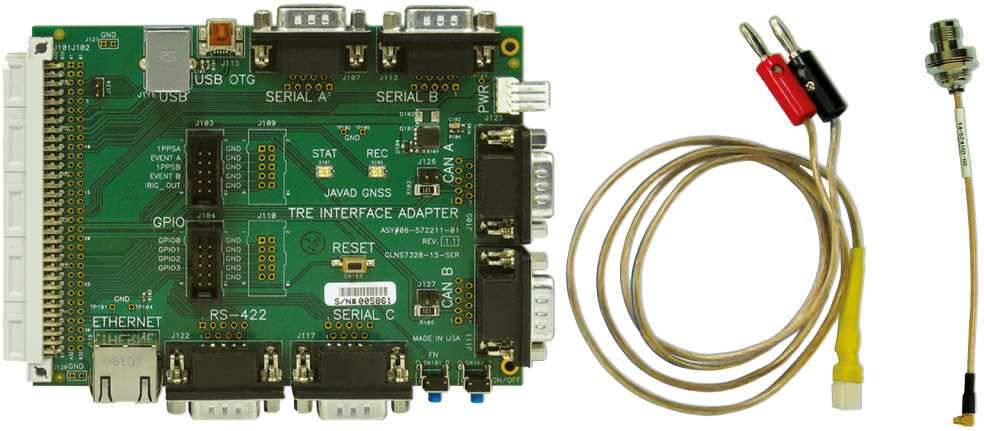
TRE

EVALUATION KIT

Application Notes



VERSION 1.1
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Contents

PREFACE

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TERMS AND CONDITIONS

USE – JAVAD GNSS receivers are designed to be used by a professional. The user is expected to have a good knowledge and understanding of the user and safety instructions before operating, inspecting or adjusting. Always wear the required protectors (safety shoes, helmet, etc.) when operating the receiver.

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SAFETY – Improper use of the TRE Evaluation Kit can lead to injury to persons or property and/or malfunction of the product. The TRE/TR Evaluation Kit should only be repaired by authorized JAVAD GNSS warranty service centers. Users should review and heed the safety warnings in Appendix A.

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WEEE DIRECTIVE

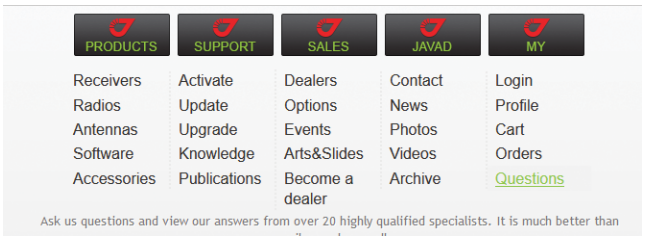
The following information is for EU-member states only:

The use of the symbol indicates that this product may not be treated as household waste. By ensuring this product is disposed of correctly, you will help prevent potential negative consequences for the environment and human health, which could otherwise be caused by inappropriate waste handling of this product. For more detailed information about the take-back and recycling of this product, please contact your supplier where you purchased the product or consult.

TECHNICAL ASSISTANCE

If you have a problem and cannot find the information you need in the product documentation, contact your local dealer.

Alternatively, request technical support using the JAVAD GNSS World Wide Web site at: www.javad.com. To contact JAVAD GNSS Customer Support use the QUESTIONS button available on the www.javad.com:



Operation

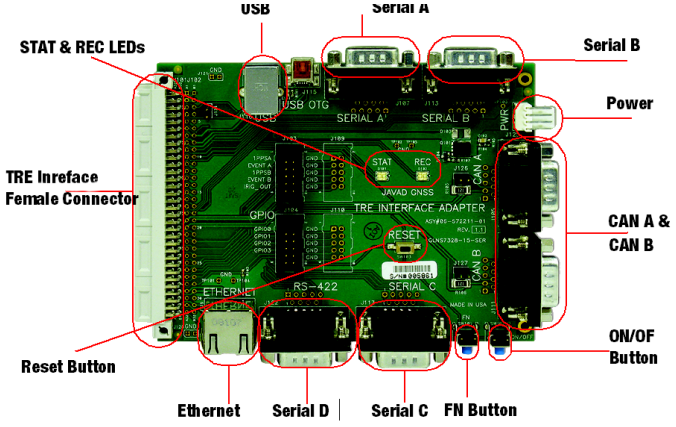
KIT PACKAGING

The TRE Evaluation Kit provides an easy connection to any of JAVAD GNSS OEM receiver boards. It is designed for use in laboratories and allows:

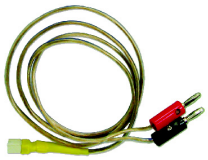
- JAVAD GNSS OEM boards testing;
- evaluating all the features of JAVAD GNSS OEM boards;
- developing applications based on JAVAD GNSS OEM boards.

The kit consists of:

- TRE Interface Adapter p/n 05-572211-01



-- 4-Pin Header to Banana Plugs Power Cable p/n 14-508021-01;



- TNC to MMCX RA Antenna cable p/n 14-574101-03.

CONNECTION

OEM board connection

The OEM board of TRE series connected directly to Evaluation Kit by its 64-pin DIN41612 Euro connector.

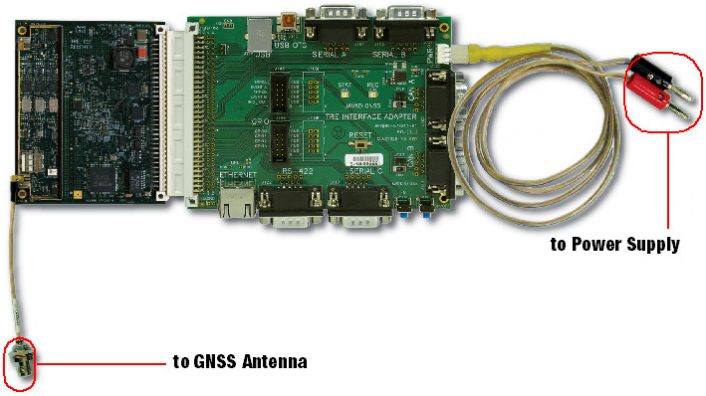


Figure 1. TRE series OEM board connected to Evaluation Kit

GNSS antenna connection

The OEM board may be connected to external GNSS antenna using TNC to MMCX RA Antenna cable #14-574101-03 (included in the Kit) and one of our external GNSS Antenna Cables (purchased separately):

- Accessory GPS Antenna Cable 3m (RG-58) #14-578107-01;

- Accessory GPS Antenna Cable 10m (RG-58) #14-578107-02.

Power connection

The OEM board powered through Evaluation Kit and Power Cable #14-508021-01 (included in Kit). The

Banana plugs of power cable may be connected to any available laboratory power supply, battery or other power source with power parameters, suitable for particular OEM board power specifications.

Note: See particular OEM board specifications on www.javad.com.

CAUTION: Evaluation Kit does not provide any over-voltage protection. Connecting Evaluation Kit to voltage exceeding particular OEM board power voltage range may cause damage of OEM board and Evaluation Kit board.

CAUTION: Evaluation Kit provides reverse polarity protection only in voltages range, specified for particular OEM board.

In most cases, power supply with 12 VDC, 1 Amp stabilized output will be good enough for Evaluation Kit powering.

Serial RS-232 connection

A standard Null-Modem cable (not included in the Kit) with DE-9 Female connectors on both ends and with length from 1 to 10 meters may be used to connect PC COM_X port with Serial A, Serial B or Serial C port, D port on Evaluation Kit as well as to provide connection between two Evaluation Kits to send some data from one OEM receiver to another OEM receiver.

DE-9 Female connector external view and pinout is shown on the picture below.

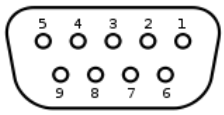


Figure 2. DE-9 Female connector

The Serial RS-232 Null-Modem cable should be wired according to the wiring table below:

Table: 1. Serial RS-232 Null-Modem cable wiring table

DE-9 Female, side 1		Cable Wiring	DE-9 Female, side 2	
Signal Name	Pin	Wire Number	Pin	Signal Name
CD	1		1	CD
RXD	2	Wire 1	3	TXD
TXD	3	Wire 2	2	RXD
DTR	4		6	DSR
GND	5	Wire 3	5	GND
DSR	6		4	DTR
RTS	7	Wire 4	8	CTS
CTS	8	Wire 5	7	RTS
RI	9		9	RI
Shield	shell	Shield + Drain Wire	shell	Shield

The Serial RS-232 Null-Modem cable should be wired according to the wiring table below.

Table: 2. Serial RS-232 Straight Through cable wiring table

DE-9 Female, side 1		Cable Wiring	DE-9 Female, side 2	
Signal Name	Pin	Wire Number	Pin	Signal Name
CD	1		1	CD
RXD	2	Wire 1	2	RXD
TXD	3	Wire 2	3	TXD
DTR	4		4	DTR
GND	5	Wire 3	5	GND
DSR	6		6	DSR
RTS	7	Wire 4	7	RTS
CTS	8	Wire 5	8	CTS
RI	9		9	RI
Shield	shell	Shield + Drain Wire	shell	Shield

Serial RS-422 connection

Serial RS-422 port may be used to connect OEM receiver with other external devices as well as connect two OEM receivers together for some data exchange between them.

A Null-Modem RS-422 cable (not included in the Kit) with DE-9 Female connectors on both ends and with length from 1 to 100 meters may be used to connect two OEM receivers together. The DE-9 Female connector external view and pinout shown in Figure 2-4.

For best results, we recommend to use high quality STP 5 or 5e category cable type as well as specialized for RS-422 applications cable types, for example: Belden 9730, 9830 or similar.

The Serial RS-422 Null-Modem cable should be wired according to the wiring table below.

Table: 3. Serial RS-422 Null-Modem cable wiring table

DE-9 Female, side 1		Cable Wiring	DE-9 Female, side 2	
Signal Name	Pin	Pair Number: Wire Number	Pin	Signal Name
GND	5	Pair 1: Wire 1	5	GND

DE-9 Female, side 1		Cable Wiring	DE-9 Female, side 2	
Signal Name	Pin	Pair Number: Wire Number	Pin	Signal Name
	2		2	
	3		3	
TXD+	7	Pair 2: Wire 1	8	RXD+
TXD-	3	Pair 2: Wire 2	2	RXD-
	6		6	
	7		7	
RXD+	8	Pair 3: Wire 1	7	TXD+
RXD-	2	Pair 3: Wire 2	3	TXD-
	shell	Shield + Drain Wire	shell	

In some cases, to connect other external devices with Evaluation Kit RS-422 port, not Null-modem, but Straight Through RS-422 cable may be used.

The Serial RS-422 Straight Through cable should be wired according to the wiring table below.

Table: 4. Serial RS-422 Straight Through cable wiring table

DE-9 Female, side 1		Cable Wiring	DE-9 Female, side 2	
Signal Name	Pin	Wire Number	Pin	Signal Name
GND	5	Pair 1: Wire 1	5	GND
	2		2	
	3		3	
TXD+	7	Pair 2: Wire 1	8	RXD+
TXD-	3	Pair 2: Wire 2	2	RXD-
	6		6	
	7		7	
RXD+	8	Pair 3: Wire 1	7	TXD+
RXD-	2	Pair 3: Wire 2	2	TXD-
	shell	Shield + Drain Wire	shell	

USB connection

Evaluation Kit USB port may be used to connect OEM receiver with PC USB port.

A standard USB 2.0 High Speed cable with USB type A Male connector on one side and USB type B Male connector on other side (not included in the Kit) may be used to connect OEM receiver with PC through J116 USB type B Female connector on Evaluation Kit board.

A standard USB 2.0 High Speed cable with USB type A Male connector on one side and USB type Mini-B Male connector on other side (not included in the Kit) may be used to connect OEM receiver with PC through J115 USB type Mini-AB Female connector on Evaluation Kit board.

For best results, we recommend to use as short as possible (from 0.5 to 3 meters) USB high quality cables with marking similar to this: “USB SHIELDED 28AWG/1P + 24AWG/2C HIGH-SPEED USB 2.0”. USB connection cannot be used to connect two OEM receivers together directly for data exchange. This is because OEM receiver has “device” type of USB port, that may be connected only to “host” type of USB port, usually present on PC or on USB hubs.

Warning: Because both J116 USB type B and J115 USB type Mini-AB Female connectors are physically connected to one and the same USB port, only one USB cable at a time may be used. Do not connect to Evaluation Kit two USB cables simultaneously.

Ethernet connection

The J119 “ETHERNET” port may be used to:

- connect OEM receiver with Local Area Network (LAN);

- connect OEM receiver with PC directly;

- connect two OEM receivers together directly.

For Ethernet connection we recommend to use short (from 1 to 10 meters) high quality UTP 5 or 5e category cable with two RJ45 Male connectors on both ends.

RJ45 Male connector external view and pinout shown below:

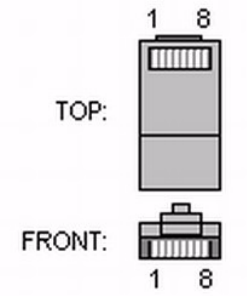


Figure 5. RJ45 Male connector

For direct connection between two OEM receivers or between one OEM receiver and PC, the Ethernet Crossover cable usually used. Crossover cable should be wired according to the wiring table below

Table: 5. Ethernet Crossover cable wiring table.

RJ45 Male, side 1		Cable Wiring	RJ45 Male, side 2	
Signal Name	Pin	Pair Number: Wire Colour	Pin	Signal Name
TX+ (BI_DA+)	1	Pair 2: White/Orange	3	RX+ (BI_DB+)
TX- (BI_DA-)	2	Pair 2: Orange	6	RX- (BI_DB-)
RX+ (BI_DB+)	3	Pair 3: White/Green	1	TX+ (BI_DA+)
- (BI_DC+)	4	Pair 1: Blue	7	- (BI_DD+)
- (BI_DC-)	5	Pair 1: White/Blue	8	- (BI_DD-)
RX- (BI_DB-)	6	Pair 3: Green	2	TX- (BI_DA-)
- (BI_DD+)	7	Pair 4: White/Brown	4	- (BI_DC+)
- (BI_DD-)	8	Pair 4: Brown	5	- (BI_DC-)

When two OEM receivers connected directly through Ethernet cable, one of them should be configured as Base (Server), while another receiver should be configured as Rover (Client) in order to provide data exchange between them.

Example: RTK (Phase Differential) operation mode organized through Ethernet direct cable connection. Base receiver is configured as source of RTCM corrections outputted once per second through /dev/tcp/d port. Rover receiver is configured to connect with Base /dev/tcp/d port, receive RTCM corrections and compute RTK solutions.

Base (server) settings:

```
%%set,net/ip/addr,192.168.0.1
%%set,net/ip/
mask,255.255.255.0
%%set,net/ip/gw,0.0.0.0
%%set,net/passwd,a
%%set,reset,y
@sleep 15000
%%em,dev/tcp/d,/msg/rtcm/
{18,19,3,22}:1
```

Rover (Client) settings

```
%%set,net/ip/addr,192.168.0.2
%%set,net/ip/
mask,255.255.255.0
%%set,net/ip/gw,0.0.0.0
%%set,net/passwd,a
%%set,reset,y
@sleep 15000
%%set,net/tcpcl/mode,off
%%set,net/tcpcl/rcv/
addr,192.168.0.1
%%set,net/tcpcl/rcv/port,8002
%%set,net/tcpcl/rcv/login,d
%%set,net/tcpcl/rcv/passwd,a
%%set,dev/tcpcl/a/imode,rtcm
%%set,net/tcpcl/mode,rcv
%%set,pos/mode/cur,pd
```

For OEM receiver Ethernet port connection with LAN, the Straight Through (Patch Cord) cable usually used. Straight Through cable should be wired according to the wiring table below.

Table: 6. Ethernet Straight Through cable wiring table

RJ45 Male, side 1		Cable Wiring	RJ45 Male, side 2	
Signal Name	Pin	Pair Number: Wire Colour	Pin	Signal Name
TX+ (BI_DA+)	1	Pair 2: White/Orange	1	TX+ (BI_DA+)
TX- (BI_DA-)	2	Pair 2: Orange	2	TX- (BI_DA-)
RX+ (BI_DB+)	3	Pair 3: White/Green	3	RX+ (BI_DA+)
- (BI_DC+)	4	Pair 1: Blue	4	- (BI_DC+)
- (BI_DC-)	5	Pair 1: White/Blue	5	- (BI_DC-)
RX- (BI_DB-)	6	Pair 3: Green	6	RX- (BI_DB-)
- (BI_DD+)	7	Pair 4: White/Brown	7	- (BI_DD+)
- (BI_DD-)	8	Pair 4: Brown	8	- (BI_DD-)

CAN connection

Evaluation Kit J105 “CAN A” and J111 “CAN B” ports may be used to connect OEM receiver CAN ports to CAN BUS as well as connect two OEM receivers together for some data exchange between them.

Direct cable (not included in the Kit) with DE-9 Female connectors on both ends and with length from 1 to 10 meters may be used to connect two OEM receivers together by CAN interface. The DE-9 Female connector external view and pinout shown in previous paragraph.

For best results, we recommend to use high quality STP cable type, specialized for RS-485/CAN applications, for example: Belden 9842 or similar.

The Direct CAN cable should be wired according to the wiring table below.

Table: 7. Direct CAN cable wiring table

DE-9 Female, side 1		Cable Wiring	DE-9 Female, side 2	
Signal Name	Pin	Pair Number: Wire Number	Pin	Signal Name
	1		1	
CAN_L	2	Pair 1: Wire 1	2	CAN_L
CAN_GND	3	Pair 2: Wire 1	3	CAN_GND

DE-9 Female, side 1		Cable Wiring	DE-9 Female, side 2	
Signal Name	Pin	Pair Number: Wire Number	Pin	Signal Name
	4		4	TXD+
	5		5	TXD-
	6		6	
CAN_H	7	Pair 1: Wire 2	7	CAN_H
	8		8	
	9		9	
Shield	shell	Shield + Drain Wire	shell	Shield

When two OEM receivers connected directly through CAN cable, their CAN ports should be terminated by 120 Ohm resistors on both ends. This may be achieved by jumpers at J126 for CAN A and J127 for CAN B ports on Evaluation Kit board.

Additionally, CAN ports messages identifiers should be configured in both OEM receivers, so each receiver will accept messages transmitted only by its partner.

Example: Two receivers connected together through their CAN A ports.

Receiver 1 settings:

```
%%set,dev/can/a/sid/in/first,0x710
%%set,dev/can/a/sid/out/first,0x700
```

Receiver 2 settings:

```
%%set,dev/can/a/sid/in/first,0x700
%%set,dev/can/a/sid/out/first,0x710
```

Appendix

Safety Warnings

- Read these instructions.
- Keep these instructions.
- Heed all warnings.
- Follow all instructions.
- Clean only with a damp cloth.
- Install in accordance with the manufacturer's instructions.
- Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
- Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.
- Only use attachments/accessories specified by the manufacturer.
- Unplug this apparatus during lightning storms or when unused for long periods of time.
- Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, or has been dropped.
- Apparatus shall not be exposed to dripping or splashing and no objects filled with liquids, shall be placed on the apparatus.

General Warnings

This product should never be used:

- Without the user thoroughly understanding operator's manual.
- After disabling safety systems or altering the product.
- With unauthorized accessories.
- Contrary to applicable laws, rules, and regulations.

Warning: THE EVALUATOION KIT SHOULD NEVER BE USED IN DANGEROUS ENVIRONMENTS.

Power Supply

Connect the supplied adapter to the side of the unit in the slot marked "PWR". Plug the two-prong end of the power cord to an AC100-240V outlet. If you have difficulty inserting the plug, turn it over and reinsert it. If the unit will not the used for a long time, disconnect the plug from the outlet.

Note: Before plugging the power cord into an AC outlet, make sure that all the connections have been made.

CAUTION: To reduce the risk of electric shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so.

CAUTION: To avoid the introduction of hazards when operating and installing, before connecting of the equipment to the supply, make sure that the supply meets local and national safety ordi- nances and matches the equipment's voltage and current requirements.

CAUTION: Never attempt any maintenance or cleaning of the supply while plugged in. Always remove supply from AC power before attempting service or cleaning.

CAUTION: If the voltage supplied is below the minimum specification, the TRE/TR Evaluation Kit will suspend operation. If the voltage supplied is above the maximum specification, the TRE/TR Evaluation Kit may be permanently damaged, voiding your warranty.

Make sure cords are located so that will not be stepped on, tripped over, or otherwise subjected to damage or stress. Do not operate equipment with a damaged cord or plug – replace immediately. To reduce the risk of damage to the equipment, pull by the plug body rather than the output cord when disconnecting the equipment. Do not operate the supply if it has received a sharp blow, been dropped, or otherwise damaged. Do not disassemble the supply.

CAUTION: Before connecting the external power source and the TRE/TR Evaluation Kit, make sure that the power source matches the TRE/TR Evaluation Kit's voltage and current requirements.

Usage Warnings

If this product has been dropped, altered, transported or shipped without proper packaging, or otherwise treated without care, erroneous measurements may occur. Inform JAVAD GNSS immediately if this product does not function properly. Only allow authorized JAVAD GNSS warranty service centers to service or repair this product.

Note: Do not connect or disconnect equipment with wet hands, you are at risk of electric shock if you do!

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