Field Service Tool User Manual & Troubleshooting Guide

TEO-540 Series Engine Models

September 2023

Part No. SSP-122 Rev. 1

Field Service Tool User Manual & Troubleshooting Guide

Lycoming Part Number: SSP-122 Rev. 1

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The information in this User Manual and Troubleshooting Guide is intended for general use of the FST as a diagnostic tool for TEO-540-Series engines. If available, refer to the model specific engine maintenance manual when identifying faults for your engine. There could be differences in the troubleshooting steps for some faults.

RECORD OF REVISIONS

Revision	Revision Date	Revision Description
Original		Original Release of Field Service Tool User Manual & Troubleshooting Guide - SSP-122
Rev. 1	September 2023	**System Requirements** • Added ST-541 to the item iE2 Field Service Tool CAN Interface for necessary hardware • Revised the NOTICE for necessary hardware • Added new Figure 3 and the NOTICE regarding ST-541 **Software Installation** • Revised the first paragraph to include software requirement when using ST-541 **ECU to FST Connection** • Revised Step 1 to include reference to ST-541 • Revised Figure 1 to include ST-541 **Field Service Tool – Software Problems** • Revised the Corrective Action for “CAN Adapter is not operating correctly.” to include reference to ST-541

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SERVICE DOCUMENT LIST

NOTICE: The following is a list of service documents referenced in or incorporated into the information in this publication. Always refer to the latest revision of any service document for changes or additional information. Supplements to a service document contain information relevant to the service document but not yet added to the service document.

The latest revision of all service documents in this list can be downloaded from our website https://www.lycoming.com/contact/knowledge-base/publications.

To narrow the search parameters and limit the number of returns, enter only the numerical portion of the service document number in the **Search** box on the website.

Number	Incorporation Date	Subject
S.I. 1573	8/22	Lycoming TEO-540 Engine Series Engine Control Unit (ECU) Assembly Cross-References
S.L. L114	8/22	Reciprocating Engine and Accessory Maintenance Publications

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INTRODUCTION

Scope of this Publication

The Field Service Tool (FST) is a diagnostic software loaded on a laptop which is connected by Controller Area Network (CAN) bus interface to the engine's Electronic Engine Control System (EECS). The EECS connects engine hardware with electronic controls to continuously monitor and automatically adjust operating conditions such as ignition timing, fuel injection timing, and fuel mixture.

The EECS is made up of:

- Engine Control Unit (ECU) - a dual channel unit which contains system processors, input signal conditioning, output actuator drive stages, and aircraft communication interfaces. The ECU monitors and controls engine operation and sends this information to the FST. The ECU has a unique part number for each engine.
- Power Box - a dual channel unit which supplies regulated primary and secondary power over to the EECS.
- Data Logger Unit (DLU or ADL) - (optional) a single channel unit that continuously collects and records engine operating data (data history) and fault codes received from the ECU via the CAN. The fault codes are used for engine diagnostics. The data history can show trends to further help with engine diagnostics.

NOTICE: The ECU configuration and part number (P/N) are unique for each engine.

The ECU and POWER BOX are connected by two wiring harnesses, the engine harness and airframe supplied interface harness. Two channels on the ECU communicate with each other through the CAN. Each channel has input processing, a microprocessor and output processing which control the engine independently of each other. Sensors connected to the engine harness send inputs to the ECU to control the engine through output to the actuators. The actuators also are connected to the ECU by the same wiring harnesses.

The CAN is the means to transmit data input and output, including fault codes, to and from the ECU and FST to monitor and control the engine as well as to download data from the optional Data Logger.

This publication contains instructions to:

- Install the FST software on a computer or laptop (or other display device)
- Operate the FST and associated navigation conventions for using the FST
- Access and display engine data
- Access, display, read, export, and clear engine fault codes
- Reset Time Limited Operation (TLO) and No Take-Off (NTO) indicators in the cockpit avionics
- Download run time data, trip data, and data history from the Data Logger
- Display runtime data and active data logged by the field service tool

The "Troubleshooting Guide" found in the maintenance manual for each specific engine model, contains recommended corrective action for the fault codes to remove the root cause which will ultimately enable the fault code to be cleared. In some instances, multiple related fault codes can display if they have a common or associated root cause. In these cases, a logic fault tree is given to help isolate the root cause.

NOTICE: The FST is to be used only during servicing and maintenance and NOT during flight.

Warning, Cautions, and Notices

Be sure to read and obey the Warnings, Cautions and Notices in this publication and in service documents. Although Lycoming cannot know all possible hazards or damages, it makes a reasonable effort to supply the best possible guidance and recommended practices for safe operation and maintenance of its engines.

The table below defines the four types of safety advisory messages used in this publication per the American National Standard and ANSI Z535-6-2006.

Safety Advisory Conventions	
Advisory Word	**Definition**
DANGER:	Indicates a hazardous situation which, if not avoided, will result in death or serious injury. This signal word is to be limited to the most extreme situations.
⚠ **WARNING**	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
⚠ **CAUTION**	Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury. It can also be used without the safety alert symbol as an alternative to **"NOTICE."**
NOTICE:	The preferred signal word to address practices not related to personal injury.

Simplified Technical English

The text in the publication is written in the form of Simplified Technical English in compliance with FAA requirements and to make translation into other languages easier.

Figures

Figures in this publication are for conceptual illustrative purposes only. Figures always start as Figure 1 in each chapter.

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Supplemental Service Information

Refer to the latest revision of Service Letter No. L114 for a list of Lycoming publications available for purchase.

Feedback

To supply comments, suggestions, or corrections to this publication, either call Lycoming Engines Customer Service at the phone number in the front of this publication or use the Lycoming.com website.

Publication Revisions

Lycoming Engines constantly examines our publications to provide our customers the most complete and up-to-date information for operating and maintaining our engines. Revisions to this publication will be published as necessary.

FIELD SERVICE TOOL USER MANUAL

FIELD SERVICE TOOL USER MANUAL ABBREVIATIONS AND ACRONYMS

A	
ADL	Data Logger
AFR	Air-Fuel Ratio
C	
CAN	Controller Area Network
CHT	Cylinder Head Temperature
CID	Cylinder Identification (camshaft position sensor)
CPS	Crankshaft Position Sensor
CRC	Cyclic Redundancy Check
CTC	Cylinder Temperature Control
D	
DC	Direct Current
DLU	Data Logger Unit
E	
ECU	Engine Control Unit (physical box consisting of a primary and a secondary channel)
EECS	Electronic Engine Control System
EGT	Exhaust Gas Temperature
EPA	Environmental Protection Agency
ETC	Electronic Throttle Control
F	
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulations
FAR	Fuel Air Ratio
FFL	Fault Found Lamp
FHA	Functional Hazard Assessment
FRT	Fuel Rail Temperature
FSM	Finite State Machine
FST	Field Service Tool
K	
KAM	Keep Alive Memory
M	
MAT	Manifold Air Temperature

FIELD SERVICE TOOL USER MANUAL ABBREVIATIONS AND ACRONYMS (CONT.)

N	
NTC	Negative Temperature Coefficient type Thermistor
NTO	No Take Off
P	
PFT	Pre-Flight Test
PSSA	Preliminary System Safety Assessment
R	
RAM	Random Access Memory
ROC	Rate of Change
ROM	Read Only Memory
RTCA	Radio Technical Commission for Aeronautics
RTD	Resistance Temperature Detector
S	
SAE	Society of Automotive Engineers
SPF	Single Point Failure
T	
TBD	To Be Decided
TBO	Time Between Overhaul
TLO	Time Limited Operation
TIT	Turbine Inlet Temperature
TPS	Throttle Position Sensor
W	
WGA	Wastegate Actuator

SYSTEM REQUIREMENTS

The following hardware is necessary to use the Field Service Tool (FST):

- A laptop using Windows 7 or 10 operating system with an internet connection.
- iE2 Service Cable - ST-528 (Figure 1).
- iE2 Field Service Tool CAN Interface - ST-530 (Figure 2) or ST-541 (Figure 3).

NOTICE: ST-528, ST-530, and ST-541 are available from an Authorized Lycoming Engines Distributor.

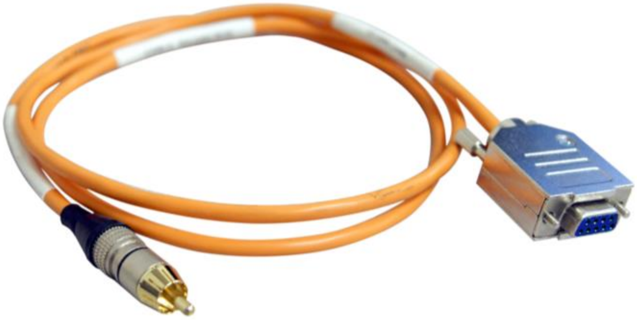

Figure 1
iE2 Service Cable - ST-528

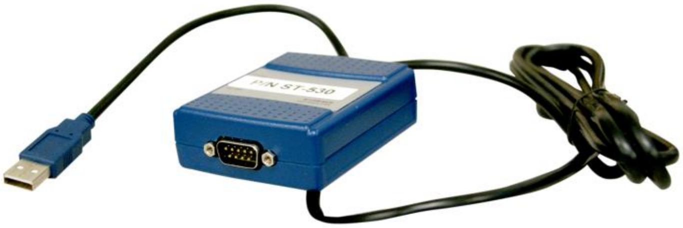

Figure 2
iE2 Field Service Tool CAN Interface - ST-530

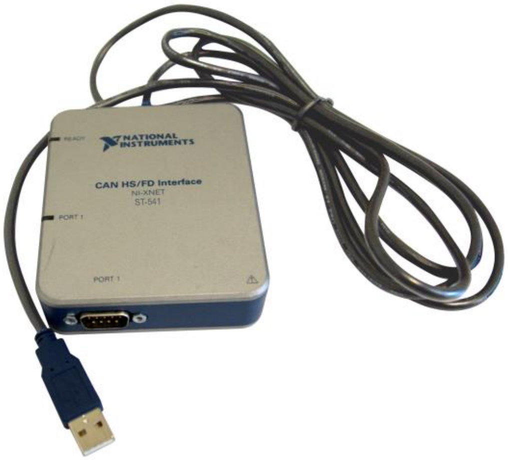
NATIONAL INSTRUMENTS
CAN HS/FD Interface
NI-XNET
ST-541
READY
PORT 1
PORT 1

Figure 3
iE2 Field Service Tool CAN Interface - ST-541

NOTICE: Software v6.0 or later is necessary when using ST-541.

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SOFTWARE INSTALLATION

This chapter contains step-by-step instructions for installing the FST software. The following download procedure pictures are for illustrative and procedural purposes. The latest version of FST software should be used. Software v6.0 or later is necessary when using ST-541.

1. With the laptop turned on and connected to the internet, navigate to the Lycoming Engines Home Page www.lycoming.com.
2. Click on the iE2 Portal tab in the ribbon at the top of the page (Figure 1).

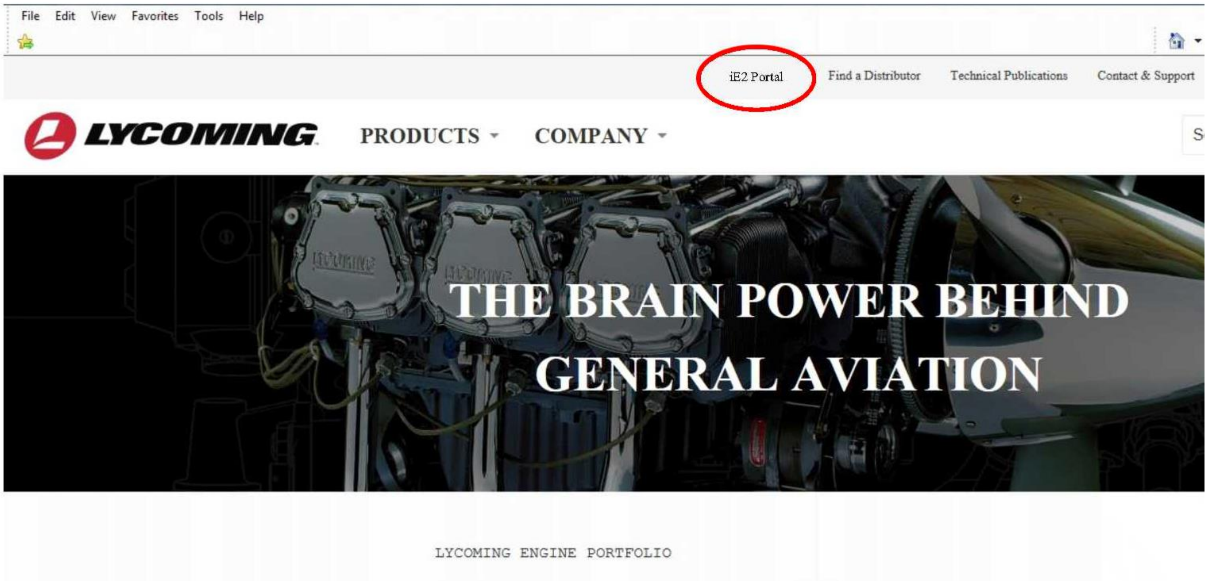
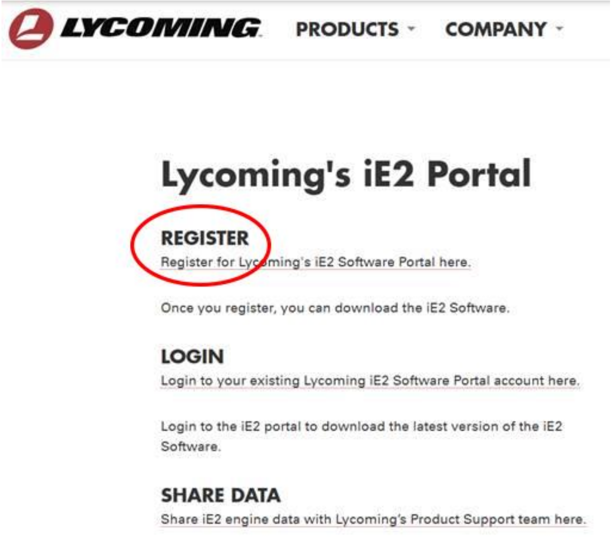

File
Edit
View
Favorites
Tools
Help
iE2 Portal
Find a Distributor
Technical Publications
Contact & Support
LYCOMING
PRODUCTS
COMPANY
THE BRAIN POWER BEHIND
GENERAL AVIATION
LYCOMING ENGINE PORTFOLIO

Figure 1
iE2 Portal on the Lycoming.com Website

3. If you are not already registered, click on **REGISTER** (Figure 2) and enter your email address and name (Figure 3) on the First-Time Registration Page.


LYCOMING
PRODUCTS
COMPANY

Lycoming's iE2 Portal

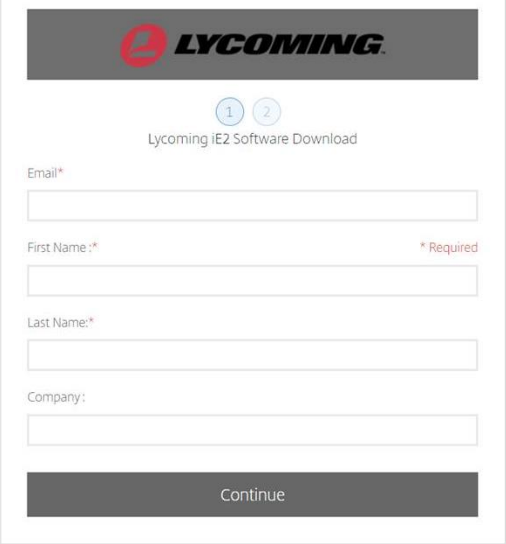
REGISTER
Register for Lycoming's iE2 Software Portal here.

Once you register, you can download the iE2 Software.

LOGIN
Login to your existing Lycoming iE2 Software Portal account here.

Login to the iE2 portal to download the latest version of the iE2 Software.

SHARE DATA
Share iE2 engine data with Lycoming's Product Support team here.


LYCOMING
1
2
Continue

Lycoming iE2 Software Download

Email*

First Name :*

* Required

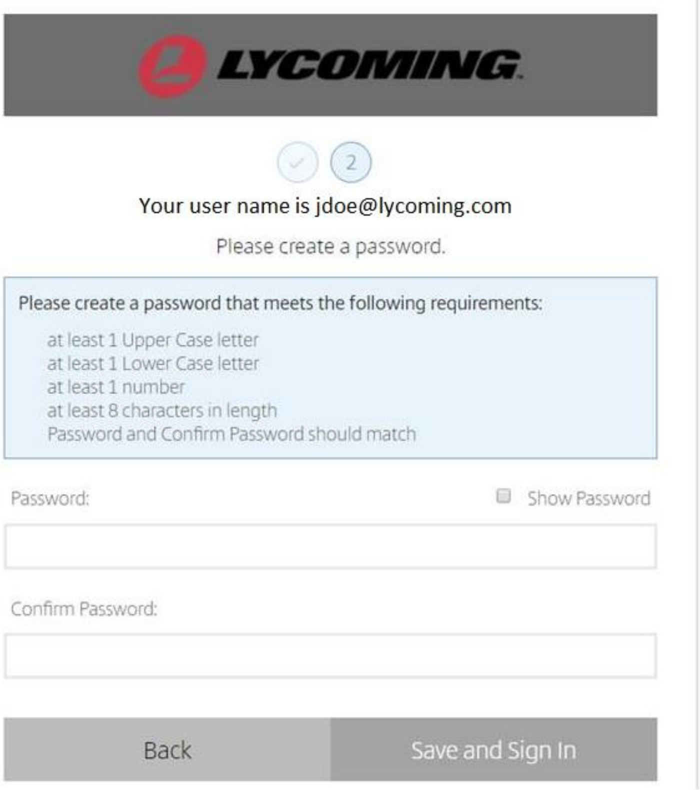
Last Name:*

Company:

Figure 2
Lycoming iE2 Software Portal

Figure 3
First-Time Registration Page

4. Click **Continue** on the First-Time Registration Page and you will be transferred to the Password Entry Page to create and confirm a password (Figure 4).
5. After you have successfully registered, you will receive a confirmation email from Lycoming.



Your user name is jdoe@lycoming.com

Please create a password.

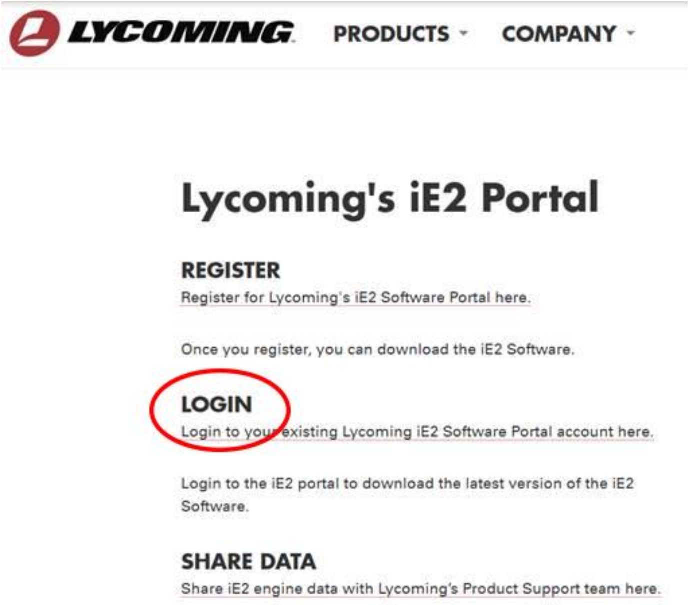
Please create a password that meets the following requirements:

at least 1 Upper Case letter
at least 1 Lower Case letter
at least 1 number
at least 8 characters in length
Password and Confirm Password should match

LYCOMING
2
Password:
☐ Show Password
Confirm Password:
Back
Save and Sign In

Figure 4
Password Entry Page

6. If you are already registered, click on **LOGIN** (Figure 5) and go directly to the Log-In page (Figure 6) to enter your username and password.



LYCOMING
PRODUCTS
COMPANY

Lycoming's iE2 Portal

REGISTER

Register for Lycoming's iE2 Software Portal here.

Once you register, you can download the iE2 Software.

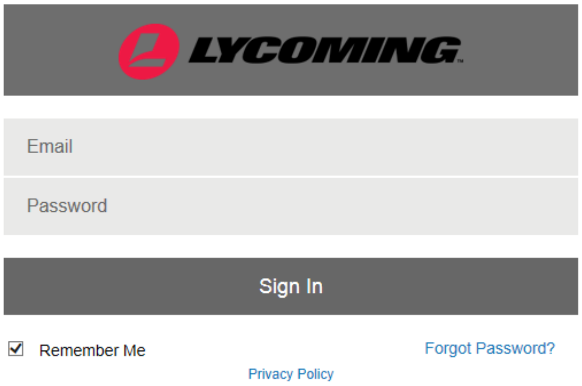
LOGIN

Login to your existing Lycoming iE2 Software Portal account here.

Login to the iE2 portal to download the latest version of the iE2 Software.

SHARE DATA

Share iE2 engine data with Lycoming's Product Support team here.

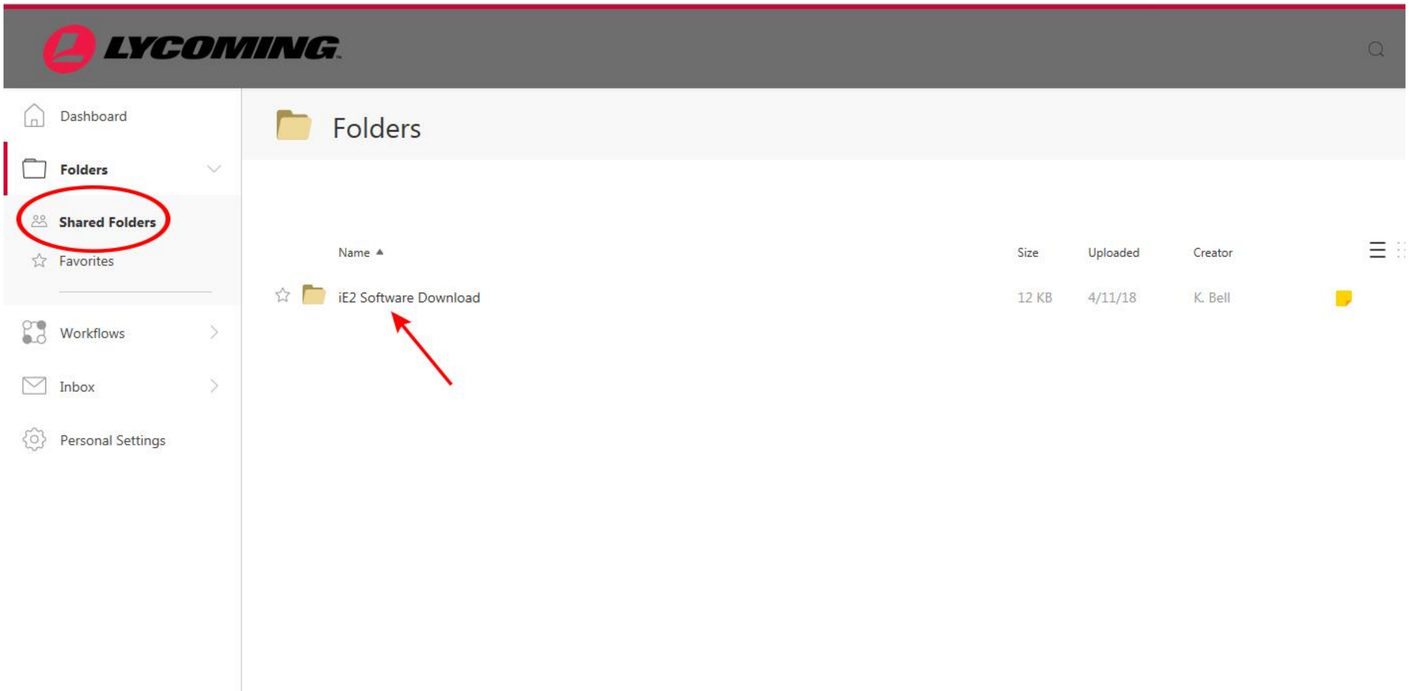


LYCOMING
Email
Password
Sign In
☑ Remember Me
Forgot Password?
Privacy Policy

Figure 5
Lycoming iE2 Software Portal

Figure 6
Log-In Page

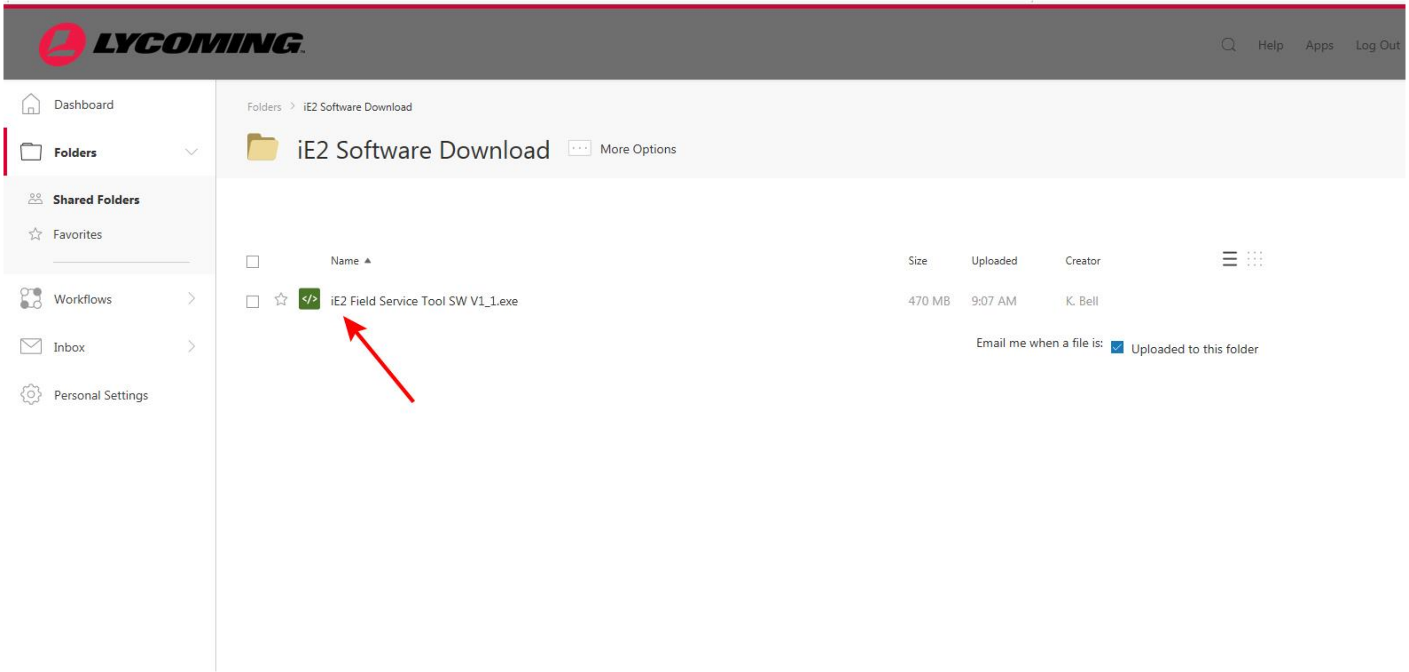
7. After log-in, navigate to the **Shared Folders** page (Figure 7) and double-click on the **iE2 Software Download**.


LYCOMING
Dashboard
Folders
Shared Folders
Favorites
Workflows
Inbox
Personal Settings
Folders
Name ▲
Size
Uploaded
Creator

iE2 Software Download 12 KB 4/11/18 K. Bell

Figure 7
Shared Folders Page

8. You will be transferred to the **iE2 Software Download** page (Figure 8). Double-click on the **iE2 Field Service Tool SW** icon.

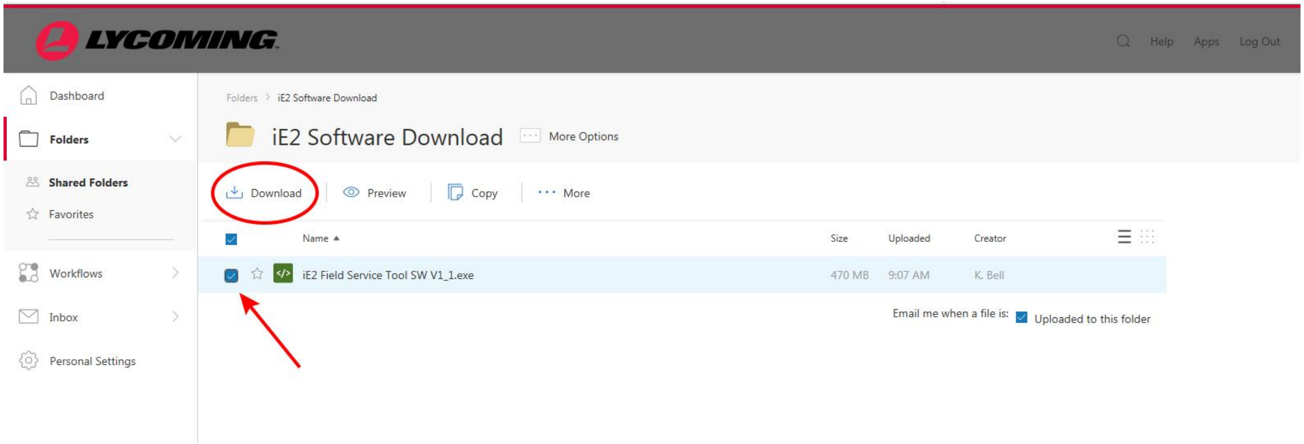

LYCOMING
Help
Apps
Log Out
Dashboard
Folders
Shared Folders
Favorites
Workflows
Inbox
Personal Settings
Folders > iE2 Software Download
iE2 Software Download
More Options
Name ▲
Size
Uploaded
Creator

iE2 Field Service Tool SW V1_1.exe 470 MB 9:07 AM K. Bell

Email me when a file is: ☑ Uploaded to this folder

Figure 8
iE2 Software Download Page

9. Check the box to the left of the “iE2 Field Service Tool SW” icon then click on the **Download** button (Figure 9).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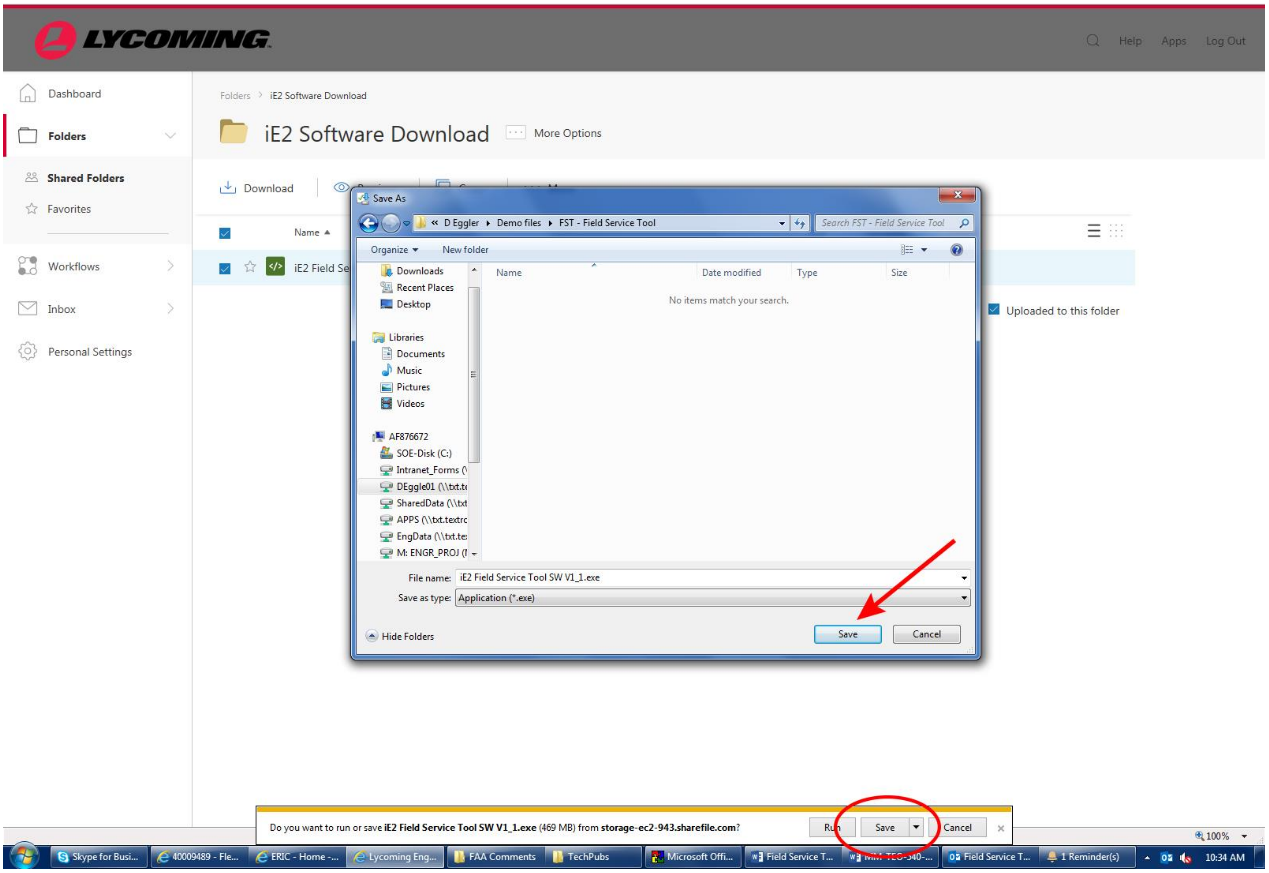
Help
Apps
Log Out
Dashboard
Folders
Shared Folders
Favorites
Workflows
Inbox
Personal Settings
Folders > iE2 Software Download
iE2 Software Download
More Options
Download
Preview
Copy
More
Name
Size
Uploaded
Creator
iE2 Field Service Tool SW V1_1.exe
470 MB
9:07 AM
K. Bell

Email me when a file is: ☑ Uploaded to this folder

Figure 9
File Download Page

10. Click the **Save** button from the pop-up window at the bottom of the page (Figure 10) and choose a file folder location for the download from the Save As dialog window, then click **Save.**


LYCOMING
Help
Apps
Log Out
Dashboard
Folders
Shared Folders
Favorites
Workflows
Inbox
Personal Settings
Folders > iE2 Software Download
iE2 Software Download
More Options
Download
Name
iE2 Field Se
Save As
« D Eggler ▸ Demo files ▸ FST - Field Service Tool
Search FST - Field Service Tool
Organize
New folder
Downloads
Recent Places
Desktop
Libraries
Documents
Music
Pictures
Videos
AF876672
SOE-Disk (C:)
Intranet_Forms (\
DEggle01 (\\txt.t
SharedData (\\txt
APPS (\\txt.textrc
EngData (\\txt.te
M: ENGR_PROJ (I
Name
Date modified
Type
Size
Hide Folders
Save
Cancel
Run
Save
Cancel
100%
10:34 AM

No items match your search.

File name: iE2 Field Service Tool SW V1_1.exe

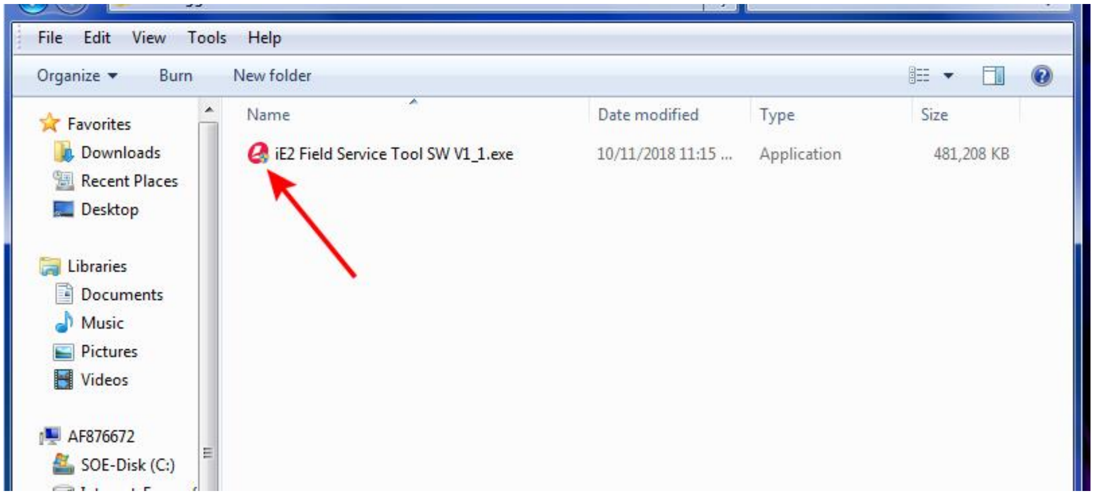
Save as type: Application (*.exe)

☑ Uploaded to this folder

Do you want to run or save **iE2 Field Service Tool SW V1_1.exe** (469 MB) from **storage-ec2-943.sharefile.com**?

Figure 10
File Save Page

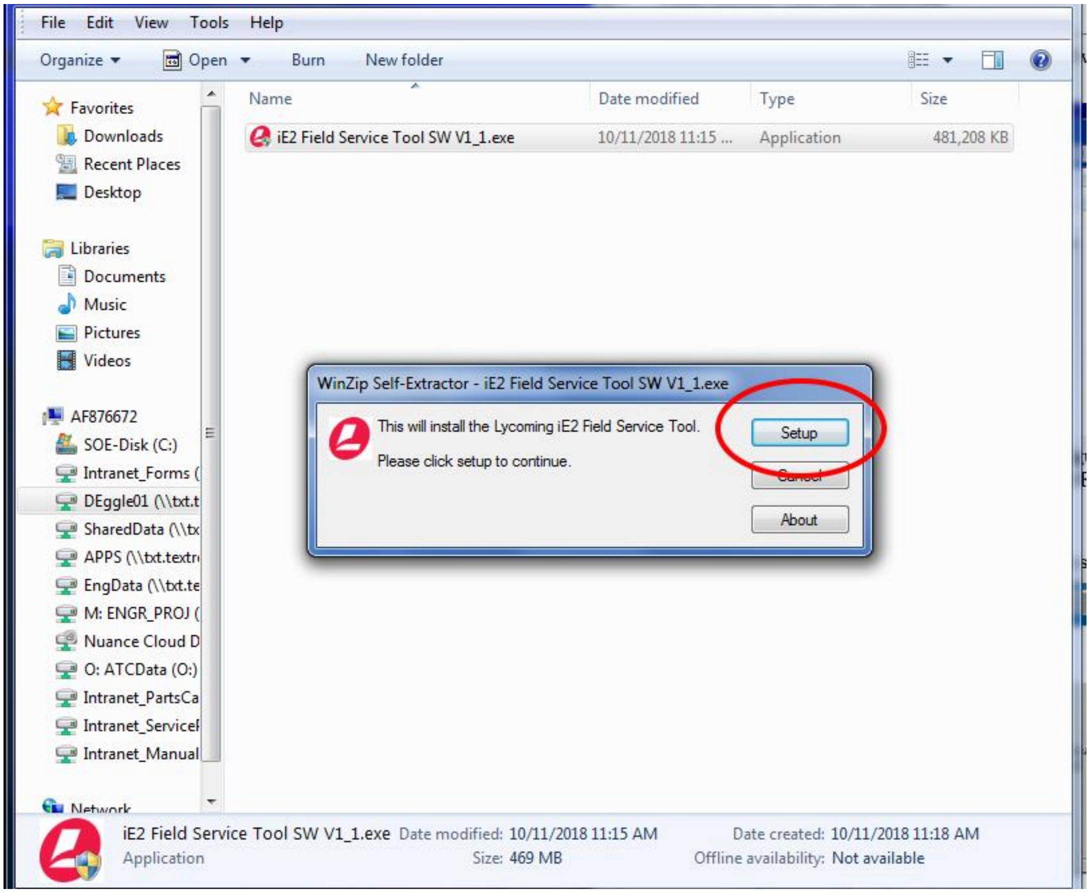
11. From the file folder where the download was saved, double-click the "iE2 Field Service Tool SW" icon (Figure 11) to open the Destination Directory.


File
Edit
View
Tools
Help
Organize
Burn
New folder
Name
Date modified
Type
Size
Favorites
Downloads
Recent Places
Desktop
Libraries
Documents
Music
Pictures
Videos
AF876672
SOE-Disk (C:)

iE2 Field Service Tool SW V1_1.exe 10/11/2018 11:15 ... Application 481,208 KB

Figure 11
Saved File Folder

12. Click the **Setup** button on the WinZip Self Extractor dialog box (Figure 12).


File
Edit
View
Tools
Help
Organize
Open
Burn
New folder
Name
Date modified
Type
Size
Favorites
Downloads
Recent Places
Desktop
Libraries
Documents
Music
Pictures
Videos
AF876672
SOE-Disk (C:)
Intranet_Forms (
DEggle01 (\\txt.t
SharedData (\\tx
APPS (\\txt.textr
EngData (\\txt.te
M: ENGR_PROJ (
Nuance Cloud D
O: ATCData (O:)
Intranet_PartsCa
Intranet_Service
Intranet_Manual
Network
Setup
Cancel
About

iE2 Field Service Tool SW V1_1.exe 10/11/2018 11:15 ... Application 481,208 KB

WinZip Self-Extractor - iE2 Field Service Tool SW V1_1.exe

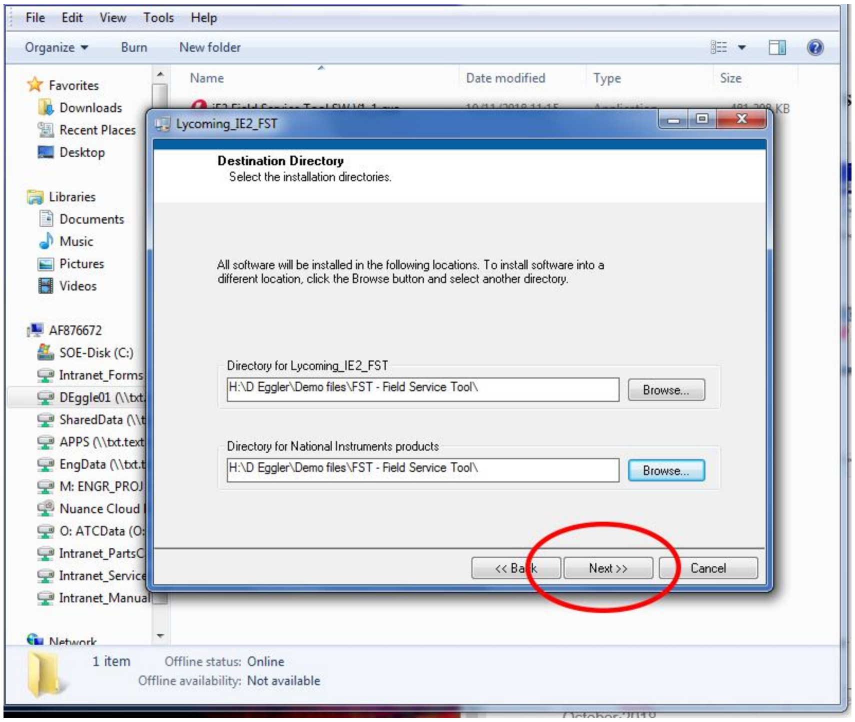
This will install the Lycoming iE2 Field Service Tool.

Please click setup to continue.

iE2 Field Service Tool SW V1_1.exe Date modified: 10/11/2018 11:15 AM Date created: 10/11/2018 11:18 AM
Application Size: 469 MB Offline availability: Not available

Figure 12
WinZip Self Extractor Dialog Box

13. Choose the folder location for the software in the Destination Directory (Figure 13), then click the **Next** button.


File
Edit
View
Tools
Help
Organize
Burn
New folder
Favorites
Downloads
Recent Places
Desktop
Libraries
Documents
Music
Pictures
Videos
AF876672
SOE-Disk (C:)
Intranet_Forms
Network
Name
Date modified
Type
Size
Lycoming_IE2_FST
<< Back
Next >>
Cancel
1 item
Offline status: Online
Offline availability: Not available

Destination Directory
Select the installation directories.

All software will be installed in the following locations. To install software into a different location, click the Browse button and select another directory.

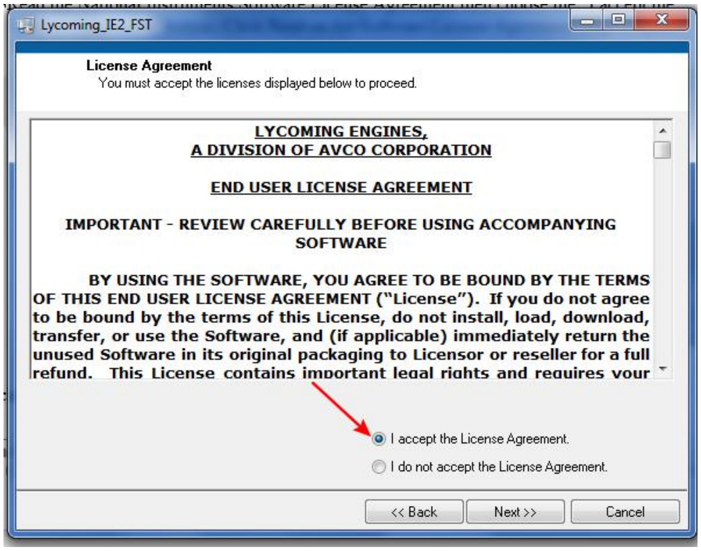
Directory for Lycoming_IE2_FST: H:\D Eggler\Demo files\FST - Field Service Tool\ Browse...

Directory for National Instruments products: H:\D Eggler\Demo files\FST - Field Service Tool\ Browse...

Figure 13
Destination Directory Dialog Box

14. Read the Lycoming Software License Agreement then choose the “I accept the License Agreement” button. Click **Next** on the License Agreement page (Figure 14).

15. Read the National Instruments Software License Agreement then choose the “I accept the License Agreement” button. Click **Next** on the License Agreement page (Figure 15).


Lycoming_IE2_FST
<< Back
Next >>
Cancel

License Agreement
You must accept the licenses displayed below to proceed.

LYCOMING ENGINES,
A DIVISION OF AVCO CORPORATION

END USER LICENSE AGREEMENT

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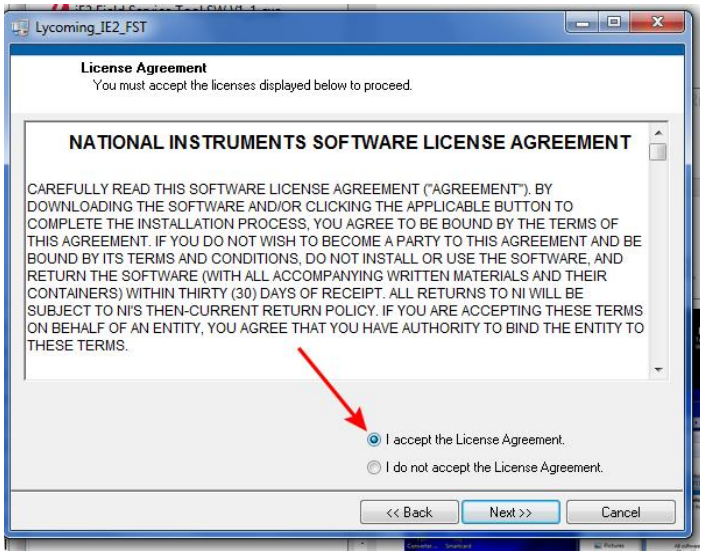
● I accept the License Agreement.
○ I do not accept the License Agreement.

Figure 14
Lycoming Software License Agreement


Lycoming_IE2_FST
<< Back
Next >>
Cancel

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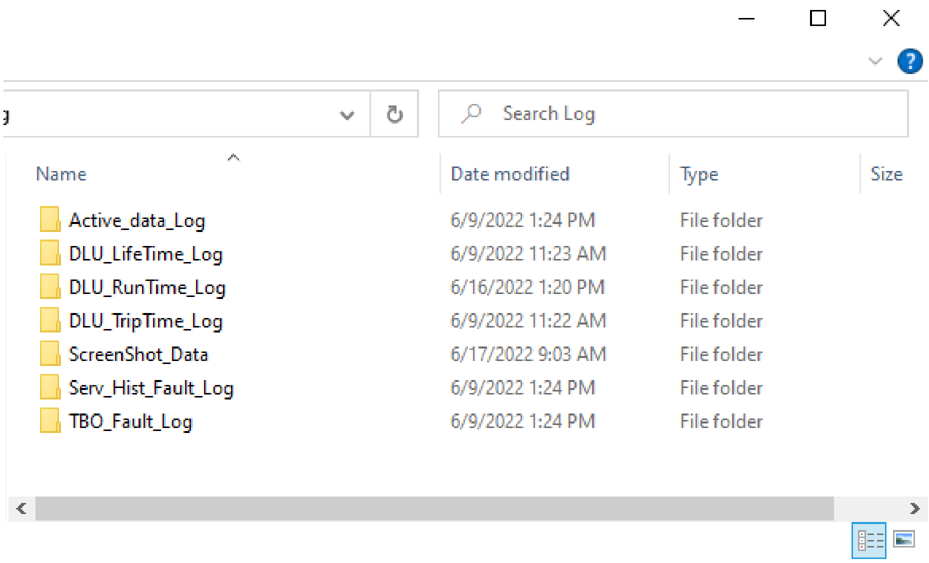
● I accept the License Agreement.
○ I do not accept the License Agreement.

Figure 15
Software License Agreement

NOTICE: The program will create an icon in the Program Menu named “FST”. The program also creates folders in the Documents folder of the laptop hard drive (Figure 16):

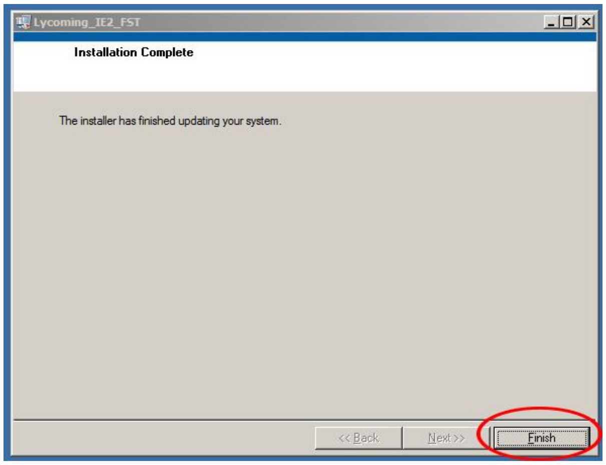
- A separate folder for storing downloaded Active Fault Codes
- Separate folders for storing data from the Data Logger for LifeTime, RunTime, and TripTime
- A separate folder for storing downloaded Screen Shots
- A separate folder for storing Service History Faults
- A separate folder for storing TBO Fault History



Name	Date modified	Type	Size
Active_data_Log	6/9/2022 1:24 PM	File folder	
DLU_LifeTime_Log	6/9/2022 11:23 AM	File folder	
DLU_RunTime_Log	6/16/2022 1:20 PM	File folder	
DLU_TripTime_Log	6/9/2022 11:22 AM	File folder	
ScreenShot_Data	6/17/2022 9:03 AM	File folder	
Serv_Hist_Fault_Log	6/9/2022 1:24 PM	File folder	
TBO_Fault_Log	6/9/2022 1:24 PM	File folder	

Figure 16
Folder on the Laptop Hard Drive

16. After the “Installation Complete” message is shown, click the **Finish** button (Figure 17).



Installation Complete

The installer has finished updating your system.

Figure 17
Installation Complete

17. Reboot the laptop to finalize the FST installation.

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ECU TO FST CONNECTION

Connect the ECU to the laptop where the FST is installed

1. Connect the USB plug end of the iE2 Field Service Tool CAN Interface (ST-530 or ST-541) to the USB port on the laptop.
2. Connect the CAN Interface plug end of the iE2 Service Cable (ST-528) to the CAN Interface.
3. Connect the RCA plug end of the iE2 Service Cable (ST-528) to the airframe-supplied RCA jack in the cockpit.

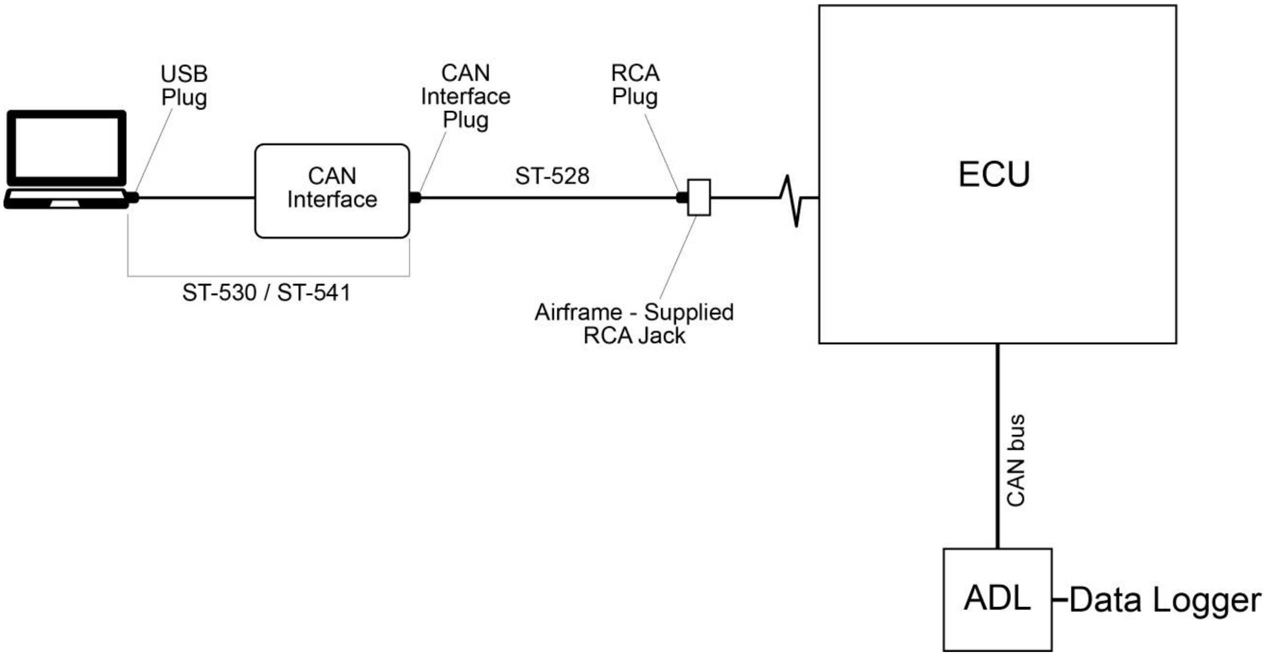
USB Plug
CAN Interface Plug
RCA Plug
CAN Interface
ST-528
ECU
ST-530 / ST-541
Airframe - Supplied RCA Jack
CAN bus
ADL
Data Logger

Figure 1
Laptop Connected to the ECU

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ACCESS THE FIELD SERVICE TOOL

This section contains step-by-step instructions for accessing the FST installed on the laptop.

Start the FST Program

NOTICE: Always connect the laptop to the RCA jack in the cockpit before opening the FST program.

1. Connect the laptop to the RCA jack in the cockpit per the “ECU to FST Connection” chapter.

NOTICE: If possible, use ground power instead of the aircraft batteries to supply power to the aircraft.

2. Turn power to the ECU **ON** per instructions in the applicable aircraft manual.
3. Turn on the laptop.
4. Click the **Start** button.
5. Click **All Programs.**
6. Find the FST Folder in the menu and double-click on **Field Service Tool** (Figure 1).

NOTICE: The program will open and display the Home screen (Figure 2). If the program does not open, refer to the “Field Service Tool - Software Problems” chapter in this manual.

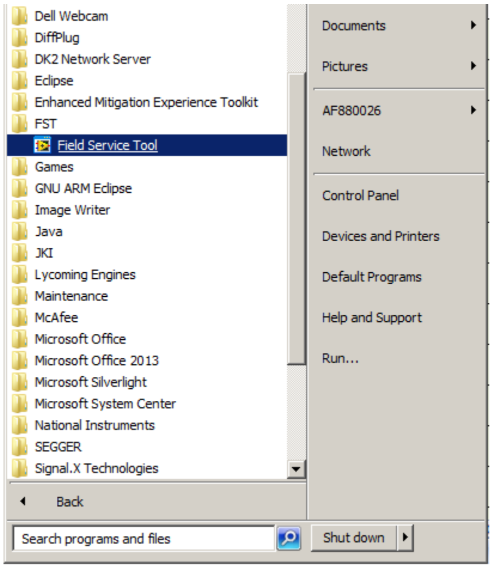

Dell Webcam
DiffPlug
DK2 Network Server
Eclipse
Enhanced Mitigation Experience Toolkit
FST
Field Service Tool
Games
GNU ARM Eclipse
Image Writer
Java
JKI
Lycoming Engines
Maintenance
McAfee
Microsoft Office
Microsoft Office 2013
Microsoft Silverlight
Microsoft System Center
National Instruments
SEGGER
Signal.X Technologies
Back
Search programs and files
Documents
Pictures
AF880026
Network
Control Panel
Devices and Printers
Default Programs
Help and Support
Run...
Shut down

Figure 1
Field Service Tool Folder

NOTICE: Each Tab is an independent function and do not have to be accessed in a certain order.

Home Tab

1. Click the **Upload** button on the Home screen (Figure 2) to display:
   - Engine Serial Number
   - Engine Hours
   - ECU Serial Number
   - ECU Hours
   - CRC Code Version
   - CRC Data Version
   - CRC Boot Version
2. Verify that the serial numbers displayed by the FST are the same as the serial numbers on the data tags on the engine and the ECU.

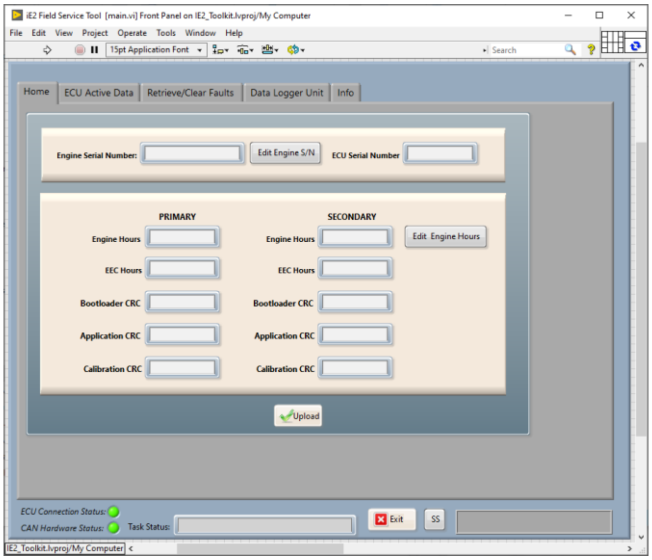

iE2 Field Service Tool [main.vi] Front Panel on IE2_Toolkit.lvproj/My Computer
File
Edit
View
Project
Operate
Tools
Window
Help
15pt Application Font
Search
Home
ECU Active Data
Retrieve/Clear Faults
Data Logger Unit
Info
Engine Serial Number:
Edit Engine S/N
ECU Serial Number
PRIMARY
SECONDARY
Engine Hours
Engine Hours
Edit Engine Hours
EEC Hours
EEC Hours
Bootloader CRC
Bootloader CRC
Application CRC
Application CRC
Calibration CRC
Calibration CRC
Upload
ECU Connection Status:
CAN Hardware Status:
Task Status:
Exit
SS
IE2_Toolkit.lvproj/My Computer

Figure 2
Home Tab

NOTICE: Connection is indicated by the two status lights in the lower left corner of the screen.

3. If the Connection Status indicator in the lower left corner of the screen indicates there is no ECU Connection even though the CAN Hardware is connected (Figure 3):

   A. Close the FST program per the Close the FST Program" section in this chapter then start to FST program per the "Start the FST Program" previously in this chapter.

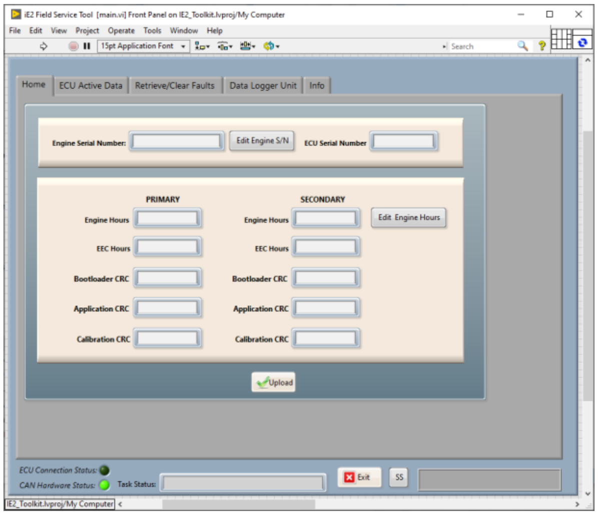

IE2 Field Service Tool [main.vi] Front Panel on IE2_Toolkit.lvproj/My Computer
File Edit View Project Operate Tools Window Help
15pt Application Font
Search
Home
ECU Active Data
Retrieve/Clear Faults
Data Logger Unit
Info
Engine Serial Number:
Edit Engine S/N
ECU Serial Number
PRIMARY
SECONDARY
Engine Hours
EEC Hours
Bootloader CRC
Application CRC
Calibration CRC
Edit Engine Hours
Upload
ECU Connection Status:
CAN Hardware Status:
Task Status:
Exit
SS
IE2_Toolkit.lvproj/My Computer

Figure 3
ECU Not Connected

NOTICE: If neither of the status lights are lit:

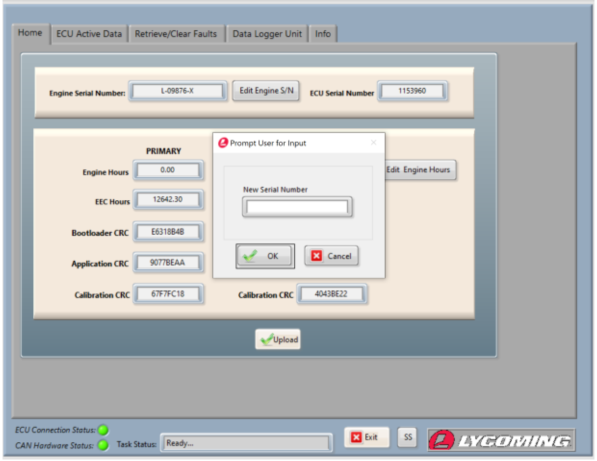
   (1) Examine the cable and connection between the CAN Adapter and the ECU to make sure the connections are secure, and the cable is not damaged.
   (2) Replace damaged cables or cables with damaged connectors.
   (3) Attach the cable per the "ECU to FST Connection" Chapter in this manual.
   (4) Start to FST program per the "Start the FST Program".

4. If the engine serial number displayed by the FST is not the same as the serial number on the engine data tag:

   A. Click the **Edit Engine S/N** (Figure 4) button on the "Engine Serial Number" panel.

   B. Enter the correct engine serial number in the "New Serial Number" box of the "Prompt User for Input" window.

   C. Click **OK** then click **Upload** on the "Engine Serial Number" panel.


Home
ECU Active Data
Retrieve/Clear Faults
Data Logger Unit
Info
Edit Engine S/N
PRIMARY
Prompt User for Input
New Serial Number
OK
Cancel
Edit Engine Hours
Upload
ECU Connection Status:
CAN Hardware Status:
Exit
SS
LYCOMING

Engine Serial Number: L-09876-X
ECU Serial Number: 1153960
Engine Hours: 0.00
EEC Hours: 12642.30
Bootloader CRC: E6318B4B
Application CRC: 9077BEAA
Calibration CRC: 67F7FC18
Calibration CRC: 4043BE22
Task Status: Ready...

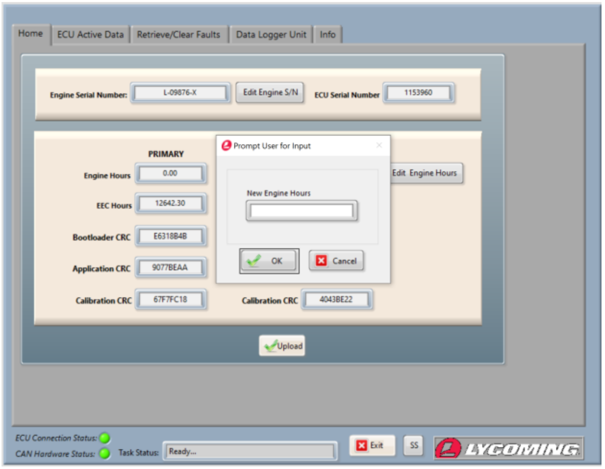
Figure 4
New Serial Number Window

5. If the engine hours displayed by the FST is not correct:

   A. Click the **Edit Engine Hours** (Figure 5) button on the "Engine Serial Number" panel.

   B. Enter the correct engine serial number in the "New Engine Hours" box of the "Prompt User for Input" window.

   C. Click **OK** then click **Upload** on the "New Engine Hours" panel.


Home
ECU Active Data
Retrieve/Clear Faults
Data Logger Unit
Info
Edit Engine S/N
PRIMARY
Prompt User for Input
New Engine Hours
OK
Cancel
Edit Engine Hours
Upload
ECU Connection Status:
CAN Hardware Status:
Exit
SS
LYCOMING

Engine Serial Number: L-09876-X
ECU Serial Number: 1153960
Engine Hours: 0.00
EEC Hours: 12642.30
Bootloader CRC: E6318B4B
Application CRC: 9077BEAA
Calibration CRC: 67F7FC18
Calibration CRC: 4043BE22
Task Status: Ready...

Figure 5
Engine Hours Update

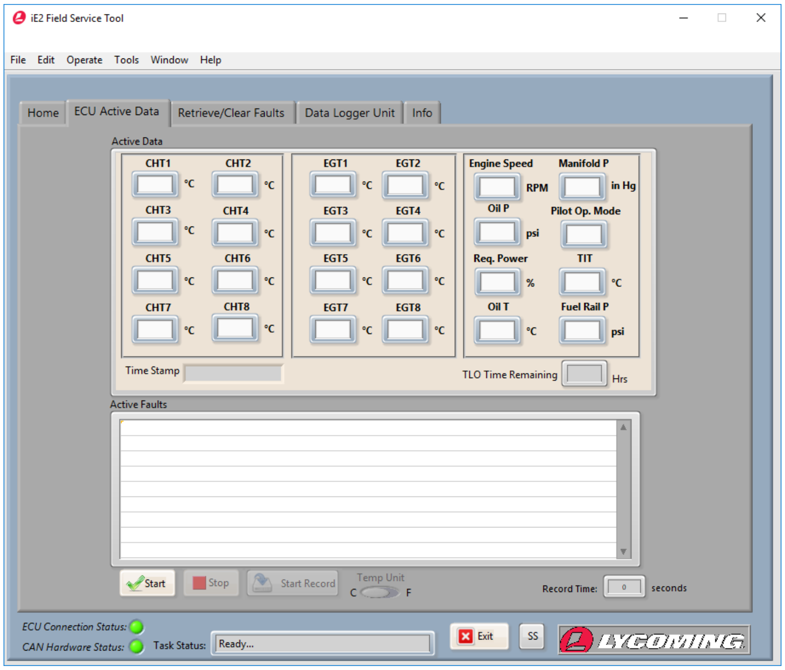
Displaying ECU Active Data

The “ECU Active Data” screen contains two panels.

- The “Active Data” panel displays current active data.
- The “Active Faults” panel displays active faults as they are broadcast from the ECU.

1. Open the FST program per the “Start the FST Program” procedure.
2. Click on the ECU Active Data tab (Figure 6).
3. Click the **Start** button on the “ECU Active Data” screen (Figure 6) to display active faults data from the ECU.

NOTICE: If the “Active Faults” panel is blank there is no active fault data in the ECU.

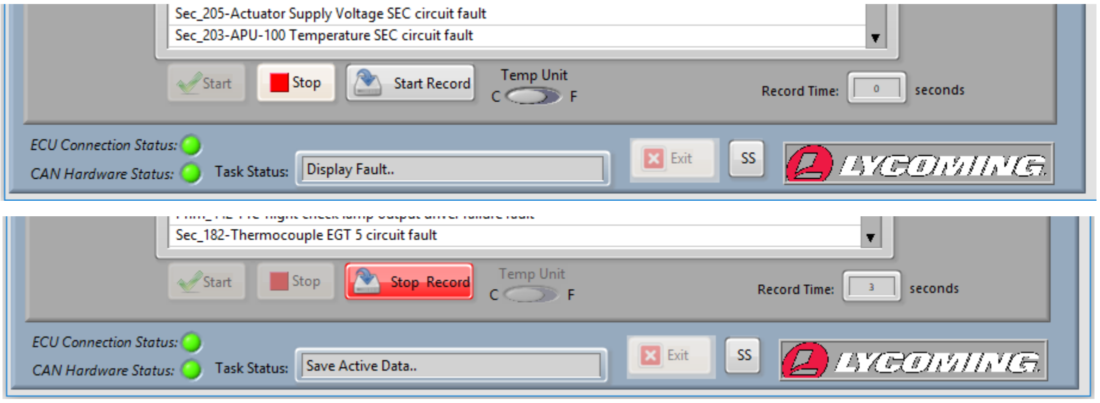

iE2 Field Service Tool
File Edit Operate Tools Window Help
Home
ECU Active Data
Retrieve/Clear Faults
Data Logger Unit
Info
Active Data
CHT1 CHT2 CHT3 CHT4 CHT5 CHT6 CHT7 CHT8 °C
EGT1 EGT2 EGT3 EGT4 EGT5 EGT6 EGT7 EGT8 °C
Engine Speed RPM
Manifold P in Hg
Oil P psi
Pilot Op. Mode
Req. Power %
TIT °C
Oil T °C
Fuel Rail P psi
Time Stamp
TLO Time Remaining Hrs
Active Faults
Start
Stop
Start Record
Temp Unit C F
Record Time: 0 seconds
ECU Connection Status:
CAN Hardware Status:
Task Status:
Exit
SS
LYCOMING

Task Status: Ready...

Figure 6
ECU Broadcast Faults Tab

4. Click the **Stop** button (Figure 7) to stop reading active data from the ECU.

NOTICE: Must be streaming active data to record.


Sec_205-Actuator Supply Voltage SEC circuit fault
Sec_203-APU-100 Temperature SEC circuit fault

Task Status: Display Fault..

Sec_182-Thermocouple EGT 5 circuit fault

Task Status: Save Active Data..

Start
Stop
Start Record
Temp Unit C F
Record Time: 0 seconds
ECU Connection Status:
CAN Hardware Status:
Exit
SS
LYCOMING
Start
Stop
Stop Record
Temp Unit C F
Record Time: 3 seconds
ECU Connection Status:
CAN Hardware Status:
Exit
SS
LYCOMING

Figure 7
Start and Stop Record Buttons

5. Click the **Start Record** button (Figure 7) to record the broadcast active data in a file on the laptop.

NOTICE: After clicking on the **Start Record** button it will change to a **Stop Record** button. Click on the **Stop Record** button to quit recording the broadcast active data in a file on the laptop.

Uploading Fault History

1. Open the FST program per the “Start the FST Program” procedure.
2. Click on the “Retrieve/Clear Faults” tab (Figure 8).

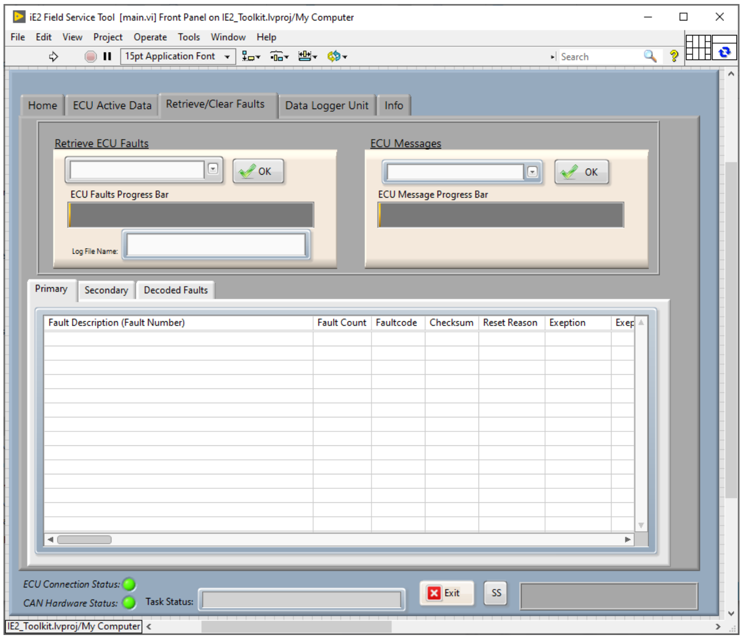
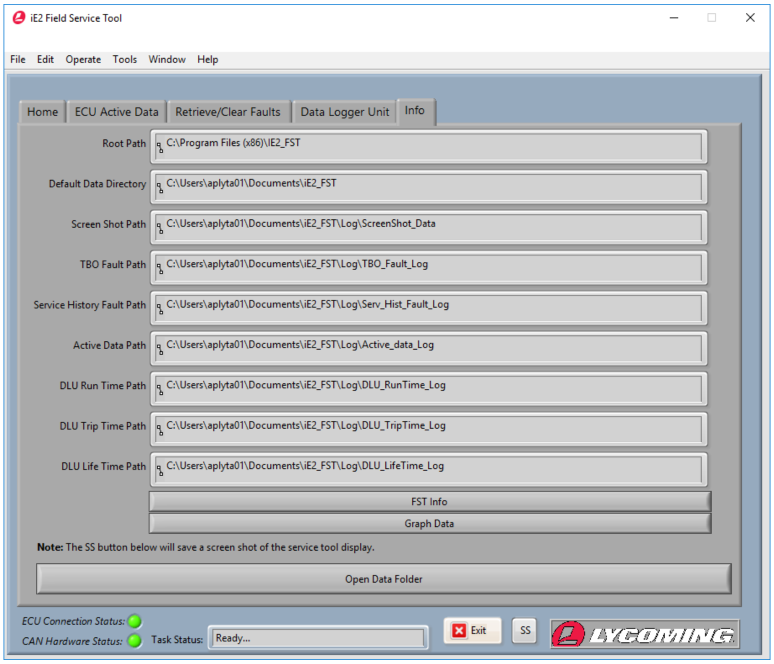

iE2 Field Service Tool [main.vi] Front Panel on IE2_Toolkit.lvproj/My Computer
File
Edit
View
Project
Operate
Tools
Window
Help
15pt Application Font
Search
Home
ECU Active Data
Retrieve/Clear Faults
Data Logger Unit
Info
Retrieve ECU Faults
OK
ECU Faults Progress Bar
Log File Name:
ECU Messages
OK
ECU Message Progress Bar
Primary
Secondary
Decoded Faults
Fault Description (Fault Number)
Fault Count
Faultcode
Checksum
Reset Reason
Exeption
Exep
ECU Connection Status:
CAN Hardware Status:
Task Status:
Exit
SS
IE2_Toolkit.lvproj/My Computer

Figure 8
Retrieve/Clear Faults Tab

NOTICE: The destination file pathway for each data category is associated with that data category on the “Info Tab” (Figure 9).


iE2 Field Service Tool
File
Edit
Operate
Tools
Window
Help
Home
ECU Active Data
Retrieve/Clear Faults
Data Logger Unit
Info
FST Info
Graph Data
Open Data Folder
ECU Connection Status:
CAN Hardware Status:
Exit
SS
LYCOMING

Root Path: C:\Program Files (x86)\IE2_FST
Default Data Directory: C:\Users\aplyta01\Documents\iE2_FST
Screen Shot Path: C:\Users\aplyta01\Documents\iE2_FST\Log\ScreenShot_Data
TBO Fault Path: C:\Users\aplyta01\Documents\iE2_FST\Log\TBO_Fault_Log
Service History Fault Path: C:\Users\aplyta01\Documents\iE2_FST\Log\Serv_Hist_Fault_Log
Active Data Path: C:\Users\aplyta01\Documents\iE2_FST\Log\Active_data_Log
DLU Run Time Path: C:\Users\aplyta01\Documents\iE2_FST\Log\DLU_RunTime_Log
DLU Trip Time Path: C:\Users\aplyta01\Documents\iE2_FST\Log\DLU_TripTime_Log
DLU Life Time Path: C:\Users\aplyta01\Documents\iE2_FST\Log\DLU_LifeTime_Log

Note: The SS button below will save a screen shot of the service tool display.

Task Status: Ready...

Figure 9
Info Tab

3. From the “Retrieve ECU Faults” drop-down menu (Figure 10) select one of the following options:
   - Upload TBO Fault History
   - Upload Service History Faults
4. Click the **OK** Button on the “Retrieve ECU Faults” drop-down menu to start to retrieve the selected data from the ECU.
5. The Data Table will show streaming data from the ECU.

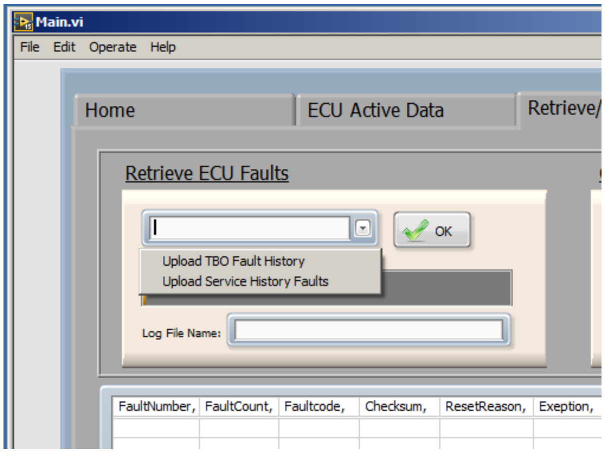

Main.vi
File Edit Operate Help
Home
ECU Active Data
Retrieve/
Retrieve ECU Faults
OK
Upload TBO Fault History
Upload Service History Faults
Log File Name:
FaultNumber, FaultCount, Faultcode, Checksum, ResetReason, Exeption,

Figure 10
Retrieve DLU Data

ECU Messages

1. From the “ECU Messages” drop-down menu (Figure 11) select one of the following options:
   - Reset TLO Time
   - Clear Service History Faults
   - Reset TPS Correction Factor
   - Reset Ign Switch Cycle Count
2. Click the **OK** Button on the “ECU Messages” drop-down menu to clear the selected faults from the ECU.

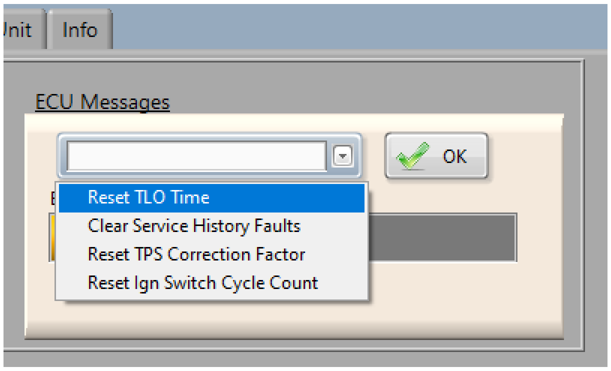

nit
Info
ECU Messages
OK
Reset TLO Time
Clear Service History Faults
Reset TPS Correction Factor
Reset Ign Switch Cycle Count

Figure 11
ECU Messages

NOTICE: The data from the Data logger unit will be logged in a folder in the FST folder on the laptop hard drive.

Retrieving Data Logger Unit Information

1. Open the FST program per the “Start the FST Program” procedure.
2. Click on the “Data Logger Unit” tab (Figure 12).

NOTICE: The destination file pathway for each data category is associated with that data category on the “Info Tab” (Figure 9).

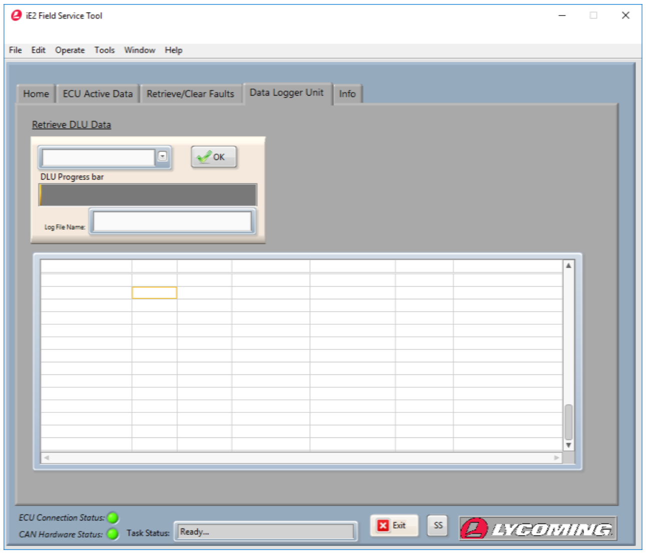
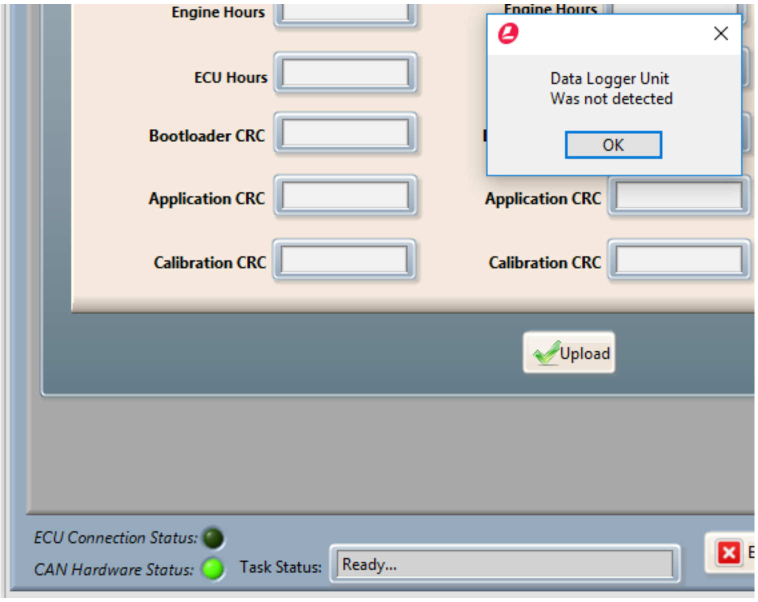

iE2 Field Service Tool
File Edit Operate Tools Window Help
Home
ECU Active Data
Retrieve/Clear Faults
Data Logger Unit
Info
Retrieve DLU Data
OK
DLU Progress bar
Log File Name:
ECU Connection Status:
CAN Hardware Status:
Task Status:
Ready...
Exit
SS
LYCOMING

Figure 12
Data Logger Unit Tab

NOTICE: If the data logger is not installed or not communicating with the ECU a “Data Logger Unit was not detected” warning will be displayed (Figure 13). Check the connection between the data logger and the ECU and correct the problem. If the problem persists, contact Lycoming.


Engine Hours
ECU Hours
Bootloader CRC
Application CRC
Calibration CRC
Engine Hours
Application CRC
Calibration CRC
OK
Upload
ECU Connection Status:
CAN Hardware Status:
Task Status:

Data Logger Unit
Was not detected

Task Status: Ready...

Figure 13
Data Logger Unit Not Detected

1. From the “Retrieve DLU Data” drop-down menu (Figure 14) select the following option:
    - Run Time Data
    - Trip Time Data
    - Life Time Data
2. Click the **OK** button to start to retrieve the selected data. The Data Table will show streaming data from the ECU.

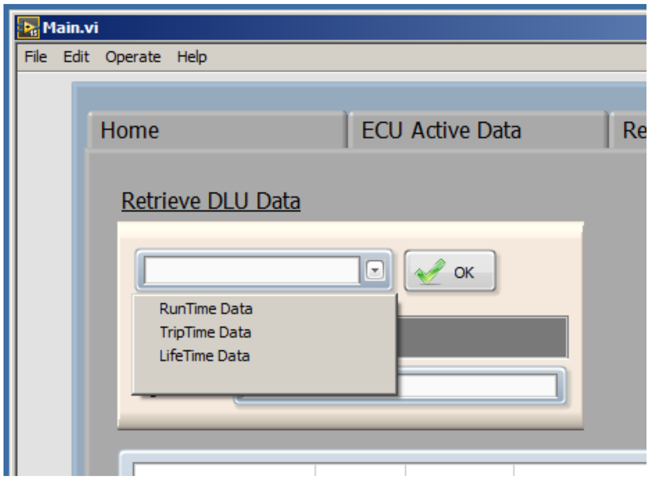

Main.vi
File
Edit
Operate
Help
Home
ECU Active Data
Re
Retrieve DLU Data
OK
RunTime Data
TripTime Data
LifeTime Data

Figure 14
Retrieve DLU Data Drop-Down Menu

NOTICE: The ECU data will be logged in a file using the following format:

- Decode
- Data
- Year
- Month
- Day
- Hour
- Minute
- Second
- AM/PM

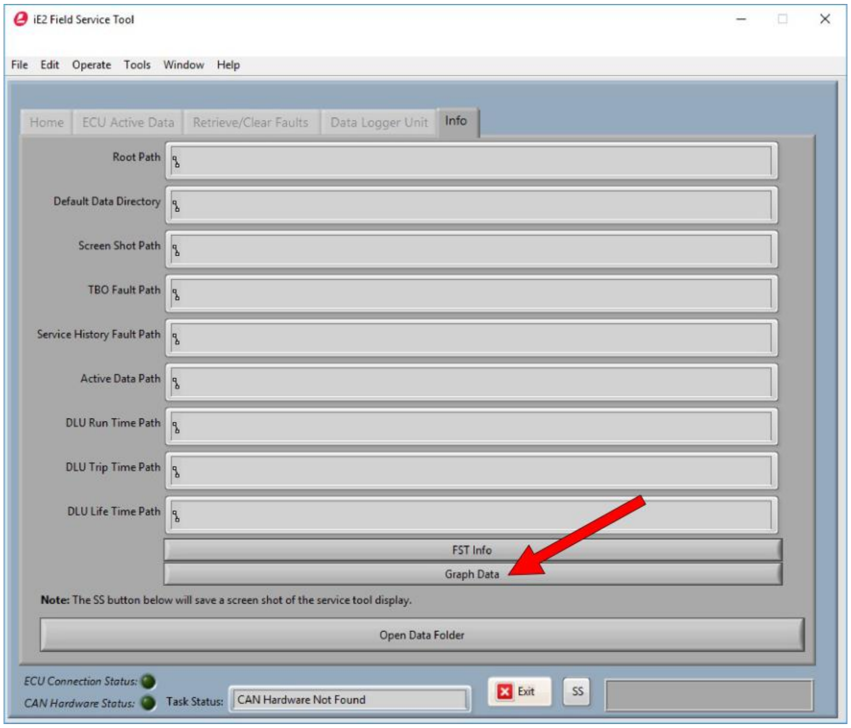
Data Graphing

This feature allows the user to graph runtime data and active data logged by the field service tool. This feature can be used when the ECU is not connected (Figure 15).

1. Open the FST program per the “Start the FST Program” procedure.

NOTICE: All tabs except Info are disabled when the FST is started with no hardware attached. (Figure 15)

2. Click on the “Graph Data” button (Figure 15).


iE2 Field Service Tool
File
Edit
Operate
Tools
Window
Help
Home
ECU Active Data
Retrieve/Clear Faults
Data Logger Unit
Info
Root Path
Default Data Directory
Screen Shot Path
TBO Fault Path
Service History Fault Path
Active Data Path
DLU Run Time Path
DLU Trip Time Path
DLU Life Time Path
FST Info
Graph Data
Open Data Folder
ECU Connection Status:
CAN Hardware Status:
Exit
SS

Note: The SS button below will save a screen shot of the service tool display.

Task Status: CAN Hardware Not Found

Figure 15
Open Data Folder Button

3. The program will open a separate Data Graph window (Figure 16).

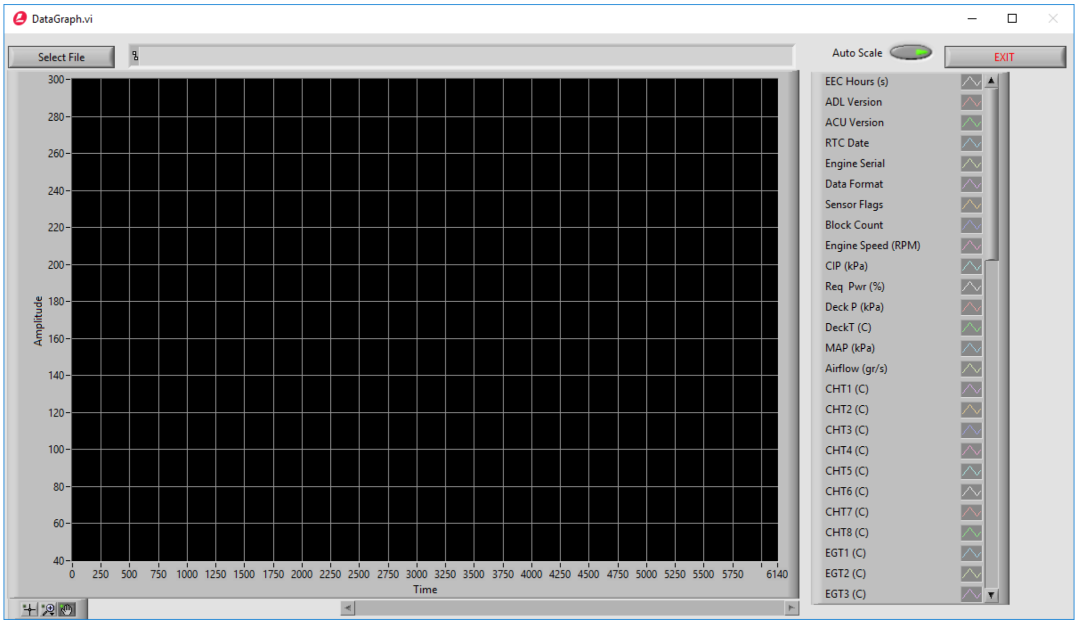
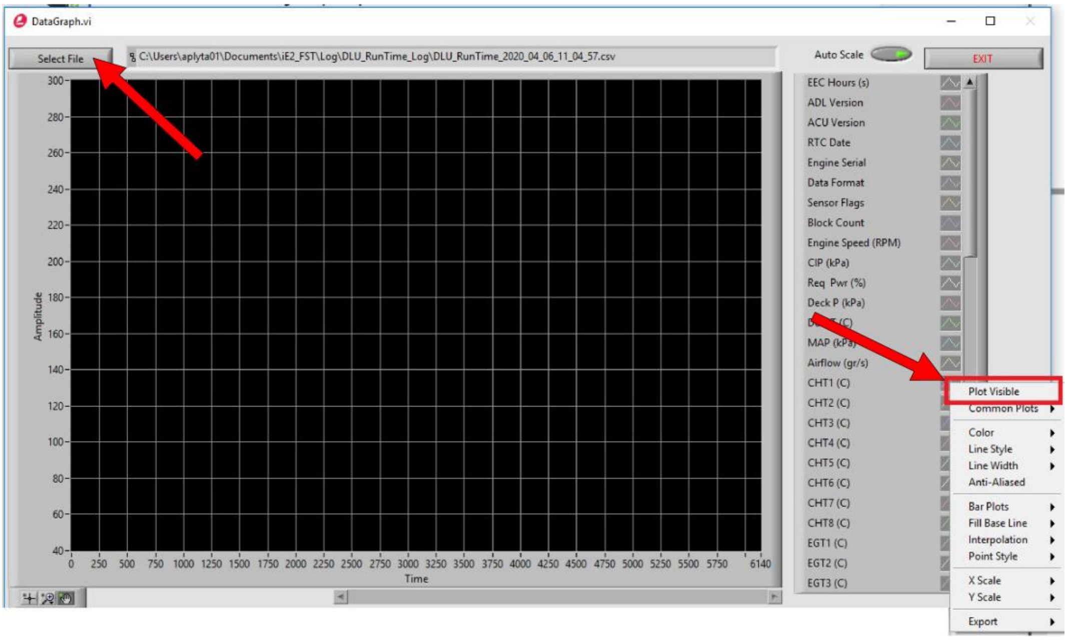

DataGraph.vi
Select File
Auto Scale
EXIT
300
280
260
240
220
200
180
160
140
120
100
80
60
40
Amplitude
0
250
500
750
1000
1250
1500
1750
2000
2250
2500
2750
3000
3250
3500
3750
4000
4250
4500
4750
5000
5250
5500
5750
6140
Time
EEC Hours (s)
ADL Version
ACU Version
RTC Date
Engine Serial
Data Format
Sensor Flags
Block Count
Engine Speed (RPM)
CIP (kPa)
Req Pwr (%)
Deck P (kPa)
DeckT (C)
MAP (kPa)
Airflow (gr/s)
CHT1 (C)
CHT2 (C)
CHT3 (C)
CHT4 (C)
CHT5 (C)
CHT6 (C)
CHT7 (C)
CHT8 (C)
EGT1 (C)
EGT2 (C)
EGT3 (C)

Figure 16
Data Graph Window

4. Click the “Select File” button (Figure 17) to open the file for path selection and select a runtime file.
5. Right or Left click the button for the data you want to plot from the right-hand column (Figure 18).

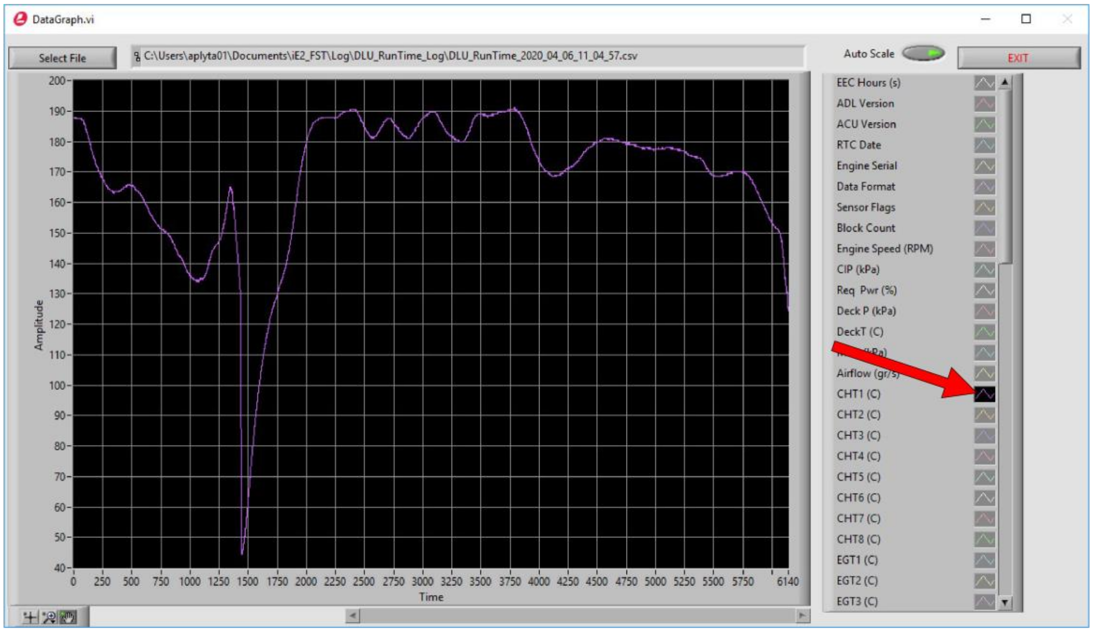

DataGraph.vi
Select File
Auto Scale
EXIT
Amplitude
Time
EEC Hours (s)
ADL Version
ACU Version
RTC Date
Engine Serial
Data Format
Sensor Flags
Block Count
Engine Speed (RPM)
CIP (kPa)
Req Pwr (%)
Deck P (kPa)
MAP (kPa)
Airflow (gr/s)
CHT1 (C)
CHT2 (C)
CHT3 (C)
CHT4 (C)
CHT5 (C)
CHT6 (C)
CHT7 (C)
CHT8 (C)
EGT1 (C)
EGT2 (C)
EGT3 (C)
Plot Visible
Common Plots
Color
Line Style
Line Width
Anti-Aliased
Bar Plots
Fill Base Line
Interpolation
Point Style
X Scale
Y Scale
Export

C:\Users\aplyta01\Documents\iE2_FST\Log\DLU_RunTime_Log\DLU_RunTime_2020_04_06_11_04_57.csv

Figure 17
Data Graph Window - Plot Visible

6. Click the “Plot Visible” button on the drop-down menu (Figure 17).

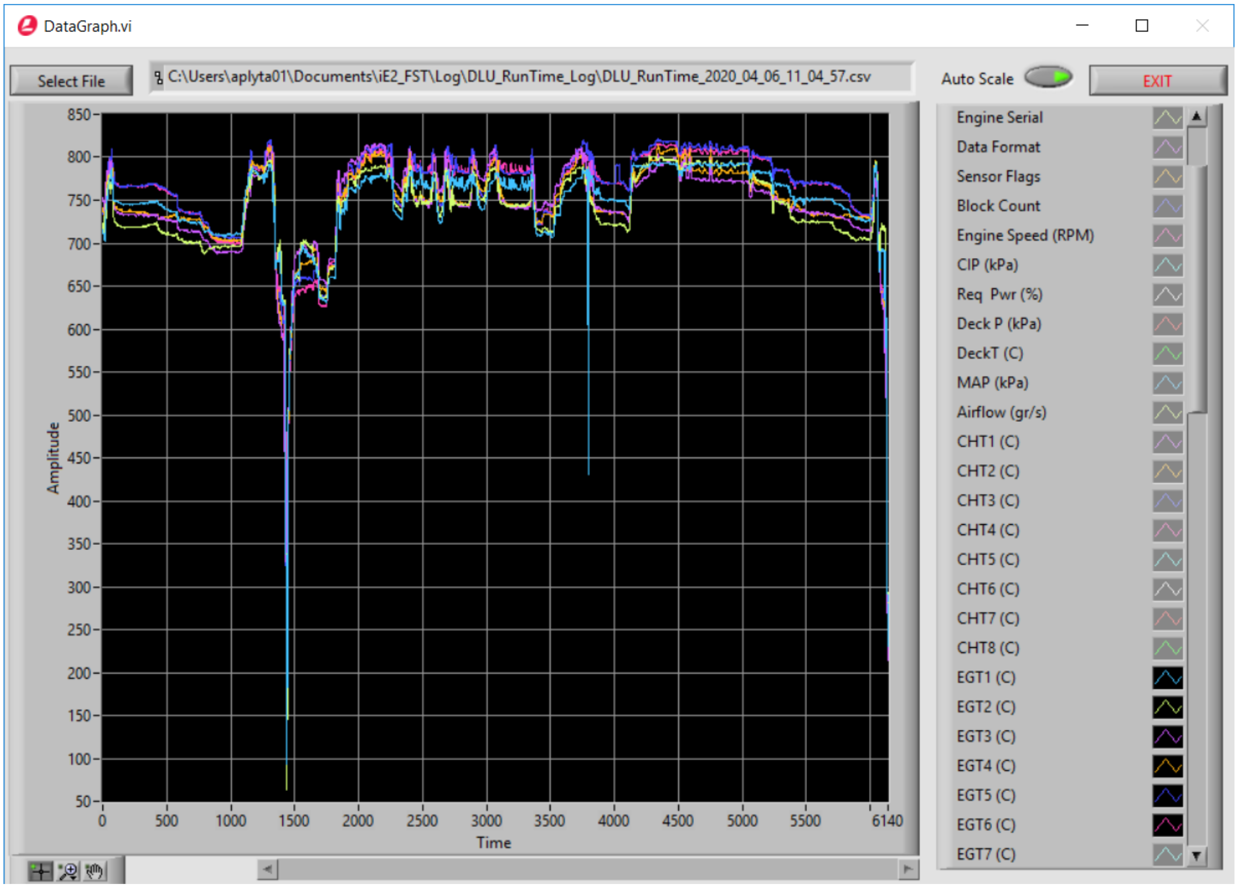
NOTICE: The Drop-Down menu also has selections to personalize the graph.


DataGraph.vi
Select File
Auto Scale
EXIT
Amplitude
Time
EEC Hours (s)
ADL Version
ACU Version
RTC Date
Engine Serial
Data Format
Sensor Flags
Block Count
Engine Speed (RPM)
CIP (kPa)
Req Pwr (%)
Deck P (kPa)
DeckT (C)
Airflow (gr/s)
CHT1 (C)
CHT2 (C)
CHT3 (C)
CHT4 (C)
CHT5 (C)
CHT6 (C)
CHT7 (C)
CHT8 (C)
EGT1 (C)
EGT2 (C)
EGT3 (C)

C:\Users\aplyta01\Documents\iE2_FST\Log\DLU_RunTime_Log\DLU_RunTime_2020_04_06_11_04_57.csv

Figure 18
Data Graph Window – Plot

7. Display multiple data plots on the screen by Right or Left clicking the buttons for the data you want to plot from the right-hand column. As an example, Figure 19 shows data plots for all six EGTs.


DataGraph.vi
Select File
Auto Scale
EXIT
Amplitude
850
800
750
700
650
600
550
500
450
400
350
300
250
200
150
100
50
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
5500
6140
Time
Engine Serial
Data Format
Sensor Flags
Block Count
Engine Speed (RPM)
CIP (kPa)
Req Pwr (%)
Deck P (kPa)
DeckT (C)
MAP (kPa)
Airflow (gr/s)
CHT1 (C)
CHT2 (C)
CHT3 (C)
CHT4 (C)
CHT5 (C)
CHT6 (C)
CHT7 (C)
CHT8 (C)
EGT1 (C)
EGT2 (C)
EGT3 (C)
EGT4 (C)
EGT5 (C)
EGT6 (C)
EGT7 (C)

C:\Users\aplyta01\Documents\iE2_FST\Log\DLU_RunTime_Log\DLU_RunTime_2020_04_06_11_04_57.csv

Figure 19
Data Graph Window – Data Plots for all Six EGTs

NOTICE: Navigation buttons (Figure 20) to move, enlarge, reduce, and isolate sections of the graph are available to use by clicking on the icons in the lower left of the Data Graph Window.

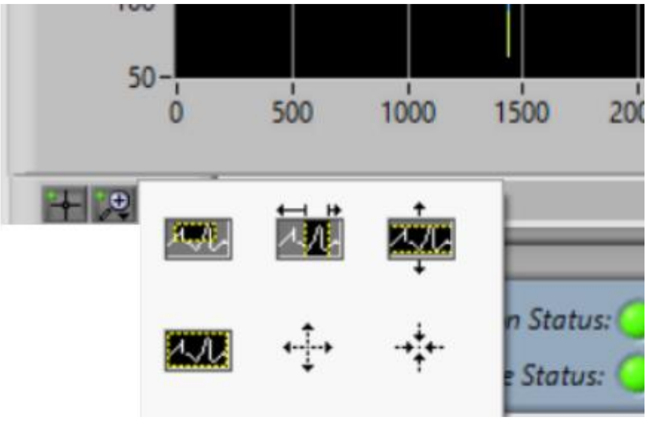
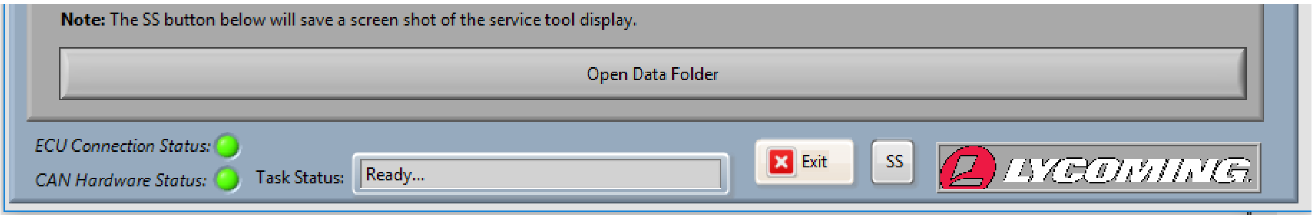

50
0
500
1000
1500
Status:
Status:

Figure 20
Navigation Buttons

Close the FST Program

NOTICE: Do not close the program by clicking on the X in the upper right of the screen.

1. Close the FST program by clicking on the **Exit** button at the bottom of the screen (Figure 21).



Note: The SS button below will save a screen shot of the service tool display.

ECU Connection Status: ●

CAN Hardware Status: ●

Task Status: Ready...

Figure 21
Exit Button

Disconnect the ECU and FST

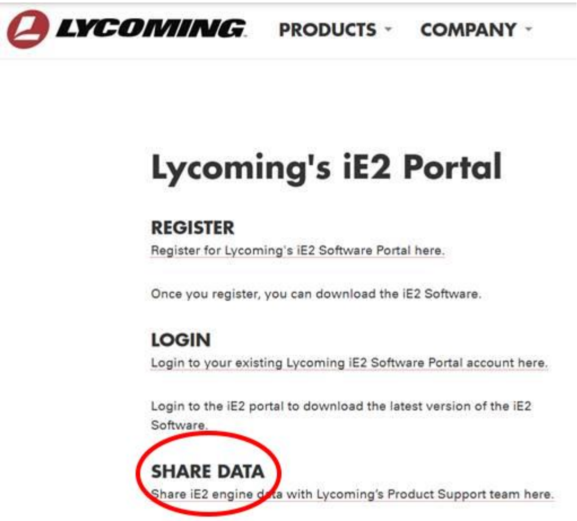
1. Turn power to the ECU **OFF** per instructions in the applicable aircraft manual.
2. Disconnect the RCA plug of the ST-528 from the airframe-supplied RCA jack in the cockpit.
3. Disconnect the USB plug of the ST-530/ST-541 adapter (Figure 1 in the ECU TO FST CONNECTION chapter of this manual) from the USB port on the laptop.

SENDING DATA TO LYCOMING TECHNICAL SUPPORT

Sending Data

Lycoming Engines has set up a file share site so that data files from the FST can be analyzed by the Technical Support Department at Lycoming. To upload data files to the file share site:

1. With the laptop turned on and connected to the internet, navigate to the Lycoming Engines Home Page www.lycoming.com.
2. Open Lycoming's iE2 Portal (Figure 1) and click on **SHARE DATA**.



Lycoming's iE2 Portal

REGISTER

Register for Lycoming's iE2 Software Portal here.

Once you register, you can download the iE2 Software.

LOGIN

Login to your existing Lycoming iE2 Software Portal account here.

Login to the iE2 portal to download the latest version of the iE2 Software.

SHARE DATA

Share iE2 engine data with Lycoming's Product Support team here.

Figure 1
Lycoming iE2 Software Portal

3. Enter your email, name, and company in the designated areas on the left-hand side of the page (Figure 2).
4. Click on the icon for all the data files you want to share with Lycoming Technical Support, then drag-and-drop the files in the designated area on the right-hand side of the page.
5. After all data files have been dropped in the designated area, click the **UPLOAD** button.

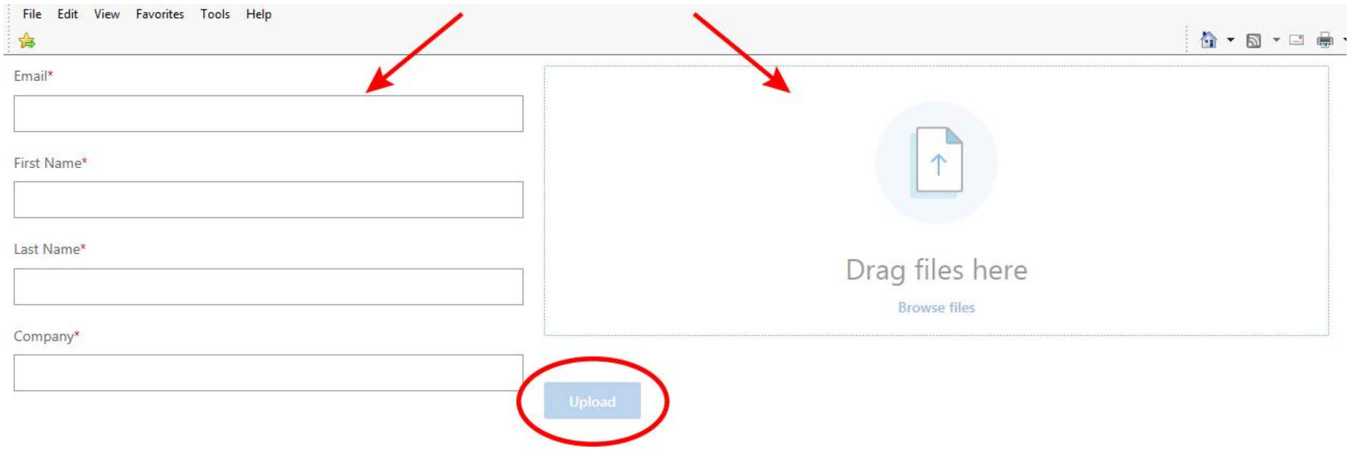


Figure 2
Lycoming Engines iE2 File Share Page

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FIELD SERVICE TOOL - SOFTWARE PROBLEMS

Table 1 shows the more common and recurring problems, causes, and corrective actions. Continue from the simplest to the most complex possible causes.

Table 1
Corrective Action Guide

Problem	Cause	Corrective Action
Software will not load on the laptop.	Laptop operating system is not compatible with Field Service Tool software.	Make sure the laptop has Windows 7 or 10 operating system installed. Replace the laptop if necessary.
Laptop will not interface with the ECU.	Aircraft power is off.	Turn the aircraft power on.
	Cable is not connected.	Check all cable connections; make sure all plugs are correctly installed.
	Cable is damaged or broken.	Contact Lycoming for a replacement iE^2 Service Cable (ST-528).
	CAN Adapter is not operating correctly.	Contact Lycoming for a replacement iE^2 Field Service Tool CAN Interface (ST-530/ST-541).
After opening the FST program, the “ECU Connection Status” indicator in the lower left corner of the screen is not lit.	There is no communication between the laptop and the ECU.	Close the FST program per the “Close the FST Program” section in this chapter then start to FST program per the “Start the FST Program” in the “Access the Field Service Tool” chapter.
After opening the FST program, both the “ECU Connection Status” indicator and the “CAN Hardware Status” indicator in the lower left corner of the screen are not lit.	There is a problem with the connecting hardware and/or cables.	1. Examine the cable and connection between the CAN Adapter and the ECU to make sure the connections are secure, and the cable is not damaged. 2. Replace damaged cables or cables with damaged connectors. 3. Attach the cable per the “ECU to FST Connection” Chapter in this manual. 4. Start to FST program per the “Start the FST Program” in the “Access the Field Service Tool” chapter.

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