



HYDRAULIC BRAKE TRAINING DISPLAY

Introduction

The HBTD is a completely assembled, ready-to-operate training display designed to provide many years of reliable service.

The HBTD includes four wheel hydraulic disc brakes with a Bosch pin slide caliper, a Bosch Hydro-Max power booster and a WABCO, D version ABS system.

Your panel is powered by a 12V battery and charger system. The battery charger keeps the battery charged when the display is not in use. It is recommended that the charger not be used during operation of the display. (Operation of the charger during use could cause damage to the ABS controller.)

Setting Up the HBTD

Setting up the HBTD requires safe handling practice and the use of machinery designed to handle this type of equipment. Setup requires a forklift or crane to lift the display into place.

Two EYE HOOKS are located at the top of each leg for lifting the display. Each lift strap or chain should be capable of lifting a minimum of 1000 pounds.

The power cord attached to the Haldex pump assembly must be connected to a 120 VAC outlet.

Using This Manual

Numbered items in the component list and elsewhere refer to components in the accompanying photographs. Review the component descriptions carefully as you refer to the photos and recommended service manuals before operating the display. Numbers in this text in parenthesis refer to an item in the **Components List**, for example (1) refers to the ignition switch.

Components List

FRONT PANEL

#	COMPONENT	FUNCTION
1	Ignition switch	OFF-ON-START
2	J-1587 diagnostic port	Connection for computer and diagnostic equipment
3	Blink code diagnostic switch	Alternate diagnostic code reader. See WABCO site or Maintenance Manual 39
4	Accelerator pedal	Depress and hold lightly for 3 seconds to start wheel speed acceleration
5	Bosch Hydro-Max power booster failure light	Indicates failure of Bosch Hydro-Max power booster
6	Hydraulic brake circuit failure light	Used in conjunction with a buzzer to indicate failures in the hydraulic brake circuit. Failures are simulated through use of failure mode switches (28)
7	ABS diagnostic/failure warning light	Indicates failures in the ABS system. Used in conjunction with the ABS blink code switch (3) to identify faults in the ABS system
8	ABS fuses	See WABCO Service Manual
9	ABS modulator pump relay	See WABCO Service Manual
10	Bosch Hydro-Max power booster and brake pedal assembly	See Bosch Service Manual
11	Bosch Hydro-Max reserve electric motor pump	See Bosch Service Manual
12	Bosch Hydro-Max flow switch	See Bosch Service Manual
13	Bosch electric motor relay	See Bosch Service Manual
14	Bosch dual master cylinder	See Bosch Service Manual
15	Bosch dual master cylinder differential switch	See Bosch Service Manual
16	Secondary hydraulic pressure gauge	Front brake pressure
17	Primary hydraulic pressure gauge	Rear brake pressure
18	Bosch rotor	See Bosch Service Manual
19	Bosch pin slide caliper	See Bosch Service Manual
20	WABCO "D" version ECU	See WABCO Service Manual

21	Wheel speed digital read outs	Wheel speed is electronically simulated
22	WABCO ABS modulator/ pump assembly	See WABCO Service Manual
23	Brake lights (2)	

REAR PANEL

24	Secondary circuit hydraulic failure solenoid valve	Used by failure mode switches (28)
25	Primary circuit hydraulic failure solenoid valve	Used by failure mode switches (28)
26	Wheel speed solid state control board	Sends speed information to the wheel speed sensors and 4 digital read outs (22) on front of the HBTD
27	Warning buzzers	Sounds when there is a hydraulic system failure. Does <u>not</u> sound when there is an ABS system failure
28	Failure mode switch panel	Switches permit simulation of various component failure situations
29	Failure mode chart	Description of the failure modes possible through use of the failure mode switches
30	Haldex hydraulic pump assembly	Used in the HBTD to mimic a vehicle's power steering pump. It energizes when the ignition switch is in the START position.
31	12 VDC battery	Provides 12 VDC to the Bosch Hydro-Max power back up motor, WABCO ABS, tail lights and warning devices in the system.
32	12 VDC battery charger	

General Operation

1. With the key inserted, turn the ignition switch (1) to the ON position. The Hydro-Max warning light (5) and buzzer and the Bosch Hydro-Max reserve motor (14) will start.
2. Momentarily turn the ignition switch (1) to the START position and then back to the ON position. The power steering pump (30) (Haldex pump assembly) will start, the warning light, buzzer and reserve pump will go off. You can now apply the brake pedal (10) for a normal application.
3. Partially depress and hold the accelerator pedal (4) for 3 seconds. The wheel acceleration speed will appear on the 4 digital read outs (21) and stabilize at 60 MPH.

4. Depress and hold the brake pedal **(10)**. The wheel speed will drop from 60 MPH to 20 MPH in 1 second and then cycle through an ABS stop.

Failure Modes

1. To create failure modes, toggle a switch on the failure mode panel **(28)** on the back of the display.
2. If an ABS failure is created the J-1587 diagnostic port can be used to connect diagnostic test equipment to find and evaluate the problem. The J-1587 diagnostic port can also be used to test the ABS system. Refer to Meritor WABCO Maintenance Manual 39 for test and repair procedures.

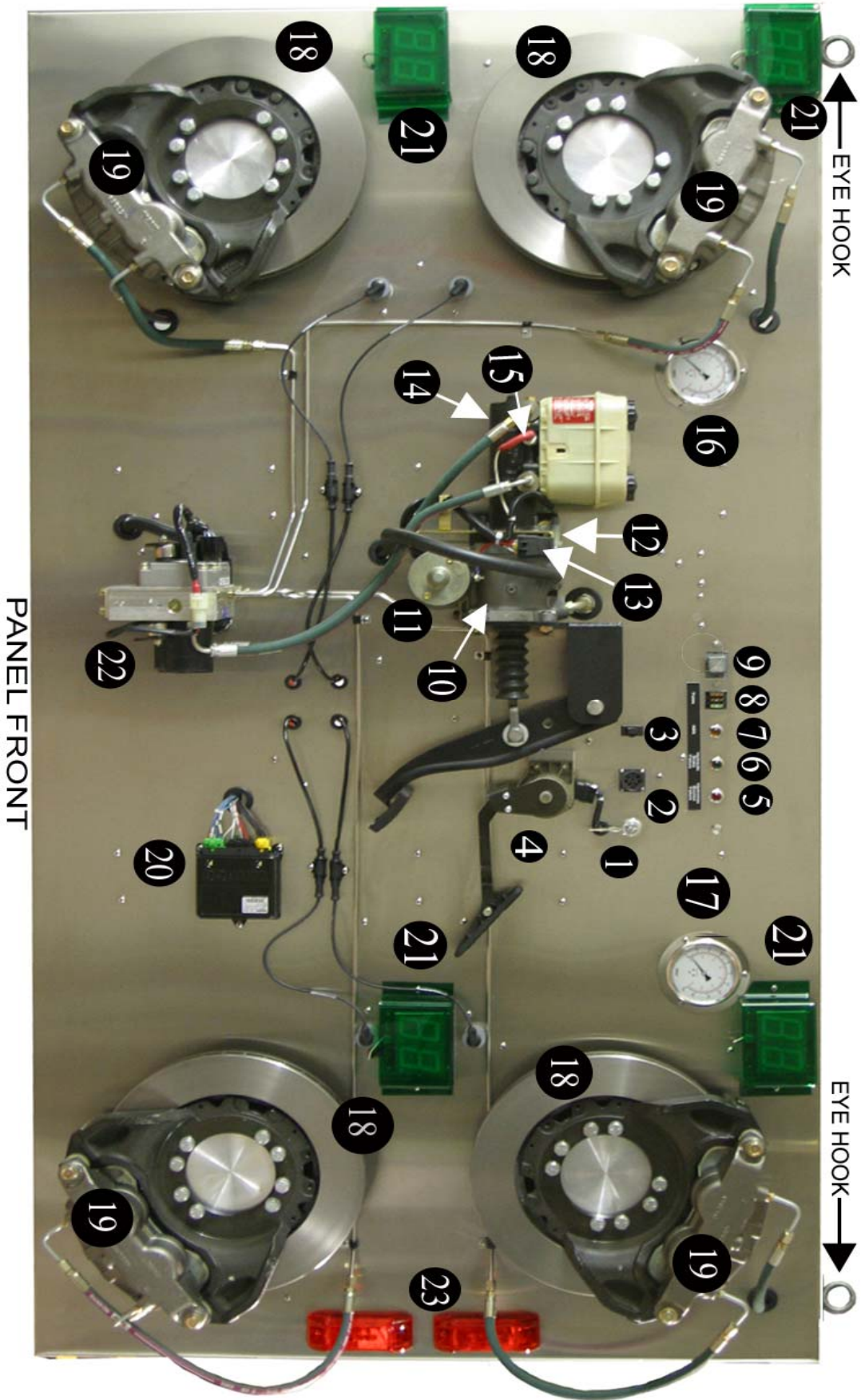
Hydraulic Brake Circuit

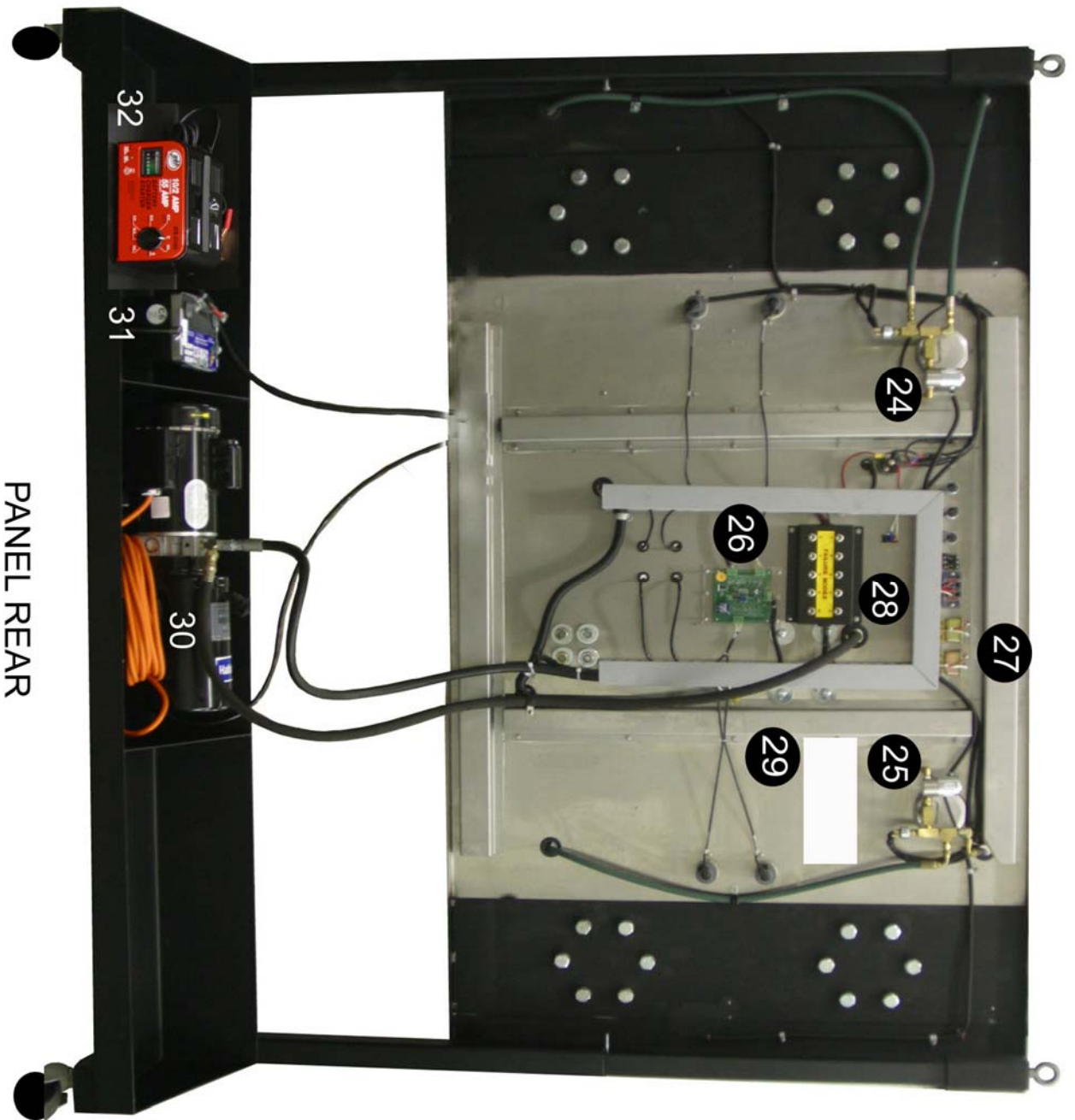
Failure Mode and Brake Bleed Procedures

The solenoid valves **(24) & (25)** are used to create hydraulic circuit failures and bleed the brake system. They are controlled by the failure mode switches located on the Failure Mode Switch Panel **(28)** located on the panel rear. When failure mode switch # 9 or #10 are toggled to the upward position the solenoid valve will open and brake fluid pressure will be lost. The fluid will flow back to the reservoir on top of the master cylinder. No actual fluid loss occurs. A failure light will appear and a warning buzzer sounds when a hydraulic failure occurs. Toggle the switch to the down position to close the solenoid valve. The system will return to normal.

Since bleed screws have been removed from the disc brake calipers to accommodate the hydraulic circuit failures, the method for bleeding the system differs from that of an actual brake system. If it is necessary to bleed the system follow this step by step instruction:

1. Turn the ignition switch **(1)** to the OFF position.
2. On the Failure Mode Panel **(28)**, toggle switches #9 & #10 to the upward position.
3. While pushing down on the brake pedal **(10)**, turn the ignition switch to ON. With the power steering pump **(30)** running (Haldex pump assembly), continue pushing the brake pedal until the pedal stops. While holding the pedal down, turn the ignition switch **(1)** to the OFF position. This procedure closes the solenoid valve and prevents air from being drawn into the system when the pedal is released. Repeat this step as necessary until the system is free of air.







Close up of the Failure Mode Panel (28)

Failure Modes (29)

1. Right steer speed sensor
2. Left steer speed sensor
3. Right drive speed sensor
4. Left drive speed sensor
5. ABS light (open wire)
6. 25 amp power failure
7. Hydro-Max flow switch (wire open)
8. Master cylinder differential switch (wire open)
9. Steer axle hydraulic failure
10. Drive axle hydraulic failure

Further component information is available at:

Bosch	http://rb-kwin.bosch.com/en-NA/start/nfz_brake0.html
WABCO	www.meritorwabco.com
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