CARRARO TRAX
TLB2 Electronic Module
Specification

29/11/2006, Rev. 5

Description (I)

Application

TRAX electronic module is designed to drive and control CARRARO TLB2 transmission in mobile applications

Main TRAX ECU features:

- Remote mounting

- High I/O capability for advanced applications

- Advanced ARM7-TDMI microcontroller

- Coils currents digital closed loop control

- Active shuttle clutches management during up and down shifting

- Real time system diagnosis available via RS232 / CAN BUS

- High insulation degree

- Broad range of supply voltages without degradation in performance

- Reverse polarity protected power supply

- Short circuit proof coil outputs

Description (II)

TRAX hardware features:

- 4 analog inputs (also configurable as digital inputs)

- 1 analog input specific for temperature sensor

- 2 frequency inputs for hall-effect or inductive speed sensors

- 1 encoder input for double hall effect speed sensors

- 4 PWM outputs (2A, also configurable as digital output)

- 6 source digital outputs (2A)

- 2 sink digital outputs (2A)

- 12 digital inputs (configurable pull-up or pull-down)

- Serial Interface standard RS232 for diagnostics and service

- CAN interface standard SAE J1939 / ISO 11783 / ISO 11898.

Dimensions:	c. 150 x 100 mm.
Enclosure:	c. 190 x 120 mm, IP67.
Power Supply:	12V DC rated

Description (V)

TRAX connector

TLB2 + TRAX Features overview

BASIC PACKAGE

- ✓ Forward – Reverse Management
- ✓ Manual gear selection
- ✓ Declutch Feature
- ✓ TRAX Status Signal available for Vehicle Dashboard
- ✓ RS232 Communication for service and diagnostics

OPTIONAL FEATURES

- Automatic gear-shifting
- Kick-down
- Signal exchange between TRAX and vehicle dashboard
- Signal exchange between TRAX and 4WS steering ECU
- 4WD Management
- HDL Management
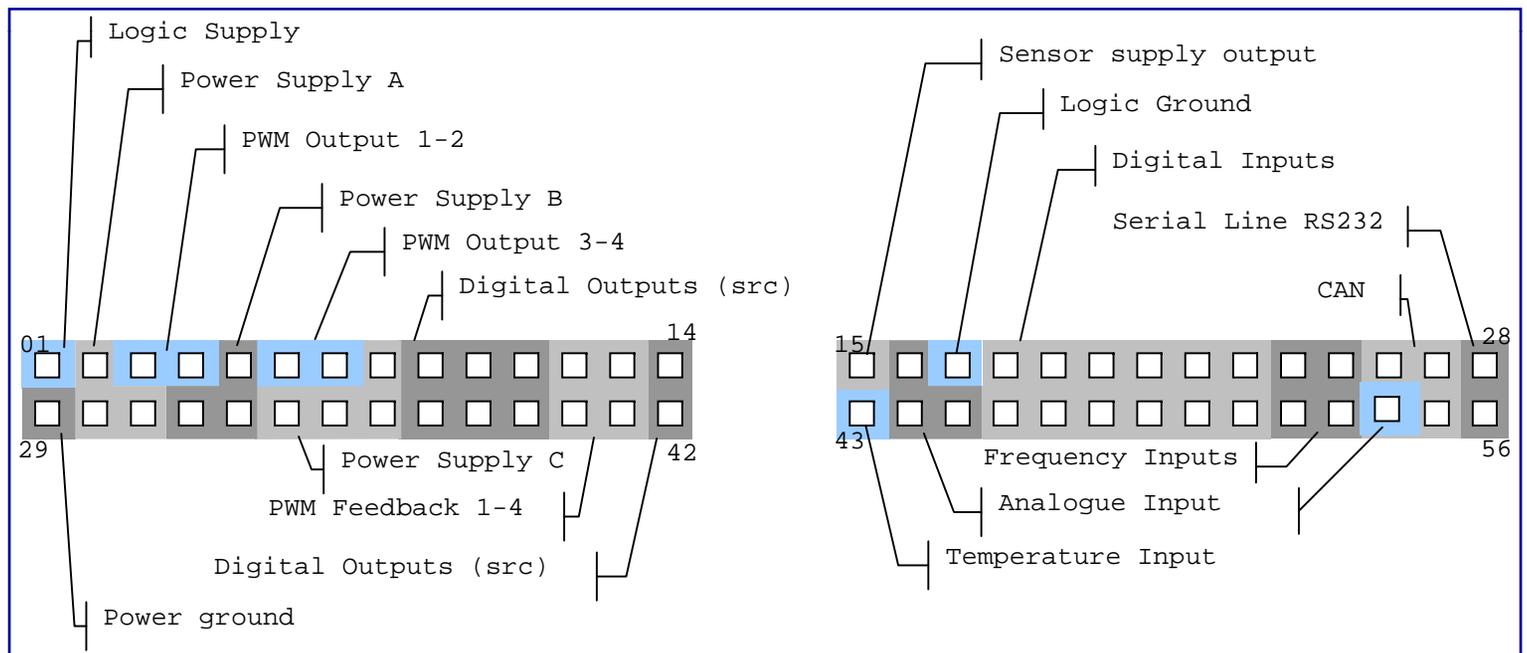- CAN bus communication

TLB2 + TRAX Pin-Out (I)

TRAX PIN	TRAX PIN Description	Configuration	Connection
1	Logic Supply +12V	+12v battery	Direct to battery
17,29	Logic ground	Battery GND	Direct to battery
2,30,5,32,8,35,36,34	Power Supply +12V	+12v battery under key	Battery under key
18	Digital input 01	Pull-down	Forward input command
46	Digital input 02		Reverse input command
19	Digital input 03		GearCmd01 input command
47	Digital input 04		GearCmd02 input command
20	Digital input 05	Pull-up	Crab signal (optional)
48	Digital input 06		Circle signal (optional)
21	Digital input 07		Declutch input command
49	Digital input 08		Kickdown input command (optional)
22	Digital input 09	Pull-down	4WD Switch (optional)
50	Digital input 10		STOP Switch (optional)
43	Temperature input	NTC	Temperature sensor
44	Analog Input 01	Pull-up	Main Ring Pressure Switch
25	Frequency Input 01	Inductive	Transmission output speed sensor
53	Frequency Input 02	Inductive	Engine alternator "W" signal
28	Rs232 TX		Serial/CAN interface
56	Rs232 RX		Serial/CAN interface
27	CAN: CAN_H		Serial/CAN interface
55	CAN: CAN_L		Serial/CAN interface
26	CAN: SHIELD		Serial/CAN interface
3	PWM 01 Output	PWM	Forward valve command
12	PWM 01 Current	Current input	Forward valve current feedback
7	PWM 04 Output	PWM	Reverse valve command
41	PWM 04 Current	Current input	Reverse valve current feedback
9	Digital output 01	Source digital out	Valve s1 (1st Gear)
37	Digital output 02	Source digital out	Valve s2 (2nd Gear)
10	Digital output 03	Source digital out	Valve s3 (3rd Gear)
38	Digital output 04	Source digital out	Valve s4 (4th Gear)
11	Digital output 05	Source digital out	HDL Valve (optional)
39	Digital output 06	Source digital out	4WD Valve (optional)
42	Digital output 07	Switch to ground digital out	dashboard "Automatic" Lamp (optional)
14	Digital output 08	Switch to ground digital out	Buzzer / danger lamp
4	PWM02 Output	as digital output, source	4WD Lamp

TRAX Pin-Out (II)

TRAX PINOUT OVERVIEW

Logic Supply
Power Supply A
PWM Output 1-2
Power Supply B
PWM Output 3-4
Digital Outputs (src)

Sensor supply output
Logic Ground
Digital Inputs
Serial Line RS232
CAN

01   14
29   42
15   28
43   56

Power Supply C
PWM Feedback 1-4
Digital Outputs (src)
Power ground

Frequency Inputs
Analogue Input
Temperature Input

TRAX Technical data (III)

Electrical Tests

	Test Principle	Severity level
Operating Voltage	ASAE EP455 § 5.10.1 Level 2	Test for impaired function while Usupply = 10.5 – 16 Vdc
Over Voltage	ASAE EP455 § 5.10.2 Level 2	Test for impaired function after 5 min at Usupply = 26 Vdc
Batteryless Operation	ASAE EP455 § 5.11.3 Level 2	Test for impaired function after Usupply = 6 + 12.6(sin (2πft)) Source impedance = 1.5 Ω F = 500 Hz – 1.5 kHz over 5 min
Reverse Polarity	ASAE EP455 § 5.10.3	Test for impaired function after 5 min at Usupply = -26 Vdc
Short Circuit to Ground Protection	ASAE EP455 § 5.10.4	Test for impaired function after shorting for 5 min all external leads to ground at Usupply = 16Vdc

Installation notes (I)

Installation block diagram
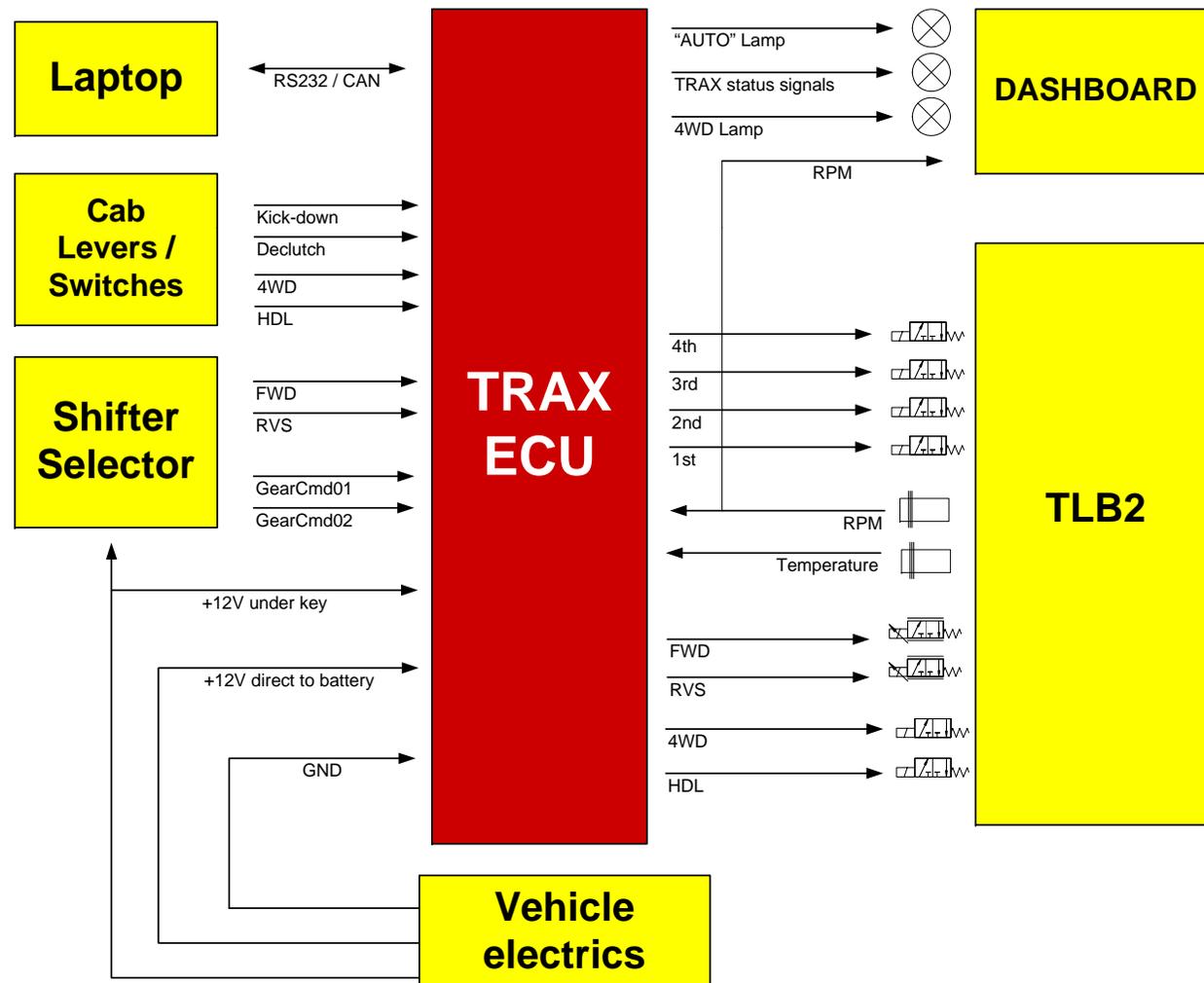
Installation notes (II)

Valeo selector drawing

For reference only
Customer is open to choose another selector if electrically compatible. Please contact Carraro for further information.
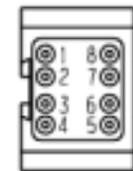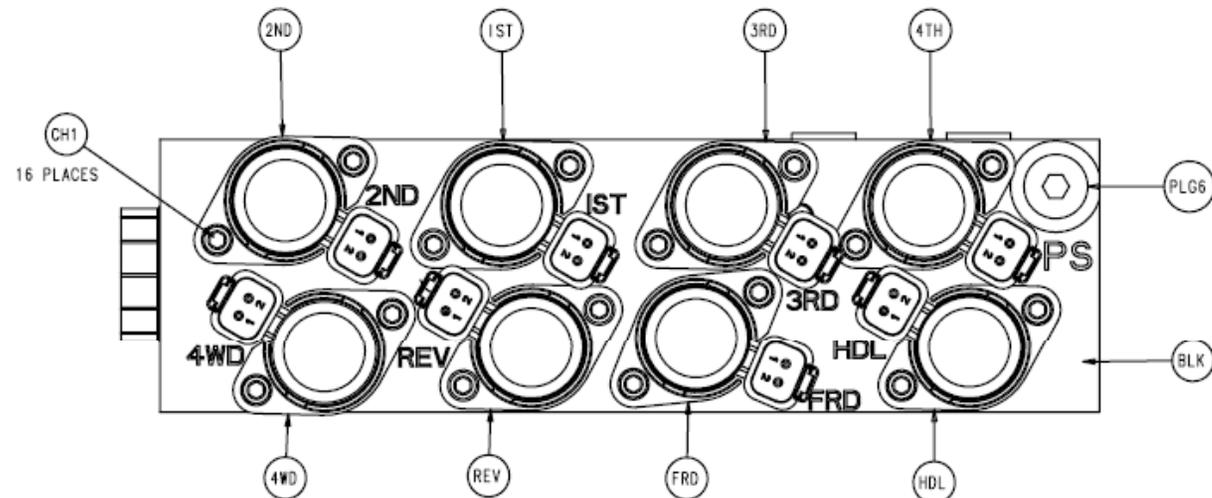
Installation notes (III)

Valeo selector connector
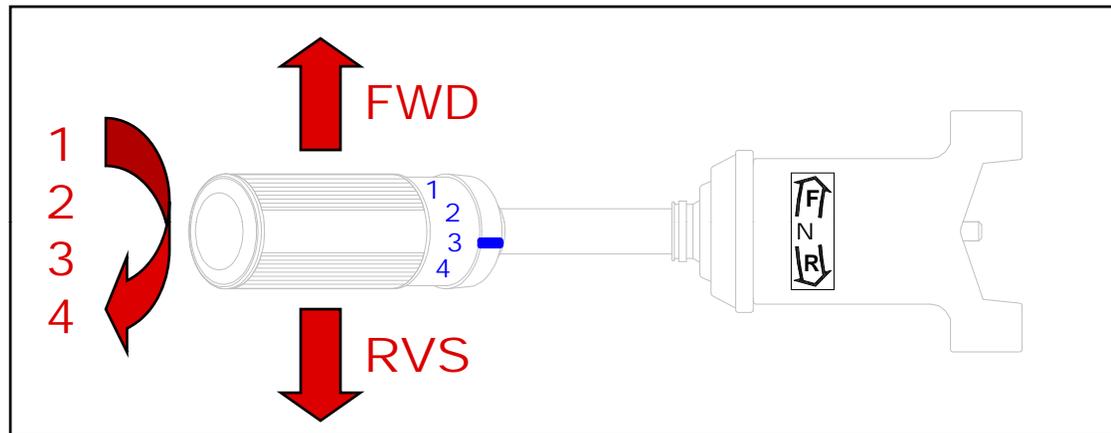
- CONNECTOR V1 -

Receptacle: DEUTSCH DT 04-8PA-CE02

Mates with:
Plug: DEUTSCH DT 06-8S

For reference only
Customer is open to choose another selector if electrically compatible. Please contact Carraro for further information.

Installation notes (IV)

TLB2 transmission hydraulic connectors with HDL valve

- **CONNECTORS: 1st, 2nd, 3rd, 4th, FWD, RVS, 4WD,HDL**
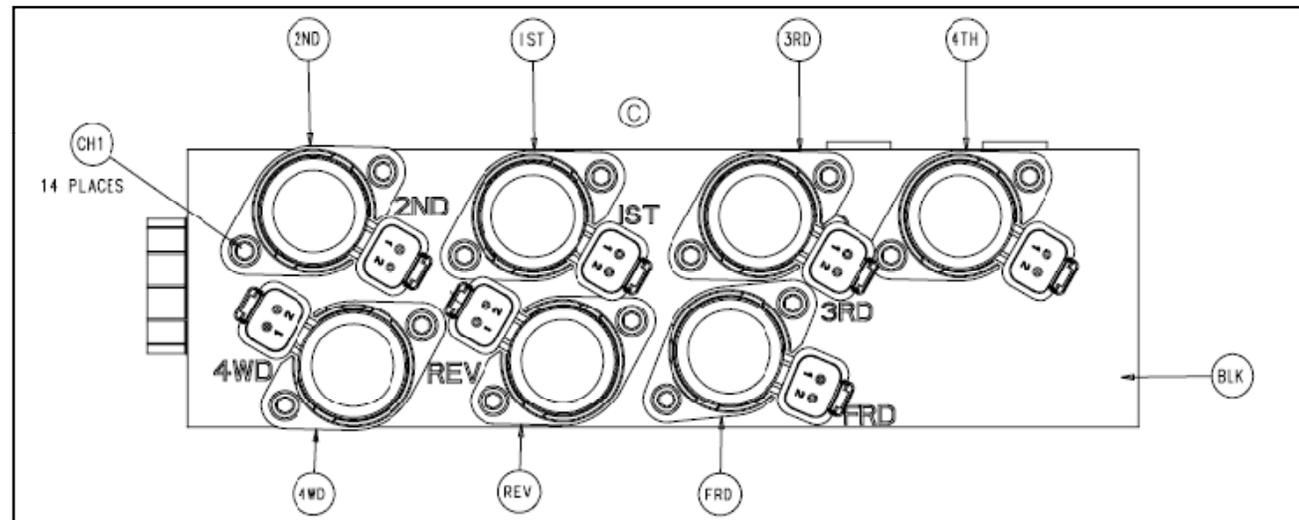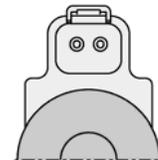Receptacle: DEUTSCH DT 04-2P
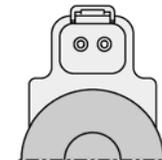
Mates with:
Plug: DEUTSCH DT 06-2S

Installation notes (V)

TLB2 transmission hydraulic connectors without HDL valve

- **CONNECTORS: 1st, 2nd, 3rd, 4th, FWD, RVS, 4WD**
Receptacle: DEUTSCH DT 04-2P

Mates with:
Plug: DEUTSCH DT 06-2S

Installation notes (IX)

TRAX Serial/CAN interface

- TRAX ECU can communicate with other peripherals via RS232 serial line / CAN
- Suggested serial/can connectors:
  - Deutsch DTM06-06S-E007 (TRAX ECU side)
  - Deutsch DTM04-06P-E003 (CAN BUS / SERIAL interface)
- Serial line PC connection (optional diagnostic interface):
  - DB9 SUB-D (male housing, female pins) connectors (see next page wiring spreadsheet)
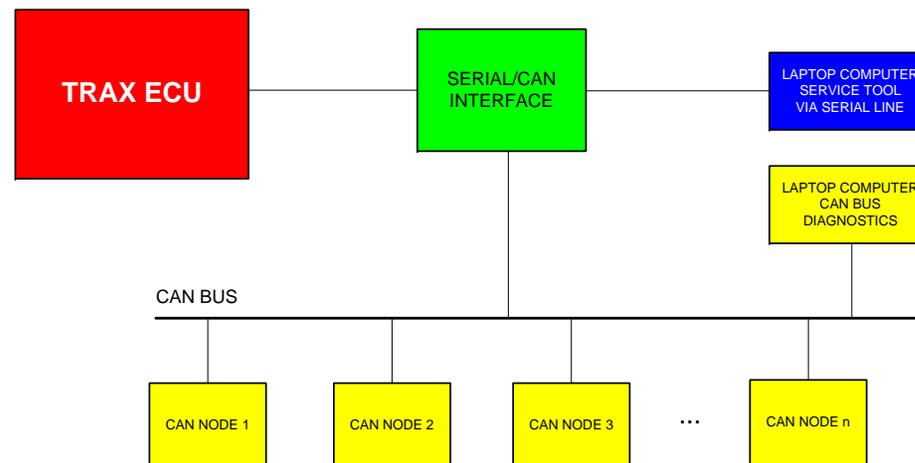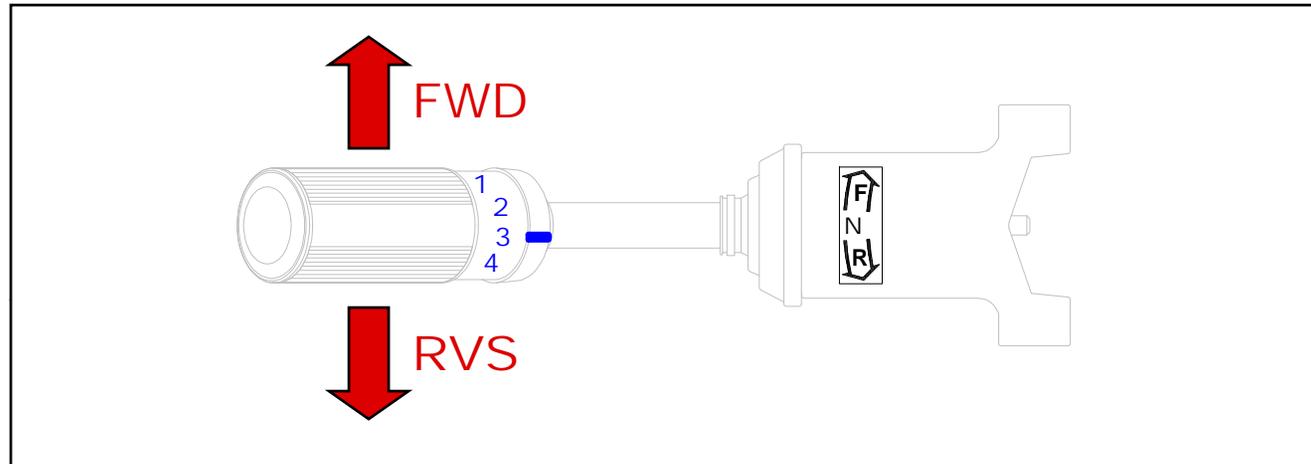
Installation notes (X)

Installation wiring spreadsheet
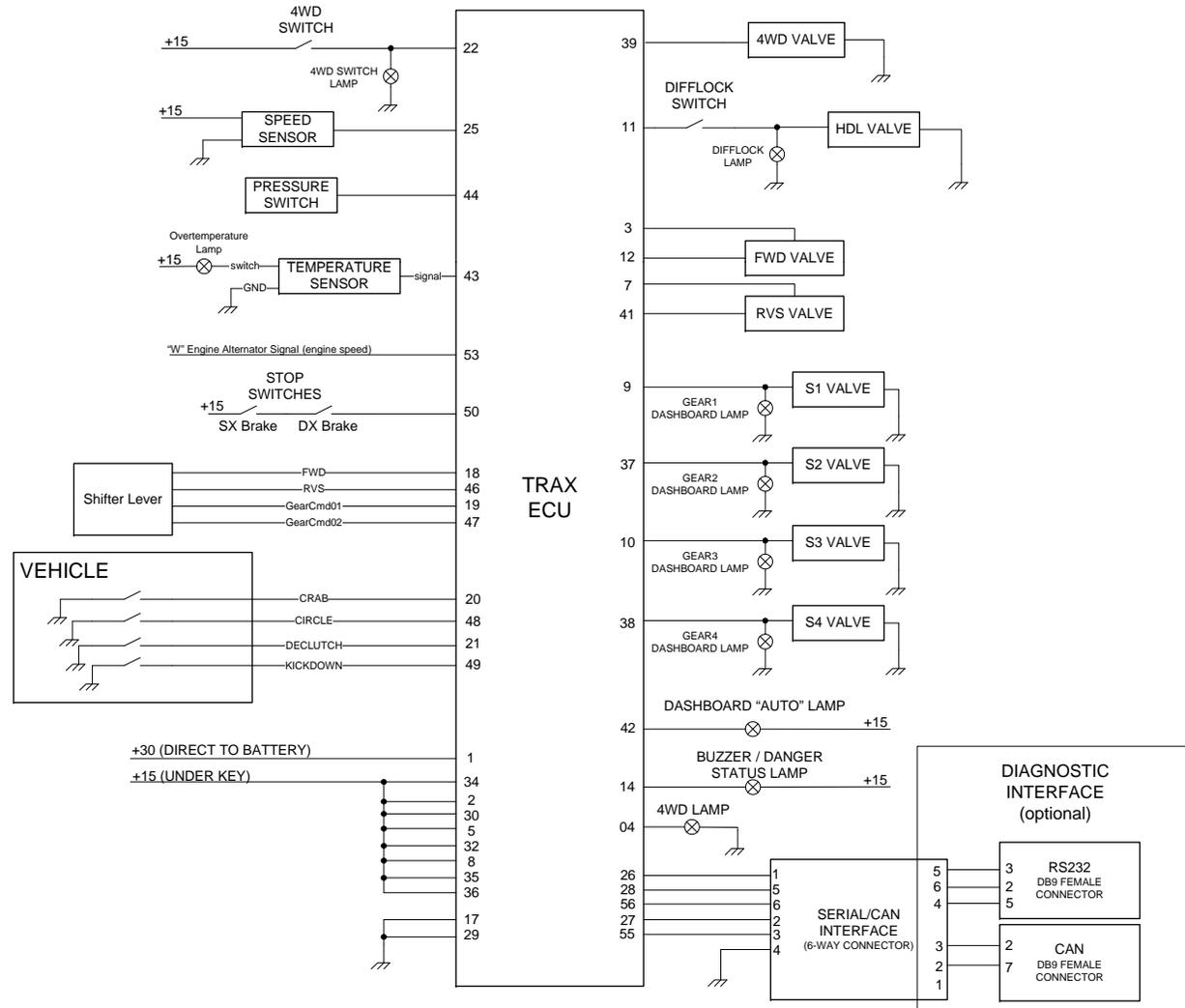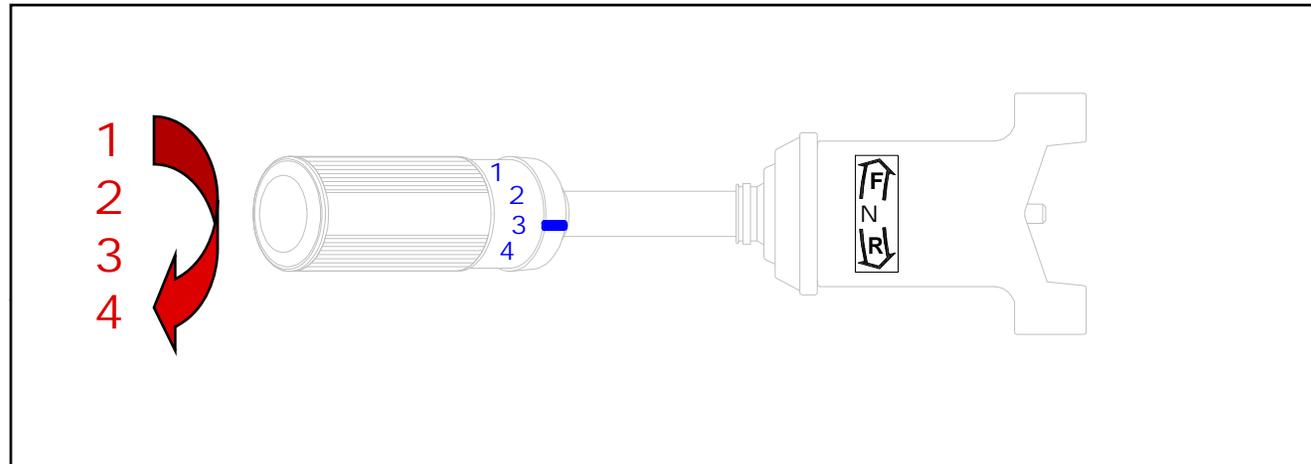
Basic package (I)

Forward – Reverse Management

- Neutral position selected: Vehicle stopping or rolling free
- Forward position selected: Vehicle moving in forward direction
- Reverse position selected: Vehicle moving in reverse direction
- All 4 gears allowed in Forward and Reverse

Basic package (II)

Manual gear selection

Shifter selector positions: 1-2-3-4

- Position 1: 1st gear engaged

- Position 2: 2nd gear engaged

- Position 3: 3rd gear engaged

- Position 4: 4th gear engaged

Selected gear not engaged until vehicle speed is not compatible

Basic package (III)

Declutch feature

Instantaneous interruption in power transmission, irrespective of shifter position (FWD, RVS), piloted by the driver through a monostable switch.

TRAX status signal available for Vehicle Dashboard

TRAX is capable to provide a single electric signal to allow a visualization of its current operating status. Typical application: failure blinking codes, indication of incongruence between selected and engaged gear , etc.

RS232/CAN Communication

Via RS232 serial port or CAN port, TRAX allows typical functions related to the communication as real time visualization of system variables, system parameterisation, advanced diagnostic, history error log.

Optional features (I)

Automatic gear shifting

- **Shifter selector positions:**
- Position 1: 1st gear engaged
- Position 2: 2nd gear engaged
- Position 3: 3rd gear engaged
- Position 4: 2nd to 4th automatic gear shifting depending on vehicle speed
- 2nd gear engaged in automatic mode when starting (if speed is compatible)
- AUTO to Manual mode switching always available

Important:

While above described principle is actually considered the state-of-the-art for automatic gear shifting, Carraro is available to develop different feasible logic in case of customer special requests

Optional features (II)

Kick-down

Principle of functioning

- Sequential Up & Down shifting (i.e 2nd to 1st, then 1st to 2nd, ...)
- Kick Down can be armed only when 2nd gear is engaged
- Kick Down function is always available, irrespective of shifter position (F, N, R)
- Kick Down is cancelled shifting the gear selector (1st, 2nd, 3rd, Auto)
- Kick Down is maintained moving the shifter position (F to N, F to R, ...)

During manual gear selection

- After Kick Down selection, 1st gear is maintained irrespective of vehicle speed

During automatic gear shifting

- Kick Down is cancelled exceeding a programmable speed threshold

Important:

While above described principle is actually considered the state-of-the-art for kick-down, Carraro is available to develop different feasible logic in case of customer special requests

Optional features (IV)

4WD management

4WD feature works in negative way, that is if the 4WD operator switch is OFF (4WD disabled), then 4WD valve is ON. 4WD operator switch can activate 4WD feature in all operating conditions (1st, 2nd, 3rd or 4th gear), while it is automatically activated if the transmission is in 3rd or 4th gear and the operator brakes.

HDL management

if 1st or 2nd gear is engaged, then HDL switch is enabled to pilot HDL valve, which is responsible to activate the differential lock feature

Important:

Carraro is available to assist the customer during vehicle wiring design in order to electrically implement the above mentioned features