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# HHT User Manual Document # 200422

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## Approvals

Revision	Name	Title	Signature
08	Edward Li	General Manager	

#### **Revision History**

Revision	Date	Responsible Person	Description
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02	May 22, 2018	Karin Garandza	First Release
03	Oct 24, 2017	Edward Li	Added SAFT batt replacement option
04	July 29, 2018	Derek Soo	Continuous mode operation 4.1
05	June 27, 2018	Derek Soo	Update to LV2017
06	Oct 16, 2020	Derek Soo	LVNXG installer
07	July 3, 2024	Wesley Lam	Software limitations and known issues
08	Jan 29, 2025	Karin Garandza	New software revision, new features

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## **DEFINITIONS AND ABBREVIATIONS**

The following terms and/or abbreviations are used in this manual:

Term	Definition
IR	Infrared – the type of communications interface which the HHT uses to transmit data.
SAE J2799	The SAE standard that defines the serial packets that are sent via infrared, from a fuel cell vehicle to a hydrogen station.
ННТ	Hand-held transmitter – the product discussed in this manual, which is used to test infrared data communications.
Data message	One single line of SAE J2799 infrared data
Test pattern	The entire data file containing many data messages

# **APPLICABLE DOCUMENTS**

The following documents are recommended as reference material.

Docume nt Referen ce	Document Title	Document Number
[1]	SAE J2799-2024: Hydrogen Surface Vehicle to Station Communications Hardware and Software	SAE J2799-2024
[2]	SAE J2601-5_202402: High-Flow Prescriptive Fueling Protocols for Gaseous Hydrogen Powered Medium and Heavy-Duty Vehicles	SAE J2601-5_202402



# 1 SCOPE

This user manual provides an overview description of the **hand-held transmitter (HHT).** The HHT is a hand-held device used to test IR communication at a hydrogen fueling station.

# **2** INTRODUCTION

The **SAE J2799 standard** is a method of communicating information such as tank pressure and tank temperature from a hydrogen-powered vehicle to a hydrogen fueling station, during a fueling operation, using infrared. This communication is used to ensure that the hydrogen fueling is conducted in a controlled and safe manner.

The **HHT** is a hand-held device that can be used to test the infrared data communication at a hydrogen dispenser. The HHT is preprogrammed with a set of four test patterns that can be transmitted to the hydrogen station. The HHT can also be programmed by the user with a custom set of test patterns. The HHT is compatible with SAE J2799 version 1.0, 1.1, and 2.0 messages and SAE J2601-5.



FIGURE 2-1 HHT (HAND-HELD TRANSMITTER) FRONT VIEW

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This manual includes the following:

- An overview of the HHT, including:
  - HHT interface details;
  - Pre-programmed test pattern information; and,
  - A quick-start guide.
- A guide to programming the HHT with user-defined test patterns, including:
  - An overview of SAE J2799 infrared data packets; and,
  - A guide to using the HHT Test Pattern Generator software to program the HHT.
- A troubleshooting section;
- A guide to installing the HHT test pattern generator software; and,
- A guide to updating the HHT firmware if/when new firmware upgrades are released.

## **3 REQUIREMENTS**

The HHT requires the following equipment:

#### TABLE 3-1: REQUIRED EQUIPMENT

Qty	Part #	Description
1	200428	HHT (hand-held transmitter)
1		Desktop or laptop computer, Windows 7 SP1 or higher
1	200421	HHT test pattern generator software
1		USB cable (supplied by user) – USB A-Type to USB Mini-b (5-pin)

The batteries used in the HHT **must be purchased** on the one of the two following web sites:

Eve Batteries ER1405 at https://www.evemall.eu/

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SAFT battery LS14500 at Amazon.com

# 4 GETTING STARTED

The HHT is a simple hand-held device that allows the user to select one of **four pre-programmed IRDI test patterns** to transmit to a hydrogen nozzle.

## 4.1 HHT USER INTERFACE

The HHT has the following features:



FIGURE 4-1 HHT FEATURES – BUTTONS AND LIGHTS

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Button/LED	Action
Power button	<ul> <li>a. When the HHT is turned off, hold the power button down for approximately</li> <li>2 seconds to turn on the HHT.</li> <li>b. When the HHT is turned on, hold the power button down for approximately</li> </ul>
	2 seconds to turn off the HHT. NOTE: If the HHT is idle for 5 minutes or more, it will turn off automatically.
Power indicator light	The light is on when the HHT is powered up.
Battery indicator light	The light is on when the batteries need to be changed.
Test pattern selection button	When the HHT is turned on, press the test button to change the test pattern to one of the 4 selections – T1, T2, T3 or T4. Each time the test button is pressed, the selection moves to the next test pattern (e.g. from T2 to T3).
Test pattern indicator lights	The light is on when the corresponding test pattern is selected (e.g. T1 light is on when test pattern T1 is selected).
Transmit button	<ol> <li>1. When the HHT is turned on, press and release the transmit button to send the selected test pattern – all test packets in the test pattern will be transmitted through once, at 100 ms intervals.</li> </ol>
	2. When the HHT is turned on, <b>press-and-hold</b> (for 4 seconds, minimum) & release the transmit button to send the selected test pattern <b>continuously</b> – all test packets in the test pattern will be transmitted through, at 100 ms intervals, and repeated.
	<b>Press-and-hold</b> (for 4 seconds, minimum) & release the transmit button to finish the test pattern and <b>stop</b> (end continuous transmission)
	NOTE: While a test pattern is being transmitted, all other button presses will be ignored [except <b>press-and-hold</b> (for 4 seconds, minimum) & release the transmit button]
Transmit indicator light	The light is on while the HHT is transmitting a test pattern. The light goes off when the test pattern is finished transmitting.

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The HHT's infrared transmitter is located as follows:



FIGURE 4-2 HHT INFRARED TRANSMITTER LOCATION

# 4.2 CHANGING THE BATTERIES

The HHT uses two **3.6V Lithium batteries**. Please purchase these batteries from the one of the following two suppliers **only**:

Eve Batteries ER14505 at https://www.evemall.eu/

SAFT battery LS14500 at Amazon.com

To change the batteries in the HHT, do the following:

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	Action	
STEP 1	Using a 2.5 mm HEX driver, open the back cover of the HHT.	
STEP 2	Remove the old batteries – see Figure 4-3.	
STEP 3	Install two new batteries – see Figure 4-3.	
	Make sure to place the batteries in the right orientation – see the polarity markings on the circuit board under the battery holders.	
STEP 4	Using a 2.5 mm HEX driver, reattach the back cover of the HHT.	
STEP 5	Test the new batteries - press and hold the power button on the HHT for about 2 seconds, until the "power" light comes on.	



FIGURE 4-3 HHT BATTERIES - LOCATION IN HHT

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## 4.3 HHT QUICK-START GUIDE

To use the HHT, do the following:

	Action
STEP 1	Prepare the hydrogen dispenser to display and record IR data.
STEP 2	Press and hold the power button on the HHT for about 2 seconds, until the "power" light comes on.
STEP 3	Press the "test pattern selection" button on the HHT, to select the test pattern (T1, T2, T3 or T4) - the associated LED for the selection will light up.
STEP 4	Holding the nozzle in one hand, insert the HHT into the end of the hydrogen nozzle, as shown in Figure 4-4 below.
STEP 5	Press the "transmit" button on the HHT, to transmit the selected test pattern. Verify that the station received the IRDI test pattern correctly.
STEP 6	Repeat steps 3 and 5 above, to transmit additional test patterns.
NOTE	To turn off the HHT, press and hold the power button for about 2 seconds.



FIGURE 4-4 HHT ATTACHED TO HYDROGEN NOZZLE

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## 4.4 Notes

	Action
NOTE 1	The HHT will turn off automatically after 5 minutes.
NOTE 2	If the battery is too low to operate, pressing the power button will cause the battery light to come on for 3 seconds, after which the HHT will power down.
NOTE 3	If the HHT is on and the battery voltage falls below the operating threshold, the battery light will turn on, and the HHT will continue to function.
NOTE 4	If the battery light is on, and the HHT is turned off, the user will no longer be able to turn on the HHT – if the power button is pressed, the battery light will come on for 3 seconds, then the HHT will turn off.

## 4.5 PRE-PROGRAMMED (DEFAULT) TEST PATTERNS

The HHT is delivered with **four pre-programmed (default)** infrared data message test patterns - T1, T2, T3 and T4.

These four pre-programmed test patterns are as follows:

#### 4.5.1 Test Pattern 1 (T1)

NOTE: The BOF, CRC and EOF fields are included but not shown.

Number of transmitted IRDI packets: 5 identical test messages, as follows:

Lin e #	Test Pattern	OD Field
1	ID=SAE J2799 VN=1.10 TV=0180.0 RT=H70 FC=Dyna MP=010.0 MT=116.0	None

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#### 4.5.2 Test Pattern 2 (T2)

NOTE: The BOF, CRC and EOF fields are included but not shown.

Number of transmitted IRDI packets: 10 test messages in compliance with ISO 17268-2020 (Section 7.28 – Communication Test)

Lin e #	Test Pattern	OD Field
1, 3, 5, 7, 9	ID=SAE J2799 VN=01.00 TV=0050.0 RT=H70 FC=Abort MP=087.5 MT=358.2	None
2, 4, 6, 8, 10	ID=SAE J2799 VN=01.00 TV=0050.0 RT=H70 FC=Dyna MP=087.5 MT=358.2	None

#### 4.5.3 Test Pattern 3 (T3)

NOTE: The BOF, CRC and EOF fields are included but not shown.

Number of transmitted IRDI packets: 50 test messages with increasing MP and MT data, as follows:

Lin e #	Test Pattern	OD Field
1 to 25	ID=SAE J2799 VN=1.10 TV=0180.0 RT=H70 FC=Halt MP=X MT=Y	None
	NOTE. See table # below for the NF and NT values	
26 to	ID=SAE J2799 VN=1.10 TV=0180.0 RT=H70 FC=Abort MP=X MT=Y	None
50	NOTE: see Table 4-1 below for the MP and MT values	

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Line #	MP, X Value	MT, Y Value	Line #	MP, X Value	MT, Y Value
1	0	20	26	25	170
2	1	26	27	26	176
3	2	32	28	27	182
4	3	38	29	28	188
5	4	44	30	29	194
6	5	50	31	30	200
7	6	56	32	31	206
8	7	62	33	32	212
9	8	68	34	33	218
10	9	74	35	34	224
11	10	80	36	35	230
12	11	86	37	36	236
13	12	92	38	37	242
14	13	98	39	38	248
15	14	104	40	39	254
16	15	110	41	40	260
17	16	116	42	41	266
18	17	122	43	42	272
19	18	128	44	43	278
20	19	134	45	44	284
21	20	140	46	45	290
22	21	146	47	46	296
23	22	152	48	47	302
24	23	158	49	48	308
25	24	164	50	49	314

#### TABLE 4-1: TEST PATTERN 3 - MT AND MP VALUES

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#### 4.5.4 Test Pattern 4 (T4)

NOTE: The BOF, CRC and EOF fields are included but not shown.

Number of transmitted IRDI packets: 100 test messages with increasing MP and MT data, as follows:

Lin e #	Test Pattern	OD Field
1 to	ID=SAE J2799 VN=1.10 TV=0180.0 RT=H70 FC=Dyna MP=X MT=Y	None
10 0	NOTE: see Table 4-2 below for the MP and MT values	

#### TABLE 4-2: TEST PATTERN 4 - MT AND MP VALUES

Line #	MP, X Value	MT, Y Value	Line #	MP, X Value	MT, Y Value
1	0	20	51	25	268
2	0.5	25	52	26	271
3	1	30	53	26	274
4	2	35	54	27	277
5	2	40	55	27	280
6	3	45	56	28	283
7	3	50	57	28	286
8	4	55	58	29	289
9	4	60	59	29	292
10	5	65	60	30	295
11	5	70	61	30	298
12	6	75	62	31	301
13	6	80	63	31	304
14	7	85	64	32	307
15	7	90	65	32	310
16	8	95	66	33	313
17	8	100	67	33	316
18	9	105	68	34	319

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Line #	MP, X Value	MT, Y Value	Line #	MP, X Value	MT, Y Value
19	9	110	69	34	322
20	10	115	70	35	325
21	10	120	71	35	328
22	11	125	72	36	331
23	11	130	73	36	334
24	12	135	74	37	337
25	12	140	75	37	340
26	13	145	76	38	343
27	13	150	77	38	346
28	14	155	78	39	349
29	14	160	79	39	352
30	15	165	80	40	355
31	15	170	81	40	358
32	16	175	82	41	361
33	16	180	83	41	364
34	17	185	84	42	367
35	17	190	85	42	370
36	18	195	86	43	373
37	18	200	87	43	376
38	19	205	88	44	379
39	19	210	89	44	382
40	20	215	90	45	385
41	20	220	91	45	388
42	21	225	92	46	391
43	21	230	93	46	394
44	22	235	94	47	397
45	22	240	95	47	400
46	23	245	96	48	403
47	23	250	97	48	406
48	24	255	98	49	409
49	24	260	99	49	412
50	25	265	100	50	415

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# **5 PROGRAMMING THE HHT TEST PATTERNS**

The HHT is delivered with four pre-programmed (default) test patterns (see Section 4.5 for details). To **change these test patterns**, use the supplied **HHT test pattern generator software**. The test pattern generator software installer can be found at https://irdisystem.com/software/.

This section describes how to use the HHT test pattern generator software.

## 5.1 SETTING UP HHT FOR PROGRAMMING

The HHT can be programmed with new user-defined test patterns, using the HHT test pattern generator software.



The following figure shows the HHT with its back cover removed:

FIGURE 5-1 HHT PROGRAMMING SETUP

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To set up the HHT for reprogramming, do the following:

	Action
STEP 1	Using a 2.5 mm HEX driver, open the back cover of the HHT.
STEP 2	Attach the USB cable (5-pin Mini-b connector) to the USB connector on the HHT's circuit board – see Figure 5-1 above.
STEP 3	Attach the other end of the USB cable (A-type connector) to a USB port on your computer.
STEP 4	Depending on your PC settings, the USB drivers may install automatically from Windows Update – Note that you must be connected to the Internet.
STEP 5	Device may appear in Device Manager with a yellow exclamation mark. If this happens, open Device Manager - see Figure 5-2. To verify– see Figure 5-3. Initiate the USB driver installation by right-clicking the USB device and selecting "> Update Drivers > Automatic? (Search Windows Update)"

#### 5.1.1 Plugging in the HHT

To set up infrared data transmitter hardware, be sure that you are connected to the internet, then follow the steps below, and see Figure 5-1.

	Action
STEP 1	Insert the infrared data transmitter's USB plug into an available USB port on the computer.
STEP 2	Depending on your PC settings, the USB drivers may install automatically from Windows Update – Note that you must be connected to the Internet.
STEP 3	Device may appear in Device Manager with a yellow exclamation mark. If this happens, open Device Manager - see Figure 5-2. To verify– see Figure 5-3. Initiate the USB driver installation by right-clicking the USB device and selecting "> Update Drivers > Automatic? (Search Windows Update)".

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FIGURE 5-2 OPEN DEVICE MANAGER

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S Y S T E M		
📇 Device Manager	- 🗆 X	]
<u>File</u> <u>Action</u> <u>V</u> iew <u>H</u> elp		_
> 4 Audio inputs and outputs	^	
> 😵 Batteries > 📓 Biometric devices		

)	<u>چ</u>	Biometric devices	
)	> 🚯	Bluetooth	
)		Computer	
)	-	Disk drives	
)		Display adapters	
)		DVD/CD-ROM drives	
)	-	IDE ATA/ATAPI controllers	
)	ìo	Imaging devices	
)		Keyboards	
)		Memory technology devices	
)	0	Mice and other pointing devices	
)		Monitors	
)		Network adapters	
)		Portable Devices	
· ·	/ 🖗	Ports (COM & LPT)	
		💭 Intel(R) Active Management Technology - SOL (COM3)	
		USB Serial Port (COM5)	
)		Print queues	
)		Processors	
)	- 🃭	Security devices	
)		Smart card readers	
)		Software devices	
)	1	Sound, video and game controllers	
, ·	Ģ.	Storage controllers	×

#### FIGURE 5-3 VERIFY IN DEVICE MANAGER

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#### 5.1.2 Installing HHT Test Pattern Generator Software

ownload the test pattern generator software installer from ttps://irdisystem.com/software/. Locate the installation files for 200421_R05 - RDI HHT Test Pattern Generator. ouble-click on "setup" to begin – see Figure 5-4.
0 tt ₹

Cut Copy path Paste shortcut	Move Copy to * to *	Delete Rename	New ite New folder	erss T Prope	ties Open v	Select all	n b
rd	Org	Janize	New		Open	Select	E
200421_R05 - IRDI HH	IT Test Pattern Ger	erator - Installer >	Release	~ Ū	Search Releas	e	
Name	^	Da	ite modified	Туре	Size		
🛃 IRDITestPat	ternGeneratorSetu	p 12	/19/2024 2:21 PM	Windows I	nstaller 38	8,645 KB	
setup		12	/19/2024 2:20 PM	Applicatio	n	537 KB	

FIGURE 5-4 INSTALLER FILE LOCATION

	Action
STEP 2	The installer splash screen will appear as follows – click on the "Next" button:
	IRDITestPatternGeneratorSetup       —       ×         Welcome to the IRDITestPatternGeneratorSetup       Image: Compute state
	WARNING: This computer program is protected by copyright law and international treaties. Unauthorized duplication or distribution of this program, or any portion of it, may result in severe civil or criminal penalties, and will be prosecuted to the maximum extent possible under the law.
	< Back Next > Cancel



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	Action
STEP 3	Select the destination directory, then click on the "Next" button – see Figure 5-6.

🖟 IRDITestPatternGeneratorSetup			_		×
Select Installation Folde	r				
The installer will install IRDITestPatternGe	eneratorSetup to the	e following folder			
To install in this folder, click "Next". To in	stall to a different fo	older, enter it belo	ow or c	lick ''Brov	vse".
<u>F</u> older: C:\Program Files (x86)\IRDI System Ir	c\IRDITestPattern	GeneratorSe		Browse	
		[	0	)isk Cost.	
Install IRDITestPattemGeneratorSetup	for yourself, or for a	anyone who uses	this c	omputer:	
Just me					
	< Back	Next >		Cano	el

FIGURE 5-6 DESTINATION DIRECTORY

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	Action
STEP 4	Confirm the installation process by clicking the "Next" button - see Figure 5-7. (To cancel the installation, click on the "Cancel" button.)

🛃 IRDITestPatternGeneratorSetup	-		×
Confirm Installation			5
The installer is ready to install IRDITestPatternGeneratorS	Setup on your computer.		
Click "Next" to start the installation.			
< Back	Next >	Car	ncel

FIGURE 5-7 CONFIRMING INSTALLATION

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	Action
STEP 5	Wait for the software to install – see Figure 5-8.

🕷 IRDITestPatternGeneratorSetup		_		×
Installing IRDITestPatternGeneratorSe	tup			
IRDITestPatternGeneratorSetup is being installed.				
Please wait				
< E	lack	Next >	Ca	ancel

FIGURE 5-8 INSTALLING SOFTWARE

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	Action
STEP 6	When the installation is complete, click on the "Close" button – see Figure 5-9.

₩ IRDITestPatternGeneratorSetup -	_		×
Installation Complete			
IRDITestPatternGeneratorSetup has been successfully installed.			
Click "Close" to exit.			
Please use Windows Update to check for any critical updates to the .NET Fra	mewoi	rk.	
< <u>B</u> ack <b>Dose</b>		Car	ncel

FIGURE 5-9 INSTALLATION COMPLETE

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#### 5.1.3 Starting HHT Test Pattern Generator Software

To start the HHT Test Pattern Generator software, do the following:

		Action	
STEP 1	Locate the program	n the Windows Start menu – see Figure 5-10.	
		Get Help System	
	(	Calenda IRDI HHT Test Pattern Generator Rev 5 New	
		IrfanView	
		Tunes V Microso	
		K K-Lite Codec Pack	
	R	M Weathe	
		Mail	
		O Maps	
		Microso Microso	
	Ø	Microsoft 365 (Office)	
		C Microsoft Edge	
	Ċ	Microsoft Office	

FIGURE 5-10 SOFTWARE SHORTCUT IN START MENU



main screen will appear - see Figure 5-11.

IRDI HHT Test Patte	rn Generator Rev 5.0	)					-		X
<b>NRD</b>		Message	# Message					_	
COM Port Config		_							
COM PORT:	~ <b>S</b>								
OPEN	CLOSE								
Please con	nect the HHT								
Command Config HHT Test Number:	1 ~								
Write	Read								
		Total Fueling	g Time (seconds): 0	Characters in P	attem: 0				3
RDI Data Link Frame Pr	eview	Total Fueling	g Time (seconds): 0	Characters in P	attem: 0		Reset J	12799 Fiel	) ds
RDI Data Link Frame Pr ÿÿÿÿÿÅ ID=SAE J2`	eview 799 VN=02.00 TV=	Total Fueling	g Time (seconds): 0 FC=Halt MP=064.	Characters in P. 0 MT=280.0 ¢lÅ	attem: 0		Reset J	12799 Fiel	ds
RDI Data Link Frame Pr ÿÿÿÿÿÅID=SAE J2' SAE Protocol Identifier	eview 799 VN=02.00 TV= Version Number	Tank Volume (L)	g Time (seconds): 0 FC=Halt[MP=064.	Characters in P 0 MT=280.0 ¢lÅ Fill Command	Measured Pressure (MPa)	Measured Temperature (K)	Reset J	12799 Fiel	ds
RDI Data Link Frame Pr ÿÿÿÿÿÅID=SAE J2' SAE Protocol Identifier SAE J2799	eview 799 VN=02.00 TV= Version Number 2.0 ~	Total Fueling 0180.0 RT=H70 F Tank Volume (L)	g Time (seconds): 0 EC=Halt[MP=064. Receptacle Type H70 ~	Characters in P 0 MT=280.0 e1A Fill Command Halt ~	Measured Pressure (MPa)	Measured Temperature (K)	Reset J CRC	12799 Fiel	ds
RDI Data Link Frame Pr ÿÿÿÿÄIID=SAE J2' SAE Protocol Identifier SAE J2799 Comupt ID	eview 799 VN=02.00 TV= Version Number 2.0 ~ Corrupt VN	Tank Volume (L)	g Time (seconds): 0 EC=Halt[MP=064. Receptacle Type H70 ~ Corrupt RT	Characters in P 0JMT=280.0JelA Fill Command Hait ~ Comupt FC	Attem: 0 Measured Pressure (MPa)	Measured Temperature (K) 280.0 Comupt MT	Reset J CRC Com	upt CRC	ds
RDI Data Link Frame Pr yÿyÿyÄ ID=SAE J23 SAE Protocol Identifier SAE J2799 Corrupt ID Optional Data	eview 799 VN=02.00 TV= Version Number 2.0 ~ Comupt VN	Total Fueling 0180.0 RT=H70 F Tank Volume (L) ☆ 180 Comupt TV	g Time (seconds): 0 EC=Halt MP=064. Receptacle Type H70 ✓ Corrupt RT	Characters in Pr 0 MT=280.0 elA Fill Command Halt ~ Corrupt FC	Attem: 0 Measured Pressure (MPa)	Measured Temperature (K) 280.0 Comupt MT OD	CRC CRC Com	12799 Fiel upt CRC Count:	ds 0
RDI Data Link Frame Pr yÿyÿyÄ ID=SAE J23 SAE Protocol Identifier SAE J2799 Corrupt ID Optional Data	eview 799 VN=02.00 TV= Version Number 2.0 ~ Comupt VN	Tank Volume (L)	g Time (seconds): 0 EC=Halt MP=064. Receptacle Type H70 Corrupt RT	Characters in Pr 0 MT=280.0 elA Fill Command Halt ~ Corrupt FC	attem: 0 Measured Pressure (MPa)	Measured Temperature (K) 280.0 Corrupt MT OD	CRC Caracter	upt CRC	ds 0
RDI Data Link Frame Pri ÿÿÿÿÿÅ ID=SAE J2' SAE Protocol Identifier SAE J2799 Comupt ID Optional Data	eview 799 VN=02.00 TV= Version Number 2.0 ~ Corrupt VN	Total Fueling 0180.0/RT=H70/F Tank Volume (L) → 180 Corrupt TV	g Time (seconds): 0 FC=Halt MP=064. Receptacle Type H70 Corrupt RT	Characters in P 0 MT=280.0 ¢lÅ Fill Command Halt ~ Comupt FC	Attem: 0 Measured Pressure (MPa) \$\$ 64.0 Corrupt MP	Measured Temperature (K) 280.0 Comupt MT OD	CRC Com Character	upt CRC	> ds 0

FIGURE 5-11 HHT TEST PATTERN GENERATOR SOFTWARE

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# 6 HHT PROGRAMMING GUIDE

## 6.1 UNDERSTANDING THE INFRARED DATA MESSAGES

The HHT transmits infrared data messages through an infrared data transmitter. The user can receive these messages via a user-supplied infrared data receiver, and can view these messages using any terminal program, such as HyperTerminal.

Each message is a text string of fixed length, with a fixed set of fields. The meaning of each field in the infrared data message is as follows:

Field Identifier	Definition	Range of Values
ÿÿÿÿÿÀ	Delimiting characters that define start of infrared data message	n/a
ID	Name of the communication protocol – in this case, SAE J2799	SAE J2799
VN	Version number of the communications protocol	Range: 00.00 – 99.99 Valid values: 1.0, 1.1, 2.0
TV	Total volume – the volume of the hydrogen tank(s) in the vehicle	0000.0 – 5000.0 litres
RT	Receptacle type – style of hydrogen receptacle used on the vehicle	H25, H35, H50 and H70
FC	Fill command – indicates the type of hydrogen fill in progress, or the reason for the fill's termination	Dyna, Stat, Halt and Abort
MP	Measured pressure – the pressure reading of the hydrogen tank in the vehicle	000.0 – 100.0 MPa
MT	Measured temperature – the temperature reading of the hydrogen tank in the vehicle	16.0 – 425.0 K
MéÁ	Delimiting characters that define end of infrared data message, plus checksum	Varies depending on the checksum

#### TABLE 6-1 INFRARED DATA MESSAGE FIELDS

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SYSTEM		

## 6.2 USING THE IRDI HHT TEST PATTERN GENERATOR SOFTWARE

The Test Pattern Generator software and handheld transmitter (HHT) provide the user with full control over the transmitted infrared data messages, allowing the user to generate test messages to the infrared data transmitter using manually-entered data.

To set up and use the HHT hardware and software, do the following:

	Action
STEP 1	Set up the HHT hardware and Test Pattern Generator software as per Section 5.1.
STEP 2	Start the computer on which the HHT Test Pattern Generator software is installed.
STEP 3	From the Start menu, locate and start the program. The program's main screen appears as shown in Figure 6-1.

IRDI HHT Test Pattern Generator Rev 5.0					-		×
	Message # Message					_	]
COM Port Config							
COM PORT: V							
OPEN CLOSE							
Please connect the HHT							
Command Config							
HHT Test Number: 1 ~							
Write Read	<					,	>
	Total Fueling Time (seconds): 0	Characters in Pa	ttem: 0		-		
IRDI Data Link Frame Preview					Reset J2	2799 Fields	
ÿÿÿÿÿAlD=SAE J2799 VN=02.00 TV=0180.0	RT=H70 FC=Halt MP=064.	0 MT=280.0 ¢IA					
SAE Protocol Identifier Version Number Tank Vo	lume (L) Receptacle Type	Fill Command	Measured Pressure (MPa)	Measured Temperature (K)	CRC		
SAE J2799 2.0 ~	180 H70 ~	Halt $\checkmark$	<b>\$</b> 64.0	280.0			
Corrupt ID Corrupt VN Corru	pt TV Corrupt RT	Corrupt FC	Corrupt MP	Corrupt MT	Comu	pt CRC	
Optional Data				OD	Character (	Count: 0	
# of Lines to Insert/Delete	Delete Line(s) Interpolat MP/MT Value	e Clear Patte	m MP/MT Graph	Save as Text File	Impo	ort Pattern	

FIGURE 6-1 HHT TEST PATTERN GENERATOR SOFTWARE, MAIN SCREEN

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	Action
STEP 4	Select the communications port in the "COM PORT" drop-down menu – see Figure 6-2. This port should correspond to the IRDI Transmitter found in Device Manager (see Figure 5-3).
NOTE	If the HHT was not connected at program startup, you may need to use the refresh button at the right side of the "COM PORT" field, to refresh the COM port list (see below).

IRDI HHT Test Pattern Generator Rev 5.0		-		×
COM Port Config COM PORT: CLOSE OPEN CLOSE	Message # Message			
IRDI HHT Test Pattern Generator Rev 5.0		_		×
COM Port Config	Message # Message	i	i	

FIGURE 6-2 REFRESH PORTS, SELECT A COMMUNICATION PORT

CLUS

connect the HHT

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	Action
STEP 5	Click on the "OPEN" button under the "COM PORT", to open the port and start communicating with the HHT.
	If the port opens successfully, the screen will appear as shown in Figure 6-3, with the "HHT Connected" message shown in green.

IRDI HHT Test Pattern Generator Rev 5.0			-	×
COM Port Config COM PORT: COM3 C OPEN CLOSE Please connect the HHT	Message #	Message		
IRDI HHT Tert Dattern Generator Rev 5.0				 
				~
	Message #	Message		



FIGURE 6-3 COMMUNICATION PORT OPENED

To exit from the HHT Test Pattern Generator application, click on the "X" in the top right corner of the screen.

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The HHT Test Pattern Generator software screen is comprised of several areas, as follows:

IRDI HHT Test Patt	ern Generator Rev 5	0					– 🗆 X
COM PORT: OPEN Command Config HHT Test Number Write IRDI Data Link Frame P ÿÿÿÿÿAJID=SAE J2	1 CLOSE CLOSE meet the HHT 1 Read	2 Cotal Fuel -0180.0(RT=H70	p II Message	<u>Oharacters in P</u> DJMT=280.0JelA	4	3	> Reset J2799 Fields
SAE Protocol Identifier SAE J2799	Version Number	Tank Volume (L)	Receptacle Type	Fil Command	Measured Pressure (MPa)	Measured Temperature (K)	CRC
Corrupt ID	Corrupt VN	Comupt TV	Comupt RT	Corrupt FC	Corrupt MP	Corrupt MT	Corrupt CRC
Optional Data						OD	Character Count: 0

#### FIGURE 6-4 HHT TEST PATTERN GENERATOR SOFTWARE - SCREEN AREAS

The main screen areas include the following (refer to Figure 6-4 above):

#### 1: HHT communications status:

- Allows user to select and open a communication port
- Shows the state of the HHT communications either "Please connect the HHT" or "HHT connected".
- 2: Test pattern file control:
  - Allows user to select an HHT Test Number to either write to (programming the HHT), or read (reading existing test pattern from the HHT).

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#### **3: Test pattern assembly area:**

- Used to create and preview a user-defined test pattern line, consisting of user-defined values for each IR data field.
- NOTE: The CRC is generated automatically, based on the pattern values.

#### • 4: Test pattern file information:

Shows the test pattern lines that have been either read from the HHT, or assembled for the HHT. Includes the amount of time (total fueling time) it takes to transmit the file using the HHT, and the total number of characters in the test pattern.

#### **5: Test pattern file management area:**

Used to insert or delete new lines for a new test pattern, create and save a new test pattern file, open an existing test pattern file, interpolate temperature and pressure values for a new test pattern, and graph the temperatures and pressures in a test pattern.

#### 6.2.1 Maximum Single Data Message Length

The HHT can accommodate custom data messages up to 320 characters. Single messages that exceed the 320 characters will be truncated automatically.

#### 6.2.2 Maximum Test Pattern Length

The HHT can accommodate up to 1024 lines of custom data messages in each test pattern, provided that they do not exceed 200,000 characters in length. Test patterns exceeding this limit may appear corrupted, and will not properly signal the termination of a test. Refer to Table 6-1 below for the approximate maximum number of lines based on optional data length.

Optional Data Characters	Single Data Message Length	Maximum Lines
0	76*	2631*
16	96*	2083*
70	151*	1324*
240	320*	625*

#### TABLE 6-1: APPROXIMATE MAXIMUM TEST PATTERN LENGTHS

\* approximate values

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# 6.3 OPENING A TEST PATTERN FILE

To open an existing test pattern file, do the following:



IRDI HHT Test Pattern Generator Re	v 5.0	-		×
	Message # Message	_	_	
COM Port Config COM PORT: COM3 ~	3			
HHT Connected: IRDI SYSTEM - V2	<b>40</b>			
HHT Test Number: 1 Write Read				>
IRDI Data Link Frame Preview	Total Fueling Time (seconds): 0 Characters in Pattern: 0	Reset	J2799 Fie	lds
yyyyyA iD=SAE J2799 VN=02.00	I V=0180.0 K I =H70 FC=Halt MP=064.0 M I =280.0 ¢/A			
SAE Protocol Identifier Version Number SAE J2799 2.0	Tank Volume (L)     Receptacle Type     Fill Command     Measured Pressure (MPa)     Measured Temperature (K) <ul> <li></li></ul>	CRC		
Corrupt ID Corrupt VN	Comupt TV Comupt RT Comupt FC Comupt MP Comupt MT	Cor	rupt CRC	
Optional Data	OD	Characte	r Count:	0
# of Lines to Insert/Delete	ne(s) Delete Line(s) Interpolate Clear Pattern MP/MT Graph Save as Text Fil	e Im	port Patte	m

FIGURE 6-5 HHT TEST PATTERN GENERATOR SOFTWARE - IMPORT PATTERN BUTTON

	Action
STEP 2	A browser window will appear. Browse to the directory containing the file, and click on the file to select it (e.g. "myPattern1" in Figure 6-6).
STEP 3	Click on the "Open" button to open the file.

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NOTE

A test pattern file can contain a maximum of 200,000 characters.

						-	
rganize 🔻 New fold	er				==	· 🛄	
A Quick access	Name	Date modified	Туре	Size			
Desisten a	200421_R05 - IRDI HHT Test Pattern Gener	1/12/2025 6:50 PM	File folder				
	HHT Test Pattern Generator Rev 5 Demo	1/12/2025 6:50 PM	File folder				
Downloads	NEW HHT TEST PATTERNS	1/12/2025 6:48 PM	File folder				
🗄 Documents 🖈	- Screenshots	1/12/2025 7:31 PM	File folder				
📰 Pictures 🛛 🖈	200421_R05 - IRDI HHT Test Pattern Gener	1/8/2025 12:13 PM	zip Archive	38,189 KB			
Christmas 2024	👜 200422_R07 - HHT User Manual	1/12/2025 6:52 PM	Microsoft Word D	8,676 KB			
Denmark Trip 20.	👜 200422_R08 - HHT User Manual	1/12/2025 6:52 PM	Microsoft Word D	8,676 KB			
R08 Jan 2025	HHT Test Pattern Generator Rev 5 Demo	12/3/2024 3:31 PM	zip Archive	37,713 KB			
Screenshots	🖭 HHT User Manual Notes	12/3/2024 3:34 PM	Microsoft PowerP	1,442 KB			
Screenshots	🖳 Interpolate Demo	12/3/2024 3:34 PM	Microsoft Excel C	1 KB			
Dropbox	myPattern1	1/12/2025 7:31 PM	Text Document	1 KB			
OneDrive - Persor							
71.00							
This PC							
🛉 Network 🗸 🗸							
							_

FIGURE 6-6 HHT TEST PATTERN GENERATOR SOFTWARE - SELECT A FILE TO OPEN

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Action
STEP 4 View the imported test pattern in the upper right area of the HHT Test Pattern
Generator screen – see Figure 6-7.

COM Port Config COM Port Config COM PORT: COM3 OPEN CLI HHT Connected: IRDI SYSTE Command Config HHT Test Number: 1 Write R IRDI Data Link Frame Preview ÿÿÿÿÿÅIID=SAE J2799 VN=0 SAE Protocol Identifier Version N SAE J2799 2.0 Corrupt ID Corruy	✓ 2 LOSE EM - V2.4.0	Message # 1 2 3 4 5 6 7	Message yyyyy AllD=SAE J2 yyyyy AllD=SAE J2 yyyyy AllD=SAE J2 yyyyy AllD=SAE J2 yyyyy AllD=SAE J2 yyyyy AllD=SAE J2 yyyyy AllD=SAE J2	2799/VN=01.00/TV=0 2799/VN=01.00/TV=0 2799/VN=01.00/TV=0 2799/VN=01.00/TV=0 2799/VN=01.00/TV=0	050.0 RT=H70 FC=Dyna MP 050.0 RT=H70 FC=Dyna MP 050.0 RT=H70 FC=Dyna MP 050.0 RT=H70 FC=Dyna MP	=000.0 MT=020.0 »}áÁ =000.5 MT=025.0 ÞRÁ =001.0 MT=030.0 µ(Á =002.0 MT=035.0 ŐÁ			^
COM Port Config COM PORT: COM3 OPEN CL HHT Connected: IRDI SYSTE Command Config HHT Test Number: 1 Write R IRDI Data Link Frame Preview ÿÿÿÿÿÄ ID=SAE J2799 VN=0 SAE J2799 2.0 Corrupt ID Corrug	C LOSE EM - V2.4.0	1 2 3 4 5 6 7	yyyyy AIID=SAE J2 yyyyy AIID=SAE J2 yyyyy AIID=SAE J2 yyyyy AIID=SAE J2 yyyyy AIID=SAE J2 yyyyy AIID=SAE J2 yyyyy AIID=SAE J2	2799 VN=01.00 TV=0 2799 VN=01.00 TV=0 2799 VN=01.00 TV=0 2799 VN=01.00 TV=0 2799 VN=01.00 TV=0	050.0 RT=H70 FC=Dyna MP 050.0 RT=H70 FC=Dyna MP 050.0 RT=H70 FC=Dyna MP 050.0 RT=H70 FC=Dyna MP	=000.0 MT=020.0 »}áÁ =000.5 MT=025.0 ÞRÁ =001.0 MT=030.0 μ(Á =002.0 MT=035.0 ŐA			-
COM Port Config COM PORT: COM3 OPEN CL HHT Connected: IRDI SYSTE Command Config HHT Test Number: 1 Write R IRDI Data Link Frame Preview ÿÿÿÿÿÄ ID=SAE J2799 VN=0 SAE Protocol Identifier Version N SAE J2799 2.0 Corrupt ID Corrug	C LOSE EM - V2.4.0	2 3 4 5 6 7	yyyyy AIID=SAE J2 yyyyy AIID=SAE J2 yyyyy AIID=SAE J2 yyyyy AIID=SAE J2 yyyyy AIID=SAE J2 yyyyy AIID=SAE J2	799 VN=01.00 TV=0 799 VN=01.00 TV=0 799 VN=01.00 TV=0 799 VN=01.00 TV=0	050.0 RT=H70 FC=DynalMP 050.0 RT=H70 FC=DynalMP 050.0 RT=H70 FC=DynalMP	=000.5IMT=025.0IÞRÁ =001.0IMT=030.0Iµ(Á =002.0IMT=035.0IŐÁ			
COM PORT: COM3 OPEN CL HHT Connected: IRDI SYST Command Config HHT Test Number: 1 Write R IRDI Data Link Frame Preview ÿÿÿÿÿÄ ID=SAE J2799 VN=0 SAE Protocol Identifier Version N SAE J2799 2.0 Corrupt ID Corrup	C C	3 4 5 6 7	ÿÿÿÿÿÄIID=SAE J2 ÿÿÿÿÿÄIID=SAE J2 ÿÿÿÿÿÄIID=SAE J2 ÿÿÿÿÿÄIID=SAE J2	2799 VN=01.00 TV=0 2799 VN=01.00 TV=0 2799 VN=01.00 TV=0	050.0 RT=H70 FC=Dyna MP 050.0 RT=H70 FC=Dyna MP	=001.0 MT=030.0 µ(Á =002.0 MT=035.0 ŐÁ			-
OPEN     CL       HHT Connected: IRDI SYST       Command Config       HHT Test Number:       1       Write       RDI Data Link Frame Preview       ÿÿÿÿÿÄ ID=SAE J2799 VN=0       SAE Protocol Identifier       Version N       SAE J2799       2.0       Comupt ID	LOSE	4 5 6 7	ÿÿÿÿÿÄIID=SAE J2 ÿÿÿÿÿÄIID=SAE J2 ÿÿÿÿÿÄIID=SAE J2	2799 VN=01.00 TV=0 2799 VN=01.00 TV=0	050.0 RT=H70 FC=Dyna MP	=002.0 MT=035.0 ÕA			
OPEN     CL       HHT Connected: IRDI SYST       Command Config       HHT Test Number:       1       Write       RDI Data Link Frame Preview       ÿÿÿÿÿÄ ID=SAE J2799 VN=0       SAE Protocol Identifier       Version N       SAE J2799       2.0       Comupt ID	CLOSE	5 6 7	ÿyyyyÄIID=SAE J2 ÿyyyyÄIID=SAE J2	2799/VN=01.00/TV=0					-
HHT Connected: IRDI SYST         Command Config         HHT Test Number:         Write         RDI Data Link Frame Preview         ÿÿÿÿÿÄ ID=SAE J2799 VN=(         SAE Protocol Identifier       Version N         SAE J2799       2.0         Corrupt ID       Corrupt	FEM - V2.4.0	6	ÿÿÿÿÿÅlID=SAE J2		050.0 RT=H70 FC=Dyna MP	=002.0 MT=040.0 mÁ			-
HHT Connected IRDI SYST Command Config HHT Test Number: 1 Write R RDI Data Link Frame Preview ÿÿÿÿÿÅIID=SAE J2799 VN=0 SAE Protocol Identifier Version N SAE J2799 2.0 Corrupt ID Corrug	TEM - V2.4.0	7		799/VN=01.00/TV=0	050.0 RT=H70 FC=Dyna MP	=003.0 MT=045.0 àùÁ			
Command Config HHT Test Number: 1 Write R RDI Data Link Frame Preview ÿÿÿÿÿÅIID=SAE J2799 VN=0 SAE Protocol Identifier Version N SAE J2799 2.0 Corrupt ID Corrug			ÿÿÿÿÿÅlID=SAE J2	799 VN=01.00 TV=0	050.0 RT=H70 FC=Dyna MP	=003.0 MT=050.0 êÁ			
HHT Test Number: 1 Write R RDI Data Link Frame Preview ÿÿÿÿÿÅIID=SAE J2799 VN=( SAE Protocol Identifier Version N SAE J2799 2.0 Comupt ID Comu		8	ÿÿÿÿÿÅIID=SAE J2	799 VN=01.00 TV=0	050.0 RT=H70 FC=Dyna MP	=004.0 MT=055.0 óþÁ			-
Write     R       Write     R       RDI Data Link Frame Preview	~	9	ÿÿÿÿÿÅIID=SAE J2	799 VN=01.00 TV=0	050.0 RT=H70 FC=Dyna MP	=004.0 MT=060.0 eÁ			-
Write     R       RDI Data Link Frame Preview	*	10	ÿÿÿÿÿÅIID=SAE J2	799 VN=01.00 TV=0	050.0 RT=H70 FC=Dyna MP	=005.0 MT=065.0 ëÁ			
RDI Data Link Frame Preview         ÿÿÿÿÿÅ ID=SAE J2799 VN=(         SAE Protocol Identifier       Version N         SAE J2799       2.0         Comupt ID       Comupt	Read	11	monthin ever in	0.1/11/00104	050 0IDT 1170ICC DIMD	00E 01MT 070 01Å			1
AE Protocol Identifier Version N AE J2799 2.0 Corrupt ID Corrup									
SAE J2799 2.0 Corrupt ID Corrup	Number Tr	ank Volume (L) F	Receptacle Type	Fill Command	Measured Pressure (MPa)	Measured Temperature (K)	CRC		
Corrupt ID Corrup	~	180	H70 ~	Stat $\checkmark$	÷ 64.0	280.0			
	upt VN	Corrupt TV	Corrupt RT	Corrupt FC	Corrupt MP	Corrupt MT	Com	upt CRC	
ptional Data						OD	Character	Count:	0
# of Lines to Insert/Delete									

#### FIGURE 6-7 HHT TEST PATTERN GENERATOR SOFTWARE - FILE CONTENTS

At the **top right** of the screen, the messages in the test pattern file are shown – each line is a single IR test packet with a unique "Message #". To scroll through the message lines, use the scroll bar on the right side of the file contents display.

See Section 6.1 for details on how to read an IR message.

Below the file contents display, the following is shown:

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- Total fueling time the time, in milliseconds, that it will take to transmit the contents of the test pattern file.
- Characters in pattern the total number of characters in the test pattern messages.

**NOTE:** The HHT transmits 1 test pattern line every 100 ms. For example, a test pattern file with 5 lines will take 500 ms, so "Total fueling time" will be "00:00.500".

# 6.4 CREATING A NEW TEST PATTERN FILE

To create a new user-defined test pattern file, do the following:

	Action
STEP 1	Create and add test pattern lines (IR packets), using the "Test Pattern Assembly Area" of the HHT Test Pattern Generator software.
STEP 2	Save the file under a file name.

Each of these steps is described in detail in the following subsections.

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# 6.4.1 Creating and Adding Test Pattern Lines

The user can create unique test pattern lines by changing the values of the "VN", "TV", "RT", "FC", "MP", "MT" and/or "OD" message fields manually.

To create a new test pattern line, do the following (refer to Figure 6-8):

	Action
STEP 1	Select the desired values for each of the message fields (see the following subsections for details on each message field).
STEP 2	View the test pattern in the "IRDI Data Link Frame Preview" window, to make sure that it is correct.
STEP 3	Click in the "# of Lines to Insert/Delete" field at the bottom left of the screen, and enter the number of copies of the line that you wish to add to the file.
STEP 4	Click on the "Insert Line(s)" button to add the line or lines to the test pattern file.
STEP 5	View the new test pattern lines in the "Test Pattern File Information" area of the screen.

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IRDI		Message #	Message						
SVETEN		1	yyyyyAID+SAE J	2799/VN+02.00/TV+0	180.0/RT+H70/FC+Ha	AMP+064.0MT+	280.0(e)A		
COM Port Config		2	yyyyyAID+SAE J	2799/VN+02.00/TV+0	180.0/RT+H70/PC+Ha	&MP+064.0MT+	280.0jelA		
COM PORT: COM	B v C	3	www.AID+SAE J	2799/VN+02.00/TV+0	180.0IRT+H70IFC+Ha	AMP+064.0MT+	280.0ielA		
	~	4	yyyyyÅID+SAE J	2799/VN=02.00/TV=	Stop 5	&MP+064.0/MT+	280.0jelA		
OPEN	CLOSE	1 5	yyyyyAliD-SAE J	2799/VN=02.00/TV=	Steps	&MP+064.0MT+	280.0ielÁ		
		6	yyyyyAID-SAE J	2799/VN+02.00/TV+0	180.0/RT+H70/FC+Ha	&MP+064.0MT+	-280.0jelÅ		
Pati	em Read	7	yyyyyAID+SAE J	2799/VN+02.00/TV+0	180.0/RT+H70/FC+Ha	AMP+064.0MT+	-280.0jelA		
Command Config		8	yyyyy AlD+SAE J	2799/VN=02.00/TV=0	180.0/RT=H70/FC=Ha	&MP+064.0MT+	280.0jelA		
HHT Test Number	1 ~	9	yyyyyAID+SAE J	2799/VN+02.00/TV+0	180.0/RT+H70/FC+Ha	&MP+064.0MT+	-280.0ielA		
	1.4.1	10	yyyyyAID+SAE J	2799/VN=02.00/TV=0	180.0/RT=H70/FC=Ha	EMP+064.0MT+	-280.0ielA		
						TREE ARE ARET	200.00.01		
Wite II Data Link Frame F yyyAllD=SAE J2 Step 2	Read heview 2799 VN=02.00 TV	-0180.0(RT=H70)F0	Time (seconds): 2.	4 Characters in Pi 0jMT-280.0jelA	ittem: 1800			Reset	J2799 Fx
Wite DI Data Link Frame F nyyyAjID=SAE J2 Step 2 E Protocol Identifier	Read Perview 2799/VN=02.00/TV Version Number	-0180.0(RT=H70)F(	Time (seconds): 2.	4 Characters in Pi 0/MT=280.0/clA Fil Command	item: 1800	MPa) Measure	d Temperature (K)	Reset .	J2799 Fx
Wite II Data Link Frame F yyyyAjID=SAE J2 Step 2 E Protocol Identifier E J2799	Read heview 2799jVN=02.00jTV Version Number 2.0 ~	< Total Fueing =0180.0(RT=H70)F( Tank Volume (L) ↓ 180	Time (seconda): 2 / C+Halt(MP=064 ( Receptacle Type H70 ~	4 Characters in Pr 0/MT=280.0/clA Fil Command Hat ~	Measured Pressure (	MPa) Measure	d Temperature (K) 280.0	Reset	J2799 Fx
Write II Data Link Frame F yyyyAllD+SAE J2 Step 2 E Protocol Identifier E J2799 Corrupt ID	Read review 2799/VN=02.00/TV Version Number 2.0 ~ Compt VN	<ul> <li>Total Fueling</li> <li>-0180.0(RT=H70)F(</li> <li>Tank Volume (L)</li> <li>↓ 180</li> <li>Compt TV</li> </ul>	Time (seconds): 2. C-Halt(MP=064 ( Receptacle Type H70 Compt RT	4 Characters in Pi DIMT=280.0(elÅ Fill Command Halt ~ Comut FC	Measured Pressure ( © 64.0 Compt MP	MPa) Measure	d Temperature (K) 280.0 upt MT	Reset	J2799 Fr
Write II Data Link Frame F ryyyAjID=SAE J2 Step 2 E Protocol Identifier E J2799 Comupt IID onal Data	Read heview 2799/VN=02.00/TV Version Number 2.0 ~ Comust VN Step 1	<ul> <li>Total Fueing</li> <li>Total Fueing</li> <li>Tark Volume (L)</li> <li>↓ 180</li> <li>Compt TV</li> </ul>	Time (seconda): 2.4 C+Halt(MP=064.0 Receptacle Type H70 ~ Comupt RT	4 Characters in Pi DIMT=280.0(clA Fil Command Hat ~ Conupt FC	Measured Pressure (	MPa) Measure	d Temperature (K) 200.0 upt MT 00	CRC CRC Con	J2799 Fri nupt CRC r Count:
Write II Data Link Frame F yyyyAllD+SAE J2 Step 2 E Protocool Identifier E J2799 Corrupt ID Ional Data	Read Perview 2799/VN=02.00/TV Version Number 2.0 ~ Compt VN Step 1	Conupt TV	Time (seconds): 2. C-Halt(MP=064 ( Receptacle Type H70 ~ Compt RT	4 Characters in Pi DIMT=280.0(clA Fill Command Halt ~ Compt FC	Measured Pressure ( G 64.0 Compt MP	MPa) Measure	d Temperature (K) 280.0 upt MT OD	CRC CRC Con	J2799 Fi
Write II Data Link Frame F yyyyAjID+SAE J2 Step 2 E Protocol Identifier E J2799 Compt ID Ional Data	Read heview 2799/VN=02.00/TV Version Number 2.0 ~ Comut VN Step 1	<ul> <li>Total Fueing</li> <li>180.0(RT=H70)F(</li> <li>Tark Volume (L)</li> <li>180</li> <li>Conupt TV</li> </ul>	Time (seconds): 2. C+Halt(MP=064.0 Receptacle Type H70 Comupt RT	4 Characters in Pr 0 MT=280.0 clÅ Fil Command Hat ~ Comupt FC	Measured Pressure ( Generation of the second of the secon	MPa) Measure	d Temperature (K) 280.0 upt MT OD	CRC CRC Con	J2799 Fx
Write II Data Link Frame F ryyyAllD+SAE J2 Step 2 E Protocol Identifier E J2799 Corrupt ID Ional Data	Read heview 2799jVN=02.00jTV Version Number 2.0 ~ Comust VN Step 1	< Total Fueling -0180.0(RT=H70)F( Tank Volume (L) © 180 Compt TV	Time (seconds) 2.4 C+Halt(MIP=064.0 Receptacle Type H70 ~ Compt RT	4 Characters in Pi 0/MT=280.0/clA Fil Command Halt ~ Comut FC	Measured Pressure ( © 64.0 Compt MP	MPa) Measure	d Temperature (K) 200.0 upt MT OD	CRC CRC Con Character	J2799 Fri rupt CRC r Count:
Write II Data Link Frame F yyyyAllD=SAE J3 Step 2 E Protocol Identifier E J2799 Corrupt ID konal Data ( Lines to Insert/Del 24	Read herview 2799/VN=02.00/TV Version Number 2.0 ~ Comust VN Step 1	Compt TV	Time (seconds): 2.4 C+Halt(MP=064.0 Receptacle Type H70 ~ Compt RT Interpolate MP-MT Vak	4 Characters in Pi 0/MT=280.0/clA Fil Command Hat ~ Conupt FC	Measured Pressure ( Compt MP compt MP	MPa) Measure	d Temperature (K) 200.0 upt MT OD Save as Text File	CRC Con Character	J2799 Fx

FIGURE 6-8 HHT TEST PATTERN GENERATOR SOFTWARE - CREATING TEST PATTERN LINES

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The following shows an example of changing the "FC" field – the selected value, "HALT", is displayed as part of the test pattern line in the "IRDI Data Link Frame Preview" window:

RDI Data Link Frame Pr	review						Reset J2799 Reld
yyyyyAID+SAE J2	799 VN=02.00 TV	-0180.0 RT-H	FC-HaltMP-064	0 MT=280.0 elA			
			-				
				<			
Second Concerns		22/00/22/20 10/23	Ac. 2 Million 4	<u> </u>		www.come.com	DAMAGE
SAE Protocol Identifier	Version Number	Tank Volume (L)	Receptacle Type	Fill Command	Measured Pressure (MPa)	Measured Temperature (K)	CRC
SAE J2799	2.0 ~	\$ 180	H70 ~	Hat 🗸	\$ 64.0	\$ 280.0	
	a contration	0	Convert DT	Constant SC	Council MD	Come MT	0

#### FIGURE 6-9 HHT TEST PATTERN GENERATOR SOFTWARE - FILL COMMAND INPUT

The following sub-sections provide details on how to change the value of each field in the test pattern:

## Changing the "VN" Value

To change the "VN" (version number) value manually, do the following:

	Action
STEP 1	Click on the "down" arrow to the right of the "VN" window, to see a pull-down menu of version number options. (see below)
STEP 2	Select one of the available version numbers, to change the version number value in the infrared data message. (see below)

IRDI Data Link Frame Pr	eview						Reset J2799 Fields
ÿÿÿÿÿÄ ID=SAE J2	799 VN=02.00 TV	=0180.0 RT=H70	FC=Halt MP=064.0	) MT=280.0 ¢lA			
SAE Protocol Identifier	Version Number	Tank Volume (L)	Receptacle Type	Fill Command	Measured Pressure (MPa)	Measured Temperature (K)	CRC
SAE J2799	2.0 🗸	<b>\$</b> 180	H70 ~	Halt $\vee$	÷ 64.0	280.0	
Corrupt ID	1.0 1.1	Corrupt TV	Corrupt RT	Corrupt FC	Corrupt MP	Corrupt MT	Corrupt CRC
Ontional Data	2.0					OD(	Character Count: 0

## FIGURE 6-10 HHT TEST PATTERN GENERATOR SOFTWARE - VERSION NUMBER INPUT



#### Changing the "RT" Value

To change the "RT" (receptacle type) value manually, do the following:

	Action
STEP 1	Click on the "down" arrow to the right of the "RT" window, to see a pull-down menu of options. (see below)
STEP 2	Select one of the available RT values ("H25", "H35", "H50" or "H70") to change the receptacle type value in the infrared data message. (see below)

IRDI Data Link Frame Pr	eview						Reset J2799 Fields		
ÿÿÿÿÿÅ ID=SAE J2	ÿÿÿÿÿÄIID=SAE J2799/VN=02.00/TV=0180.0/RT=H70/FC=HaltjMP=064.0/MT=280.0/clÅ								
SAE Protocol Identifier	Version Number	Tank Volume (L)	Receptacle Type	Fill Command	Measured Pressure (MPa)	Measured Temperature (K)	CRC		
SAE J2799	2.0 ~	\$ 180	H70 ~	Halt 🗸	\$ 64.0	\$ 280.0			
ComunityID	Commet V/N	Comunit TV	H25	Convert FC	Comunit MD	Comunit MT	Commit CDC		
Compt ID	Compt VIV	Comupt I v	H35	Compt PC	Compt MP	Compt M I	Comupt CHC		
Optional Data			H50 H70			OD	Character Count: 0		

#### FIGURE 6-11 HHT TEST PATTERN GENERATOR SOFTWARE - RECEPTACLE TYPE INPUT

# Changing the "TV" Value

To change the "TV" (total volume) value manually, do the following:

	Action
STEP 1	Click on the "TV" window and use the keyboard to enter a new value OR click on the "up" or "down" arrows to the left of the "TV" window, to change the total volume value in the infrared data message. (see below)
NOTES	The user must include the decimal place when entering a value in the window. Each "up" or "down" arrow click will increment or decrement the "TV" value by 1.0. If the user enters a fractional number, the value will be automatically rounded to the nearest whole number.

S Y		1					Document # Revision Date Revised		200 Jan 29 2	1422 8.0 2025
	IRDI Data Link Frame Pr ÿÿÿÿÿÅIID=SAE J2 SAE Protocol Identifier	review 799 VN=02.00 TV= Version Number	=0180.0 RT=H70  Tank Volume (L)	FC=Halt MP=064.0 Receptacle Type	MT=280.0 ¢lÅ Fill Command	Measured Pressure	(MPa) Measured Tempera	ature (K)	Reset J2799 Fields	
	SAE J2799 Corrupt ID	2.0 ~ Corrupt VN	+ 180 Corrupt TV	H70 ~ Corrupt RT	Halt ~ Corrupt FC	Corrupt MP	280.0 Corrupt MT		Corrupt CRC	

## FIGURE 6-12 HHT TEST PATTERN GENERATOR SOFTWARE - TOTAL VOLUME INPUT

# Changing the "FC" Value

To change the "FC" (fill command) value manually, do the following:

	Action
STEP 1	Click on the "down" arrow to the right of the "FC" window, to see a pull-down menu of options. (see below)
STEP 2	Select one of the available fill commands ("DYNA", "STAT", "HALT" or "ABORT") to change the fill command value in the infrared data message. (see below)

IRDI Data Link Frame Pr	eview						Reset J2799 Fields	
ÿÿÿÿÿÄID=SAE J2	ÿÿÿÿÿÅIID=SAE J2799IVN=02.00 TV=0180.0 RT=H70 FC=Halt MP=064.0 MT=280.0 clÅ							
SAE Protocol Identifier	Version Number	Tank Volume (L)	Receptacle Type	Fill Command	Measured Pressure (MPa)	Measured Temperature (K)	CRC	
SAE J2799	2.0 ~	÷ 180	H70 🗸	Halt 🗸 🗸	÷ 64.0	280.0		
0	0	0 · · T/	0	Dyna	0	0 WT		
Comupt ID	Comupt VN	Corrupt TV	Corrupt RT	Stat	Comupt MP	Corrupt M I	Comupt CRC	
				Halt				
Optional Data				ADUIL		ODC	Character Count: 0	

#### FIGURE 6-13 HHT TEST PATTERN GENERATOR SOFTWARE - FILL COMMAND INPUT

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# Changing the Measured Pressure "MP" Value

To change the pressure sensor value manually, do the following:

	Action
STEP 1	Click on the "MP" window and use the keyboard to enter a new value OR click on the "up" or "down" arrows to the left of the "MP" window, to change the measured pressure value in the infrared data message. (see below)
NOTES	The user must include the decimal place when entering a value in the window. Each "up" or "down" arrow click will increment or decrement the "MP" value by 0.1.

IRDI Data Link Frame Preview	Reset J2799 Fields
ÿÿÿÿÿÄ ID=SAE J2799 VN=02.00 TV=0180.0 RT=H70 FC=Halt MP=064.0 MT=280.0 ¢İÅ	
SAE Protocol Identifier Version Number Tank Volume (L) Receptacle Type Fill Command Measured Pressure (MPa) Measured Temperature (K	CRC
SAE J2799 2.0 V 🗢 180 H70 V Hait V 🗢 64.0 🔄 280.0	
Comunit ID Comunit VN Comunit TV Comunit BT Comunit FC Comunit MP Comunit MT	Comunt CBC
	condprende

## FIGURE 6-14 HHT TEST PATTERN GENERATOR SOFTWARE - PRESSURE INPUT

## Changing the Measured Temperature "MT" Value

To change the temperature sensor value manually, do the following:

	Action
STEP 1	Click on the "MT" window and use the keyboard to enter a new value OR click on the "up" or "down" arrows to the left of the "MT" window, to change the measured temperature value in the infrared data message. (see below)
NOTES	The user must include the decimal place when entering a value in the window. Each "up" or "down" arrow click will increment or decrement the "MT" value by 0.1.

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<b>\</b>	<b>RD</b>	4					Doc ] Date	cument # Revision Revised		200 Jan 29 2	0422 8.0 2025
	IRDI Data Link Frame Pr	' eview 799 VN=02.00 TV=	=0180.0 RT=H70	0 FC=Halt MP=064.0	MT=280.0 ¢ÌÁ				Reset	: J2799 Fields	
	SAE Protocol Identifier SAE J2799 Comupt ID	Version Number 2.0 ~ Corrupt VN	Tank Volume (L)	Receptacle Type H70 ~ Corrupt RT	Fill Command Halt ✓ Corrupt FC	Measured Pressur 64.0 Corrupt MP	e (MPa)	Measured Temperati	ure (K) CRC	mupt CRC	

#### FIGURE 6-15 HHT TEST PATTERN GENERATOR SOFTWARE - TEMPERATURE INPUT

## Changing the Optional Data ("OD") Value

• I

To change the optional data ("OD") value manually, do the following:

	Action
STEP 1	Click on the "OD" display window and use the keyboard to enter a new value. (see below)
	As an example, if the user wants to transmit three parameters, "A", "B" and "C", with values 1, 2, and 3 respectively, the user can enter "A=1;B=2;C=3", or "A1B2C3", or some other similar format, in the "OD" display window. The data format for the "OD" data is defined by the user.
NOTES	The user may enter up to 16 characters for J2799 v1.0, 74 characters for J2799 v1.1, or 240 characters for J2799 v2.0. If more than 240 characters are entered, the characters will be truncated automatically. The user may not use the character " " (ASCII), or "\$7C" (hexadecimal)

IRDI Data Link Frame Pr	eview						Reset J2799 Fields
ÿÿÿÿÿÅ ID=SAE J2	799 VN=02.00 TV	=0180.0 RT=H70	FC=Halt MP=064.0	) MT=280 <mark>0</mark>  OD=T	EST1 1ôÁ		
SAE Protocol Identifier	Version Number	Tank Volume (L)	Receptacle Type	Fill Command	Measured Pressure (MPa)	Measured Temperature (K)	CRC
SAE J2799	2.0 ~	÷ 180	H70 ~	Halt $\sim$	÷ 64.0	280.0	
Corrupt ID	Corrupt VN	Corrupt TV	Corrupt RT	Corrupt FC	Corrupt MP	Corrupt MT	Corrupt CRC
Optional Data						OD	Character Count: 5
TEST1							

#### FIGURE 6-16 HHT TEST PATTERN GENERATOR SOFTWARE - OPTIONAL DATA INPUT

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# 6.4.2 Deleting Test Pattern Lines

To delete one or more test pattern lines, do the following:

	Action
STEP 1	Click in the "# of Lines to Insert/Delete" field at the bottom left of the screen, and enter the number of lines that you wish to delete. (see Figure 6-17)
STEP 2	Click on the "Delete Line(s)" button to delete the last line (or the last X number of lines) of the test pattern shown in the top right area of the screen. In the example below, the last line, line # 14, will be deleted. (see Figure 6-17)

IRDI HHT Test Pattern Generator Rev 5.0						-		×
* IRDI	Message #	Message						^
SYSTEM	5	ÿÿÿÿÿÄIID=SAE J2	2799/VN=02.00/TV=0	180.0IRT=H70IFC=HaltIMP=	064.01MT=280.01¢1Å			-
COM Port Config	6	ÿÿÿÿÿÅIID=SAE J2	2799/VN=02.00/TV=0	180.0 RT=H70 FC=Halt MP=	064.0 MT=280.0 ¢1A			-
	7	ÿÿÿÿÿÅlID=SAE J2	2799/VN=02.00/TV=0	180.0 RT=H70 FC=Halt MP=	064.0 MT=280.0 ¢1Å			
	8	ÿÿÿÿÿÄlID=SAE J2	2799/VN=02.00/TV=0	180.0 RT=H70 FC=Halt MP=	064.0 MT=280.0 ¢1Å			
OPEN CLOSE	9	ÿÿÿÿÿÄIID=SAE J2	2799 VN=02.00 TV=0	180.0 RT=H70 FC=Halt MP=	064.0 MT=280.0 ¢1A			
	10	ÿÿÿÿÿÄIID=SAE J2	2799 VN=02.00 TV=0	180.0 RT=H70 FC=Halt MP=	064.0 MT=280.0 ¢1A			
HHT Connected: IRDI SYSTEM - V2.4.0	11	ÿÿÿÿÿÿÅIID=SAE J2	2799 VN=02.00 TV=0	180.0 RT=H70 FC=Dyna MP	=064.0 MT=280.0 0YA			
Command Config	12	ÿÿÿÿÿÿÅlID=SAE J2	2799 VN=02.00 TV=0	180.0 RT=H70 FC=Dyna MP	=064.0 MT=280.0 0YÁ			
HHT Test Number: 1	13	ÿÿÿÿÿÿÅIID=SAE J2	2799 VN=02.00 TV=0	180.0 RT=H70 FC=Stat MP=	064.0 MT=280.0  NÁ			
	14	ÿÿÿÿÿÅlID=SAE J2	2799/VN=02.00/TV=0	180.0 RT=H70 FC=Stat MP=	064.0 MT=280.0  NÁ			
Write Read	<							, *
IRDI Data Link Frame Preview ÿÿÿÿÿÄIID=SAE J2799 VN=02.00 TV=0180.0	RT=H70 FC	=Stat MP=064.0	MT=280.0  NÁ			Reset	J2799 Fiel	lds
SAF Protocol Identifier Version Number Tank Vo	lume (I.) F	leceptacle Type	Fill Command	Measured Pressure (MPa)	Measured Temperature (K)	CRC		
SAE J2799 2.0 V	180	H70 ~	Stat ~	\$ 64.0	280.0			
Corrupt ID Corrupt VN Corrupt	upt TV	Corrupt RT	Corrupt FC	Corrupt MP	Corrupt MT	Cor	rupt CRC	
Optional Data					OD	Characte	r Count:	0
# of Lines to Insert/Delete	Delete Line(s)	Interpolate MP/MT Valu	es Clear Patt	em MP/MT Graph	Save as Text File	e Im	port Patter	m



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# 6.4.3 Clearing a Test Pattern

To clear the entire test pattern, do the following:

	Action
STEP 1	Click on the "Clear Pattern" button at the bottom of the screen – see Figure 6-18. The pattern shown in the top right area of the screen will disappear.

IRDI HHT Test Pattern Generator Rev 5.0						-		×
	Message #	Message				_	_	
COM Port Config								
COM PORT: COM3 V								
OPEN CLOSE								
HHT Connected: IRDI SYSTEM - V2.4.0								
Command Config								
White Head	<							>
	Total Fueling Ti	me (seconds): 0	Characters in Pa	attem: 0		Reset	.12799 Field	ds
	) 0IRT=H70IFC=	=HaltIMP=064.0	IMT=280.01c14					
yyyyynib one ozrosjana oz.ooji a oroc			1111-200.016#1					
SAE Protocol Identifier Version Number Tank	Volume (L) Re	eceptacle Type	Fill Command	Measured Pressure (MPa	a) Measured Temperature (K)	CRC		
SAE J2799 2.0 ~	180 H	170 ~	Halt $\vee$	<b>64.0</b>	280.0			
Corrupt ID Corrupt VN C	Corrupt TV	Corrupt RT	Corrupt FC	Corrupt MP	Corrupt MT	Cor	rupt CRC	
Optional Data					OD	Characte	r Count:	0
# of Lines to Insert/Delete	Delete Line(s)	Interpolate	Clear Patte	m MP/MT Grant	Save as Text File	- Im	nort Patter	n
	Delete Elle(a)	MP/MT Valu	es		Cave as rext ne		port ditor	

FIGURE 6-18 HHT TEST PATTERN GENERATOR SOFTWARE - CLEARING A TEST PATTERN

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# 6.4.4 Creating and Adding a Corrupted Test Pattern Line

Each field in the data message can be "corrupted", in order to test the hydrogen station's ability to detect and react to issues of data corruption in the IRDI data message. The message fields may be corrupted using the corresponding "**corrupt**" buttons.

The following fields can be "corrupted":

- ID field;
- VN field (version);
- TV field (total volume);
- RT field (receptacle type);
- FC field (fill command);
- MP field (measured pressure);
- MT field (measured temperature); and,
- CRC field (cyclic redundancy check used to check for errors in the message).

When a field is "corrupted", its current value is replaced with the invalid value shown in the following table:

Data Field	SAE J2799 Tag	Valid Data Values (in range)	Preset Invalid (Corrupt) Data Value
Protocol Identifier	ID=	SAE J2799	SAE J2779
Data Communications Software Version Number	VN=	00.00 to 99.99	99.99
Total Volume	TV=	0000.0 to 5000.0	6000.0
Receptacle Type	RT=	H25, H35, H50, H70	H35
Fueling Command	FC=	Dyna, Stat, Halt, Abort	Boart
Measured Pressure	MP=	000.0 to 100.0	110.0
Measured Temperature	MT=	16.0 to 425.0	999.9
CRC			ÁÁ

## TABLE 6-2: INVALID (CORRUPT) DATA VALUES

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As an example, to corrupt the "TV" field, do the following (see Figure 6-19):

	Action
STEP 1	Click on the "Corrupt TV" button. Note that the "TV" field in the "IR Data Link Frame Preview" window now shows an invalid (or corrupt) value of "6000.0", and the "Corrupt TV" button becomes a blue shade, while the "Total Volume" field is greyed out.
STEP 2	Click on the "Insert Line(s)" button, to insert this line, with the corrupted "TV" value, into the file – this line is now shown as a new line in the test pattern area at the top right of the screen.
STEP 3	Click on the "TV CORRUPT" button again, to turn off the corruption of the "TV" field. The button now changes from blue to lighter grey, indicating that the "TV" field has resumed, allowing only valid values.

IRDI HHT Test Pattern Generator Rev 5.0					-		Х
COM Port Config	# Message ÿÿÿÿÿÅID=SAE J	2799/VN=02.00/TV=6	000.0/RT+H70/FC+Hat/MP4	-064.0MT-280.0PcA			
OPEN CLOSE Pattern Read							
HHT Test Number: 1 V							
Wite Read							
IRDI Data Link Frame Preview ÿÿÿÿÿÿAJID=SAE J2799JVN=02.00JTV=6000.0JRT=H70JF	FC=Halt(MP=064.0	0 MT=280.0 ²«Å			Reset	t J2799 Fie	ids
SAE Protocol Identifier Version Number Tank Volume (L)	Receptacle Type	Fill Command	Measured Pressure (MPa)	Measured Temperature (K	CRC		_
SAE J2799 2.0 ~ 180	H70 ~	Hat v	64.0	280.0			
Comupt ID Comupt VN Comupt TV	Corrupt RT	Corrupt FC	Corrupt MP	Corrupt MT	Co	mupt CRC	
Optional Data				00	) Charact	er Count:	0
# of Lines to Insert/Delete	(s) Interpolate MP/MT Valu	es Clear Path	em MP/MT Graph	Save as Text Fi	le la	nport Patte	m

FIGURE 6-19 HHT TEST PATTERN GENERATOR SOFTWARE - CORRUPTING A TEST PATTERN

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# 6.4.5 Saving the Test Pattern File

Once the test pattern lines are defined, **save the test pattern** with a user-defined file name. To save the file, do the following (see Figure 6-20):

	Action
STEP 1	Click on the "Save as Text File" button.
STEP 2	A browser window will appear - – see the following figure. Browse to the directory where you want to store the file.
STEP 3	In the "File Name" field of the browser window, enter the file name you want to use for this test pattern file.
STEP 4	Click on the "Save" button to save the file.

IRDI HHT Test Pattern Gen	erator Rev 5.0				_		$\times$
Save As							
🛧 🗎 > Th	nis PC > Documents >			√ Ū	Search Documents		
Organize 🔻 New fold	er						
^	Name	Date modified	Туре	Size			
🖈 Quick access	Add-in Express	5/24/2016 2:23 PM	File folder				
📃 Desktop 🛛 🖈	Autodesk	5/24/2016 2:23 PM	File folder				
🕂 Downloads 🖈	BlackBerry	5/24/2016 2:23 PM	File folder				
🚆 Documents  🖈	BLACKBERRY-3638	2/3/2016 9:18 PM	File folder				
📰 Pictures 🛛 🖈	Bluetooth Exchange Folder	7/10/2011 7:09 PM	File folder				
Christmas 2024	Calibre Library	5/24/2016 2:23 PM	File folder				
Denmark Trip 20	CDM_2.08.14_CANUSB[1]	5/24/2016 2:23 PM	File folder				
R08 Jap 2025	Corel	5/24/2016 2:23 PM	File folder				
- Coreanshate	Fax	5/24/2016 2:23 PM	File folder				
Screensnots	gegl-0.0	5/24/2016 2:23 PM	File folder				
💱 Dropbox	Inventor	5/24/2016 2:23 PM	File folder				
	Inventor Server SDK ACAD 2014	5/24/2016 2:23 PM	File folder				
- OneDrive - Persor	Inventor Server SDK ACADE 2014	5/24/2016 2:23 PM	File folder				
This PC 🗸 🗸	Inventor Server x64 3dsMaxDesign	5/24/2016 2:23 PM	File folder				
File name: myP	attern						-
Save as type: Text f	iles (*.txt)						
the state of the s							-
Hida Foldora					Save	Can	cel
Hide Folders						cun	
t Lines to Insert/Delete	Insert Line(s) Delete Line(s) Interpo	olate Clear Pattern	MP/MT Graph	Sa	ave as Text File Im	port Patter	n
1	MP/MT	values					

## FIGURE 6-20 HHT TEST PATTERN GENERATOR SOFTWARE - SAVING THE FILE

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# 6.5 PROGRAMMING THE HHT WITH A TEST PATTERN FILE

To program the HHT with a test pattern file, do the following (see Figure 6-21):

	Action
STEP 1	Open or create a test pattern file.
STEP 2	Under "HHT Test Number", use the drop-down menu to select a number (1 through 4) to write this test pattern file to.

U IRDI HHT lest Patto	ern Generator Rev 5.	0						-		×
<b>NIRDI</b>		Message	# Message							
SYSTEM		1	yyyyyAID+SAE J	2799/VN=02.00/TV=0	180.0/RT=H70/FC=Hat/	MP=064.0	MT=280.0(clÅ			_
COM Port Config		2	yyyyyÅID+SAE J.	2799/VN+02.00/TV+0	180.0IRT=H70IFC=Haki	MP+064.0	MT=280.0(clÅ			
COM PORT: COM	3 v C	3	yyyyyAID=SAE J	2799/VN+02.00/TV+0	180.0(RT-H70(FC-Hak)	MP+064.0	MT=280.0(clÅ			
OPEN	CLOSE	_								
HHT Connected. I Command Config	RDI SYSTEM - V2.4.0									
HHT Test Number: Witte	1 ~ 1 2									
	3 4	Total Evalu	a Time (seconds): 0.1	) Characters in P	attam: 225					
		TOUR LOUIS								
IRDI Data Link Frame Pr ÿÿÿÿÿÅJID=SAE J2	eview 799/VN=02.00/TV	-0180.0(RT=H70)F	FC=Halt(MP=064.0	01MT=280.0(elÅ				Rese	t J2799 Fi	ekda
IRDI Data Link Frame Pr ÿÿÿÿÿÄJID=SAE J2 SAE Protocol Identifier	eview 799 VN=02.00 TV Version Number	-0180.0 RT=H70 F Tank Volume (L)	FC=Halt[MP=064.0	0JMT=280.0JcIA	Measured Pressure (Mi	Pa) Mear	sured Temperature ()	Rese	rt J2799 Fir	elds
IRDI Data Link Frame Pi ÿÿÿÿÿÅlID=SAE J2 SAE Protocol Identifier SAE J2799	eview 799 VN=02.00 TV Version Number 2.0 ~	-0180.0[RT=H70]F Tank Volume (L)	FC=Halt MP=064.0 Receptacle Type H70	0 MT=280.0 elA Fil Command Hat ~	Measured Pressure (Mi	Pa) Mear	aured Temperature (* 280.0	Rese	t J2799 Fe	eids
IRDI Data Link Frame Pi ÿÿÿÿÿÅJID=SAE J2 SAE Protocol Identifier SAE J2799 Comupt ID	eview 799 VN=02.00 TV Version Number 2.0 ~ Compt VN	-0180.0(RT=H70(F Tank Volume (L) © 180 Compt TV	FC=Halt MP=064.( Receptacle Type H70 ~ Compt RT	0 MT=280.0 elA Fil Command Hait ~ Comupt FC	Measured Pressure (Mi	Pa) Mear	aured Temperature († 280.0 Compt MT	Rese	t J2799 Fe	eids
IRDI Data Link Frame Pi ÿÿÿÿÿÅJID=SAE J2 SAE Protocol Identifier SAE J2799 Comupt ID Octional Data	eview 299 VN=02.00 TV Version Number 2.0 ~ Comupt VN	-0180.0JRT-H70JF Tank Volume (L) © 180 Comupt TV	FC=Halt MP=064.0	0 MT=280.0 elA Fill Command Halt ~ Comupt FC	Measured Pressure (Mi	Pa) Mear	aured Temperature ( 280.0 Comupt MT	Rese	et J2799 Fie	eids
IRDI Data Link Frame Pi ÿÿÿÿÿÅJID=SAE J2 SAE Protocol Identifier SAE J2799 Comut ID Optional Data	eview 799 VN=02.00 TV Version Number 2.0 ~ Comupt VN	-0180.0 RT=H70 F Tank Volume (L) © 180 Comupt TV	FC=Halt MP=064.0 Receptacle Type H70 ~ Compt RT	0 MT=280.0 elA Fil Command Hat ~ Compt FC	Measured Pressure (M) G 64.0 Compt MP	Pa) Mear	aured Temperature () 280.0 Comupt MT O	Rese	et J2799 Fie omupt CRC ter Count:	elds
IRDI Data Link Frame Pi ÿÿÿÿÿÄJID=SAE J2 SAE Protocol Identifier SAE J2799 Comupt ID Optional Data	eview 799 VN=02.00 TV- Version Number 2.0 ~ Corrupt VN	-0180.0 RT=H70 F Tank Volume (L) © 180 Comupt TV	FC=Halt MP=064.0 Receptacle Type H70 Comupt RT	0 MT=280.0 elA Fil Command Halt ~ Comupt FC	Measured Pressure (M	Pa) Mear	sured Temperature () 280.0 Comupt MT O	Rese	et J2799 Fie orrupt CRC ter Count:	elds
IRDI Data Link Frame Pi ÿÿÿÿÿÅJID=SAE J2 SAE Protocol Identifier SAE J2799 Comupt ID Optional Data	eview 799 VN=02.00 TV Version Number 2.0 ~ Comupt VN	-0180.0[RT=H70[f Tark Volume (L) - 180 Comupt TV	FC=Halt MP=064.0 Receptacle Type H70 Comupt RT	0 MT=280.0 elA Fil Command Hait ~ Comupt FC	Measured Pressure (M	Pa) Mear	sured Temperature () 280.0 Comupt MT O	Rese 0 CRC C 0 Oharad	et J2799 Fie omupt CRC ter Count:	elds 0
IRDI Data Link Frame P ÿÿÿÿÿÅJID=SAE J2 SAE Protocol Identifier SAE J2799 Comut ID Optional Data # of Lines to Insert/Dele 1	eview 799 VN=02.00 TV Version Number 2.0 ~ Comupt VN te Insert Line(s	-0180.0JRT-H70JF Tank Volume (L) © 180 Comupt TV	FC=Halt MP=064 ( Receptacle Type H70 Comupt RT (b) Interpolate MP/MT Value	DIMT=280.0(clÅ Fil Command Hait ~ Comupt FC	Measured Pressure (Mi G 64.0 Comupt MP em	Pa) Mear	sured Temperature ( 280.0 Comupt MT O Save as Text F	Rese 0 CRC 0 Oharad	et J2799 Fie omupt CRC ter Count: mport Patte	elds 0 em

FIGURE 6-21 HHT TEST PATTERN GENERATOR SOFTWARE - SELECT TEST NUMBER



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	Action
	<b>NOTE:</b> The file number corresponds to test patterns 1 through 4. For example, if you program file number 4, you must then select "T4" on the HHT to transmit that test pattern.
STEP 3	Click on the "Write" button.
	In the "HHT Status" window, the message "Writing Pattern" will be displayed – see Figure 6-22 below. Wait while the HHT is programmed.

IRDI HIHT Test Pattern Generator Rev 5.0			-	×
%IRDI	Message #	Message		 ٦
SYSTEM	1	yyyyyÅID=SAE J2799/VN=02.00/TV=0180.0/RT=H70/FC=Hab/MP=064.0/MT=280.0/elÅ		
COM Port Config	2	yyyyyÅID=SAE J2799/VN=02.00/TV=0180.0/RT=H70/FC=Hak/MP=064.0/MT=280.0/elÅ		
COM PORT: COM3 V C	3	jjjjjjÅID=SAE J2799IVN=02.00/TV=0180.0/RT=H70/FC=Hab/MP=064.0/MT=280.0/elÅ		
OPEN CLOSE				
Command Config				
HHT Test Number: 1 ~				
Wite Read	<	Tena (sanonda): 0.3 Charactera in Pattern: 226		>

FIGURE 6-22 HHT TEST PATTERN GENERATOR SOFTWARE - HHT PROGRAMMING IN PROGRESS

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	Action
STEP 4	The "HHT Status" message will display "Pattern Written" when the HHT programming is completed – see Figure 6-23 below.

IRDI HHT Test Pattern Generator Rev 5.0		,	-	×
* IRDI	Message #	Message		
S Y S T E N	1	jjjjjjÅID=SAE J2799/VN=02.00/TV=0180.0/RT=H70/FC=Hab/MP=064.0/MT=280.0/elÅ		
COM Port Config	2	yyyyyÅID=SAE J2799/VN=02.00/TV=0180.0/RT=H70/FC=Hak/MP=064.0/MT=280.0/elÅ		
COM PORT: COM3	3	yyyyyÅID=SAE J2799/VN=02.00/TV=0180.0/RT=H70/FC=Hak/MP=064.0/MT=280.0/elÅ		
OPEN CLOSE Pattern Written				
Command Config HHT Test Number: 1 ~				
Wite Read	٢.			>
	Total Fueling	Time (seconds): 0.3 Characters in Pattern: 225		





# 6.6 READING A TEST PATTERN FILE FROM THE HHT



There is a known issue associated with using the "Read" command for test patterns longer than 8,000 characters.

To read the HHT's current test pattern files, do the following:

	Action
STEP 1	Open or create a test pattern file.
STEP 2	Under "HHT Test Number", use the drop-down menu to select the number (1 through 4) of the test file to read from the HHT – see Figure 6-24.

IRDI HHT Test Patte	ern Generator Rev 5.	0					-		×
<b>SIRDI</b>		Message #	Message						
SYSTEM		1	www.AID+SAE J2	799/VN=02.00/TV=0	180.0(RT=H70)FC=Hat	MP=064.0IMT=280.0(clÅ			
COM Port Config		2	yyyyyAID+SAE J2	799/VN+02.00/TV+0	180.0IRT+H70IFC+Halt	MP+064.0IMT+280.0le1Å			
COM PORT: COM	3 V C	3	99999AID+SAE J	799(VN=02.00(TV=0	180.0(RT=H70)FC=Halt	MP=064.0/MT=280.0/clÅ			
OPEN HHT Connected, II Command Config HHT Test Number:	CLOSE								
Wite	2	4							
	4	Total Evelop	Time (seconds): 0.1	Characters in P	ttem: 225				
IRDI Data Link Frame Pr	aview.		interpreterioup. e.				Reset	J2799 Fie	ids
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,									
SAE Protocol Identifier	Version Number	Tank Volume (L)	Receptacle Type	Fill Command	Measured Pressure (M	Pa) Measured Temperature (K)	CRC		_
SAE J2799	2.0 ~	₽ 180	H70 ~	Hat ~	÷ 64.0	280.0			
Corrupt ID	Corrupt VN	Corrupt TV	Corrupt RT	Comupt FC	Corrupt MP	Corrupt MT	Co	mupt CRC	
Optional Data						00	Characte	er Count:	0
# of Lines to Insert/Dele	te Insert Line(s	) Delete Line(s)	Interpolate MP/MT Valu	es Clear Path	em MP/MT Gra	ph Save as Text File	, ir	nport Patte	m

FIGURE 6-24 HHT TEST PATTERN GENERATOR SOFTWARE - SELECT TEST NUMBER

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	Action
	<b>NOTE:</b> The file number corresponds to test patterns 1 through 4. For example, file number 4 is accessed on the HHT by selecting "T4".
STEP 3	Click on the "Read" button. In the "HHT Status" window, the message "Reading Pattern" will be displayed. Wait while the HHT is read. The "HHT Status" message will display "Pattern Read" when the HHT read is completed – see Figure 6-25 below. The contents of the file that was read will be shown in the top right area of the screen.

	en denerator ner s.						-		>
<b>NRD</b>		Message #	# Message						
SYSTEM		1	yyyyyAID+SAE J	2799/VN=02.00/TV=0	180.0/RT+H70/FC+Hat/MP+	-064.0/MT=280.0(e)Å			
COM Port Config		2	yyyyyAID+SAE J	2799/VN=02.00/TV=0	180.0/RT+H70/FC+Hat/MP+	•064.0/MT=280.0/elA			
COM PORT: COM	3 v C	3	yyyyyAID+SAE J	2799/VN=02.00/TV=0	180.0IRT+H70IFC+HabIMP+	-064.0IMT+280.0ielÅ			_
OPEN	CLOSE								
Patte	m Read								
HHT Test Number:	1 ~								
		1							
Wite	Read	<						_	
RDI Data Link Frame P	eview						Rese	12799 Fie	elds
manuful our in	2000 01 00 00 70 /	0100 0IDT 1 ID0/	0.11.000.004	ML 10 000 TH					
ÿÿÿÿÿÅ ID=SAE J2	799 VN=02.00 TV	•0180.0 RT=H70 F	C-Halt(MP-064.	0 MT=280.0 elÅ					
ÿÿÿÿÿÅ(ID=SAE J2 SAE Protocol Identifier	799 VN=02.00 TV	0180.0 RT=H70 F	C-Halt(MP=064.	0JMT=280.0JcIA	Measured Pressure (MPa)	Measured Temperature (K)	CRC		
ÿÿÿÿÿÅlID+SAE J2 SAE Protocol Identifier SAE J2799	799 VN=02.00 TV-	0180.0 RT=H70 F Tank Volume (L)	C-Halt MP-064.	0JMT=280.0jelA Fil Command Hat ~	Measured Pressure (MPa)	Measured Temperature (K)	CRC		
ÿÿÿÿÿÄĮID×SAE J2 SAE Protocol Identifier SAE J2799 Comupt ID	Version Number 2.0 V Comupt VN	0180.0[RT=H70]F	C-Halt MP-064.0	0IMT=280.0(elÅ Fil Command Halt ~ Comupt FC	Measured Pressure (MPa)	Measured Temperature (K)	CRC	mupt CRC	;
ÿÿÿÿÿÄID×SAE J2 SAE Protocol Identifier SAE J2799 Comupt ID Optional Data	Version Number 2.0 V Comupt VN	Tark Volume (L)	C-Halt MP-064.0	0JMT=280.0JelÅ Fil Command Halt ~ Comupt FC	Measured Pressure (MPa)	Measured Temperature (K) 200.0 Comupt MT OD	CRC	mupt CRC er Count:	0
ÿÿÿÿÿÄID+SAE J2 SAE Protocol Identifier SAE J2799 Compt ID Dptional Data	Version Number 2.0 V Comupt VN	O180.0[RT=H70]F	C-Halt MP-064.0	0JMT=280.0JelA Fil Command Hait ~ Comupt FC	Measured Pressure (MPa)	Measured Temperature (K) 2000 Comupt MT OD	CRC	mupt CRC er Count:	0

# FIGURE 6-25 HHT TEST PATTERN GENERATOR SOFTWARE - HHT FILE READ

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# 6.7 INTERPOLATING A TEST PATTERN

The HHT software includes a feature to allow the user to create dynamic data, by interpolating pressure and/or temperature values automatically, and creating a set of IRDI messages from the interpolated data. To create a test pattern using the "interpolation" feature, do the following:

	Action	
STEP 1	Click on the "Interpolate MP/MT Values" button – see Figure 6-26.	

IRDI HHT Test Pattern Generator Rev 5.0					_		×
	Message # Message					_	1
COM Port Config COM PORT: COM3 ~ C							
OPEN CLOSE HHT Connected: IRDI SYSTEM - V2.4.0							
Command Config HHT Test Number: 1 ~							
Write Read	<						>
IRDI Data Link Frame Preview	Total Fueling Time (seconds): 0	Characters in Pa	ittem: 0		Reset	J2799 Field	ds
ўўўўўÅ ID=SAE J2799 VN=02.00 TV=0180.0	RT=H70 FC=Halt MP=064	.0 MT=280.0 ¢ Å					
SAE Protocol Identifier Version Number Tank Vo	lume (L) Receptacle Type	Fill Command	Measured Pressure (MPa)	Measured Temperature (K)	CRC		
SAE J2799 2.0 ~	180 H70 ~	Halt ~	÷ 64.0	280.0			
Corrupt ID Corrupt VN Corru	upt TV Corrupt RT	Corrupt FC	Corrupt MP	Corrupt MT	Cor	rupt CRC	
Optional Data				OD	Characte	r Count:	0
# of Lines to Insert/Delete	Delete Line(s) Interpola MP/MT Va	te lues Clear Patte	ern MP/MT Graph	Save as Text File	e Im	port Patterr	n

FIGURE 6-26 HHT TEST PATTERN GENERATOR SOFTWARE - INTERPOLATE

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There are several options for interpolating data:

- Interpolate only pressure values (MP)
- Interpolate only temperature values (MT)
- Interpolate both pressure and temperature (MP and MT)

There are two methods for calculating the interpolated data:

- Select the number of messages to create
- Select the step value (either pressure steps or temperature steps) between each message the number of messages is then calculated automatically

## 6.7.1 Interpolating One Value, Using "Number of Lines" Method

To interpolate one value, using the "# of Lines" method for calculating the IRDI messages, do the following. This example shows how to interpolate the pressure (MP) value. The procedure is identical for interpolating the temperature (MT) value.

	Action
STEP 1	To select the number of IRDI messages to be calculated, do the following – see Figure 6-27 below:
	a. Click on the "Interpolate Measured Pressure" button – the button will turn blue b. Click on the "Start Value" field, and enter a value at which to start the interpolation
	c. Click on the "End Value" field, and enter a value at which to end the interpolation
	d. Click on the "Number of Lines" field, and enter the number of IRDI messages (lines) that you would like to generate
NOTE	The first IRDI message will contain the "Start Value" for pressure, and each message after that will contain an interpolated new value for pressure, calculated based on the "Start" and "End" values. The last IRDI message will contain the "End Value" for pressure.

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Γ	Interpolate Value	5		- 0	×	
	Import Interpolation \	/alues From .csv				
		Import Valu	es From .csv			
	Linear Interpolation					
	Interpolate Me	asured Pressure	Interpolate Mea	sured Temperatur	е	
	Start Value:	0.0	Start Value:	425.0	×	
	End Value:	100.0 🚖	End Value:	16.0	*	
	Step:	2.0 🜲	Step:	5.0	*	
		Number of Lines:	50 🜩			
		Calcula	te Values			

FIGURE 6-27 HHT TEST PATTERN GENERATOR SOFTWARE - INTERPOLATE MP (# OF LINES)

	Action
STEP 2	Click on the "Calculate Values" button, to generate the set of IRDI messages – see Figure 6-28 below.
	1 Interpolate Values — L X
	Import Interpolation Values From .csv
	Import Values From .csv
	Linear Interpolation
	Interpolate Measured Pressure Interpolate Measured Temperature
	Start Value: 0.0 🚖 Start Value: 425.0 🚖
	End Value: 100.0 🖨 End Value: 16.0 🖨
	Step: 2.0 \$10 \$5.0 \$
	Number of Lines: 50
	Calculate Values

FIGURE 6-28 HHT TEST PATTERN GENERATOR SOFTWARE - MP INTERPOLATION (# OF LINES)

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	Action
STEP 3	A popup window will appear (see below), to remind the user that the other value (in this example, temperature) will not be interpolated, and will remain static. Click on the "OK" button to continue.
NOTE	To set the static value (in this example, temperature), return to the main screen and set the value using the "MT" field.



## FIGURE 6-29 HHT TEST PATTERN GENERATOR SOFTWARE - INTERPOLATE WARNING NOTE

	Action
STEP 4	The interpolated IRDI messages will now appear in the "Value Preview" area at the bottom of the screen – see Figure 6-30.
NOTE	The step value between each interpolated value is automatically calculated, and is shown in the "Step" field. In this example, since the number of lines selected was 50, the step value for pressure, between each IRDI message, is 2.

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Interpolate Values	□ × I Temperature 5.0 ↓ 0 ↓	
Walue Preview:         Measured Pressure         Measured Temper           1         0         /           2         2.0         /           3         4.1         /           4         6.1         /           5         8.2         /           6         10.2         /	Reset Value	

FIGURE 6-30 HHT TEST PATTERN GENERATOR SOFTWARE – MP RESULTS (# OF LINES)



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	Action
STEP 5	To save this interpolated test pattern to a file, click on the "Save as csv" button – see Figure 6-31.
	A browser window will pop up – see Figure 6-32. Browse to the folder where you want to save the file, enter a file name for this test pattern, and click on the "Save" button, to save the file.

Import Interpolatio	on Values From .csv					
	Impor					
l inear Internolatio	n					
Interpolate	Measured Pressure		nterpolate Mea	asured Tem	perature	1
						1
Start Value:	0.0	Sta	art Value:	425.0	Ŧ	
End Value:	100.0	🗧 En	d Value:	16.0	A T	
Step:	2.0	≑ Ste	ep:	5.0	* *	
	Number of Line	s: 50		1		
			•	1		
	Ca	lculate Valu	es			
				D	11/1	
Value Preview:				Res	et values	;
Message #	Measured Pressure		Measured T	emperature		^
1	0		1			
2	2.0		1			
3	4.1		1			
4	6.1		1			
5	8.2		/			
6	10.2		/			~
Save As csv				Ac	ld Lines	

FIGURE 6-31 HHT TEST PATTERN GENERATOR SOFTWARE - SAVE RESULTS (# OF LINES)

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IRDI HHT Test Pattern Generator Rev 5.0		– 🗆 X
🗧 🗓 Save As		
$\leftarrow$ $\rightarrow$ $\checkmark$ $\uparrow$ $\blacksquare$ « Karin - Ed Li $\Rightarrow$ Release, HH	T Manual > R08 Jan 2025 > NEW HHT TEST PATTERNS	Search NEW HHT TEST PATTE
Organize 🔻 New folder		
Desktop * Name Downloads * Downloads * Documents * Pictures * NEW HHT TEST R08 Jan 2025 sc2 Screenshots RC8 Jan 2025 sc2 ConeDrive - Persor	↑ Date modified Type No items match your searc	Size
SA File name: NewPattern SA Save as type: CSV files (*.csv)		
Op A Hide Folders	6 10.2	Save Cancel
# of Lines to Insert/Delete	ne(s) Interpolate MP/MT Values Clear Pattern MP/MT Gr	Add Lines Add Lines aph Save as Text File Import Pattern

FIGURE 6-32 HHT TEST PATTERN GENERATOR SOFTWARE - SAVE FILE (# OF LINES)

S Y				Document # Revision Date Revised	200422 8.0 Jan 29 2025			
	Action							
	STEP 6	To copy this interpolated test pattern to the main screen, so that you can program the HHT, click on the "Add Lines" button – see Figure 6-33.						
		Close the "Interpolate Values" window by clicking on the "X" at the top right						

corner.

Interpolate Va	lues			-		>
Import Interpolati	on Values From .	CSV				
	Ir	mport Valu				
Linear Interpolati	on					
Interpolate	e Measured Press	sure	Interpolate	Measured T	emperatu	ire
Start Value:	0.0	<b>+</b>	Start Value:	425.	0	*
End Value:	100.0	-	End Value:	16.0		*
Step:	2.0	*	Step:	5.0		*
	Number of	f Lines:	50	<b>_</b>		
		Calcula	te Values			
Value Preview:					Reset Va	lues
Message #	Measured Pre	ssure	Measu	red Temperat	ure	^
1	0		/			
2	2.0		/			
3	4.1		/			
4	6.1		/			
5	8.2		1			
6	10.2		1			
-	100			6		v
Save As .csv					Add Lin	es

FIGURE 6-33 HHT TEST PATTERN GENERATOR SOFTWARE - ADD MP LINES (# OF LINES)



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	Action
STEP 7	View the interpolated test pattern on the main screen, in the top right area – see Figure 6-34.
	You can now program the HHT with this test pattern – refer to Section 6.5 for details.

IRDI HHT Test Pattern Generator Rev 5.0							ı x
<b>NIRDI</b>	Message #	Message					^
S Y S T E M	1	ÿÿÿÿÿÅIID=SAE J2	2799/VN=02.00/TV=0	180.0 RT=H70 FC=Stat MP=	:000.0 MT=280.0 IIIÁ		
COM Port Config	2	ÿÿÿÿÿÅIID=SAE J2	2799/VN=02.00/TV=0	180.0 RT=H70 FC=Stat MP=	010.0 MT=280.0 d}]Á		
	3	ÿÿÿÿÿÅIID=SAE J2	2799/VN=02.00/TV=0	180.0 RT=H70 FC=Stat MP=	020.0 MT=280.0 cCÁ		
	4	ÿÿÿÿÿÄlID=SAE J2	2799/VN=02.00/TV=0	180.0 RT=H70 FC=Stat MP=	030.0 MT=280.0 ©Á		
OPEN CLOSE	5	ÿÿÿÿÿÄlID=SAE J2	2799/VN=02.00/TV=0	180.0 RT=H70 FC=Stat MP=	040.0 MT=280.0 é.Á		
	6	ÿÿÿÿÿÄlID=SAE J2	2799/VN=02.00/TV=0	180.0 RT=H70 FC=Stat MP=	050.0 MT=280.0 ĂÁ		
HHT Connected: IRDI SYSTEM - V2.4.0	7	ÿÿÿÿÿÄlID=SAE J2	2799/VN=02.00/TV=0	180.0 RT=H70 FC=Stat MP=	:060.0 MT=280.0 lúÁ		
Command Config	8	ÿÿÿÿÿÄlID=SAE J2	2799/VN=02.00/TV=0	180.0 RT=H70 FC=Stat MP=	:070.0 MT=280.0 jtlÁ		
HHT Test Number: 4	9	ÿÿÿÿÿÄlID=SAE J2	2799/VN=02.00/TV=0	180.0 RT=H70 FC=Stat MP=	080.0 MT=280.0 õôÅ		
	10	ÿÿÿÿÿÄlID=SAE J2	2799/VN=02.00/TV=0	180.0 RT=H70 FC=Stat MP=	090.0 MT=280.0 Å		
Write Read	11	manahin eve is		100 0IDT 1170ICC CL-1MD	100 0IMT 200 0ID128		
SAE Protocol Identifier Version Number T	ank Volume (L) F	Receptacle Type	Fill Command	Measured Pressure (MPa)	Measured Temperature (K)	CRC	
SAE J2799 2.0 ~	180	H70 ~	Stat 🗸 🗸	<b>≑</b> 64.0	280.0		
Corrupt ID Corrupt VN	Corrupt TV	Corrupt RT	Corrupt FC	Corrupt MP	Corrupt MT	Corrupt	CRC
Optional Data					OD	Character Cou	unt: 0
# of Lines to Insert /Delete	Delete Line(s)	Interpolate MP/MT Valu	es Clear Patt	em MP/MT Graph	Save as Text File	e Import	Pattern

FIGURE 6-34 HHT TEST PATTERN GENERATOR SOFTWARE -MP LINES ADDED (# OF LINES)

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# 6.7.2 Interpolating One Value, Using Step Value Method

To interpolate one value, using the "Step" value method to calculate the IRDI messages, do the following. This example shows how to interpolate the pressure (MP) value. The procedure is identical for interpolating the temperature (MT) value.

	Action
STEP 1	To select the step value (pressure, in this example) between each calculated IRDI message, do the following – see Figure 6-35.
	a. Click on the "Interpolate Measured Pressure" button – the button will turn blue
	b. Click on the "Start Value" field, and enter a value at which to start the interpolation
	c. Click on the "End Value" field, and enter a value at which to end the interpolation
	d. Click on the "Step" field, and enter the step amount (in MPa) to use between each calculated IRDI message that you would like to generate
	e. Click on the "Number of Lines" field, and enter zero.
NOTE	The first IRDI message will contain the "Start Value" for pressure, and each message after that will contain an interpolated new value for pressure, based on the "Start" and "End" values, and using the "Step" value. The last IRDI message will contain the "End Value" for pressure.

Interpolate Valu	es		-		×
Import Interpolation	Values From .csv				
	Import Valu	es From .csv			
Linear Interpolation					
Interpolate M	leasured Pressure	Interpolate Me	asured Temp	perature	
Start Value:	0.0 🖨	Start Value:	425.0	A T	
End Value:	100.0	End Value:	16.0	- 	-
Step:	10 ≑	Step:	0.0	4 7	-
	Number of Lines:	0			
	Calculat	e Values			

#### FIGURE 6-35 HHT TEST PATTERN GENERATOR SOFTWARE -INTERPOLATE MP (STEP)

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		Actio	on				
STEP 2	2 Click on the "Calculate Values" button, to generat see Figure 6-36.					t of IRDI message	es –
	Interpolate Values		_		×		
	Import Interpolation Values	s From .csv					
		Import Values From .csv					

Interpolate Measured Temperature

End Value:	100.0 🖨	End Value:	16.0	*
Step:	10 🚔	Step:	0.0	*
	Number of Lines:	0		
	Calcul	ate Values		

Linear Interpolation

Interpolate Measured Pressure

## FIGURE 6-36 HHT TEST PATTERN GENERATOR SOFTWARE - MP INTERPOLATION (STEP)

	Action
STEP 3	A popup window will appear (see below), to remind the user that the other value (in this example, temperature) will not be interpolated, and will remain static. Click on the "OK" button to continue.
NOTE	To set the static value (in this example, temperature), return to the main screen and set the value using the "MT" field.





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	Action
STEP 4	The "Number of Lines" value will update automatically to show the number of IRDI messages that were generated. In this example, the number of IRDI messages generated was 11 – see Figure 6-38.
NOTE	With this interpolation option, the IRDI messages <b>do not display</b> in the "Value Preview" area.

🕽 Interpolate Valu	ies		_		
Import Interpolation	Values From .csv				
	Import Valu				
Linear Interpolation	1				
Interpolate N	Interpolate Measured Pressure Interpolate Measured				
Start Value:	0.0	Start Value:	425.0	*	
End Value:	100.0 ≑	End Value:	16.0	*	
Step:	10.0 🖨	Step:	0.0	*	
	Number of Lines:	11			
	Calcula	te Values			
			Peer	at Values	
Value Preview:			nese		
Message #	Measured Pressure	Measure	d Temperatur	e	
Save As. csv			Ad	d Lines	

FIGURE 6-38 HHT TEST PATTERN GENERATOR SOFTWARE - MP RESULTS (STEP)



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	Action
STEP 5	To save this interpolated test pattern to a file, click on the "Save as csv" button – see Figure 6-39.
	A browser window will pop up – see Figure 6-40. Browse to the folder where you want to save the file, enter a file name for this test pattern, and click on the "Save" button, to save the file.

	ies		_		$\geq$
Import Interpolation	Values From .csv				
	Import Valu				
Linear Interpolation					
Interpolate N	Aeasured Pressure	Interpolate I	Measured Temp	perature	
Start Value:	0.0	Start Value:	425.0	* *	
End Value:	100.0 🚖	End Value:	16.0	*	
Step:	10.0 🜲	Step:	0.0	*	
	Number of Lines:	11			
	Number of Lines.	11	Y		
	Calcula	te Values			
					_
Value Preview:			Res	set Values	
Message #	Measured Pressure	Measu	ired Temperatu	ire	
-					_
_					
_				-	
				-	

FIGURE 6-39 HHT TEST PATTERN GENERATOR SOFTWARE -SAVE INTERPOLATION (STEP)

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IRDI HHT Test Pattern Generator Rev 5.0		- 🗆 X
🖉 🗓 Save As		
• 🔶 🐳 📩 « Karin - Ed Li 🔹 Release, HHT Manu	ual > R08 Jan 2025 > NEW HHT TEST PATTERNS	✓ ♂ Search NEW HHT TEST PATTE
Organize 🔻 New folder		:== ▼
Desktop A Name Downloads A Documents A Pictures A NEW HHT TEST I R08 Jan 2025 Screenshots IRI Dropbox OneDrive - Persor This PC	Date modified Type No items match your search.	Size
S/ Detwork		
File name: NewPattern Save as type: CSV files (*.csv)		
Op A Hide Folders	6 10.2	Save Cancel
# of Lines to Insert/Delete	Interpolate MP/MT Values Clear Pattern MP/MT Graph	Add Lines Save as Text File Import Pattern

FIGURE 6-40 HHT TEST PATTERN GENERATOR SOFTWARE -SAVE FILE (STEP)

S Y	S T E M			Document # Revision Date Revised	200422 8.0 Jan 29 2025
			Action		
	STEP 6	To copy this interpolated test patte program the HHT, click on the "Add	rn to the mai d Lines" butto	n screen, so that on – see Figure 6	t you can 5-41.
		Close the "Interpolate Values" wind corner.	dow by clickir	ng on the "X" at t	he top right

Interpolate Measured Pressure       Interpolate Measured Temperature         Start Value:       0.0       \$         End Value:       100.0       \$       End Value:       16.0         Step:       10.0       \$       Step:       0.0       \$         Number of Lines:       11       \$       \$       \$         Le Preview:       Reset Value       \$       \$       \$	ear Interpolation	1			
Start Value: 0.0  Start Value: 425.0  and Value: 100.0  Step: 10.0  Calculate Values  Le Preview: Reset Value	Interpolate I	Measured Pressure	Interpolate Mea	sured Tempe	erature
End Value: 100.0  End Value: 16.0  Step: 0.0  Number of Lines: 11  Calculate Values  Jue Preview: Reset Value	Start Value:	0.0	Start Value:	425.0	Å
Step: 10.0 Step: 0.0	End Value:	100.0	End Value:	16.0	4
Number of Lines: 11  Calculate Values Use Preview: Reset Value	Step:	10.0	Step:	0.0	A T
Calculate Values Use Preview: Reset Value		Number of Lines:	11 🛓	]	
ue Preview: Reset Valu		Calco	ulate Values	]	
	lue Preview:			Rese	t Value
lessage # Measured Pressure Measured Temperature	Message #	Measured Pressure	Measured	Temperature	;

FIGURE 6-41 HHT TEST PATTERN GENERATOR SOFTWARE -ADD MP LINES (STEP)



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	Action
STEP 7	View the interpolated test pattern on the main screen, in the top right area – see Figure 6-42.
	You can now program the HHT with this values – refer to Section 6.5 for details.

IRDI HHT Test Pattern Generator Rev 5.0						-		×
<b>NIRDI</b>	Message #	Message						^
SYSTEM	1	ÿÿÿÿÿÄlID=SAE J2	799 VN=02.00 TV=0	180.0 RT=H70 FC=Stat MP=	000.0 MT=280.0 mÁ			-
COM Port Config	2	ÿÿÿÿÿÄlID=SAE J2	799/VN=02.00/TV=0	180.0 RT=H70 FC=Stat MP=	010.0 MT=280.0 d}]Á			-
	3	ÿÿÿÿÿÅlID=SAE J2	799/VN=02.00/TV=0	180.0 RT=H70 FC=Stat MP=	020.0 MT=280.0 qCÁ			-
	4	ÿÿÿÿÿÄIID=SAE J2	799/VN=02.00/TV=0	180.0 RT=H70 FC=Stat MP=	030.0 MT=280.0 ©Á			-
OPEN CLOSE	5	ÿÿÿÿÿÄIID=SAE J2	799 VN=02.00 TV=0	180.0 RT=H70 FC=Stat MP=	040.0 MT=280.0 é.Á			-
	6	ÿÿÿÿÿÄlID=SAE J2	799 VN=02.00 TV=0	180.0 RT=H70 FC=Stat MP=	050.0 MT=280.0 ÄÅ			_
HHT Connected: IRDI SYSTEM - V2.4.0	7	ÿÿÿÿÿÄlID=SAE J2	799 VN=02.00 TV=0	180.0 RT=H70 FC=Stat MP=	060.0 MT=280.0 l\úÁ			
Command Config	8	ÿÿÿÿÿÄlID=SAE J2	799 VN=02.00 TV=0	180.0 RT=H70 FC=Stat MP=	070.0 MT=280.0 jüÁ			
HHT Test Number: 4	9	ÿÿÿÿÿÅlID=SAE J2	799 VN=02.00 TV=0	180.0 RT=H70 FC=Stat MP=	080.0 MT=280.0 õôÅ			
	10	ÿÿÿÿÿÄlID=SAE J2	799 VN=02.00 TV=0	180.0 RT=H70 FC=Stat MP=	090.0 MT=280.0 Á			
Write Read	11 <	anazylin eve in	1000/00 CO 14/0007	100 0IDT 1170IFC CLAIMD	100 0IMT 200 0ID1/Å		>	Ť
ÿÿÿÿÿÄlID=SAE J2799 VN=02.00 TV=0180.0 F	₹T=H70 FC	=Stat MP=100.0	MT=280.0 R½Á					
SAE Protocol Identifier Version Number Tank Volu	ume (I) B	eceptacle Type	Fill Command	Measured Pressure (MPa)	Measured Temperature (K)	CBC		
SAE J2799 2.0 V	180	470 ~	Stat ~	<b>♦</b> 64.0	280.0			
Corrupt ID Corrupt VN Corrupt	ot TV	Corrupt RT	Corrupt FC	Corrupt MP	Corrupt MT	Cor	mupt CRC	
Optional Data					OD	Characte	r Count:	0
# of Lines to Insert/Delete	elete Line(s)	Interpolate MP/MT Value	Clear Patte	ern MP/MT Graph	Save as Text File	e Im	port Patter	n

FIGURE 6-42 HHT TEST PATTERN GENERATOR SOFTWARE - MP LINES ADDED (STEP)

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## 6.7.3 Interpolating Both Values (MT and MP)

To interpolate both values – temperature and pressure - do the following. This example uses the "number of lines" procedure. Refer to Figure 6-43.

	Action
STEP 1	<ul> <li>a. Click on the "Interpolate Measured Pressure" button – the button will turn blue.</li> <li>b. Click on the "Start Value" field, and enter a value at which to start the interpolation.</li> <li>c. Click on the "End Value" field, and enter a value at which to end the interpolation.</li> </ul>
STEP 2	<ul> <li>a. Click on the "Interpolate Measured Temperature" button – the button will turn blue.</li> <li>b. Click on the "Start Value" field, and enter a value at which to start the interpolation.</li> <li>c. Click on the "End Value" field, and enter a value at which to end the interpolation.</li> </ul>
STEP 3	Click on the "Number of Lines" field, and enter the number of IRDI messages (lines) that you would like to generate.
NOTE	The first IRDI message will contain the "Start Value" for pressure and temperature, and each message after that will contain interpolated new values for pressure and temperature, based on the "Start" and "End" values. The last IRDI message will contain the "End Value" for pressure and temperature.

🗓 Interpolate Valu	es		_		×
Import Interpolation	Values From .csv				
	Import Valu	ues From .csv			
Linear Internolation		<b>F</b>			ר
Interpolate N	Aeasured Pressure	Interpolate Me	asured Ten	nperature	
Start Value:	10.0 🚖	Start Value:	425.0	Ŀ	
End Value:	100.0 🚖	End Value:	16.0	Ŀ	
Step:	3.1	Step:	-14.1	÷	
	Number of Lines:	30			
	Calcula	ate Values			

## FIGURE 6-43 HHT TEST PATTERN GENERATOR SOFTWARE -INTERPOLATE MP AND MT

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	Action
STEP 4	Click on the "Calculate Values" button, to generate the set of IRDI messages – see Figure 6-44.
	The interpolated IRDI messages will now appear in the "Value Preview" area at the bottom of the screen.
NOTE	The step value between each interpolated value is automatically calculated, and is shown in the "Step" field, for temperature and pressure. In this example, since the number of lines selected was 30, the step value for pressure was 3.1, and the step value for temperature was -14.1, between each IRDI message.

nport Interpolatio	n Values From .csv			
	Import \			
inear Interpolatio	n			
Interpolate	Measured Pressure	Interpolate Mea	sured Tempe	rature
Start Value:	10.0	Start Value:	425.0	<b>*</b>
End Value:	100.0	End Value:	16.0	-
Step:	3.1 🜲	Step:	-14.1	A T
	Number of Lines	: 30 🖨		
(alua Praviauu	Calc	culate Values	]] Beset	t Values
Massage	Measured Pressure	Measured To	emperature	
message #				_
#	10	425		
1 2	10 13.1	425 410.9		
1 2 3	10 13.1 16.2	425 410.9 396.8		
Message # 1 2 3 4	10 13.1 16.2 19.3	425 410.9 396.8 382.7		
Message # 1 2 3 4 5	10 13.1 16.2 19.3 22.4	425 410.9 396.8 382.7 368.6		

## FIGURE 6-44 HHT TEST PATTERN GENERATOR SOFTWARE - MP AND MT INTERPOLATION

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	Action
STEP 5	To save this interpolated test pattern to a file, click on the "Save as csv" button at the bottom of the screen.
STEP 6	To copy this interpolated test pattern to the main screen, so that you can program the HHT, click on the "Add Lines" button at the bottom of the screen. See Section 6.7.1 or Section 6.7.2 for details.

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## 6.7.4 Importing an Interpolated Pattern File

To import an interpolated pattern from an existing file, do the following:

	Action
STEP 1	At the top of the "Interpolation" popup window, click on the "Import Values from csv" button – see Figure 6-45.

	Import \	/alues From .csv	J _	
near Interpolation	1			
Interpolate N	Measured Pressure	Interpolate Me	asured Tempe	erature
Start Value:	0.0	Start Value:	425.0	- 
End Value:	100.0	End Value:	16.0	A T
Step:	0.0	Step:	0.0	÷ T
	Number of Lines:	50	•	
	Calc	culate Values		
alue Preview:			Rese	t Value
Message #	Measured Pressure	Measure	d Temperature	;

FIGURE 6-45 HHT TEST PATTERN GENERATOR SOFTWARE - IMPORT INTERPOLATED VALUES



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# STEP 2 A browser window will pop up – see Figure 6-46. Browse to the folder where the interpolation data file is located, select the file, and click on the "Open" button, to open the file.

Action

<b>M</b> •				~
uj Open				~
$\leftrightarrow$ $\rightarrow$ $\checkmark$ $\land$	This PC > Desktop > WriteInk > Karin - Ed Li > Release, HHT Manua	al > R08 Jan 2025 🗸 🗸 🖑	Search R08 Jan 2025	Q
Organize 👻 New fo	lder			
Quick access	Name ^	Date modified	Туре	Size
Deskton	📙 200421_R05 - IRDI HHT Test Pattern Generator - Installer	1/12/2025 6:50 PM	File folder	
	HHT Test Pattern Generator Rev 5 Demo	1/12/2025 6:50 PM	File folder	
Downloads *	NEW HHT TEST PATTERNS	1/12/2025 6:48 PM	File folder	
🔮 Documents 🖈	Screenshots	1/12/2025 7:40 PM	File folder	
📰 Pictures 🛛 🖈	🖾 Interpolate Demo	12/3/2024 3:34 PM	Microsoft Excel C	1 K
Christmas 2024				
Denmark Trip 20.				
R08 Jan 2025				
Screenshots				
🗦 Dropbox				
📥 OneDrive - Persor				
📃 This PC				
💣 Network 🔍	× <			>
File	name: Interpolate Demo	~	CSV files (*.csv)	~
			Open 🔽 Ca	ncel

FIGURE 6-46 HHT TEST PATTERN GENERATOR SOFTWARE –INTERPOLATED VALUES FILE

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	Action
STEP 3	View the imported interpolation data in the "Value Preview" section of the Interpolation window – see Figure 6-47.

Import Interpolate	tion Values From .csv		_		
	Import Valu	es From .csv	]		
Linear Interpolat	tion				
Interpolat	e Measured Pressure	Interpolate Me	asured Ten		
Start Value:	0.0	Start Value:	425.0	4	
End Value:	100.0	End Value:	16.0	4	-
Step:	0.0	Step:	0.0	4	
	Number of Lines:	50	-		
	Number of Lines:	50			
	Number of Lines:	50 🖨			
Value Preview:	Number of Lines: Calculat	50	Re	eset Value	es
Value Preview: Message #	Number of Lines: Calculat Measured Pressure	50 ¢	Re	eset Value	es
Value Preview: Message #	Number of Lines: Calculat Measured Pressure 100.00	50 \$	Re	eset Value	es 🔦
Value Preview: Message # 1 2	Number of Lines: Calculat Measured Pressure 100.00 99.96	50 \$	Re	eset Value	es 🔺
Value Preview: Message # 1 2 3	Number of Lines: Calculat Measured Pressure 100.00 99.96 99.83	50 \$	Re	eset Value e	*
Value Preview: Message # 1 2 3 4	Number of Lines:           Calculat           Measured Pressure           100.00           99.96           99.83           99.63	50 \$	Re	eset Value	es
Value Preview: Message # 1 2 3 4 5	Number of Lines:         Calculat           Measured Pressure         100.00           99.96         99.83           99.63         99.33	50 C	Re	eset Value	*
Value Preview: Message # 2 3 4 5 6	Number of Lines:           Calculat           Measured Pressure           100.00           99.96           99.83           99.63           99.33           99.33           98.96	50 C	Temperatur	eset Value	es -

## FIGURE 6-47 HHT TEST PATTERN GENERATOR SOFTWARE – IMPORTED FILE CONTENTS

	Action
STEP 4	To copy this interpolated test pattern to the main screen, so that you can program the HHT, click on the "Add Lines" button at the bottom of the screen. See Section 6.7.1 or Section 6.7.2 for details.

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# 6.8 GRAPHING A TEST PATTERN

The HHT software includes a feature to allow the user to graph the test pattern data, as a means of checking that the test pattern is correct. To graph a test pattern, do the following:

	Action
STEP 1	Add a set of IRDI messages, to create a test pattern, or import an existing test pattern.
	For details on creating a test pattern, see Section 6.4.
	For details on importing an existing test pattern, see Section 6.3.
	The example below shows an imported test pattern.

U INDI HIT IEST Pattern Generator Rev 3.0							-		×
<b>NIRDI</b>	Message #	Message							^
SYSTEM	1	ÿÿÿÿÿÄIID=SAE J2	2799/VN=01.00/TV=0	)50.0 RT=H70 FC=Dy	na MP=	000.0 MT=020.0 »}áÁ			-
COM Port Config	2	ÿÿÿÿÿÅIID=SAE J2	2799/VN=01.00/TV=0	050.0 RT=H70 FC=Dy	na MP=	000.5 MT=025.0 ÞRÁ			
	3	ÿÿÿÿÿÄIID=SAE J2	2799 VN=01.00 TV=0	050.0 RT=H70 FC=Dy	na MP=	001.0 MT=030.0 µ(Á			_
	4	ÿÿÿÿÿÄIID=SAE J2	2799 VN=01.00 TV=0	050.0 RT=H70 FC=Dy	na MP=	002.0 MT=035.0 ÕA			
OPEN CLOSE	5	ÿÿÿÿÿÿÅIID=SAE J2	2799 VN=01.00 TV=0	050.0 RT=H70 FC=Dy	na MP=	002.0 MT=040.0 ШÁ			
	6	ÿÿÿÿÿÄIID=SAE J2	2799 VN=01.00 TV=0	050.0 RT=H70 FC=Dy	na MP=	003.0 MT=045.0 àùÁ			
HHT Connected: IRDI SYSTEM - V2.4.0	7	ÿÿÿÿÿÄIID=SAE J2	2799 VN=01.00 TV=0	050.0 RT=H70 FC=Dy	na MP=	003.0 MT=050.0 êÁ			
Command Config	8	ÿÿÿÿÿÄIID=SAE J2	2799 VN=01.00 TV=0	050.0 RT=H70 FC=Dy	na MP=	004.0 MT=055.0 óþÁ			_
HHT Test Number: 1 ~	9	ÿÿÿÿÿÅIID=SAE J2	2799 VN=01.00 TV=0	050.0 RT=H70 FC=Dy	na MP=	004.0 MT=060.0 eÅ			_
	10	ÿÿÿÿÿÅIID=SAE J2	2799 VN=01.00 TV=0	050.0 RT=H70 FC=Dy	na MP=	005.0 MT=065.0 ëÅ			
Write Read	<	and the second	1 1/TIDD FO 14/10070	100 00T 1170FC D.		OUE UNKE 020 UN			>
ÿÿÿÿÿÄ ID=SAE J2799 VN=02.00 TV=0180.0	RT=H70 FC	=Stat MP=064.0	MT=280.0  NÁ						
SAE Protocol Identifier Version Number Tank Vo	ume (L) F	eceptacle Type	Fill Command	Measured Pressure (	MPa)	Measured Temperature (			
SAE J2799 2.0 🗸 📥	180	170	0	1			n) unu		
L.V * V		H/U ∨	stat V	÷ 64.0		280.0			
Comupt ID Comupt VN Com	pt TV	Corrupt RT	Corrupt FC	Corrupt MP	]	280.0 Corrupt MT		Corrupt CRC	;
Corrupt ID Corrupt VN Corrupt Optional Data	pt TV	Corrupt RT	Corrupt FC	Corrupt MP	]	280.0 Corrupt MT O	D Charao	Comupt CRC	0

#### FIGURE 6-48 HHT TEST PATTERN GENERATOR SOFTWARE – IMPORTED TEST PATTERN EXAMPLE

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FIGURE 6-49 HHT TEST PATTERN GENERATOR SOFTWARE -MP/MT GRAPH BUTTON





FIGURE 6-50 HHT TEST PATTERN GENERATOR SOFTWARE -MP/MT GRAPH SCREEN

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	Th
STEP 4	The graph screen shows the temperature and pressure values for all IRDI messages in the test pattern.
	To check the value of pressure at any point in the graphed data, use your mouse to hover the cursor over the blue line on the graph, and click the mouse at the location you want to check – a circle will appear at that location on the blue line – see Figure 6-51. The pressure value at the point where the cursor is located will be displayed at the top left of the popup window, along with the associated IRDI message number.

Measured Pressure is 17 MPa at message 35



FIGURE 6-51 HHT TEST PATTERN GENERATOR SOFTWARE -CHECKING GRAPHED PRESSURE

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	Th	
STEP 5	To check the value of temperature at any point in the graph mouse to hover the cursor over the red line on the graph, a the location you want to check – a circle will appear at that line – see Figure 6-52. The temperature value at the point located will be displayed at the top left of the popup window associated IRDI message number.	ned data, use your and click the mouse at location on the red where the cursor is w, along with the
🚺 Measured Tempe	erature is 298 K at message 61	– 🗆 ×
	Fueling Pressure/Temperature vs. Time	
400 350 300 250 150	asured Pressure (MPa) asured Temperature (K)	
100 50	SYSTE	M

FIGURE 6-52 HHT TEST PATTERN GENERATOR SOFTWARE -CHECKING GRAPHED TEMPERATURE

Line Number

70 75

80 85 90 95 100

65

35 40 45 50 55 60

15 20 25 30

0 5 10

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# 7 **TROUBLESHOOTING**

This section provides guidance on troubleshooting any issues the user may have when using the HHT or the HHT test pattern generator software.

# 7.1 PROBLEM: "POWER" LIGHT NOT TURNING ON

POSSIBLE ROOT CAUSE #1	
The battery power is too low to allow the HHT to power up.	
TROUBLESHOOTING STEPS	
1. Replace the batteries as per Section 4.2.	

## 7.2 PROBLEM: INFRARED DATA NOT BEING TRANSMITTED/RECEIVED

If the "Power" light is on, but there is no infrared data being transmitted (hydrogen station is not receiving data):

POSSIBLE ROOT CAUSE #1			
The battery power is too low to allow the transmitter to work.			
TROUBLESHOOTING STEPS			
1. Check the "Battery" light – if the lig	ght is on, replace the batteries as per Section 4.2.		
POSSIBLE ROOT CAUSE #2			
Data is not getting from the transmitter to the receiver.			
TROUBLESHOOTING STEPS			
1. Check that the HHT is properly inserted into the end of the nozzle.			
2. Check that the surfaces of the transmitter and receiver are dust-free and not obstructed.			

## 7.3 PROBLEM: HHT TEST PATTERN GENERATOR SOFTWARE NOT COMMUNICATING

If the "HHT Status" window indicates "Not Connected":

POSSIBLE ROOT CAUSE #1	
The USB cable is not connected prop	perly.
TROUBLESHOOTING STEPS	

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SYSIEM					
1. Check that the USB cable is connected properly to the HHT's USB port, and to a USB port					

1. Check that the USB cable is connected properly to the HHT's USB port, and to a USB port on the computer running the HHT Test Pattern Generator software.

 Unplug the USB cable from the computer, and plug it in again – the computer should autodetect the HHT and automatically set the port number and communications parameters.
 Quit and restart the HHT Test Pattern Generator software.

#### POSSIBLE ROOT CAUSE #2

The HHT is in "sleep" mode.

#### TROUBLESHOOTING STEPS

1. On the HHT Test Pattern Generator software screen, check the "HHT Status" window – if the message reads "HHT in Sleep Mode.", the HHT is in a mode that does not allow it to communicate.

- 2. Alternatively, check the "Power" light on the front of the HHT if it is off, the HHT is off.
- 3. Press the "Power" button on the front of the HHT for at least 3 seconds, to turn on the HHT.
- 4. Make sure that the "Power" light is now on.

5. Run the HHT Test Pattern Generator software, and recheck the "HHT Status" window – the message should now read "HHT Connected and Ready.".

## POSSIBLE ROOT CAUSE #3

The FTDI drivers were not installed correctly.

#### TROUBLESHOOTING STEPS

1. Re-install the FTDI drivers, as per Appendix A.



# 8 APPENDIX A: UPDATING THE HHT FIRMWARE

Occasionally, a firmware upgrade will be provided for the HHT. This upgrade will consist of a firmware (HEX) file.

To program the HHT firmware, do the following:

	Action					
STEP 1	Make sure that the HHT has batteries, or that it has a 3.6 VDC power supply attached.					
STEP 2	Start up the computer, and make sure it is connected to the internet.					
STEP 3	Connect the HHT USB to a computer USB port, and wait while the FTDI drivers install automatically.					
	If the drivers do not install automatically, manually install the drivers following the instructions at this link:					
	http://www.ftdichip.com/Drivers/VCP.htm					
	<b>NOTE:</b> You may need to restart your computer afterwards if the com port does not show up in your list of ports (under Windows Control Panel).					
STEP 4	Install the "Serial Bootloader AN1310 v1.05r" program.					
STEP 5	Open the Serial Bootloader program – see Figure 8-1.					
STEP 6	Go to "Program -> Settings".					
	Choose the correct com port for the HHT and click on "OK" – see Figure 8-1 and Figure 8-2.					
	Make sure that the COM port is connected – see Figure 8-3.					





S AN1310 v1.05r	
File Program Help	
Settings Communication COM Port: USB Serial Port (COM13) Bootload Baud Rate 19200 bps Write Options Write Options Vertic Options	
Config Bits EEPROM OK Cancel	
Disconnected COM1	3 19200

FIGURE 8-2 SERIAL BOOTLOADER PROGRAM - SELECTING COM PORT

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	Action
STEP 7	Click on the red square button to enter bootloader mode – see Figure 8-3. Make sure that the bottom toolbar indicates that the HHT is connected.
STEP 8	In the "File" menu, click on "Open", and open the HEX file provided by IRDI.
STEP 9	Click on the "Write Device" button, to program the firmware – see Make sure that the bottom toolbar indicates that the programming was successful – see Figure 8-5.
STEP 10	Click on the green arrow to run the firmware and exit bootloader mode. <b>NOTE:</b> Alternatively, you can power cycle the HHT to run the firmware, or unplug the USB connector from the HHT, then plug it back it, which forces a reset of the HHT via the RTS line.
STEP 11	Make sure that the power light and the "Test 1" light on the front of the HHT are both on.



FIGURE 8-3 SERIAL BOOTLOADER PROGRAM - CONNECTING TO HHT

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ANIALO VLOSE	
File Program Help	
00 02 04 06 0 Bootload, Mode DE ABCII	
O TTET TETE TETE TETE TETE TETE	(3
10 FFFF FFFF FFFF FFFF FFFF FFFF TFFF	
20 FFFF FFFF FFFF FFFF FFFF 'TFF FFFF	
30 FFFF FFFF FFFF FFFF FFF FFF FFF FFF F	
40 FFFF FFFF FFFF FFF FF Click "Write	
so rrrr rrrr rrrr rrrr rrPevice" button	
60 FFFF FFFF FFFF FFFF FFFF FFFF FFFF	
70 FFFF FFFF FFFF FFFF FFFF FFFF FFFF	
BO FFFF FFFF FFFF FFFF FFFF FFFF FFFF	
90 FFFT FFFT FFFT FFFT FFFT FFFT FFFT	
AD FFFF FFFF FFFF FFFF FFFF FFFF FFFF	
BO FFFF FFFF FFFF FFFF FFFF FFFF FFFF	
CO FFFF FFFF FFFF FFFF FFFF FFFF FFFF	
DO FFFF FFFF FFFF FFFF FFFF FFFF FFFF	
EQ FFFF FFFF FFFF FFFF FFFF FFFF FFFF	
FO FFFF FFFF FFFF FFFF FFFF FFFF FFFF	
100 FFFF FFFF FFFF FFFF FFFF FFFF FFFF	
110 FFFF FFFF FFFF FFFF FFFF FFFF FFFF	
120 FFFF FFFF FFFF FFFF FFFF FFFF FFFF	
130 FFFF FFFF FFFF FFFF FFFF FFFF FFFF	
140 FFFF FFFF FFFF FFFF FFFF FFFF FFFF	
150 FFFF FFFF FFFF FFFF FFFF FFFF FFFF	
RASH EEPROM CONFIG	
Bootloader Firmware v1.05 (0.288s)	PIC18F25K80 Revision 6 COM19 19200



File Program	Helt	ter_Rev	(2AP		A.Dex-	ANU	ID WHOS		and property on the second second
0 . 0					4		E 41		
00	02	04	06	08	OA	00	0E	ASCII	
0 2781	F032	TTTT	****	8251	CFF	. 200	CFFB	> Q	
10 P002 0	CFE9	2003	CFEA	P004	CFE	1 100	S CFE2		
20 2006		P007	CFDA	1008	CFP:	. roo	9 CFF4		
30 PODA (	crr6	POOB	CTT?	100c	CFF	1 root	o crrs		
40 FOOE 1	BAP2	A4F2	DOA4	9472	BE41	5 BA4	E D003	N.N	
50 4A38 2	2A39	D116	8081	D018	483	6 2A3	7 0200	839*637*	
60 6E32 (	0200	6E33	0200	6E34	oro	623	5 0200	2n3n 4n5n	
70 6249	0200	6248	0246	5036	OEO!	5 583	7 A0D8	InHnF. 6\7X	
80 D00E	0200	62.37	0200	6236	AA41	t D00	2 8842	7n 6nN0.	
90 D006 I	004E	D004	0200	6237	OEO	623	6 503A	N 7n6n:P	
A0 1038 1	8408	D004	063A	AODS	0631	5 D02	0 8281	1	
BO DOLA	4A3C	2A3D	0200	6E32	ORO	623	3 0200	<j=* 2n3n<="" td=""><td></td></j=*>	
CO 6234 0	0200	6235	503D	E104	0230	503	C A008	4n5n=p<.<\	
DO DOOR	0020	6230	0200	623C	8041	020 3	0 623B	*n <nn< td=""><td></td></nn<>	
20 0282 4	623A	D004	0200	6E3D	0200	623	c 503z		
FO 103F	8408	D004	063E	AODB	0631	P D02	0 8481	7>	
Verify th	nat t	the	writ	e 232	OEO	623	3 0200	@JA* 2n3n	
	10.0		alat	104	0230	504	0 A008	4n5nAP<.8\	
process	IS C	om	piete	240	8241	020 3	0 623F	An @nN7n	
130 0882	62: :	D004	0000	6241	OEO	624	0 0801	>n An@n	
140 2632 6	020	2233	2234	2235	5035	5 E10	B OEEO	243*4* 5*5P	
150 5032	OL	5833	0204	5834	AOD	000 B	9 0200	2\3X 4X	
RASH EEP	ROM	CONF	FNG						
Write complete	FLAS	44311	10 1						PSC18F25K80 Revision 6 COM19 19200

FIGURE 8-5 SERIAL BOOTLOADER PROGRAM – PROGRAMMING FIRMWARE

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