Axiom Diagnostic Terminal (ADT)

User Guide

Issue 1.1

Contents

VERSION HISTORY

Issue	Changes	Changes Made By	Date
1.0	Initial release of document	K Corcoran	09/09/2024
1.1	Updates to reflect changes to program functionality	K Corcoran	13/01/2025

OVERVIEW

This document describes the operation of the Axiom Diagnostics Terminal (ADT) application to configure and test Axiom gas refrigerant sensors.

This is an application program designed to run on Windows OS based computers using either an RS232/485 serial communications interface or a direct USB cable to link to the Axiom sensor.

It allows the user to see the current status of the Axiom and examine error flags, useful to verify correct gas readings and proper sensor function.

The application also allows the sensor to be configured in terms of the signal output and the address of the sensor when used in a communications network.

Axiom Gas Refrigerant Sensor

The Axiom sensor is a detector designed specifically to detect the presence of refrigerant gases and to indicate the level of gas by means of either analogue or digital (serial communication or open collector alarm output) signal.

The USB connector port can also be used for direct communication to a host terminal using a USB-C communications cable, even when the sensor is configured to adopt an analogue output signal. In this case, the Axiom checks for the presence of a connected host computer on the USB connector when it first power up and if found, will establish a communications link with the host. If none is found within 5 seconds, the Axiom will configure the USB connector for the selected output mode.

INSTALLATION

This chapter covers the PC hardware and software requirements necessary to be able to run the ADT application

Axiom Diagnostic Terminal Requirements

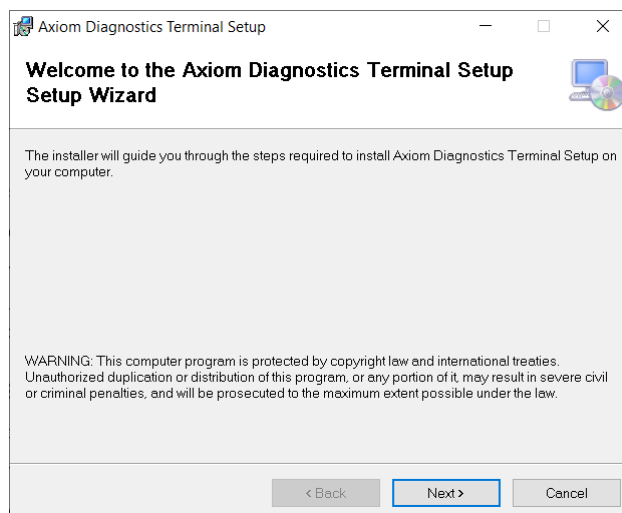To run the ADT application, a computer device with the following specification is required :

- Microsoft Windows 10/11
- 4GB RAM
- 4MB free hard disk space
- USB port or RS232/RS445 communications adapter (with suitable cable)

Installing the Software

The software is typically provided as a Microsoft Installer File, *Axiom Diagnostics Terminal Setup.msi*

This file may be provided as a link by email or through the PST/Dynament website.

To install the software, double-click on the file to open it once downloaded. This will start the installation program.

Click **Next** to continue with the installation.

Accept the default installation options or select an alternative location in which to install the program. Similarly, the user can determine if this application will be available to all users of the computer or just the currently logged in user.

Click **Next** to continue and complete the installation. This will place an icon on the main screen and a new entry in the computer's Applications list from which to launch the application.

Microsoft .Net 8

This application requires the Microsoft .Net 8 framework in order to operate. If this is not detected as being installed on the computer during the installation, then the user will be prompted to downloaded and install the necessary files.

Follow the presented link to download the .Net 8 installation file and then open the downloaded file to complete the installation, accepting all Default prompts.

Alternatively, the latest .Net 8 framework can be downloaded and installed manually from the following link:

https://dotnet.microsoft.com/en-us/download/dotnet/8.0

Use the link to download the appropriate Windows installation file (Arm64, x64, or x32 – if in doubt use x64). This may be downloaded as a compressed ZIP file, in which case open the downloaded ZIP file and extract the contents to a location on the hard disk.

Then run the program **dotnet.exe** to start the installation of the framework.

Connection Between Axiom and Computer Device

The physical communication between the Axiom sensor the ADT application is by means of either a USB cable or a serial RS2323 or RS485 communications cable.

USB Connection

This method is the simplest method of communicating with an Axiom sensor. A standard USB type C data cable is used to connect the Axiom port to a USB port on the computer running the ADT application.

This will create a Virtual COM port on the Windows computer which the ADT application uses to establish communications. The ADT application can either automatically search for such a port and connect to it, or the user can manually select the port number if known (see later).

RS232 or RS485 Connection

The Axiom sensors have a USB output connector that can be configured to provide a digital communication output stream (rather than an analogue output signal) at either RS232 voltage levels (separate Transmit and Receive lines) or an RS485 muti-drop line (balanced pair single signal for transmit and receive amongst multiple devices).

For such communications, a suitable RS232 or RS485 adapter is required to connect the Axiom to the computer running the ADT application.

For RS232, the Transmit line from the computer should be connected to the D- line of the Axiom USB connector and the Receive line to the computer connected to the D+ pin of the Axiom USB connector.
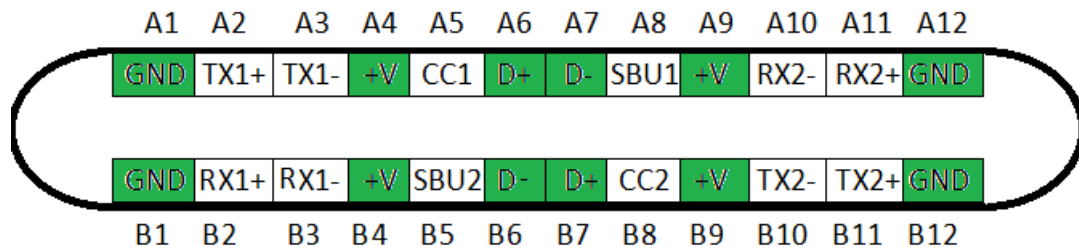
For RS485, the A (sometimes labelled A+) line should be connected to the D+ USB pin of the Axiom and the B line (labelled B- in some systems) connected to the D- pin of the USB connector.

In both cases, power and ground needs to be applied to the +V and GND pins of the USB connector respectively. The voltage can be between 5V and 24V DC and the interface adapters typically provide a 5V supply line for this purpose.

USB Connector Pin Out

The diagram below shows the pin connections of the USB type C connector on the Axiom. The pins in green are the ones to connect to in order to enable communications.

Similar pins are connected together, such that you can connect to any GND or +V pin or either D+ or D- pin. You do not need to connect to all of the pins.

A1	A2	A3	A4	A5	A6	A7	A8	A9	A10	A11	A12
GND	TX1+	TX1-	+V	CC1	D+	D-	SBU1	+V	RX2-	RX2+	GND

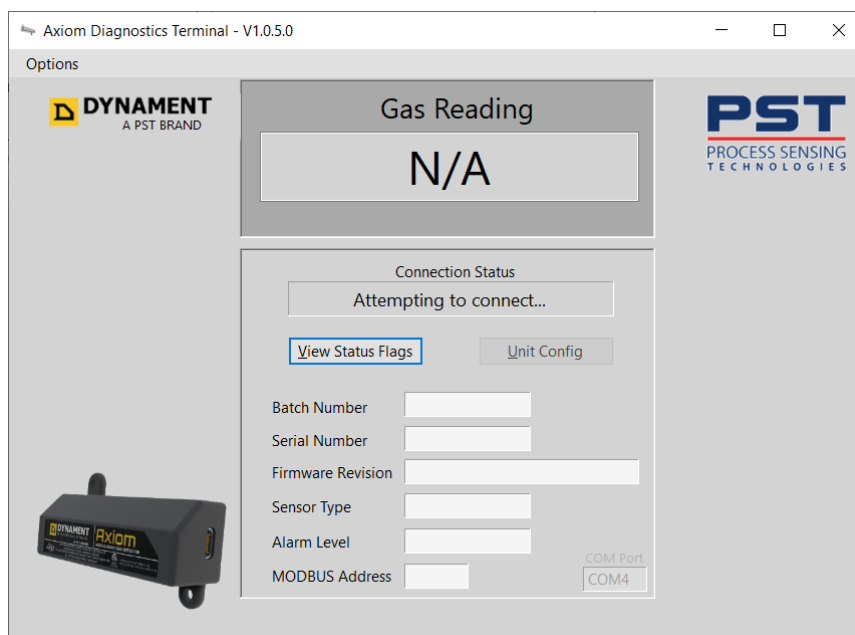| GND	RX1+	RX1-	+V	SBU2	D-	D+	CC2	+V	TX2-	TX2+	GND
B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11	B12

USER GUIDE

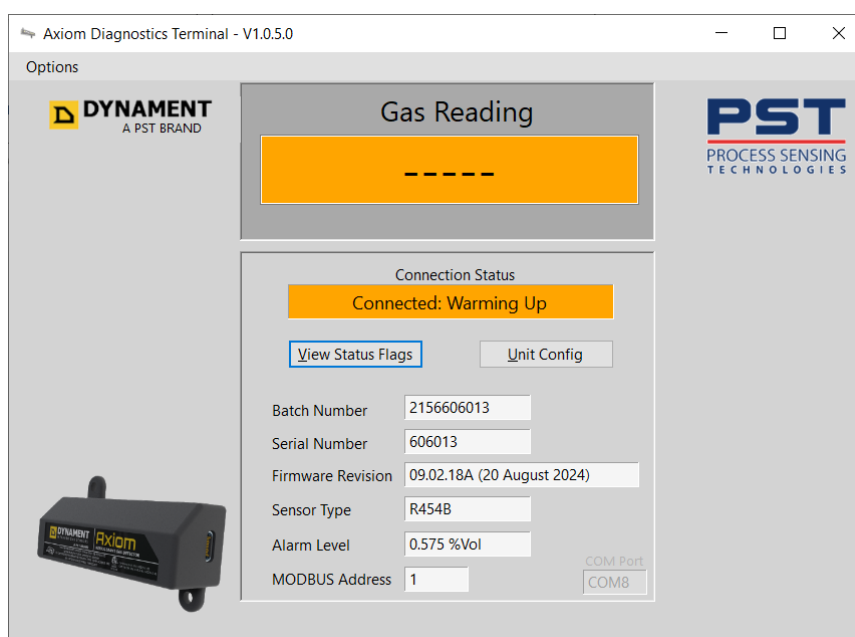This chapter covers the operation and functions of the ADT application.

Connecting to Axiom

By default, the ADT application will be scanning all physical and virtual COM (communication) ports to find an Axiom sensor, so once an Axiom is physically connected, the application should find the sensor after a period of time when it scans the port on which is it actually connected. During this period, the *Connection Status* indicator will show "*Attempting to Connect…*"
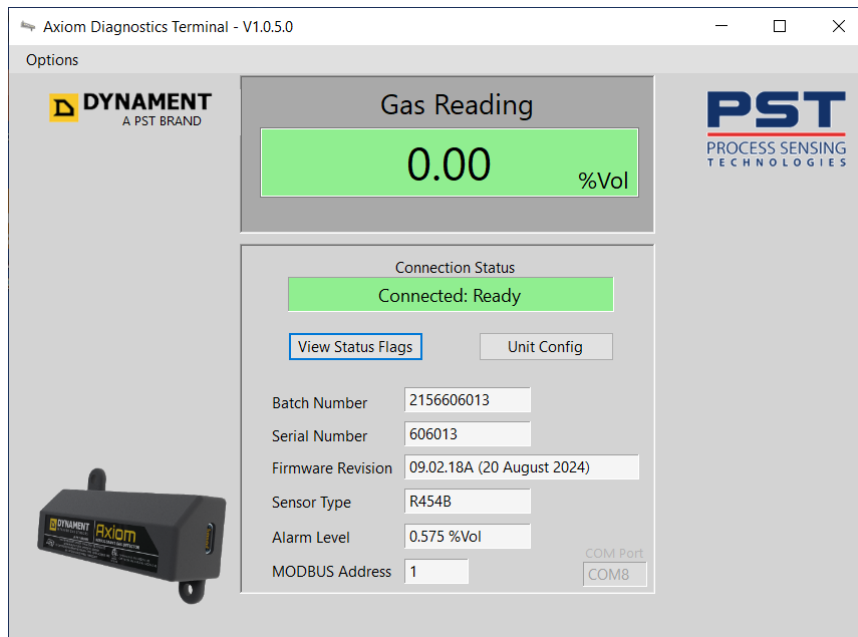

The bottom right corner of the main information window shows the COM port currently being scanned. In a computer with lots of added serial peripherals, there may be many ports so it might be useful to specify which port to use as this is typically fixed to a specific port on any given computer. Fixing the connection port makes for a quicker time to connect when an Axiom is plugged in.   This can be set in the *Program Options* function, which is explained in a chapter below

Once an Axiom is detected, the system will display the information and status of that sensor. If the sensor has just been plugged in, the screen will show that the sensor is *Warming Up.* All sensors require a warm-up period, typically 45 seconds from power on, to stabilise the gas reading. During this warm-up period, the gas reading is not shown whilst the unit stabilises.
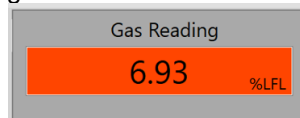
Once the warm-up period has completed, the screen will be showing the current gas reading and general information as below.

The information fields that are shown are as follows:

- **Gas Reading** – this can be shown as either a %Volume reading or as a %LFL value (or PPM for some gases). This is selectable in the Program Options. This display will either show a reading with a green background indicating a valid reading that is under the alarm threshold, or may show a reading with a red background, indicating that the gas reading has exceeded the sensor's alarm threshold:
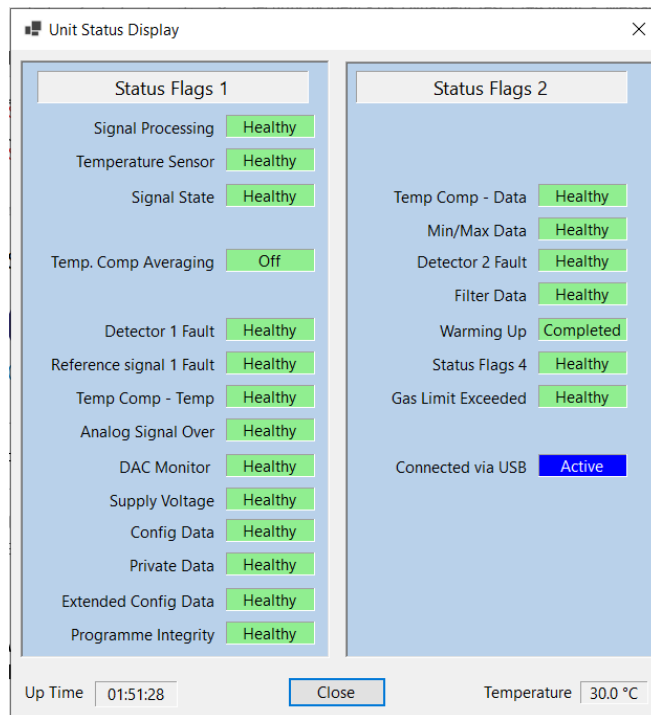

An orange background indicates that the sensor is still warming up after a power on or has detected faults that prevent a valid gas reading from being determined

- **Connection Status** – this shows the status of the communications link with the Axiom sensor. This can have the value:

  o Connected: Ready – unit is connected and communicating

  o Connected: Faults Detected – unit is connected and communicating but the sensor has detected one or more faults (which can be determined from the **View Status Flags** button).

  o Connected: Warming Up – unit is connected, but the unit has recently powered up and is in the warm-up period (gas reading value is not valid)

  o Attempting To Connect… - system is searching for any connected sensors or waiting for one to be connected
  Not Connected – no unit is attached or the fixed COM port is not available

- **Batch Number** – The unique factory identification number which identifies the manufacturing batch of the sensor as well as unique ID of the sensor. Useful when talking to Technical Support with regards to this sensor
- **Serial Number** – serial number of the connected sensor.
- **Firmware Revision** – the version number and date of the sensor's firmware. Useful when reporting any issues to Technical Support
- **Sensor Type** – the gas type that the sensor is configured to detect`
- **Alarm Level** – a level (expressed as %Volume or %LFL depending upon options selected) that determines the alarm threshold. If the gas reading exceeds this level, then an Alarm condition is indicated. If the Open Collector digital output is utilised, it will be set active whilst in alarm condition and inactive when not.
- **MODBUS Address** – when using serial communications interface (RS232 or RS485), the protocol used for information transfer is the industry standard open MODBUS protocol. All server/slave devices within the MODBUS protocol, such as the Axiom, must have a unique address to allow a client system to address the specific sensor when multiple sensors are connected on the same line. This field shows the configured address for the connected sensor (values should be set between 1 and 247). The default MODBUS address is set to 1.

The **View Status Flags** and **Unit Config** button can be used to take a more detailed look at the sensor status and also allow some simple configuration of the sensor itself.
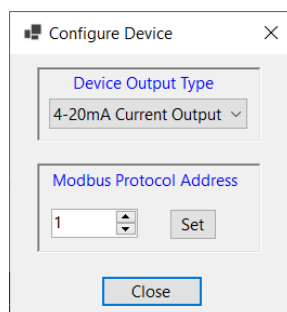
Unit Status Display

This screen shows the individual status flags that the Axiom maintains. This can be useful for the manufacturer in diagnosing issues, should a sensor not be working as expected.

The details of the individual fields are beyond the scope of this document.

Unit Config (Axiom Configuration)

This function is used to configure some basic parameters of the connected Axiom sensor, such as the communications address and the output mode.
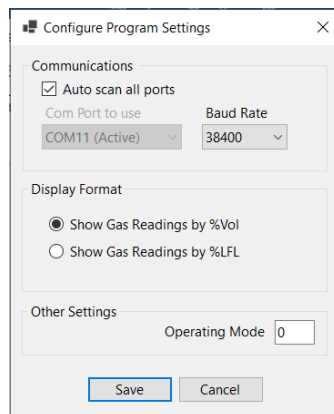

The parameters that can be set are:

➢ **Device Output Type** – This defines how the Axiom's presents the gas reading signal, either as an analogue signal level (current or voltage) or a digital serial communications signal. Options are:

  o *4-20mA Current Output* – the value of the gas reading presented as a current signal on the D+ pin of the USB connector. This indicates the gas reading from 0 (4mA) up to the maximum reading (20mA).

  o *0.2V to 4V Voltage Output* – the value of the gas reading presented as a voltage signal on the D+ pin of the USB connector. This indicates the gas reading from 0 (0.2V) up to the maximum reading (4.0V).

- o *RS485 Serial (Modbus)* – digital communications interface using the industry standard Modbus protocol using RS485 signal levels. Can be used in a multi-drop system of multiple sensors on a single line. The D+ and D- pins of the USB connector provide the balanced pair signal transmission lines.
- o *RS232 Serial (Modbus)* – digital communications interface using the industry standard Modbus protocol using RS232 signal levels. This would typically be used in a one to one system where a host is connected directly to the sensor. The D+ and D- pins of the USB connector provide the Tx and Rx lines of the RS232 interface respectively
- ➢ **Modbus Protocol Address** – The unique address of the Axiom sensor when it is communicating using the Modbus protocol. Eash sensor or server device on a network has a unique address between 1 and 247 that allows multiple sensors to be connected together and addressed dividually by the client device.

Program Options

The *Options* menu of the application contains a *Settings* menu item that allows some of the application parameters to be set, including the communications port, link speed and display format.

The available settings are as follows:

Communications

- ➢ **Auto-scan all ports** – if set, then the application will continuously scan all communication ports searching for a connected Axiom sensor until it finds one, at which point it locks onto that port and commences regular dialogue with the sensor. When the sensor is removed, the application returns to scanning all available ports for connected sensors. If not checked, then the application only scans for sensors on a specific port (as selected below). When the communication port is known, it makes for quicker connection times to specify the port. When connected to a sensor, the main screen status display shows the connected COM port, so this could be selected once known to speed up connection for future sensors.
- ➢ **COM Port to use** – if auto-scan is not enabled (see above), then this field determines which communications (or COM) port to connect to. No other ports will be scanned. Typically, when connecting to sensors using a USB cable or through an RS232/RS485 adaptor, the COM port will always be the same, so turning off auto-scanning and selecting the port here means that the application will connect quicker when a sensor is plugged in, as it doesn't need to search any other ports to check for connection.
- ➢ **Baud Rate** – this determines the speed of the communications link, which is typically set to 38,400 bits per second. Sensors can be ordered with alternative baud rates and this field allows the application to be used with any sensor configured for different speeds.

Display Format

- ➢ **Show Gas Readings by %Vol** – selecting this option ensures that all gas readings (and associated parameters such as alarm threshold) are shown as %Volume values (or PPM for certain gas types).
- ➢ **Show Gas Readings by %LFL** – selecting this option shows gas readings as %LFL (Lower Flammable Limit) figures. For example, for RS454B gas, the alarm threshold is set to 5%LFL by default, which equates to a %Volume figure of 0.575 %Vol as the LFL value is 11.5 %Vol for this gas.

Other Settings

- ➢ **Operating Mode -** this parameter is used to enable certain factory specific operating modes and is beyond the scope of this document.