TrafficCast BlueTOAD Spectra RSU System Evaluation Process Guidelines

TrafficCast International, Inc. 1800 Deming Way, Suite 100, Middleton, WI 53562, USA Telephone: 1-608-713-9300

BlueARGUS On-Going Operations Website: <u>https://bluetoad.trafficcast.com</u> TrafficCast Support Website: <u>https://trafficcast.zendesk.com</u> TrafficCast Support Telephone: 1-608-713-9299

Contact: Frank Provenzano Director of Business Development, Connected Vehicles TrafficCast International, Inc. 18 Technology Drive, Irvine, CA 92618 Email: <u>fprovenzano@trafficcast.com</u> Direct Line: 949-338-3416 Office: 949-880-2964

CONFIDENTIAL © 2020 TRAFFICCAST INTERNATIONAL, INC. USED BY PERMISSION ONLY





Contents

Acronyms and Abbreviations	2
System Evaluation Overview	4
Supporting Equipment	4
Visual Inspection	5
BlueTOAD Spectra RSU Power Up	5
How to Set Up the Traffic Controller	6
System Evaluation Procedure	8
SPaT, MAP and BSM Data Broadcasting Verification	8
OBU DSRC Message Verification Instructions	11
Objective	11
Material Requirements	
Message Capture and Validation	
BlueTOAD Spectra RSU Site Requirements Form	17
System Evaluation Checklist	





Acronyms and Abbreviations

Term	Meaning
AGL	Above Ground Level
AWS	Amazon Web Services
BlueARGUS	Web-based software to monitor BlueTOAD detectors
BlueTOAD	Bluetooth® Travel time Origin And Destination
BSM	Basic Safety Message—every 0.10 second, a connected vehicle (CV) broadcasts its vehicle type, speed, location, direction and approach relative to an intersection.
CAT-5 Cable	Category 5 cable, a twisted pair cable for computer networks. The cable standard provides performance of up to 100 MHz and is suitable for 1000BASE-T (Gigabit Ethernet). This is also called an "Ethernet Cable" or a "LAN Cable."
CV / CAV	Connected Vehicle / Connected and Autonomous Vehicles
DIAM	DENSO International America, Inc.
Discoverable/ Non- Discoverable	Discoverable = Bluetooth device searching to Pair with another Bluetooth device Non- Discoverable = Two Paired Bluetooth devices
DNS UDP	Domain Name System—a hierarchical and decentralized naming system for resources connected to the Internet or a private network. User Datagram Protocol—an alternative comm protocol to TCP
DSRC	Dedicated Short Range Communications
Egress	Going out of (leaving) an intersection
EIRP	Effective Isotropic Radiated Power
EMAC	Ethernet Media Access Controller
FCC	Federal Communications Commission
GPS	Global Positioning System
HTML	Hypertext Markup Language
Ingress	Going into (entering) an intersection
loT	Internet of Things
IP address	Internet Protocol address—host or network interface identification and location addressing
ITS	Intelligent Transportation System
LAN/WAN	Local Area Network/Wide Area Network
LED	Light Emitting Diode
MAP	Map Data Message—intersection geography and line definitions of the intersection or street. An RSU transmits one MAP message per second to OBUs.
NTCIP	National Transportation Communications for Intelligent Transportation System Protocol
NTCIP	ITS Standard NTCIP 1202 Object Definitions used for communication with Actuated Traffic
Support	Signal Controller (ASC) Units
NTP	Network Time Protocol
OBU	Onboard Unit
0/D	Origin/Destination
Omni- Directional	Receiving signals from or transmitting in all directions
PCB	Printed Circuit Board





PoE	Power over Ethernet
PuTTY	SSH Client terminal program for Microsoft Windows
RJ-45 Port	Registered Jack (RJ) is a standardized telecommunication network interface
RSU	Road Side Unit
RTCM	Radio Technical Commission for Maritime services. In the United States, the Federal Communications Commission uses RTCM standards to specify Differential GPS systems for DSRC.
SCMS	Security Certificate Management System—developed by a consortium of automakers and the United States Department of Transportation (USDOT) as a leading candidate for a vehicle-to-vehicle (V2V) security system in the United States.
SNMP	Simple Network Management Protocol—used to monitor and manage devices on networks. Typically, SNMP uses User Datagram Protocol (UDP) transport layer (layer 4) as its transport protocol.
SPaT	Signal Phase and Timing
SRM	Signal Request Message
SSH Client	A software program that uses the Secure Shell protocol to connect to a remote computer.
SYSLOG	A way for network devices to send event messages to a logging server, known as a Syslog server
TCP	Transmission Control Protocol
ТІМ	Traveler Information Message—delivered to Connected Vehicles and TravelSMART Mobile App
	-a personal message board about local conditions
ТМС	Traffic Management Center
UPER	Unaligned Packed Encoding Rules
URL	Uniform Resource Locator
Users	Authorized access through secure login to a software application
Win SCP	File transfer application



System Evaluation Overview

This Evaluation Procedure is to address the requirement for minimum required evaluation and operations tests for the TrafficCast BlueTOAD Spectra RSU.

It is assumed that the BlueTOAD Spectra RSU under test has already gone through factory acceptance inspections and demonstrated full compliance with all project requirements and works "out of the box", by visual inspection, setup and operation "on the bench", functional testing of the component including manufacturer's recommended startup diagnostics and testing prior to any field installation of equipment or material.

This Evaluation Procedure will focus on SPaT, MAP, TIM and BSM Data Broadcasting verification which were not covered in initial product configuration and inspections. This Evaluation Procedure will confirm that the BlueTOAD Spectra RSU complies with USDOT Dedicated Short Range Communications (DSRC) standards, based on Society of Automotive Engineers SAE J2735 March 2016 standards-based message exchange between Roadside Units (RSU) and vehicle Onboard Units (OBU).

For your convenience, we added an Evaluation Sign-Off Checklist form to this document for use as a guide for the evaluation procedure – see "Evaluation Sign-Off Checklist" section of this document.

Supporting Equipment

- Windows PC and Ethernet Cables
- BlueTOAD Spectra RSU Configuration Utility (Microsoft Windows 10 App)
- WinSCP or equivalent File Transfer Application
- PuTTY or equivalent SSH Client
- TrafficCast BlueTOAD Spectra RSU
- Traffic Controller with Power Cable or Similar ATC Controller
 - TrafficCast recommends any of the following Traffic Controllers as they are compatible with BlueTOAD Spectra RSU:
 - Econolite
 - Intelight
 - McCain
 - Siemens
 - · Trafficware
- 7-Zip Archiving Utility
- Advanced IP Scanner (Optional)
- PoE Injector + Power Supply
- Shielded CAT-5 or CAT-6 Cable
- Mounting Bracket + Fasteners
- Cable Band
- Access to BlueARGUS Software





Visual Inspection

Verifying the BlueTOAD Spectra RSU is in good shape and not physically damaged.

- _ Check for damage to the:
- Antenna _
- Ports
- LEDS
- Enclosure

BlueTOAD Spectra RSU Power Up

Before the RSU installation, confirm the following:

- 1. The network settings (for example, IP address, gateway, subnet mask, and DNS) are correctly set and that all ports (123, 8010, 10001) are open and set for outbound data traffic. Confirm all necessary inbound/outbound network ports have been set up.
 - a. IP Configuration Requirements
 - i. BlueTOAD Module assigned: IP Address, Subnet Mask and Gateway
 - ii. DSRC Module assigned: IP Address, Subnet Mask and Gateway
 - iii. In-Cabinet Processor assigned: IP Address, Subnet Mask and Gateway
 - b. Network Port Configuration:
 - i. Port 10001 needs to be open to 52.39.79.127 (Connected Vehicle specific data)
 - ii. Port 8010 needs to be open to btserver.trafficcast.com
 - iii. Port 123 needs to be open, only if using an external NTP server.
 - c. Required DNS entries for btserver.trafficcast.com:
 - i. 18.220.189.165
 - ii. 3.18.180.164
 - iii. 3.18.166.19
- 2. The IP addresses assigned to the Traffic Controller and to the RSU should be known. (Note: If there is a Processor (optional), it also has an IP address.).
- 3. Power ON (Connect Ethernet cable from RSU to PoE Injector) the RSU and confirm all LEDs are normal after the unit initializes:

TrafficCast RSU (Bottom View)



Green – Device operational Amber – Device ON Red - Fault



How to Set Up the Traffic Controller

This example uses an Econolite **traffic controller**, model Cobalt Advanced Traffic Controller (ATC). However, you can use ATC controllers (preferred) from other manufacturers that have Ethernet and IP interfaces. Refer to the table on Page 1-2 for Compatible Traffic Controllers. Also, you can consult TrafficCast Support for models of traffic controllers supported; these include McCain (software Version 1.10.2.6705-2018-03-23), Siemens (software Version 3.59+), Trafficware (software Version 76.15N+) and Intelight (Maxtime CV).



- 1. Attach the Traffic Controller "A" power cable to the "A" connector of the controller.
- 2. Plug the "A" power cable into an AC power source. The controller should power ON.
- 3. Using the assigned IP address of the BlueTOAD Spectra RSU, navigate to the Ethernet communications page of the controller.
- 4. Verify the controller IP address and Netmask. Set the Ping Server to the IP address of the RSU.

Ê	8 🚥	*		00 8:	5/18/2018 28.15 PM
Ethernet	IP Allocation	Stati			
To (+): 37491 To (-): 0 Rx (+): 37491 Fox (-): 0 IP: 192,383,132	Address	192	168	1	. 32
Commy Bachalder Vie System Protocol Intege Intege Intege 2009: They of Intege 2009:	Net mask	255	. 255	256	.0
	Gateway	192	160	1	1
	Ping Server	192	168	1	. 120
	Mac Address Link Speed Server Reachable	00:04 81:00: AUFID YES	abrte		

5. Plug the AC power cable of the POE injector AC adapter to an AC power source.





6. Plug the AC adapter output power cable into the POE injector. The AC adapter LED indicator should light up with power.



7. Connect the RSU to the Data+PWR port of the POE Injector with an Ethernet cable. The RSU Power LED indicator should light up with power.



8. Connect the POE Injector Data port to Port 1 of ENET-1 (WAN) of the controller with an Ethernet cable.







- 9. Connect the computer to Port 2 of ENET-1 (WAN) of the controller with an Ethernet cable.
- 10. Set the computer IP address to match the subnet of the RSU and controller.



System Evaluation Procedure

SPaT, MAP and BSM Data Broadcasting Verification

It is assumed that the BlueTOAD Spectra RSU under test has been installed in the field and already setup and configured. For TrafficCast's Recommended Network Configuration Implementation and setup procedure refer to system documentation provided by TrafficCast.

1. Open PuTTY to start an SSH session into the RSU. Set the Host Name to root@192.168.1.76, Port to 22, Connection Type to SSH, and save the session as "DefaultRSU" for future use.

Real PuTTY Configuration		? ×				
Category:						
Session	Basic options for your PuTT	Ysession				
Logging	Specify the destination you want to conne	ect to				
Keyboard	Host Name (or IP address)	Port				
Bell	root@192.168.1.76 22					
- Features - Window - Appearance	Connection type: ORaw OIelnet ORlogin SSH					
Behaviour Translation Selection	Load, save or delete a stored session Saved Sessions					
Colours	DefaultRSU					
- Connection - Data - Proxy - Telnet Recit	Default Settings 2299 2301 CobaltRM CobaltSM	^ <u>L</u> oad Sa <u>v</u> e				
- Riogin ⊕-SSH - Serial	Irvine_Blackbox Irvine_RSU	v Delete				
	Close window on exit Always Never Only of	on clean exit				
About <u>H</u> elp	Close window on exit Always Never Only Only O	on clean exit				



2. If prompted to accept the RSA key of the RSU click Yes.



- 3. After you connect to the RSU, verify the GPS (GNSS Fix) functionality:
 - a. Run "tpstestapp"
 - b. Press Enter



- 4. To query the GPS status:
 - a. Press q
 - b. Press Enter
- 5. Check that the Average Position is being reported.
 - a. Press **x**
 - b. Press Enter
 - c. The BASH prompt is shown.

valid.	
source men tune.	202
fivmality.	
fix-mode:	
date:	190618
time:	221315 70
latitude.	22 6513003
longitude:	-117 7360565
altitude:	30 50
aroundaneed:	0.200
groundspeed.	
bdop:	0.95
ndop:	1.62
laterr:	4.20
loperr:	3 20
alterr:	5.10
comi_major arr:	11 00
semi-major_err:	7 70
semi-minor_err.	17 0000
Semi-major_orient:	0
difface:	
lean seconds:	
coming le change:	
coming is change.	
uby fig tupa:	0 (0=None 1=DP 2=2D 3=3D 4=CNSS+DP 5=TimeOnly
upy IIV cybe.	0 (0-wone, 1-bk, 2-2b, 3-3b, 4-6w35+bk, 3-11meonry



- 6. Run "mk5stats" to verify the operation of the DSRC radio:
- Each row indicates the number of DSRC messages received and sent per second. Verify that the output column is sending an average of 11 messages per second. (10 SPaT messages plus 1 MAP message generated by the RSU).

# mk5s	tats								
[A2]	input	output	RxFail	TxFail	CBR%	CBR%2	RxInd	TxValid	
	12698	52012	453	0,			12698	52012	
		10		Ο,			12701	52022	
		12		Ο,			12704	52034	
		11		Ο,			12707	52045	
		11	0	Ο,			12709	52056	
		11		Ο,			12712	52067	
		11	0				12714	52078	
		11					12716	52089	
		11					12719	52100	
ecvFr	comLLC:	POLL erro	r 4 'Int	errupted	function	n call'			

- 8. Press Ctrl-C to stop the mk5stats stream and return to the BASH prompt.
- 9. Run "i2vmonitor" to verify the decoding of the controller timing messages:



- 10. To view the SPaT message:
 - a. Press 1
 - b. Press Enter
 - c. The Current Signal Phase and Time to Next Phase fields should be counting down.



- 11. Press **Ctrl-C** to stop the **i2vmonitor** stream.
- 12. When you have completed the confirmations, remove power (Ethernet cable) from the RSU.



OBU DSRC Message Verification Instructions

Objective

This procedure outlines the steps taken to capture WSMs received by the DENSO Onboard Unit (OBU) for packet analysis. J2735 messages are encoded using unaligned packed encoding (UPER) rules when transmitted from the roadside unit based on the 2016 standard's requirements. Due to this encoding scheme, any messages received must be decoded using the USDOT Connected Vehicles Tools Message Validator utility. This procedure assumes user familiarity with the OBU and Roadside Unit (RSU) as well as the WAVE short message protocol (WSMP).

Material Requirements

- 1. Windows laptop with PuTTY, WinSCP, Wireshark and web browser (Chrome or Firefox)
- 2. DENSO On Board Unit (OBU)
- 3. Preconfigured TrafficCast Roadside Unit (RSU)

Message Capture and Validation

- 1. Power up and connect the RSU.
- 2. Power up and connect the OBU.
- 3. Connect the laptop to the OBU WiFi network, denoted with the **#OBU** SSID.
- 4. Open PuTTY and connect to the OBU at the default OBU IP address 192.168.2.201.

n ort O Serial
O Serial
Serial
) Serial
⊖ Se <u>r</u> ial
Load
Save
Delete
exit



5. Change the working directory to that of the MicroSD card with "cd /mnt/microsd/".



 Enter the following command to start the packet capture "SOCK=/IIc tcpdump -i IIc0 -s 0 -w filename.pcap" (note, earlier OBU software builds use "IIc0" instead of "cw-IIc00"), replacing "filename" with any preferred name. Press Ctrl-C to stop capturing data when finished.



7. Open WinSCP and connect to the OBU.

🍡 Login			– 🗆 X
<pre>root@192.168.1.198 root@192.168.1.230 root@192.168.1.231 root@192.168.2.69 root@192.168.2.77 root@192.168.2.85 root@192.168.2.85 root@192.168.2.91 root@192.168.2.91 user@192.168.2.01 user@192.168.1.25 user@98.191.207.147 user@192.168.1.51 user@192.168.1.51 user@192.168.1.51 user@192.168.1.52 user@192.168.1.53 user@192.168.1.45 user@192.168.1.45 user@192.168.1.166 user@192.168.1.167</pre>	~	Session Eile protocol: SCP Host name: 192.168.2.201 User name: root Edit	Port number: 22 Password: Advanced V
Tools	Manage 💌	🔁 Login 🛛 🔽	Close Help



8. Navigate to the MicroSD card's directory in WinSCP.

🖺 cflash - root@192.168.2.201 - WinS	CP					-	C	x c
Local Mark Files Commands Sessio	n <u>O</u> ptions	Remote Help						
🖶 🚟 😂 Synchronize 🔳 🛷 😰	1	🚳 🕋 Queue -	Transfer Setting	s Defau	it - 🚑 -			
□ root@192.168.2.201 □ New Seco	ion				-			
		• 🛋 🗔 💼 f	a 🛆 🖉 💁 🖕	mb v	I cflach	> 🕫 🔽) Fin	d Files
📑 Upload 👻 🖉 Edit 👻 📈 🖓	Properties	Mew •	+ - 4		Download • 📝 Edit • 🗙 🚮 Ly Properties 📑 I	New -		+ - V
D:\Dropbox\TrafficCast\DENSO\				_	/mnt/cflash/			
Name	Size	Туре	Changed	^	Name		Size	Changed
🔁		Parent directory	9/15/2018 12:00:22		🔁			11/7/2018
FCC		File folder	4/25/2018 7:42:46		🣜 core			11/7/2018
📜 GUI		File folder	8/27/2018 3:08:10		📜 I2V			5/22/2018
OBU		File folder	7/31/2018 3:20:54		📜 logs			4/17/2018
OBU_Setup_Pics		File folder	6/8/2018 2:56:46 PM		📜 mapdb			11/1/2018
📜 RSU		File folder	11/5/2018 10:30:32		📜 security			5/22/2018
RSU_Setup_Pics		File folder	6/25/2018 3:45:46		📜 SR			5/22/2018
anaheim-drive-2018-08-20.pcap	8,130 KB	Wireshark capt	8/22/2018 11:09:25		📜 V2V-I			5/22/2018
cerr_21_srm_capture.pcap	1,067 KB	Wireshark capt	6/18/2018 8:16:02		Iash_nor_wsu5900a.sh	1	5 KB	1/15/2018
cerr_21_srm_capture_06-15-18_fil	3,814 KB	Wireshark capt	6/20/2018 9:15:49		ifs-denso_imx6s_v2x_87838550v2x.raw	43,	,841	9/14/2018
cerr_21_srm_capture_07-02-18.pc	39 KB	Wireshark capt	7/3/2018 9:31:15 AM		test_capture.pcap	16	3 KB	11/7/2018
How to record SR files.doc	2,389 KB	Microsoft Wor	3/27/2018 2:00:35		u-boot.imx	36	7 KB	6/22/2017
Market README.txt	1 KB	TXT File	5/29/2018 10:17:24		u-boot2.imx	36	7 KB	6/22/2017
🛃 RSU 5910A Basic Verification Gui	939 KB	Adobe Acroba	2/7/2018 6:57:28 PM		u-boot4.imx	63	0 KB	6/22/2017
RSU 5910A Release Notes v1.0	134 KB	Rich Text Format	5/29/2018 10:17:14		ws_ca.db.bak		1 KB	7/10/2017
🛃 RSU 5910A Users Guide_v1.0-1.pdf	2,073 KB	Adobe Acroba	1/4/2018 2:44:12 PM					
RSU Signal Request Message Inte	47 KB	Microsoft Wor	6/12/2018 3:30:18					
🛃 RSU Signal Request Message Inte	448 KB	Adobe Acroba	6/25/2018 9:57:43					
DCI I Cianal Descuert Marcage Inte	17 V D	Microsoft Wor	7/2/2010 0.21.21 AM	~	<		_	>
0 B of 25.1 MB in 0 of 24					162 KB of 44.3 MB in 1 of 14			
					🔒 Si	JP 🗐	2	0:00:32

- 9. Left click and drag the PCAP file with captured data onto the local directory.
- 10. Open Wireshark and open the PCAP file.
- 11. Search through the PCAP and select a packet to be decoded.

test_capture.pcap File Edit View Ge Car	turo Apoluzo Statistico To	laphany Wirelass Taols h	lolo		- U	×
			Teih			
Apply a display filter < Ctrl-					Expression.	+
No Time	Source	Destination	Protocol	Length Info		
13.0.150995	00:00:00 00:00:00	07:00:20:01:00:00	0x0000	288 Ethernet	TT	
14 0 150995	00:00:00 01:0a:01	02.00.f9.02.00.00	0x64ff	761 Ethernet	II	
15 0.150995	00:00:00 01:0a:01	02:00:02:01:00:00	Øxbeff	258 Ethernet	II	
16 0.150995	00:00:00 01:0a:01	02:00:99:00:00:00	0x72ff	153 Ethernet	II	
17 0.150995	00:00:00 01:0a:01	02:00:99:00:00:00	0x68ff	153 Ethernet	II	
18 0.150995	00:00:00 01:0a:01	02:00:99:00:00:00	0x68ff	153 Ethernet	II	
19 0.150995	00:00:00_01:0a:01	02:00:99:00:00:00	0x64ff	153 Ethernet	II	
20 0.150995	00:00:00_01:0a:01	02:00:99:00:00:00	0x72ff	153 Ethernet	II	
21 0.167772	00:00:00_01:0a:01	02:00:91:00:00:00	0xc0ff	145 Ethernet	II	
22 0.167772	00:00:00_01:0a:01	02:00:0e:03:00:00	0x70ff	782 Ethernet	II	
23 0.176161	00:00:00_01:0a:01	02:00:9b:03:00:00	0x68ff	923 Ethernet	II	
24.0 176161	00.00.00 01.02.01	03.00.24.03.00.00	Overff	605 Ethonnot	тт	
Ethernet II, Src: Data (747 bytes) Data: 64ff30ff3	00:00:00_01:0a:01 (00: 6ffa1feffffc38ff0b4177	a0500d50200008800	02:00:f9):02:00:00 (02:0	0:f9:02:00:00)	
0000 02 00 f9 02 00 30 ff 36 ff 37 0021 30 ff 30 ff 31 0020 45 20 00 88 80 0101 30 ff 30 ff 36 0020 45 20 00 88 80 22 80 0050 44 30 00 20 60 88 60 60 60 22 58 0050 44 30 00 20 60 88 60 60 60 22 58 00670 42 27 58 60 60 60 24 52 58 00680 20 60 60 60 60 44 60 60 60 60 60 60 60 60 60 60 60 60 60 60	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	64 ff 64 ff		d. .8 ?x 5' 		
Data (data), 747 bytes		Packets: 80	1 · Displayed:	801 (100.0%) · Load tim	ne: 0:0.21 Profile: Def	ault



12. Right-click and select Copy ... As a Hex Stream to copy the packet hex data.

📕 test	_capture.pcap						-		×
File Ec	dit View Go Captu	re Analyze Statistics Tele	phony Wireless	Tools H	elp				
	2 🛞 📜 🗋 🗙 🔇	है। 🤇 🗰 🏓 🕮 🚡 🛓							
Apply	a display filter <ctrl-></ctrl->						-	 Expression 	+
No.	Time	Source	Destination		Protocol	Length Info			^
	13 0.150995	00:00:00_00:00:00	07:00:20:01:	00:00	0x0000	288 Ethernet	II		
	14 0.150995	00.00.00 01.02.01	02.00.to.02.	99:00	0x64ff	761 Ethernet	II		
	15 0.150995	Mark/Unmark Packet	Ctrl+M	9:00	0xbeff	258 Ethernet	II		
	16 0.150995	Ignore/Unignore Packet	Ctrl+D	9:00	0x72ff	153 Ethernet	II		
	17 0.150995	Set/Unset Time Reference	Ctrl+T	9:00	0x68ff	153 Ethernet	II		
	18 0.150995	Time Shift	Ctrl+Shift+T	9:00	0x68ff	153 Ethernet	II		
	19 0.150995	Packet Comment	Ctrl+Alt+C	9:00	0x64ff	153 Ethernet	II		
	20 0.150995			9:00	0x72ff	153 Ethernet	II		
	21 0.167772	Edit Resolved Name		9:00	0xc0ff	145 Ethernet	II		
	22 0.167772	Apply as Filter	•	0:00	0x70ff	782 Ethernet	II		
	23 0.176161	Prepare a Filter	,	9:00	0x68ff	923 Ethernet	II		
	24 0 176161	Conversation Filter		2.00	0v6aff	605 Ethonnot	тт		¥
> Fran	me 14: 761 bytes	Colorina Composition	,	ured (6088 bits	s)			^
> Ethe	ernet II, Src: 00	Colorize Conversation		, Dst:	02:00:f9	9:02:00:00 (02:0	0:f9:0	2:00:00)	
V Data	a (747 bytes)	SCIP	•						
C	Data: 64ff30ff36f	Follow	•	00					~
0000	02 00 f9 02 00 0	Сору	•	Sumn	nary as Text				^
0010	30 ff 36 ff a1 f	Drotocol Droforoncos		as C	SV				
0020	d5 02 00 00 88 0	Protocor Preferences	,	ac V	AMI				
0030	1d 0d fd ba ff t	Decode As							- 1
0040	03 00 80 02 82 a	Show Packet in New Wind	low	As Fil	ter	Ctrl+Shift-	+C		
0050	04 30 00 20 6a 5	5e 11 49 bb f1 b8 25	1d 96 c2 13	Putor		SCII Dump			
0060	2a 02 94 22 58 0	De 68 70 08 12 48 00	0d 7f 3f 78	bytes	as nex + A.	5Cil Dunip			
0070	0c 02 7d 9a ad b	oc 9d a2 04 d8 02 41	89 00 08 b0	as F	iex Dump				
0800		90 00 1a +b /0 +2 5e	04 +b 35 27	as P	rintable lex	τ			
0090	$e_4 + c_2 = 20 + 09 + a_6 + 6$	$04 \ 62 \ 92 \ 00 \ 11 \ 20 \ 49$	ai co 20 48 91 24 co 11	as a	Hex Stream	n			
0040 0060	24 00 2c 0a 34 3	28 04 00 50 00 06 bd	be $3d \ 86 \ 01$	as R	aw Binary				
0000	3d 8d 69 c8 65 6	5a 02 76 05 22 28 00	0a 90 c1 00	as E	scaped Strir	ng			
		00 02 10 00 EE EO 00			×				~
0 🛛	Data (data), 747 bytes			Packets: 80	L · Displayed:	801 (100.0%) · Load tir	ne: 0:0.21	Profile: De	fault

- 13. Open the USDOT Connected Vehicles Tools website: https://webapp.connectedvcs.com/
- 14. Click on View Tool to open the Message Validator.

Connected Vehicle Message Validator	Message Validator
Unified Model Architecture Using J2735 3/2016 SDM ARI 1 Specification Message Type Data Executing (mm Message Type) And doct message type Prets specar. or parts the carbitrit of year The Inter Coller year ARI: 1 message to validate.	for SDC/SDW messages Use this tool to check versions of messages for accuracy against the specifications and standards prior to depositing into a warehouse.

15. Set the Message Type to Message Frame.





16. Paste the copied hex data from Wireshark onto the blank entry field.



You typically only need a few minutes' worth of capture data to find everything provided you're recording within range of the RSU from your OBU. There is a recognizable pattern for finding the legitimate data because the ones you want seem to always have the same pattern. You need to find the following byte patterns in the data:

SPAT: 00 13 **MAP:** 00 12 **TIM:** 00 1f **BSM:** 00 14

To find these specific patterns from within the pcap you created, do a Find <ctrl-f>, set the display filter for "Hex value" and click on "Find" the exact pattern you want and that's the message you're looking for. **NOTE: all above have space between the 1st and 2nd couplets.**

When you copy the hex data for translation you need to delete everything in the packet before the pattern (without spaces between the couplets) begins. That means in the hex string delete everything else (header information), but keep (copy) only what is highlighted in Red:

020099000000000000000010a019cff96ff30ff36ff55feffffa525e729a88905007500000088000000fffffffffff9a 09d7494549fffffffffffffffffff50f6220088dc030080025003804d00134a4329350082e1ce5000036fd0700104342 cbeada9801023215f15607c00c10d0afdab08e0080868585159cd00504342cbeada9803023215f1560 7c01c10d0afdab08e0100868585159cd08129d172

17. The packet includes WSMP header information. Delete the header (as noted above in Step 16) from the pasted hex data, typically the first 72 to 75 bytes.

or paste the contents of your file here					
001282a538043000206a5e1149bbf1b8251d96c2132a029422580e6870081248000d7f3f780c027d9aadbc9da20	•				
4d80241890008b020d0e0102490001afb70f25e04fb3527e4fc2009a604829200112049a1c02048035f21de8cc09					
f66a4f31f8a8134c01124002c0a34380409500006bdbe3d86013d8d69c8656a0276052228000a90c10005080b03					
80409800006bd06be0b013d8d6dab6a390278820300e0102600001af1d2fa1a04f635b759a91809d82c01143804					
09800076c500bf170148cd8a2d77a5028f1b0d80f41c04f13623f1e3f80a286c24ebe2a01450d85707bf1028a1b10					
38f47e051e36254de6ac09926c25b3e8d013740912800042c0214380409800076c4813e8381478d8a0e77a3028					
f1b0dcaf44e04f1362455e2cc0a1e6c2553e3001464d85707bbf028a1b0feef4fa0523362615e71009886c2423e86					
813880911800042c0314380409400056c417be0e01478d8a017797028a1b0db2f44e04f63624b9e2080a1e6c26	_				
76-0004464405707644000-0607	-				



18. Click on Validate to decode the hex data. Green filled area text indicates the message meets the latest USDOT standard message format. If an error appears, re-evaluate the hex data based on the error. Observe...

	Validate Clear	
gov.usdot.asn1.generated.j2735.dsro	.MessageFrame	
value MessageFrame ::= {		4
messageld 18,		
value MapData : {		
msgissueRevision 4,		
layerType intersectionData,		
layerID 0,		
intersections {		
10 13015		
h revision 4		
refPoint /		
lat 337053880.		
long -1177303869.		
elevation 810		
).		
laneWidth 330,		
laneSet {		
1		



BlueTOAD Spectra RSU Site Requirements Form

This form must be printed for each RSU along with the Sign-Off Checklist below.

SPECTRA RSU SITE REQUIREMENTS

Thank you for choosing the Spectra RSU. To ensure the best possible field deployment experience, please provide the information below. All fields are required and must be complete prior to scheduling your installation.

CONTACT INFORMATION

Agency	Nam

Agency Phone Number

Agency E-mail

INTERSECTION INFORMATION

The Spectra RSU requires a supported ATC 5.2b (or higher) compliant traffic controller with compatible software to generate Signal Phase and Timing messages. Intersection diagrams are required to generate MAP messages. FCC site licenses are required by law (47 C.F.R, Parts 90 and 95). Intersection latitude and longitude shall be in Decimal Degrees.

Intersection Location	
Intersection Latitude	Intersection Longitude
Intersection Diagram Provided	Intersection Timing Plan Provided
Traffic Controller Brand	Traffic Controller Model
Traffic Controller Software	Version
Traffic Controller IP Address	
Traffic Controller Subnet Mask	
Traffic Controller Gateway	
ATMS Software	Version
FCC Site License Registered	FCC Call Sign
FCC File Number	

SPECTRA RSU INFORMATION

The Spectra RSU requires two IP addresses for Bluetooth and DSRC functionality. Serial numbers are found on device or packaging. Serial numbers may be left blank if unknown.

Bluetooth Module Serial Number	
Bluetooth Module IP Address	
Bluetooth Module Subnet Mask	
Bluetooth Module Gateway	
DSRC Module Serial Number	
DSRC Module IP Address	
DSRC Module Subnet Mask	
DSRC Module Gateway	

TRAFFICCAST SERVER ACCESS

The Spectra RSU requires internet access to the TrafficCast servers for collection and processing of Bluetooth data. Refer to Tech Bulletin TCI-FSB-ET-2011-01 (available on request) for more information.

Port 69 Opened
Port 123 Opened
Port 8010 Opened
Port 10001 Opened



System Evaluation Checklist

This form must be printed for each RSU along with the BlueTOAD Spectra RSU Site Requirements form.

Date:

RSU Number:			
Serial Number:			
RSU IP Address:			

Category	Items tested		Date & Time	Pass	Signature of Evaluator
Visual Inspection	Confirm condition of hardware enclosure: - Antennas with Connectors - Enclosure Ports - LEDs - Enclosure				
Confirm Network Configuration Settings	Confir open Conta assist	rm ports 123, 8010 and 10001 are and set for outbound data traffic. act TrafficCast Support for ance			
Confirm Power Up	Power up unit and confirm all LEDs are normal after the unit initializes. LED Indicators: Green – Device operational Amber – Device ON Red - Fault				
Confirm Operation	1.	GPS Functionality Verified			
	2.	SPaT, MAP, TIM and BSM Data Broadcasting Verification: Verified 11 messages per second (generated by the RSU). - 10 SPaT messages - 1 MAP message			
	3.	SPaT, MAP, TIM and BSM Data DSRC Message Verification USDOT / SAE J2735 (March2016)			