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version 121212 for product 8036-31

Version	Description	Date
121126	Initial creation	26-11-2012
121212	Minor changes	12-12-2012

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1. Introduction

Thank you for choosing Squarell interfaces. Our interfaces are used around the world in trucks, vans and personal vehicles to collect and analyze vehicle data to increase your performance.

The *TT CONNECT,* Vehicle Data Interface, is an electronics device to read data from a Vehicle Data Network and translate the data into standardized protocols like CANbus FMS/J1939 or RS232. You can read data from a brand specific vehicle network with this protective interface. With Squarell solutions you do not have to visit the dealer because our FMS interfaces are ready to use. The Squarell *TT CONNECT* offers more than just streaming data. Squarell processes the data inside the interface. We provide you with exact and important data to accomplish advanced fleet management.

FMS

If a vehicle doesn't have an FMS interface on board, a Squarell *TT CONNECT* can be connected directly to the vehicle CANbus. The CANcliQ protects the vehicle CANbus from outside interference.

CANcliQ

The Squarell CANcliQ reads CAN signals without making a wire to wire connection. This technology guarantees that no intrusive signals are send to the vehicle CANbus. This eliminates liability matters, warranty issues or possible wrong connections.

SFD

The *TT CONNECT* has 3 SFD (Special function Device) ports, these ports can be used to connect devices like DAP, DatacliQ and Trailer data System.

2. Product Information

The *TT CONNECT* is a Squarell multi Source Vehicle Data Interface in a *SOLID* housing. The *TT CONNECT* has a 36-pole Automotive JAE-connector.

The *TT CONNECT* has two CAN ports and is equipped with 3 SFD (Special Function Device) ports, these SFD ports can be used to add a special function device like DAP, Trailer Data System or DatacliQ to the *TT CONNECT*.

2.1 Available Kit

The TT CONNECT kit comprises the following available.

- TT CONNECT CANcliQ kit (8836-31)
- 8036-31 TT Connect
- 8636-Q1 SOLID CANcliQ cable

Optional items

- 8600-RG Red/Green twisted 1.5m with JAE crimp terminal for wired J1708
- 8511-280 DatacliQ for J1708
- 8511-180 DatacliQ for CANbus

2.2 Drawings

2.2.1 8036-31 TT Connect



2.2.2 8636-XX SOLID Cable

The basic solid cable has the following pinning.

The wires for Power, Ground, CAN1 Termination Bridge, CAN1 and CAN2 are already in the connector. The usage of J1708 wires or the SFD ports is optional.



8636-Q1 SOLID CANcliQ cable



2.3 Technical Specifications

Physical characteristics	
Dimensions	Length 89mm, Width 71 mm, Height 27 mm
Weight	170 grams
Material	Nylon black 6/6
Environmental sealing	IP67
Drop specification	1m to concrete floor
Storage temperature	-40 to 90°C
Operating temperature	-40 to 85°C
Relative humidity	max 90% at 40°C
MTBF	26280 h
Burn in cycle	60°C/1h, -15°C/1h

Electrical characteristics			
Supply power	10 -30 Volt DC		
Electrical isolated	No		
Power consumption	12V supply	24 Supply	
Running, no external load	60 mA	30 mA	
Running, 300 mA load on external	220 mA	110 mA	
5V	CAN/RS232 drivers ON	CAN/RS232 drivers ON	
Sleepmode, wake on CAN	24 mA	12 mA	
Sleepmode, wake on timer	16 mA	8 mA	
	CAN/RS232 drivers OFF	CAN/RS232 drivers OFF	
Deep Sleep Mode (wake on RTC)	0.35 mA	0.35 mA	
Processor	MC912XE100		

CANbus characteristics	
Baudrate	Selectable: 10 – 1000 kBit/sec
Protocols CAN	Selectable: J1939 / Layer 2 / proprietary vehicle protocols
Hardware protocol	CAN V 2.0a, CAN V 2.0b
Default Device address	240

SFD port characteristics	
SFD supply	4.75 - 5.25V
SFD load	100mA per SFD, 400 mA max all SFD's
Default baudrate	9600
Default communication	UART
Optional communication SFD port #1/#2	CAN (CMOS level)

Device connector types	
Universal connectors	36-pole JAE connector

Configuration capacity	
Message capacity	
CAN messages J1939 (PGN)	510
CAN messages Layer 2	510
CANbus Data Fields (SPN)	1024
J1708 messages	510
Memory capacity	
Device Configuration file size (DCF)	64-256Kb
Constants	255
Variants	1020/5120bytes
Stored Variants	255/900 bytes
Function capacity	
Real Time Clock/TC	TC
Conversion	32
Average MA	30
Average RC	24
Delta	200
Calculation	765
Compare	510
Crossing	200
Timers (ms)	32
Timers (s) / stored	4
Convert 123-ABC	255
Convert ABC-123	255
String process	255
String compare	255

2.4 LED information

The *TT CONNECT is* equipped with a status LED. With this LED you can check if the Squarell Device is operational. The LED can light up green or red. The LED colours / patterns have the following meanings:

Led status	
	Device active. CANbus data is being acknowledged on all active CANbus ports
	 Device active. But 1 of the CANbus channels is stopped. Check CANbus connection and check the CANbus termination Acknowledgement is missing on CANbus
	 1 of the RS232 ports of the Device is in interface mode: The device is uploading a DCF to itself or to another device The device is downloading a DCF to itself or to another device The device is monitoring the CANbus
	 Device is not running a DCF: No DCF loaded or DCF corrupt (reload DCF with iUpload)
	No valid "Key" loaded in the device. DCF is not active. • reload key with iUpload
Time	When this LED patterns occurs (2 to 6 red blinks) reload the firmware and DCF. When this LED patterns occurs permanently, the device must be send in for repair.

2.5 How to modify a TT CONNECT Cable



3. Connect and Install

After receiving the *TT CONNECT* you don't have to configure the device to get started. The TT CONNECT is already loaded with a standard Squarell DCF. The *TT CONNECT* with the cable is a ready to go kit and can be installed immediately.

Important:

Please connect the *TT CONNECT* to the Permanent Power Supply.

Squarell advises to connect the devices to the Permanent Power Supply. When the ignition is turned off there is no CANbus data to be send but the digital tachographs keeps on sending data and therefore the Squarell device should be always on.

3.1 Connect a TT CONNECT inside a vehicle to get FMS/J1939 data

The *TT CONNECT* can be used to connect to a direct vehicle CANbus and send out FMS/J1939 data (and RS232 data).

Please connect the equipment like below:



Make sure to create these connections:

SOLID CANcliQ cable

see the Squarell installation instruction on where to find the connection locations.

- Connect the brown wire to the power (10..30V)
- Connect the black wire to the ground
- Connect the CANcliQ over the CAN High and CAN Low of the vehicle
- Connect the white wire to CAN High of your Telematics device.
- Connect the blue wire to CAN Low of your Telematics device.
- See paragraph 3.3 for the Termination Loop

3.2 CANbus Termination

Terminate the CANbus always with 2 terminators.

SOLID CANcliQ Cable is equipped with 2 removable terminators on CANbus 1 (blue/white).

- Remove one terminators if the CANbus already is equipped with one terminator.
- Remove both cable terminators if the Squarell device becomes part of an existing (terminated) CANbus system.



Check the Termination:

- Turn Ignition off
- Power off
- Resistance between CAN High and CAN low must be 60 Ω
 When the resistance is 40 Ω: The CANbus has 3 Terminators, remove one of the terminators.
 When the resistance is 120 Ω: The CANbus has only 1 Terminator, add one terminator.

3.3 Installation Instructions

For each vehicle Squarell supports there is an installation instruction available. The installation instruction explains were the CANbus wires, J1708 wires and ISO11992 wires can be found in the vehicle.

The installation instruction is delivered with *TT CONNECT* kit when you ordered the kit for a specific vehicle. Installation instructions can also be obtained by contacting Squarell.



4. Special Function Device

The *TT CONNECT* has 3 Special Function Device (SFD) ports. These ports can be used to connect an additional SFD to the *TT CONNECT*. There are several different SFDs. Each SFD has its own purpose. SFD port are Universal ports, any kind of SFD device can be connected to one of the free SFD ports on the *TT CONNECT*.

The SFD ports are named SFD port A, SFD port B and SFD port C.



The last three digits of each SFD device code tells the ID of the SFD device. Each SFD device connected to a *TT CONNECT* needs his own ID, It is not possible to connect two SFD devices with the same ID to the *TT CONNECT*.

Very important:

Always repower a TT CONNECT after connecting a SFD device

4.1 DatacliQ

The DatacliQ is a special CANcliQ. The DatacliQ can be used as an extra cliQ to retrieve more data from the vehicle. The DatacliQ can be used on a **direct CANbus**, but also to a **J1708 bus**.

Just like the CANcliQ the can be used to install in a vehicle to read from the direct vehicle CANbus or a J1708 bus without making a wire to wire connection. Installing a DatacliQ is easy and it does not harm the vehicle.



Important:

DatacliQ cables are programmed at Squarell for the source they should read from. This means that a J1708 DatacliQ can't read a CANbus. So this means that it is very important that when you order a DatacliQ you mention the kind of DatacliQ you want so that Squarell can program them for that purpose.

4.1.1 Different kind of DatacliQs

There are 2 different kind of DatacliQs. The 2 different kinds are:

- CANbus DatacliQ (8511-180) (Can only connect to SFD port A or B)
- J1708 DatacliQ (8511-280)

A CANbus DatacliQ only works on a CANbus and a J1708 DatacliQ only on a J1708 bus.

Very important:

- A datacliQ for CANbus can only be connected to SFD port A or B
- SFD port C cannot support DatacliQ for CANbus

4.1.2 Installing a DatacliQ

A DatacliQ has a "High" and a "Low". The High should be connected to:

- CAN High (CANbus DatacliQ)
- J1708+ (J1708 DatacliQ)

The Low should be connected to:

- CAN Low (CANbus DatacliQ)
- J1708- (J1708 DatacliQ)

See the Squarell Installation instruction to check were you can find the CANbus or J1708 wires inside a vehicle.

4.2 DAP SFD



Order information: DAP SFD: 8521-670 The DAP (short for Driver Awareness Panel) is an intelligent in vehicle display providing drivers the encouragement they need to drive smarter. It works on every vehicle with a Squarell interface and gives visual and audible notifications to the driver on several performance indicators without being intrusive. The DAP is now also available in a SFD version which makes it very easy to use. Just connect the DAP SFD to a free SFD port on the *TT CONNECT* and it is ready for use.

4.3 Other SFDs

Currently Squarell is developing several Special Function Devices. These SFDs will be released in the future and can be used for different purposes.

5. DCF Information

The DCFs (Device Configuration Files) are the software that go into the Squarell device. The functionality of each Squarell device is determined by the DCF that is loaded inside the device. Squarell develops standard DCFs and can make customer specific DCFs. Customers can use these DCFs and load them with iUpload into the devices.

Standard each Squarell device is loaded with a Default DCF. When you order a Squarell Product to install inside a vehicle, Squarell configures the devices for the customer by loading the correct DCF. If you want to use the Squarell device for a different application then you ordered it for, only then it needs to be reconfigured by loading the correct DCF.

Squarell developed standard DCFs for the *TT Connect*. All the standard DCFs contain the Squarell code in their name. The code is "SQU".

DCF names comply with the following standard:



5.1 Supported Vehicles

Trucks TRKS

For EU trucks and busses and all tachographs

Vans

FTC vehicles	Ford Transit Connect / Focus / Fiesta (new type = 2009 and younger) / Kuga / C-Max
FTS vehicles	Ford Transit
MBS vehicles	Mercedes Sprinter / Vito / Viano / A Klasse / B Klasse / C Klasse / E Klasse /
	VW Crafter
PSA vehicles	Peugeot Partner/Expert
	Citroen Berlingo/Jumpy
	Fiat Scudo
PSB vehicles	Fiat Bravo 2007-2010, Fiorino 2009+ / Doblo 2009+ / Ducato (2006+) (Only in 8000 DCFs)
	Peugeot Bipper 2009+ / Boxer (2006+)(Only in 8000 DCFs)
	Citroen Nemo 2009+ / Jumper (2006+) (Only in 8000 DCFs)
RON vehicles	Renault Master (old type = 2009 and older) / Traffic / Kangoo (old type = 2008 and older)
	Opel Movano (old type = 2009 and older) / Vivaro
	Nissan Kubistar / Interstar (old type = 2009 and older) / Primastar
REN vehicles	Renault Espace / Scenic / Laguna / Megan / Clio / Master (new type = 2010 and younger) /
	Kangoo (new type = 2009 and younger)
	Opel Movano (new type = 2010 and younger)
	Nissan Interstar (new type = 2010 and younger)
VAG vehicles:	Volkwagen T5 / Caddy / Touran / Passat / Golf / Polo
	All Seat vehicles
	All Audi vehicles
	All Skoda vehicles

Very Important:

When moving the TT CONNECT from one vehicle to another, you can erase the Stored Variants with a Reset DCF file: RESET-xxxxxxCL.dcf

In case of updating the DCF (newer DCF for the same vehicle) there is no need to run the Reset DCF.

6. CANbus Protocol

The *TT CONNECT* sends various data by FMS/J1939 CANbus. This data contains the FMS parameters, J1939 parameters, but also Squarell calculated parameters that can help you analyze the vehicle performance and increase the performance.

Remark:

The FMS/J1939 CANbus output is only active if CANbus 1 of the *TT CONNECT* is connected to a Telematics modem which reads FMS.

6.1 Parameters/Functions Overview

Various data is send by FMS CANbus. Below is a table with the parameters that are send by CANbus by the *TT CONNECT*.

Parameter	Parameter			
- 237 Vehicle ID	- 964 Years			
- 190 Engine Speed	- 963 Months			
- 7084 Vehicle Speed	- 962 Days			
- 6000 Odometer	- 961 Hours			
- 6001 Total Fuel Used	- 960 Minutes			
- 6112 Total Fuel Used in mL	- 959 Seconds			
- 7183 Actual Fuel	- 1601 Local Minute Offset			
- 513 Actual % Torque	- 1602 Local Hour Offset			
- 91 Accelerator Pedal	- 1612 Driver 1 Work State			
- 6597 Brake Switch	- 1613 Driver 2 Work State			
- 96 Fuel Level	- 1615 Driver 1 Card			
- 110 Engine Coolant Temperature	- 1616 Driver 2 Card			

Important:

Not all parameters from the list may be available. This availability of the data depends on the brand, model, year and configuration of the vehicle.

6.2 Squarell CANbus Protocol description

The CANbus communication protocol is described in the document: "Squarell CANbus Protocol". This document contains all the messages that Squarell devices send and receive by the FMS CANbus. For each message there is a description of all the parameter it contains. The protocol also contains the FMS CANbus settings.

When you want to implement the Squarell CANbus protocol into your Telematics device or solution and you need the CANbus protocol description, please contact Squarell to obtain the protocol.

7. Upload devices with iUpload

With iUpload it is easy to update a device with the latest Firmware and choose the right DCF for the device. iUpload is a program that works together with the *Squarell Server*. Therefor it is necessary to login with a username and password. Contact Squarell support to obtain a Username and Password. Because of the Server connection Squarell is able to provide all our customers with the latest Firmware and new DCFs.

Download iUpload from the Squarell website and run the Squarell_iUpload_Setup. Use the pre selected folder or choose an other folder were you have administrator rights. Select Squarell iUpload in your Windows Start menu or via your desktop and run the Program. Send an email to <u>support@squarell.com</u> to obtain a username and password.

iUpload v2.2.3	3 - Offline						X
File Options He	elp						
Login Username Use Password ••	ername	Save			Tasks (0) To do	Done O / O Success Defect	
Devices conn	ected (0)						
Serial	Туре	Profile	Firmware	DCF		Status	
							*
Synchronize Tasks	M. T	anage Fasks	Read Devices	Update Devices			
Status (11:11:56) - Scc (11:11:57) - Int (11:12:25) - Se	anning for interfi erface device fo ttings saved	ace device bund					×

Login with your Username and Password. And click on "Save".

7.1 Connect a TT CONNECT device via RS232 and connect Power

Connect the brown wire of the *SOLID* Cable to the power (10..30V). Connect the black wire of the *SOLID* Cable to the ground. Connect the RS232 direct to a free RS232 port on your PC.



7.2 Synchronize Tasks

Click on *"Synchronize Tasks"* to download all necessary information from the Squarell Server. The latest Firmware versions and latest DCFs are downloaded to your PC. You will receive all Squarell standard DXCFs and the company specific DCFs.



7.3 Read Devices

Click on "Read Devices"

The connected device appears in the screen.

Options H	elp						
ogin Username Us Password ••	ername	Save			Tasks (0) To do	Done	
)evices conn	ected (1)						
Serial 2532	Type 70113 flx12	Profile flx12sq002	Firmware 8000-01v101r02	DCF 3.bin SQU-FLX12-VOL+J	Tasks	Status No tasks available	^
Serial 2532	Type 270113 flx12	Profile flx 12sq002	Firmware 8000-01v101r02	DCF 3.bin SQU-FLX12-VOL+J	, Tasks	Status No tasks available	•
Serial 2532 Synchronize Tasks	Type 170113 flx12	Profile ftx12sq002	Firmware 8000-01v101r022 Read Devices	DCF 3.bin SQU-FLX12-VOL+3 Update Devices	,, Tasks	Status No tasks available	-

7.4 Select DCF and Firmware

Double click on the serial number to open the device edit screen.

💽 iUpload - Task		
Serial Number	253270113	
Status	Active -	
Firmware		•
DCF		•
Planner Memo		
Installer Memo		
Vehicle ID		
Кеу		
	Upload	Ok

Select firmware and DCF and click on "Ok"

It is only possible to select DCF and Firmware which are made available on the Squarell server

The "*Tasks*" window in the upper right corner now shows that there are tasks for one device. Blue text indicates tasks to apply.

Options Help							
ogin					Tasks (1)		
Username Username Password				To do	Done		
				1	0/	0	
		Save				Success	Defect
Devices connected	1 (1)						
Serial	Туре	Profile	Firmware	DCF		Status	
253270113	flx12	flx12sq002	8000-01v101r023.b	in SQU-FLX12-STD+DQJ∙		Tasks pending	
253270113	flx12	flx 12sq002	8000-01v101r023.b	in SQU-FLX12-STD+DQJ-	V	Tasks pending	
25327011: Synchronize Tasks	ffx 12	flx12sq002 nage asks	8000-01v101r023.b Read Devices	In SQU-FLX12-STD+DQJ- Update Devices	V	Tasks pending	

Click on "Update Devices" to apply tasks for the connected devices.

After updating the device the "Tasks" window shows you if the upload was successful.



Click on "Synchronize Tasks" to complete the update process.

8. Technical Support

If you require technical support for Squarell products, you can visit our website (<u>http://www.squarell.com/Support/FAQ</u>) or reach us in any of the following ways:

Telephone:	+31 (0) 252 42 02 39
Fax:	+31 (0) 252 41 36 29
Email:	support@squarell.com
Web:	www.squarell.com
Headquarter:	Oude Weerlaan 27
	2181 HX Hillegom
	The Netherlands

9. Abbreviations

In this manual there are abbreviations for the colors that are used in the Squarell products: The color abbreviations are:

BN	=	Brown	BK	=	Black
WH	=	White	BU	=	Blue
GR	=	Green	RD	=	Red
OG	=	Orange	YE	=	Yellow

Other abbreviations

DAP	Driver Awareness Panel
DCF	Device Configuration File
SFD	Special Function Device