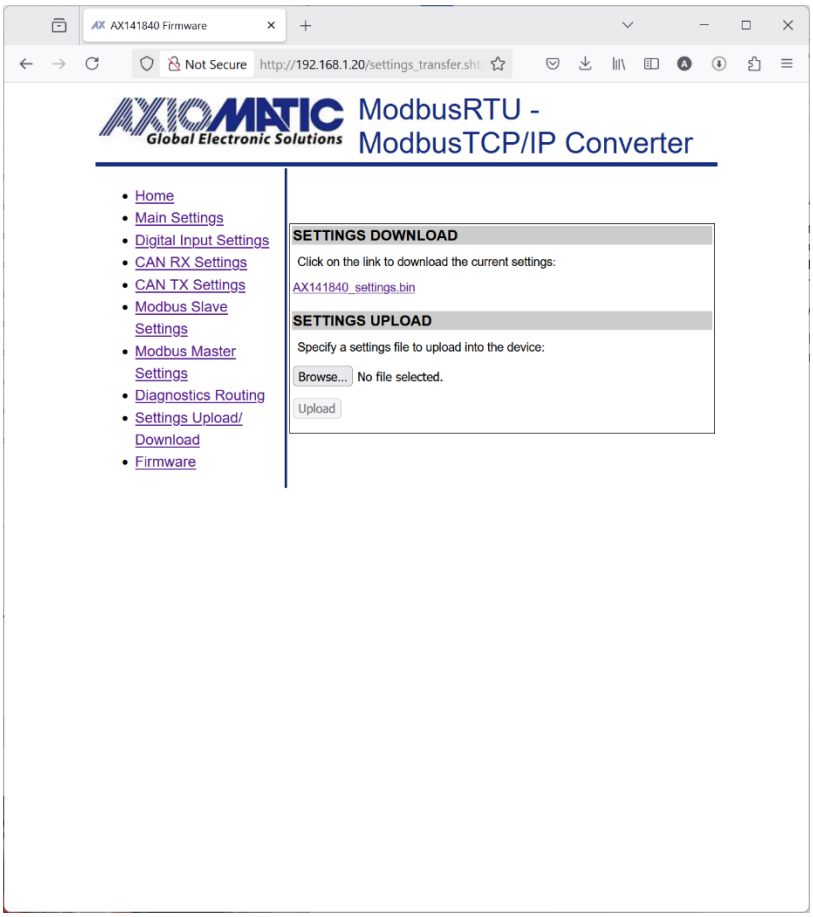
The received DM1 data is forwarded to Modbus slave holding registers using this data layout.

	Holding register	
	<15:8>	<7:0>
<MB diag. start addr.>		SPN (MSBs)
<MB diag. start addr. + 1>	SPN (16 LSBs)	
<MB diag. start addr. + 2>	Lamp	FMI
<MB diag. start addr. + 3>	SA	OC



<configured ip>/settings_transfer.shtml

The settings can be downloaded from the 4DIN-ENET-CAN as a binary file. When a settings file is uploaded to the 4DIN-ENET-CAN, the settings are checked using a CRC32 checksum. In case the checksum isn't correct, the uploaded settings won't be stored to 4DIN-ENET-CAN's non-volatile memory.



5. ECU SETPOINTS ACCESSED WITH AXIOMATIC ELECTRONIC ASSISTANT

5.1. J1939 Network Setpoints

"**ECU Instance Number**" and "**ECU Address**" setpoints and their effect are defined in section 3.2.

Name	Range	Default	Notes
ECU Instance Number	0-7	0x00	Per J1939-81
ECU Address	0-253	0x80	Preferred address for a self-configurable ECU

Table 9 – J1939 Setpoints

If non-default values for the **"ECU Instance Number"** or **"ECU Address"** are used, they will be mirrored during a setpoint file flashing and will only take effect once the entire file has been downloaded to the unit. After the setpoint flashing is complete, the unit will claim the new address and/or re-claim the address with the new NAME. If these setpoints are changing, it is recommended to close and re-open the CAN connection on EA after the file is loaded so that only the new NAME and address are shown in the J1939 CAN Network ECU list.

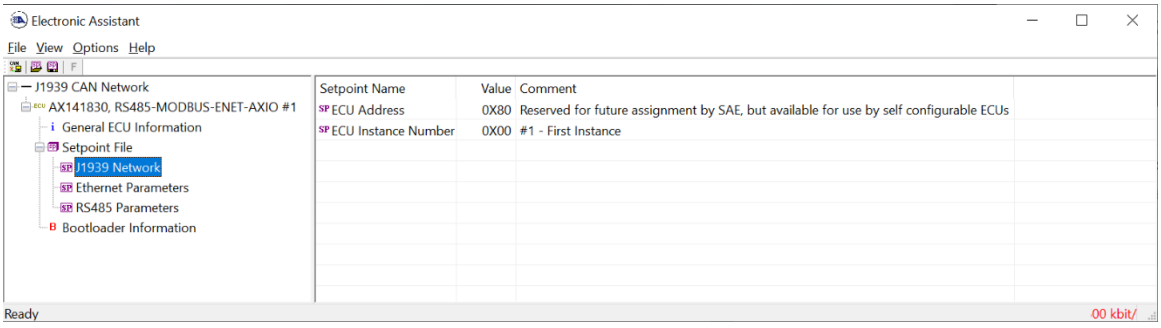


Figure 3 – Screen Capture of J1939 Setpoints

5.2. Ethernet Parameter Setpoints

The main Ethernet parameters can be configured using EA for easier initial configuration of the 4DIN-ENET-CAN device. A power cycle is needed for taking the new settings in use.

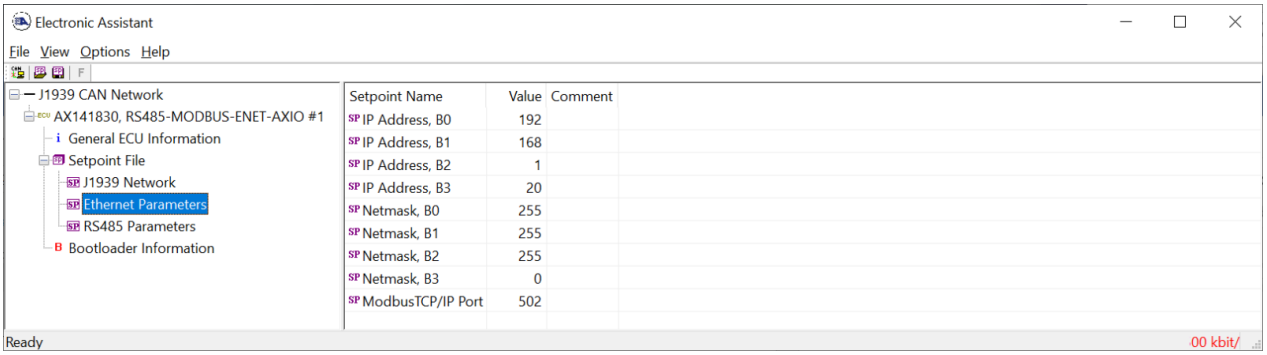


Figure 4 – Screen Capture of Ethernet Parameter Setpoints

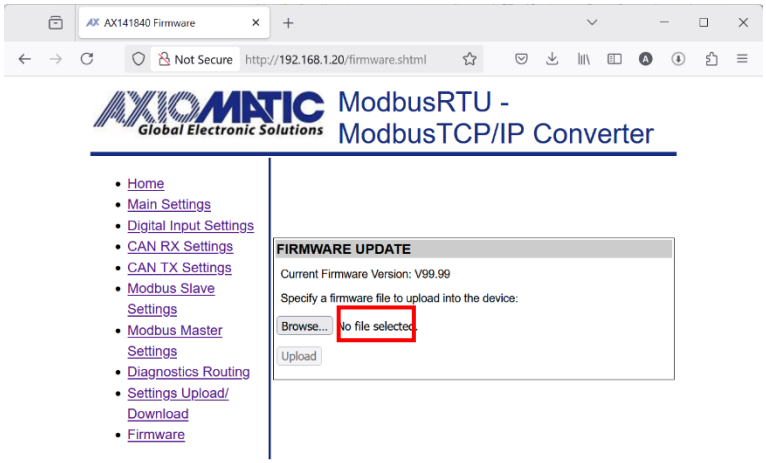
Name	Range	Default	Notes
IP Address, B0	0…255	192	These settings define an IP address: 192.168.1.20
IP Address, B1	0…255	168	
IP Address, B2	0…255	1	
IP Address, B3	0…255	20	
Netmask, B0	0…255	255	These settings define a netmask 255.255.255.0
Netmask, B1	0…255	255	
Netmask, B2	0…255	255	
Netmask, B3	0…255	0	
ModbusTCP/IP Port	0…65535	502	The port for accessing the Modbus slave interface.

Table 10 – Ethernet Parameter Setpoints

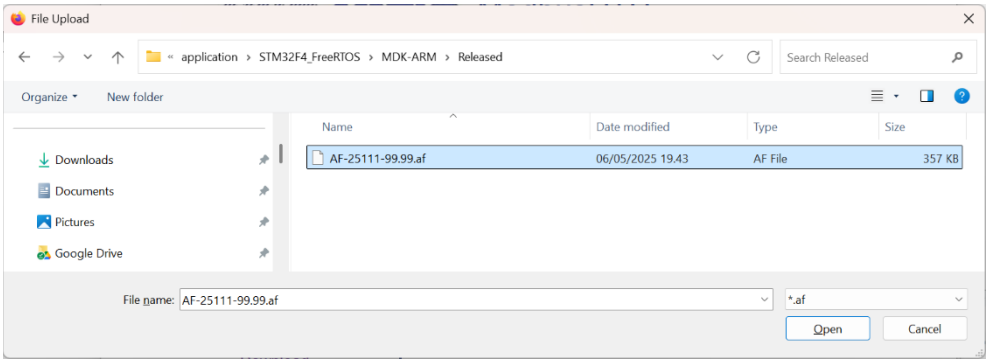
6. REFLASHING OVER ETHERNET USING A WEB BROWSER

The AX141840 can be upgraded with new application firmware using a web browser. Once the correct configuration password is entered, the firmware reflash can be done using the ‘Firmware’ page.

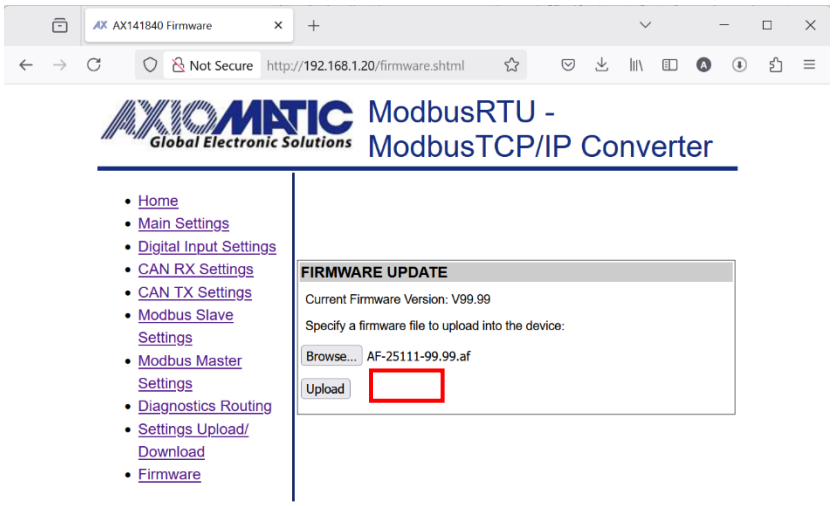
<configured ip>/firmware.shtml



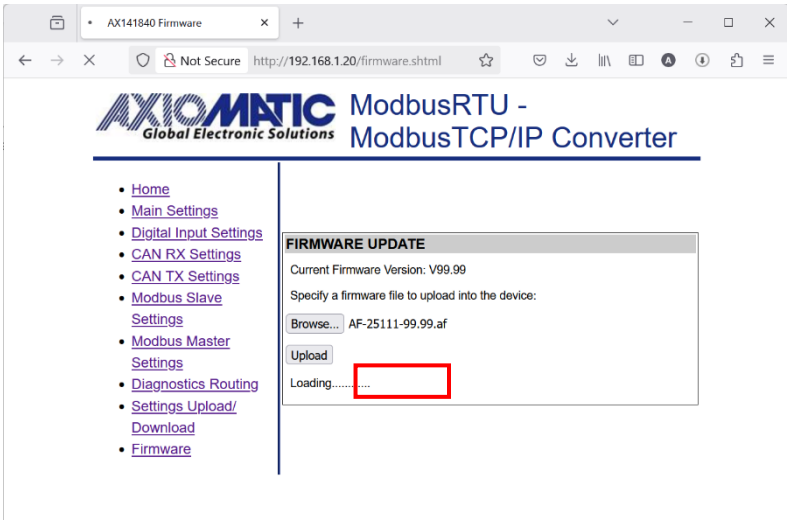
On the ‘Firmware’ page, a file selection dialog can be opened by pressing the ‘Browse…’ button.



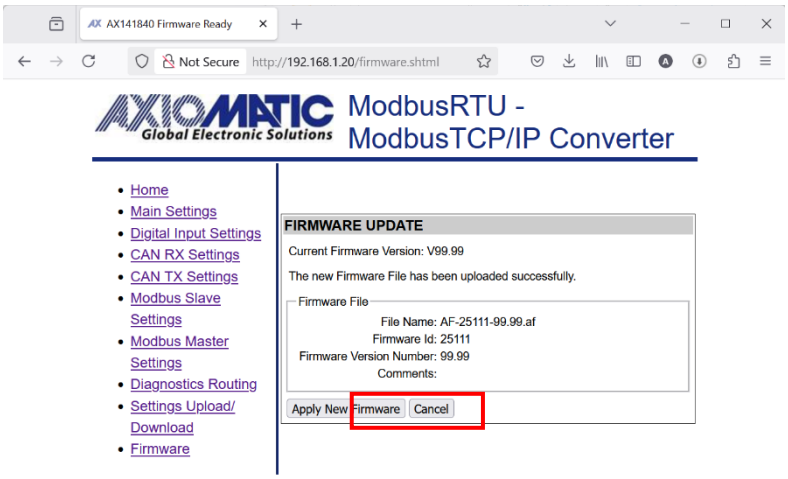
Navigate to where you had saved the **AF-25111-x.xx.af** file sent from Axiomatic. (Note: only binary (.af) files can be flashed using the web browser firmware update interface.)



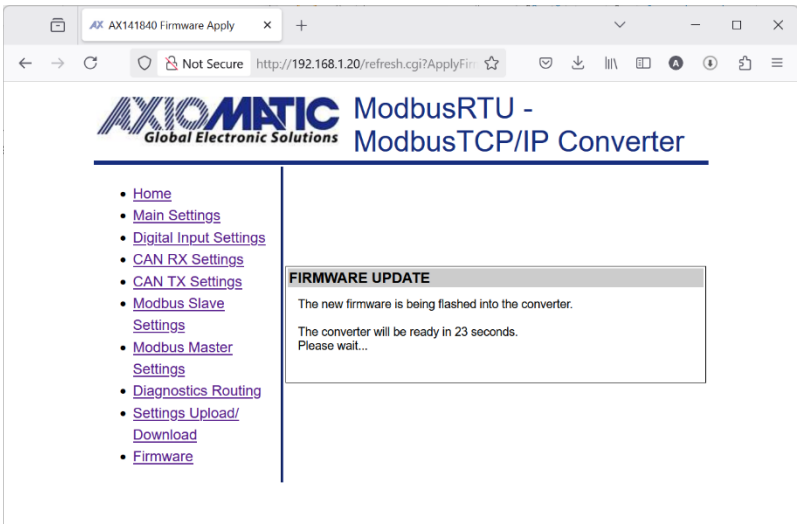
Once the file is selected, the actual upload/upgrade process is started by pressing the ‘Upload’ button.



The firmware upload process is shown below the ‘Upload’ button.



Once the upload is finished and the file checked and stored to a temporary location on the AX141840, the user is prompted to either 'Apply New Firmware' or cancel the operation.



The firmware reflash procedure takes 30 seconds to finish. After this the AX141840 reboots automatically to the new firmware and returns to the password dialog.

APPENDIX A - TECHNICAL SPECIFICATION

Specifications are indicative and subject to change. Actual performance will vary depending on the application and operating conditions. Users should satisfy themselves that the product is suitable for use in the intended application. All our products carry a limited warranty against defects in material and workmanship. Please refer to our Warranty, Application Limitations & Return Materials Process as described on https://www.axiomatic.com/service/.

Note: All specifications are typical at nominal input voltage and 25°C unless otherwise specified.

Power

Power Supply Input	12 or 24 VDC nominal (9 to 30 VDC)
Quiescent Current	TBD mA @ 12 V; TBD mA @ 24 V typical
Under-Voltage Protection	Hardware shutdown at 4 VDC
Over-Voltage Protection	Hardware shutdown at 41 VDC
Reverse Polarity Protection	Provided up to -30 V

Inputs

Inputs	4 digital inputs selectable as digital on/off, frequency/RPM, PWM, or encoder inputs

Table – User Programmable Inputs

Digital On / Off	Active high or active low with user selectable pull-up resistor of 11 kΩ or pull-down through a 10 kΩ resistor
Frequency / RPM	Range: 0.5 Hz to 10 kHz Resolution: 1 Hz
PWM	Duty Cycle: 0 to 100 % Resolution: 0.1 %
Encoder Input	Input pairs 1 & 2 and/or 3 & 4 can be configured to read quadrature / incremental / standard A & B phase encoder signals. Frequency range: 0-20 kHz Amplitude: 0-32 V

Input Ground	The input return should be connected to the “Battery -" pin.

Functionality

Ethernet	1 Ethernet port (Modbus TCP/IP) 10BASE-T 100BASE-Tx (auto-negotiation and full-duplex supported) Auto-MDIX 10/100 Mbit/s
CAN	1 CAN port (SAE J1939) Supported baud rates: 250 kbit/s (default), 500 kbit/s, 667 kbit/s, and 1 Mbit/s with auto-baud-rate detection

General Specifications

Microcontroller	STM32F407VGT7, 32-bit, 1 MByte flash memory
User Interface	Parameters are configurable using a web browser. Firmware can also be updated using a web browser. Axiomatic Electronic Assistant (P/N: **AX070502** or **AX070506K**) can be used for configuring some parameters like device IP address, Modbus port, ECU address, etc. Please see the user manual for details.
Compliance	RoHS
Operating Conditions	-40 to 85 °C (-40 to 185 °F)
Storage Temperature	-40 to 85 °C (-40 to 185 °F)
Weight	0.70 lbs. (0.32 kg)
Protection	IP67
Enclosure	Molded Enclosure, integral connector Nylon 6/6, 30% glass, ultrasonically welded 3.53 in. x 2.74 in. x 1.31 in. (89.58 mm x 69.62 mm x 33.39 mm) L x W x H including integral connector Refer to the dimensional drawing.
Electrical Connections	Integral 12-pin receptacle (TE Deutsch P/N: DTM04-12PA)
Mating Plug Kit	A mating plug kit is available from Axiomatic under P/N: **PL-DTM06-12SA** (includes 1x DTM06-12SA, 1x WM-12S, 12x 0462-201-20141, 6x 0413-204-2005 sealing plugs)
Network Termination	It is necessary to terminate the network with external termination resistors. The resistors are 120 Ω, 0.25 W minimum, metal film or similar type. They should be placed between CAN High and CAN Low terminals at both ends of the network.
Mounting	Mounting holes are sized for #8 or M4 bolts. The bolt length will be determined by the end-user's mounting plate thickness. The mounting flange of the controller is 0.425 in. (10.8 mm) thick. If the module is mounted without an enclosure, it should be mounted vertically with connectors facing left or right to reduce the likelihood of moisture entry. The CAN wiring is considered intrinsically safe. Power wires are not considered intrinsically safe and so in hazardous locations, they need to be located in conduit or conduit trays at all times. The module must be mounted in an enclosure in hazardous locations for this purpose. No wire or cable harness should exceed 30 m in length. The power input wiring should be limited to 10 m. All field wiring should be suitable for the operating temperature range. Install the unit with appropriate space available for servicing and for adequate wire harness access (6 in. or 15 cm) and strain relief (12 in. or 30 cm).

OUR PRODUCTS

AC/DC Power Supplies

Actuator Controls/Interfaces

Automotive Ethernet Interfaces

Battery Chargers

CAN Controls, Routers, Repeaters

CAN/WiFi, CAN/Bluetooth, Routers

Current/Voltage/PWM Converters

DC/DC Power Converters

Engine Temperature Scanners

Ethernet/CAN Converters, Gateways, Switches

Fan Drive Controllers

Gateways, CAN/Modbus, RS-232

Gyroscopes, Inclinometers

Hydraulic Valve Controllers

Inclinometers, Triaxial

I/O Controls

LVDT Signal Converters

Machine Controls

Modbus, RS-422, RS-485 Controls

Motor Controls, Inverters

Power Supplies, DC/DC, AC/DC

PWM Signal Converters/Isolators

Resolver Signal Conditioners

Service Tools

Signal Conditioners, Converters

Strain Gauge CAN Controls

Surge Suppressors

OUR COMPANY

Axiomatic provides electronic machine control components to the off-highway, commercial vehicle, electric vehicle, power generator set, material handling, renewable energy and industrial OEM markets. ***We innovate with engineered and off-the-shelf machine controls that add value for our customers.***

QUALITY DESIGN AND MANUFACTURING

We have an ISO9001:2015 registered design/manufacturing facility in Canada.

WARRANTY, APPLICATION APPROVALS/LIMITATIONS

Axiomatic Technologies Corporation reserves the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. Users should satisfy themselves that the product is suitable for use in the intended application. All our products carry a limited warranty against defects in material and workmanship. Please refer to our Warranty, Application Approvals/Limitations and Return Materials Process at https://www.axiomatic.com/service/.

COMPLIANCE

Product compliance details can be found in the product literature and/or on axiomatic.com. Any inquiries should be sent to sales@axiomatic.com.

SAFE USE

All products should be serviced by Axiomatic. Do not open the product and perform the service yourself.

This product can expose you to chemicals which are known in the State of California, USA to cause cancer and reproductive harm. For more information go to www.P65Warnings.ca.gov.

SERVICE

All products to be returned to Axiomatic require a Return Materials Authorization Number (RMA#) from rma@axiomatic.com. Please provide the following information when requesting an RMA number:

- Serial number, part number
- Runtime hours, description of problem
- Wiring set up diagram, application and other comments as needed

DISPOSAL

Axiomatic products are electronic waste. Please follow your local environmental waste and recycling laws, regulations and policies for safe disposal or recycling of electronic waste.

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