

■ **Integrated Vehicle Tire Pressure
Monitoring**



IVTM Installation Manual

■ 2nd edition

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An American Standard Company

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815 220 114 3

Service Notes

About This Manual

This manual contains installation instructions for WABCO's Integrated Vehicle Tire Pressure Monitoring System for trucks, tractors, trailers and buses.

Before You Begin

1. Read and understand all instructions and procedures before you begin to service components.
2. Read and observe all Warning and Caution hazard alert messages in this publication. They provide information that can help prevent serious personal injury, damage to components, or both.
3. Follow your company's maintenance and service, installation, and diagnostics guidelines.

Hazard Alert Messages and Symbols

WARNING A Warning alerts you to an instruction or procedure that you must follow exactly to avoid serious personal injury and damage to components.



CAUTION A Caution alerts you to an instruction or procedure that you must follow exactly to avoid damage to components.



How to Obtain Additional Information

On the Web

Visit www.wabco-auto.com and open INFORM. Search for IVTM in the Index.

Note:

Wheel modules and ECU's are not serviceable. Tampering with factory fasteners or seals voids the warranty.

FCC Notice:

This device consists of wheel module 960 730 XXX X (SA4-WM730) and Electronic Control Unit 446 220 XXX X (SA4-ECU220). This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. Changes or modifications not expressly approved by the party responsible for the compliance could void the user's authority to operate the equipment.

RF (Radio Frequency) products such as the IVTM system utilize RF technology to transmit a signal between the wheel module sensor and the ECU (electronic control unit). All RF signals are subjected to interference from many types of signals and products, which can cause reception issues that, effect the operation of the IVTM system. As with cell phones and other types of electronics using RF signals, signal interruption can occur and cause a lost signal transmission. The IVTM system has been tested and designed to work optimally to overcome the interference that can block signals, as with any RF products, signal guarantee can not be made.

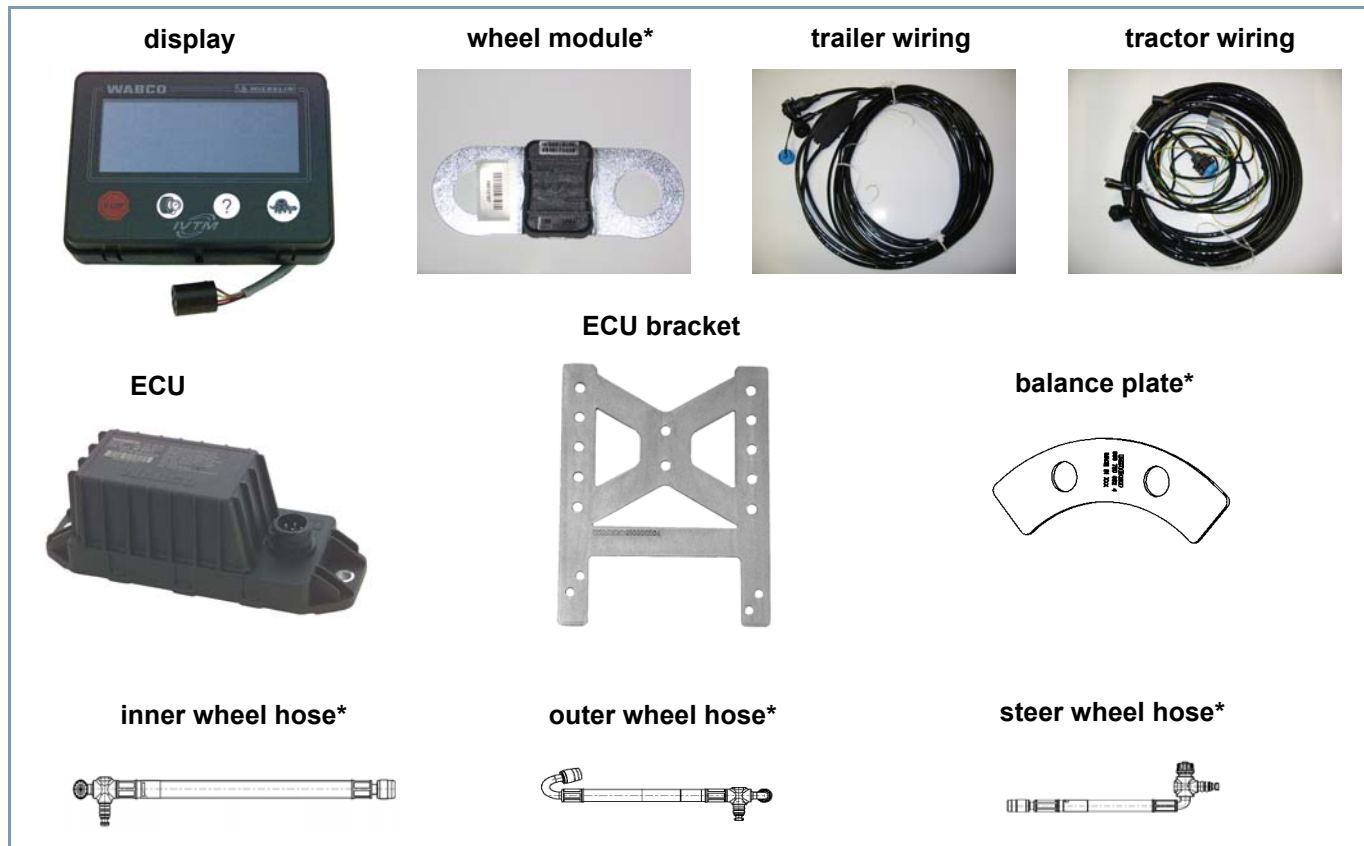
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IVTM System Overview

The IVTM system uses RF (radio frequency 433 MHz) to broadcast individual tire pressure to the ECU (electronic control unit). The ECU evaluates the pressure via an algorithm then forwards in-

formation via a cable to the display for driver action if necessary. The data provides audible and visual notification and system status. Transmission via SAE J1939 is also available.



* illustrations vary by application

Fig. 1.1: Components

Pre-Installation checklist

- Confirm the vehicle uses a hub-piloted mounting system.
- The IVTM shipment will include a list that indicates a breakdown of parts for your installation.
- PC running Windows 95 or higher, 30 MB free hard disk space, color display 1024 x 768 min. with one free serial port for ECU programming.
- This manual is divided into three sections. This will allow multiple technicians to complete the installation if desired.
- A vehicle wiring diagram or knowledge of the vehicle electrical system will be helpful to complete the installation.
- On dual wheels the valve stems must be directly opposing each other for proper installation of the wheel modules.

IVTM Installation Overview

WARNING Make sure the vehicle is secured and the wheels are blocked.



CAUTION To prevent serious eye injury, always wear eye protection when you perform vehicle maintenance or service.



Wear required safety shoes during installation, follow all safety rules and regulations that apply for your shop and location.

Before moving the vehicle into the shop, observe all safety precautions. Park the vehicle on a level non-slip surface. Block the wheels to prevent the vehicle from moving in any direction.

Do not weld, drill, cut or modify the vehicle chassis if prohibited by the vehicle manufacturer.

Consult and follow all wheel manufacturers specifications, including but not limited to the torque tightening of the wheel lug nuts.

Installation procedures

The system can be broken down into three groups (see below). If desired the installation can be completed by three technicians. Prior to beginning the installation or modification to the vehicle, determine the locations for the ECU, display and wiring path.

It is best to start with the wheel modules. Maintaining a list of the wheel module numbers and location on the vehicle is required for proper ECU programming (see form in appendix).

Section 3: Wheels - Installation of hoses and wheel modules (technician "A")

Section 4: Undercarriage - Installation of the ECU and wiring of the ECU (technician "B")

Section 5: Vehicle cab - Wiring the display, power supply (technician "C")

Section 6: ECU programming (technician "C")

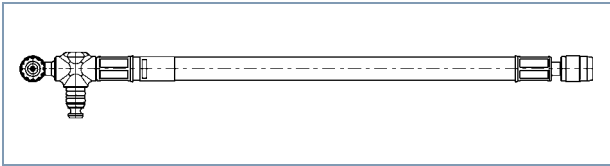
Wheels - Installation of hoses and wheel modules

CAUTION



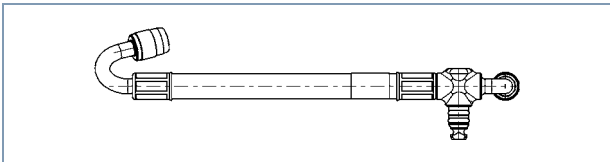
Center the wheel module between both wheel studs. When re-installing and torque tightening the wheel lugs, **use Caution** not to damage the housing of the wheel module.

1. For tandem / dual wheels, connect the longer of the hoses (#960 901 054 2) to the wheel module and then to the valve stem. Push the hose into wheel module until fully seated and turn to lock. Mount the wheel module to the wheel with lug nuts and hand tighten the hose to the inner tire without twisting or binding the hose. A good seal is required at each valve stem. Check each connection by spraying soapy water on each connection to check for leakage.



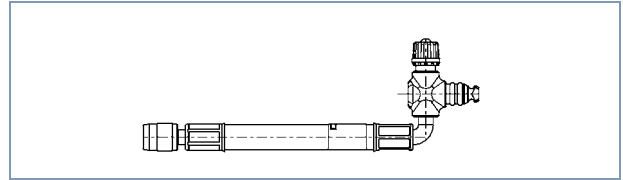
Hose #960 901 054 2

2. Repeat process for the outer wheel, install the shorter hose (#960 901 053 2) to the wheel module and then to the valve stem. On dual wheels locate wheel modules directly across from each other for balancing purposes.



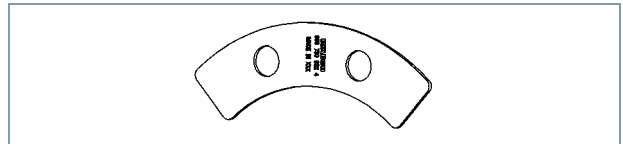
Hose #960 901 053 2

3. Repeat for front steer wheels, install the shortest hose with a straight end (#960 901 052 2) to the wheel module and then to the valve stem.



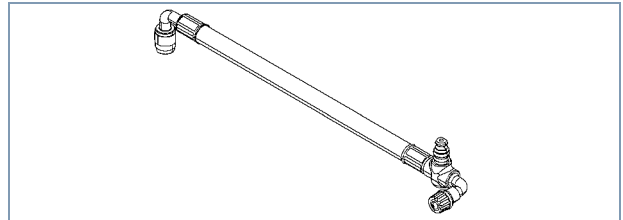
Hose #960 901 052 2

4. On steer wheels, it will be necessary to install a balancing plate (#960 730 832 4) directly opposite of the wheel module for balancing purposes.



Balance Plate #960 730 832 4

5. Where a wide base tire is fitted, a balance plate may be required opposite the wheel module. An optional wide base hose is available part # 960 730 052 4.



Hose #960 730 052 4

6. Record each wheel module I.D. number for each location. This will be used later for ECU programming (**see form in appendix**).
7. The wheel modules should be located directly opposing each other, except on steer wheels where a balancing plate must be installed.

8. Remove the wheel lug nuts where the modules are to be located and install the wheel modules on the rim. Re-torque the lug nuts to factory specifications.
9. Inflate tires to proper air pressure per manufacturer or fleet recommendations.



Torque wheels per manufacturer specifications. Recheck torque after 500 miles.

Figures 3.1

10. Verify the following:

- Modules are directly opposing each other for dual wheels. For steer wheels a balance plate must be installed directly opposite the module.
- Confirm all hoses are hand tight and test for air leakage by spraying a soapy water mixture to detect any leaks.
- All wheel nuts must be torque tightened per manufacturers recommendations.

Installation of the ECU and wiring of the ECU

Trailer Installation

1. The trailer ECU (# 446 220 013 0) should be located within 1/3 to 1/2 to the front of the trailer and must be clear of metal brackets and objects. The ECU should be parallel to main frame, in line with drive direction. This is necessary to provide RF transmission to the tractor ECU. Install as indicated in figure 4.2, 4.3 and 4.4.
2. Determine where to install the ECU and bracket on the trailer. Modifications to the trailer may be necessary to install the provided bracket. The ECU must be installed with the housing connection (mounted) facing as indicated in figure 4.4.
3. A bracket may need to be fabricated to support the supplied bracket. This can be achieved with a "C" channel section as illustrated in figure 4.7.

WARNING Vehicle's safety can be affected. Comply with all safety and vehicle manufacturer guidelines as to modification of the frame rail or its components.



4. The ECU must be mounted with bracket (# 960 901 050 4). The housing of the ECU must have clearance on the front and back sur-

faces for proper reception of the signal from the wheel modules as indicated in figure 4.4.

5. After installation of the ECU to the trailer frame, it will be necessary to wire the ECU into the trailers wiring circuit. The provided wiring may be routed along the same path as the current trailer wiring. The trailer ECU wiring (# 449 674 306 0) must be secured to the trailer ECU connection. This is a simple twist on design. Make sure the connection is tight, the connector will click when it has fully locked into place.
6. The opposing end of the trailer wiring must be wired into the following circuits:
 - a. White wire to Brake light
 - b. Brown wire to Ground
 - c. Red wire to 12 volt trailer feed (add in line 5 amp fuse - not provided)
 - d. Locate the diagnostic (blue) connector so it can be easily accessed on the trailer for future programming and diagnostic functions (see fig. 4.2)
7. All wiring including any excess should be plastic wire tied to the vehicle frame in a secure position. If the wiring is excessively long it should be wire tied to the frame, **not cut**. **Do not wrap wire in circular pattern when securing to the frame!**

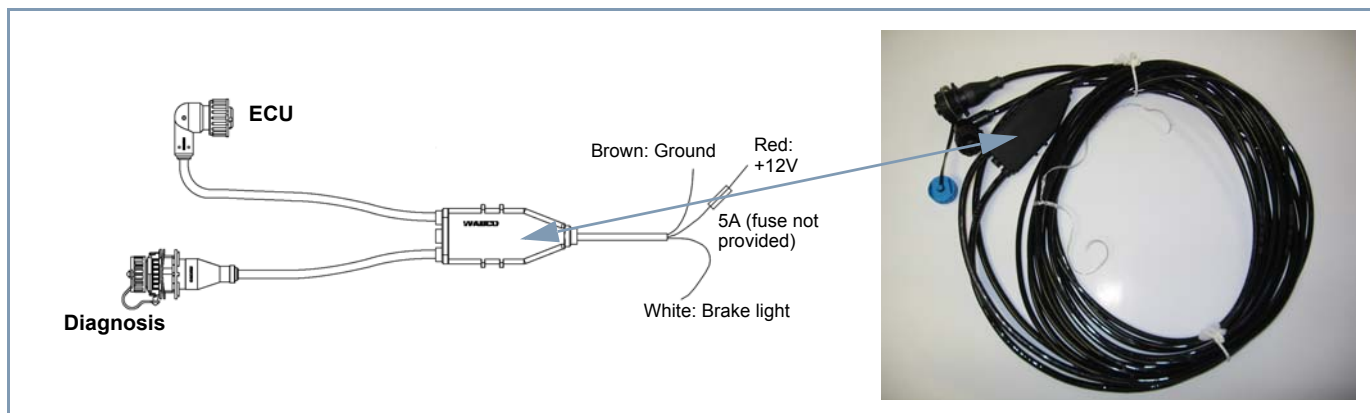
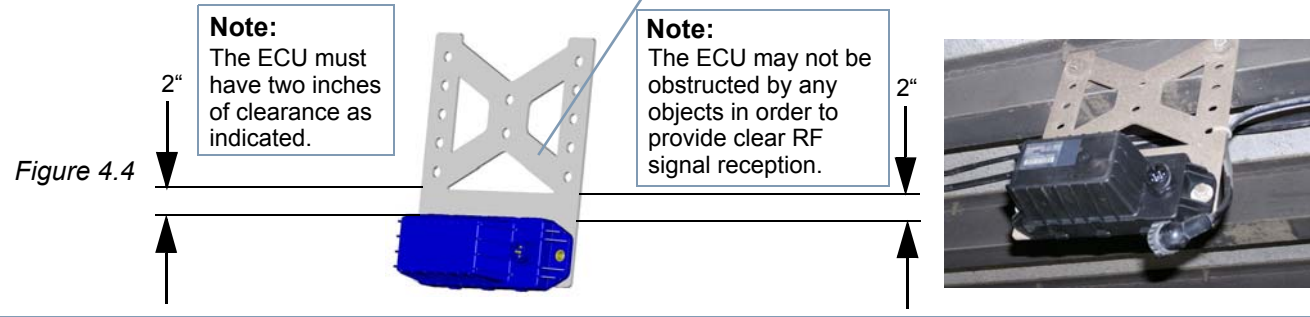
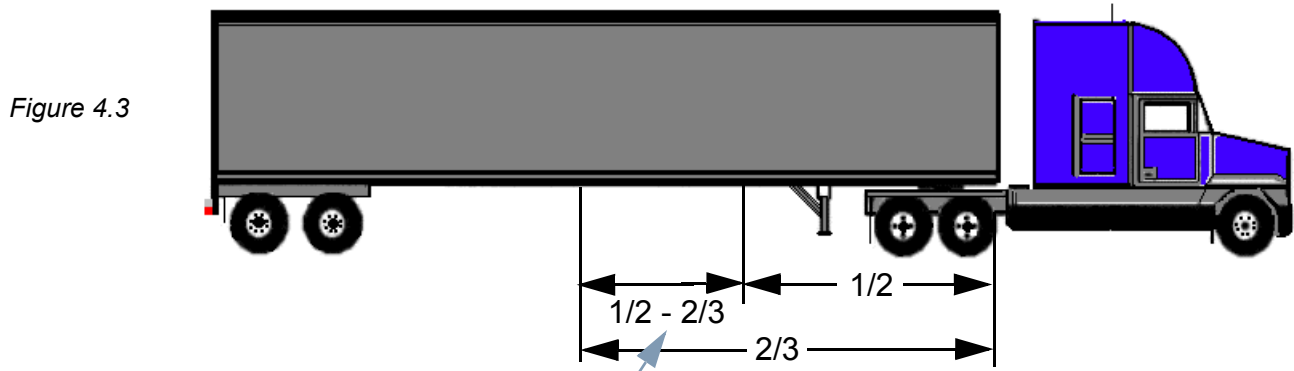
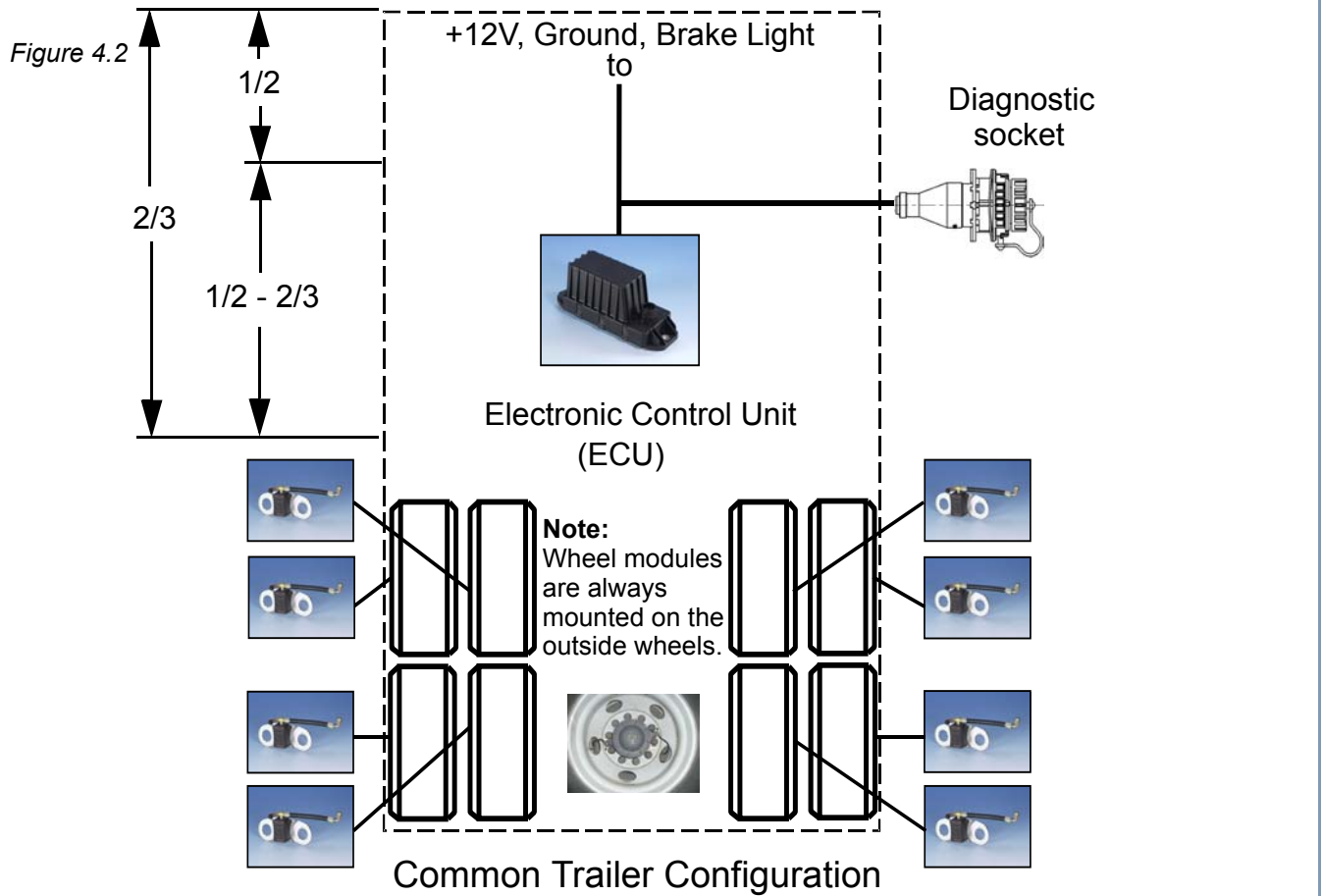


Figure 4.1



Installation of the ECU's and wiring of the ECU's (Cont)

Tractor Wiring and ECU Installation

1. The tractor ECU (# 446 220 012 0, fig. 4.6) should be located clear of the frame rail (see fig. 4.4 for proper clearance) towards the rear of the tractor. This will help insure RF reception from the trailer ECU and tractor wheel modules.
2. Determine where to install the ECU and bracket on the tractor. Modifications to the tractor may be necessary to install the provided bracket. The ECU must be installed with the housing connection mounted facing the side as indicated in figure 4.7.
3. A bracket may need to be fabricated to support the supplied bracket. This can be achieved with a "C" channel section as illustrated in figure 4.7. Comply with all safety and vehicle manufacture guidelines as to modification of the frame rail or its components.
4. The ECU must be mounted with the provided bracket (# 960 901 050 4). The housing of the ECU must have clearance on the front and back surfaces to ensure the proper reception of signals from the wheel modules and the trailer ECU as indicated in figure 4.7. The bolts must be torque tighten to 11.5 foot pounds (138 inch pounds) to provide proper clamp load.
5. After installation of the ECU to the tractor frame, it will be necessary to wire the ECU into the tractors wiring circuit. The tractor ECU wiring harness (# 894 607 390 0, fig. 4.5) must be secured to the tractor ECU connection. This is a simple twist on design. **Do not** wire tie the wiring bundle to the tractor until the connection to the inside of the cab is made. Make sure the connection is tight; the connector will click when it has fully locked into place.
6. The opposing end of the tractor wire must be pulled into the cab.

Figure 4.5



894 607 390 0 (2 piece wire set)

Figure 4.6



446 220 012 0

Figure 4.7



Tractor Installation

CAUTION Tractor and Trailer ECU's look the same; verify the part number and description on the ECU.



Wiring, display placement and power supply

- Determine where to install the display unit. The display (fig. 5.3) can be installed out of view of the driver if desired. The display housing is mounted with screws and the display is snapped into the housing. Modifications may be necessary to install this unit. Comply with all safety and vehicle manufacture guidelines see figures 5.5 and 5.6.
- The wire feed (longer of the two piece tractor set) from the undercarriage must be connected to the second shorter wiring harness provided. After connecting the two wiring harness together you must connect the remaining snap connector into the display connector. The yellow wire **MUST** be connected to the tractor stop light wiring circuit for proper operation of an IVTM trailer system. For tractor only you may wire two optional warning lamps via the yellow and green wires. A tractor and trailer combination configuration allows the wiring of one optional warning lamp. During programming of the ECU the lamps may be configured. The red, blue and gray wire leads must be wired into the vehicles wiring system.
- Connect the open end of the wiring harness to the power supply, ignition feed and ground wire. The following connections are required see figure 5.1 and 5.4:
 - Red wire to 12 volt permanent power
 - Gray wire to Ignition - only on when ignition is on
 - Blue wire to ground
 - Install separate in-line 5 amp fuses (not provided) one to the red wire (12 V) and one to the gray circuit (ignition)
- Locate the diagnostic connector near the fuse panel for accessibility. This is required for programming of functions and system diagnostics. See figures 5.2 and 5.4. For future identification mark the connector "IVTM diagnostics".
- All wiring including any excess should be plastic wire tied to the vehicle frame in a secure position. If the wiring is excessively long it should be plastic wire tied to the frame, **not cut! Do not wrap wire in circular pattern when securing to the frame!**

Note:

The trailer ECU establishes a connection with the tractor ECU when the foot brake is applied. The trailer ECU radios a signal when a voltage pulse is received by depressing the foot brake. Now the tractor and trailer tire pressures can be viewed on the display.

Figure 5.1



Figure 5.2



Figure 5.3



Tractor Wiring

Figure 5.4

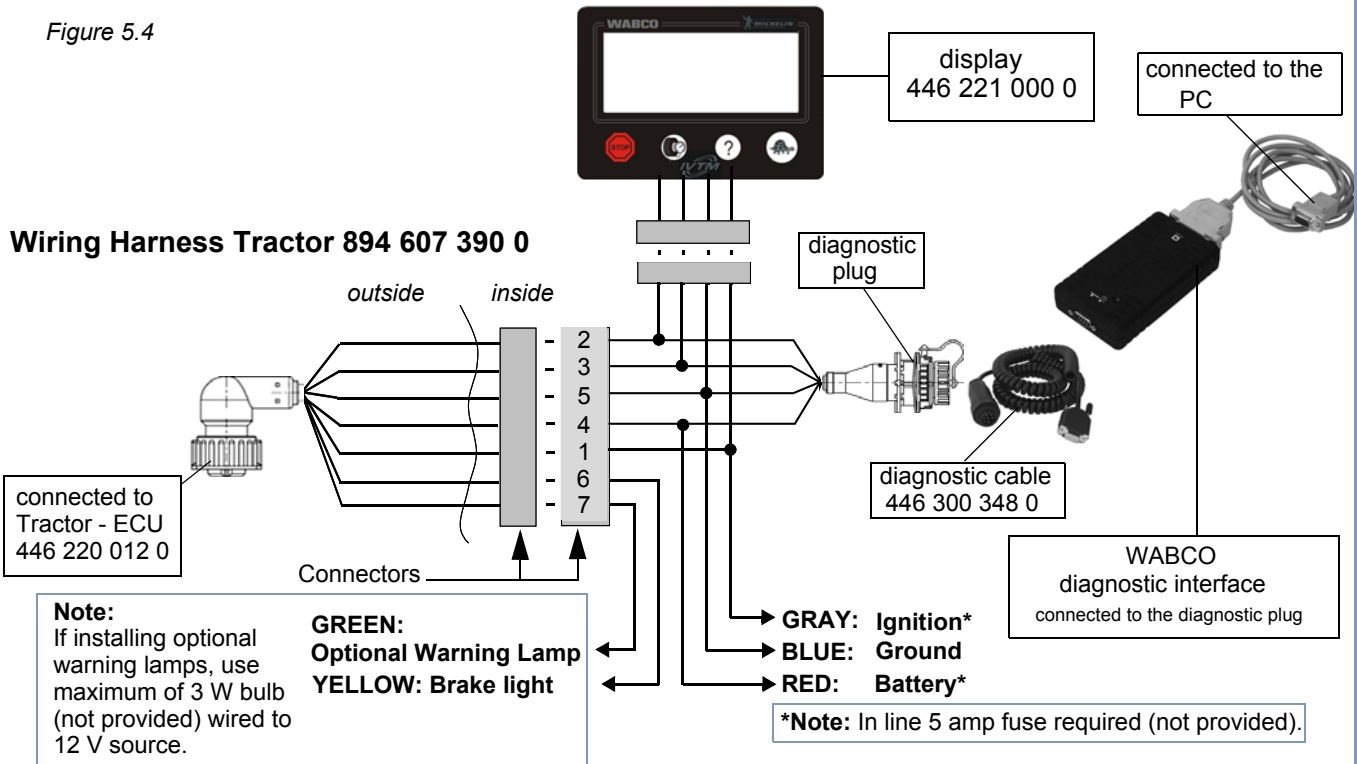
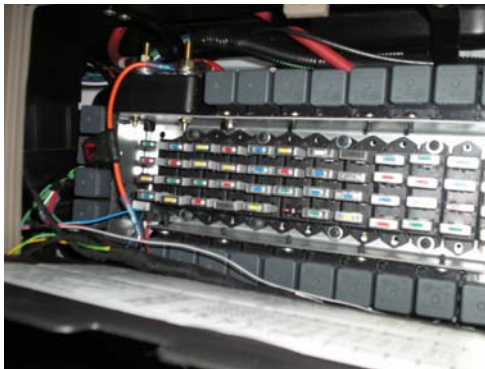


Figure 5.5




Figure 5.6



When wiring to the ignition and permanent power source, it is required that a 5 amp fuse (not provided) be installed to protect the IVTM system.

Display features



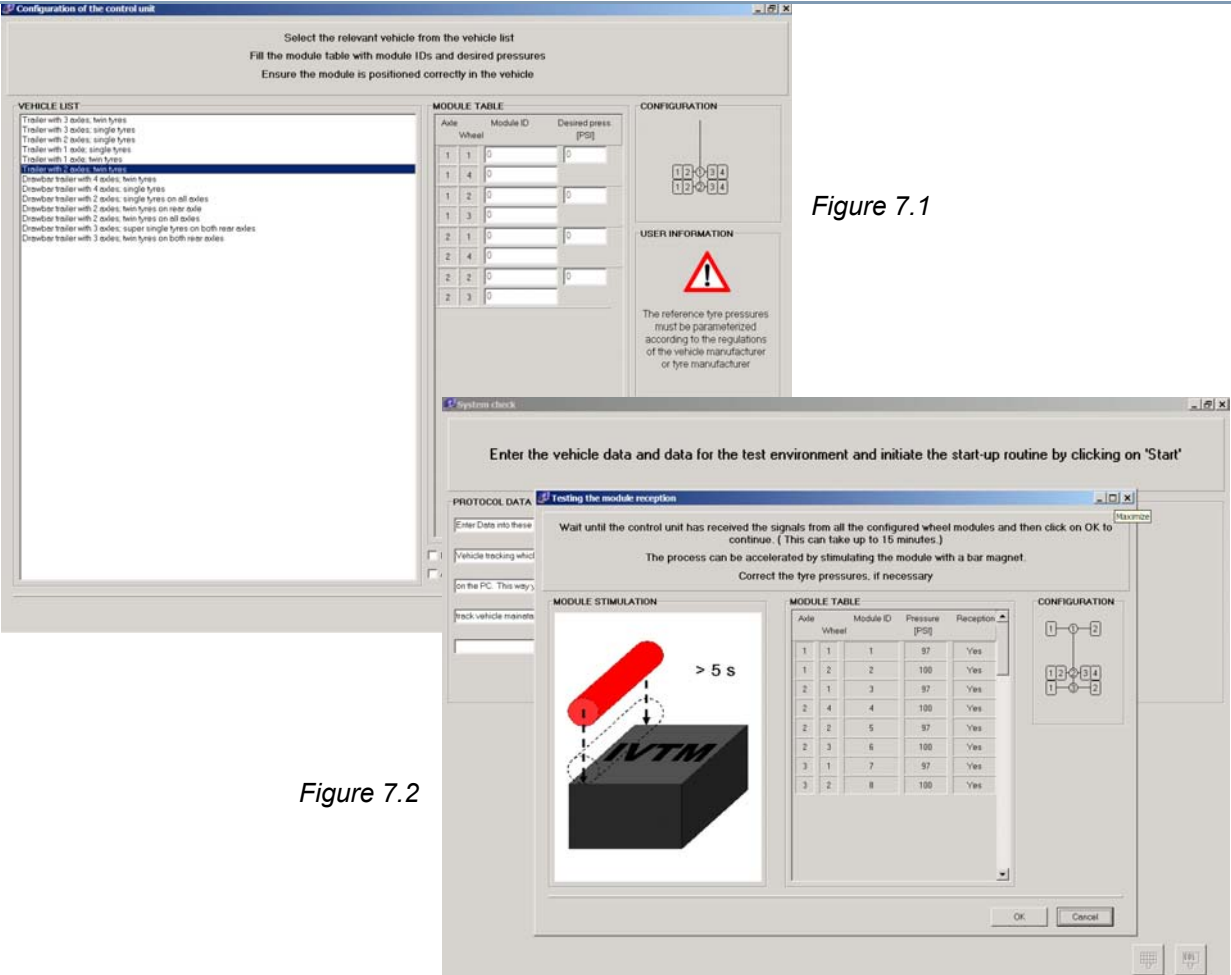
Red Warning Light – Critical under inflation. STOP vehicle immediately and take appropriate action.

Yellow Warning Light – Under inflation or slow leak. Reduce vehicle speed and check tire at next possible opportunity

Button (pressure) indication of present tire pressure of tractor and trailer if equipped

? Button (failure message) detail information on pressure and type of failure.

Also please see display operating manual brochure part # 820 000 351 3 (provided with display)



Configuration of the control unit

Select the relevant vehicle from the vehicle list
Fill the module table with module IDs and desired pressures
Ensure the module is positioned correctly in the vehicle

VEHICLE LIST

- Trailer with 3 axles, twin tyres
- Trailer with 3 axles, single tyres
- Trailer with 2 axles, single tyres
- Trailer with 1 axle, single tyres
- Trailer with 1 axle, twin tyres
- Trailer with 2 axles, twin tyres
- Demolition trailer with 4 axles, twin tyres
- Demolition trailer with 4 axles, single tyres
- Demolition trailer with 2 axles, single tyres on all axles
- Demolition trailer with 2 axles, twin tyres on rear axle
- Demolition trailer with 2 axles, twin tyres on all axles
- Demolition trailer with 3 axles, super single tyres on both rear axles
- Demolition trailer with 3 axles, twin tyres on both rear axles

MODULE TABLE

Axle	Wheel	Module ID	Desired press. [PSI]
1	1	0	0
1	4	0	0
1	2	0	0
1	3	0	0
2	1	0	0
2	4	0	0
2	2	0	0
2	3	0	0

CONFIGURATION

USER INFORMATION

The reference tyre pressures must be parameterized according to the regulations of the vehicle manufacturer or tyre manufacturer

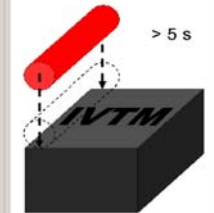
System check

Enter the vehicle data and data for the test environment and initiate the start-up routine by clicking on 'Start'

PROTOCOL DATA Testing the module reception

Wait until the control unit has received the signals from all the configured wheel modules and then click on OK to continue. (This can take up to 15 minutes.)
The process can be accelerated by stimulating the module with a bar magnet.
Correct the tyre pressures, if necessary

MODULE STIMULATION



> 5 s

MODULE TABLE

Axle	Wheel	Module ID	Pressure [PSI]	Reception
1	1	1	97	Yes
1	2	2	100	Yes
2	1	3	97	Yes
2	4	4	100	Yes
2	2	5	97	Yes
2	3	6	100	Yes
3	1	7	97	Yes
3	2	8	100	Yes

CONFIGURATION

OK Cancel

Figure 7.1

Figure 7.2

ECU programming

Required tools

PC running Windows 95 or higher with 30 MB free hard disk space, color display 1024x768 min., one free serial port.

Diagnostic interface (fig. 5.4) supplied separately.

Diagnostic cable (446 300 348 0, fig. 5.4) supplied separately.

Connection to diagnostic interface is required in the vehicle cab as well as at the trailer. Programming both ECU's is required.



Figure 7.3

Software installation and IVTM ECU Installation:

1. Click on set up on disk.
2. Install software per on screen instructions.
3. Re-start computer.
4. After re-start, under programs select WABCO, then click on " IVTM Diagnostic Software (en) V.28a".
5. Enter software code (pin) provided separately.
6. Click OK.
7. Set up communication port. Click OK.
8. Establish the connection from the PC to the diagnostic port using interface module. (see figure 7.3).
9. Turn on vehicle ignition.
10. Select your vehicle type.
11. Select system check. Click on start.
12. Enter the provided PIN into field "PIN2" and click OK (PIN provided separately).
13. Enter vehicle data for vehicle record keeping.
14. Select start.
15. From the vehicle list choose vehicle configuration (see figure 7.1).

16. After selecting vehicle configuration, enter wheel module ID's in the wheel module table (see figure 7.1).

CAUTION

The wheel module ID numbers must match the illustration and table. Otherwise the system will not operate properly. Use the wheel module sticker guide from page 16 of this manual.

17. Enter recommended tire pressure.
18. Click Ok after module ID's and tire pressures have been entered.
19. Wheel module reception will appear in module table (see figure 7.2).
20. Click OK after the reception column indicates "YES" for all modules. Module stimulation can decrease installation time. Follow procedure on screen (see figure 7.2).
21. If warning lamp connections were established during installation, follow the screen instructions for proper programming.
22. After warning lamp selection, please click on the following:
- Click on "FCC for the Americas".
 - Click on "PSI".
 - Click "OK".
23. It will be necessary to clear all error messages

for proper programming. Click OK.

24. You may save the vehicle setup information on your PC for future access and record keeping.
25. Click on diagnostic memory on tool bar.
26. Click on "delete diagnostic memory"; after memory has been cleared click OK.
27. Verify PSI is set properly by clicking on program options (from the tool bar), then select options and select PSI.
28. This completes the programming of the ECU; verify tire pressure.

Trailer Installation













29. Before restarting the software for the trailer installation, establish the connection to the trailer diagnostic port. A trailer that has been without power will require up to 20 minutes to recognize the wheel modules on the tractor display.
30. Restart the IVTM Software.
31. Select trailer.
32. Select IVTM 5V screen.
33. Now follow same process as in the tractor installation.

Record Wheel Module ID Numbers here by affixing removable label from wheel module and placing here at each wheel location

V.I.N.: _____
Reg#: _____
Miles: _____

Tractor

_____ PSI ← Vehicle Direction

			
			
			
			
Axle 1	Common configurations	Axle 2	Axle 3

V.I.N.: _____
Reg#: _____
Miles: _____

Trailer

← Vehicle Direction





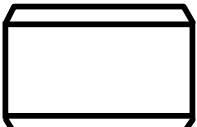
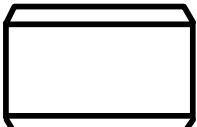


		
		
		
		
Common configurations	Axle 1	Axle 2

Figure A1

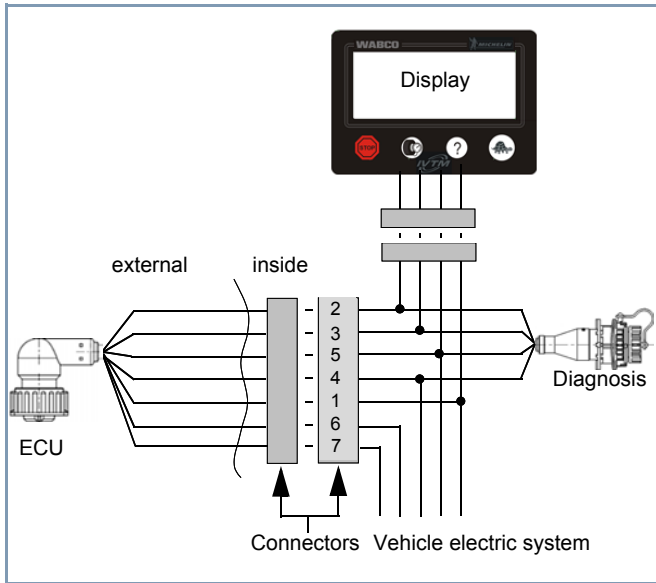


Figure A2

Pin no.	Connector pin assignment	Cable color code 7-pin type
2	CAN High	
3	CAN Low	
5	Ground	blue
4	12 Volts	red
1	Ignition	gray
6	Brake light / Warning light 1	yellow
7	Warning light 2	green

Figure A3

Note:

Brake light / warning light 1 (yellow) can be configured in two options. When running both a tractor and trailer with IVTM, the yellow wire must be connected to the tractor's brake light circuit. Without this connection the trailer ECU cannot establish a communication link with the tractor ECU. If a tractor only system is installed, then the yellow wire can be configured for an additional optional warning lamp (12 V / 3 W). During the ECU programming the use of the yellow and green wires will be configured. See programming of ECU (page 15, step 21).

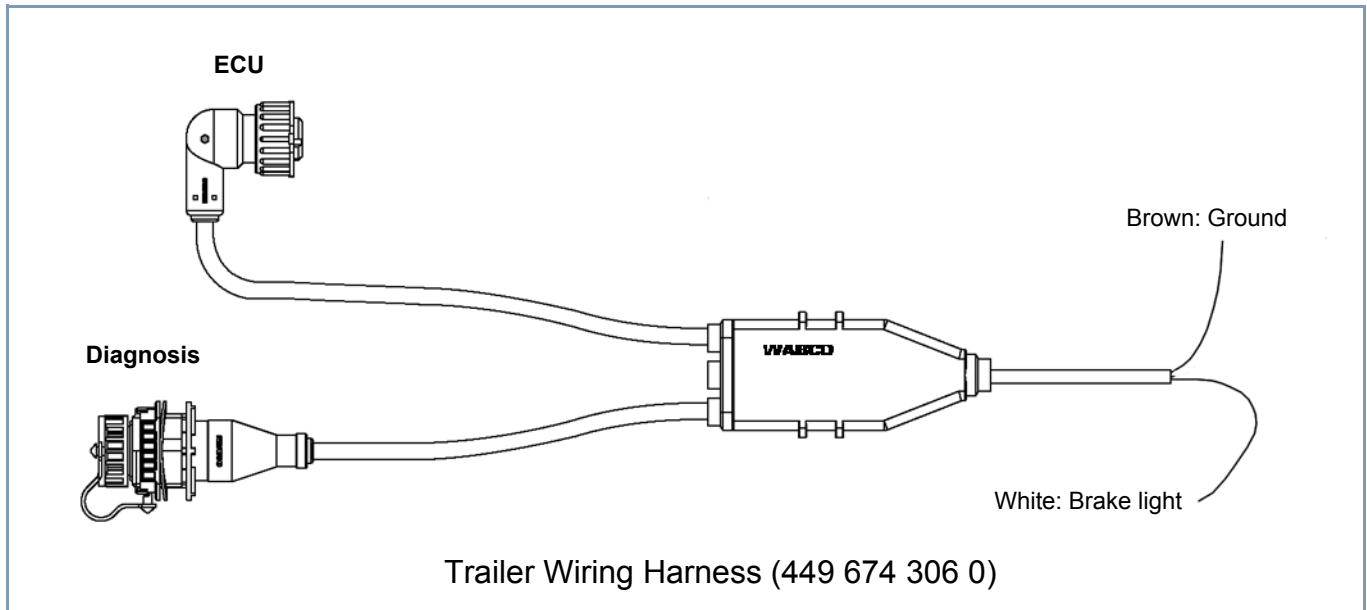


Figure A4

