

RIDING TROWEL

HDX760



SAFETY & OPERATIONS MANUAL

Manual Part #: 065550 | Revision: 10/2022
Language: English | Original Instructions



NOTICE

This manual, or a copy of it, must be kept with the machine at all times. There is a manual storage container located on the machine for your convenience.

HDX760 Riding Trowel

OPERATIONS

MANUAL

This manual covers the products listed below:

<u>Part No.</u>	<u>Description</u>
063000	HDX760 RIDING TROWEL

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Allen Products are covered under one or more of the following patent numbers:

U.S. Design Patents: 344,736; 400,542; 400,544; 402,998; 402,999; 403,332; 404,041; 404,042; 410,931; 413,127; 416,564; 465,897; 466,909; 474,203.

U.S. Utility Patents: 5,108,220; 5,238,323; 5,328,295; 5,352,063; 5,405,216; 5,476,342; 5,480,257; 5,480,258; 5,533,831; 5,562,361; 5,567,075; 5,613,801; 5,658,089; 5,685,667; 5,803,658; 5,816,739; 5,816,740; 5,890,833; 5,934,823; 5,967,696; 5,988,938; 5,988,939; 6,019,433; 6,019,545; 6,048,130; 6,053,660; 6,089,786; 6,106,193; 6,857,815; 5,288,166; 6,582,153 B1, 7,108,449; 7,114,876; 7,316,523; 7,690,864 B2

Canadian Patents: 2,039,893.

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Limited Warranty

Allen Engineering Corporation ("Allen") warrants its products to be free of defects in material or workmanship for:

TWO YEARS FROM END USER'S DATE OF PURCHASE

Warranty period begins on the date of purchase by the End User of the product. All warranty is based on the following limited warranty terms and conditions, including the disclaimer of implied warranties and consequential damages.

1. Allen's obligation and liability under this warranty is limited to repairing or replacing parts if, after Allen's inspection, there is determined to be a defect in material or workmanship. Allen reserves the choice to repair or replace.
2. If Allen chooses to replace the part, it will be at no cost to the customer and will be made available to the Allen Distributor, Dealer, or Rental Center from whom the End User purchased the product.
3. Replacement or repair parts, installed in the product, are warranted only for the remainder of warranty period of the product as though they were the original parts.
4. Allen does not warranty engines or batteries. Engine warranty claims should be made directly to an authorized factory service center for the particular engine manufacturer. Batteries are not warranted due to unknown treatment during transport, etc, and any battery claims should be directed to the battery manufacturer.
5. Allen's warranty does not cover the normal maintenance of products or its components (such as engine tuneups and oil & filter changes). The warranty also does not cover normal wear and tear items (such as belts and consumables).
6. Allen's warranty will be void if it is determined that the defect resulted from operator abuse, failure to perform normal maintenance on the product, modification to product, alterations or repairs made to the product without the written approval of Allen. Allen specifically excludes from warranty any damage to any trowels resulting from an impact to the rotors.
7. Impact damage to gear boxes is not covered under the Allen warranty and is deemed customer abuse.
8. Allen will pay shop labor on warranty items at the Allen Shop Labor Rate in existence on the date of the warranty claim. An Allen labor chart will determine the time allowed to complete a repair and will govern the shop labor hours that will be allowed.
9. Allen will pay freight on warranty replacement parts at worldwide standard ground rates. No warranty replacement parts will be shipped air freight at the expense of Allen. Allen only pays outbound freight charges when sending warranty replacement parts to the customer via ground service. Allen does not pay any inbound freight. However, if Allen determines this to be a warranted item, only then will Allen reimburse the customer for inbound freight at standard ground rates.
10. ALLEN ENGINEERING CORPORATION'S WARRANTY POLICY WILL NOT COVER THE FOLLOWING: TAXES; SHOP SUPPLIES; ENVIRONMENTAL SURCHARGES; AIR FREIGHT; TRAVEL TIME; LOSS OF TIME; INCONVENIENCE; LOSS OF RENTAL REVENUE; RENTAL COSTS OF EQUIPMENT USED TO REPLACE THE PRODUCT BEING REPAIRED; LOSS OF USE OF THE PRODUCT; COMMERCIAL LOSS; OR ANY OTHER CHARGES WHATSOEVER OR ANY LIABILITIES FOR DIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGE OR DELAY.
11. ALLEN ENGINEERING CORPORATION MAKES NO OTHER WARRANTY, EXPRESSED OR IMPLIED. THIS LIMITED WARRANTY IS IN LIEU OF THE WARRANTY OF MERCHANTABILITY AND FITNESS. THERE ARE NO OTHER WARRANTIES THAT EXTEND BEYOND THE DESCRIPTION ON THIS DOCUMENT.
12. No Allen employee or representative is authorized to change this warranty in any way or grant any other warranty unless such change is made in writing and signed by an officer of Allen Engineering Corporation.

Table of Contents

Title	Page
Limited Warranty	4
Table of Contents	5
Information Contained In This Manual	7
Dealer Information	8
Ordering Parts	9
Model Number - Serial Number Codes	10
Unit Identification	11
Technical specifications	12
Engine Specifications	14
Engine Oil & Machine Dimensions	17
Section 1 - Safety	
State Regulations	18
Federal Regulations	19
Safety Information	20
Safety Symbols	21
General Safety	22
Safety Labels and Decals	27
Section 2 - Operations	
Components	30
Control Center Display	32
Engine Components	37
Inspection	39
Operations	41
Section 3 - Service	
Maintenance	46
Engine and Filter Service	47
Hydraulic Filter Service (Y-Strainer/Charge)	48
Fault Codes	50
Fail Mode Alternator	73
Tier 4 Engine Information, Do's & Don'ts	76
Cleaning Procedure	77



OUR MISSION STATEMENT

Our Mission is to provide superior quality products (manufactured in a safe and efficient environment by highly trained and dedicated personnel), on-time deliveries, with reactive and knowledgeable customer service.

OUR QUALITY POLICY

The Allen Engineering Team is fully committed to exceeding customer expectations for the quality of the products and services provided through the continuous improvement process of reducing waste, defects, and variability in everything we do.

OUR VISION

Our Vision is to be a world-class manufacturer of concrete placing and finishing equipment.

Information Contained in this Manual



This manual provides information and procedures to safely operate and maintain the Allen Machine.

For your own safety and protection from personal injury, carefully read, understand, and observe the safety instructions described in this manual. Keep this manual or a copy of it with the machine at all times.

Always operate this machine in accordance with the instructions described in this manual. A well maintained piece of equipment will provide many years of trouble free operation.

This manual is divided into the following sections:

**SECTION 1
SAFETY**

**SECTION 2
OPERATIONS**

**SECTION 3
SERVICE**

Complete any warranty requirements as specified by the engine manufacturer in their instructions found inside the manual box located on the operator's control panel.

Your engine is not manufactured by Allen Engineering Corporation, Inc, and therefore is not covered under Allen Engineering Corporation, Inc warranty.

Your engine manufacturer should be contacted if you wish to purchase a parts manual or a repair manual for your engine.

Refer to enclosed owners engine manual for complete O&M instructions. See your battery manufacturer for battery warranty.

Dealer Information

Your Dealer has Allen Engineering Corporation trained mechanics and original Allen replacement parts. Always contact the Allen Dealer who sold you this machine for Allen Certified repairs and replacement parts.

Place Allen Dealer information below for future reference.

Dealer Name:	_____
Phone #:	(____) - ____ - _____
Address:	_____
City:	_____
State:	_____
Zip:	_____
Salesman:	_____
Mobile Phone	_____
Additional Comments:	_____



Ordering Parts

Section 4 contains illustrated parts lists for help in ordering replacement parts for your machine. Follow the instructions below when ordering parts to insure prompt and accurate delivery:

1. All orders for service parts - include the serial number for the machine. Shipment will be delayed if this information is not available.
2. Include correct description and part number from the "PARTS" section of this manual.
3. Specify exact shipping instructions, including the preferred routing and complete destination address.
4. DO NOT return parts to AEC without receiving written authorization from AEC. All authorized returns must be shipped pre-paid.
5. When placing an order, please contact the AEC dealer nearest you.

NOTE

All information, specifications, and illustrations in this manual are subject to change without notice and are based on the latest information at the time of publication.

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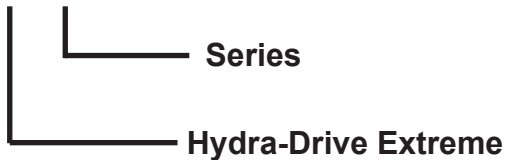
Model Number - Serial Number Codes

Manufacturer's Codes:

When ordering parts or requesting service information, you will always be asked to specify the model and serial numbers of the machine. The legends below specifically defines each significant character or group of characters of the Model Number and Serial Number codes.

Model Number

HDX760

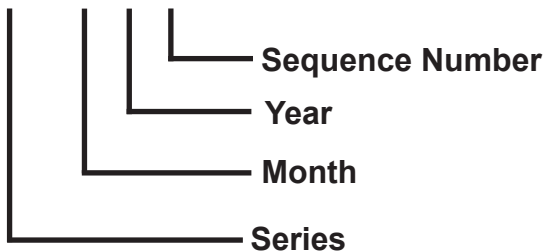


Serial Number

The serial number found on the identification plate is a ten digit format. The model number identifies your machine and will ensure that you receive the correct replacement parts.

Serial Number Example

760 01 17 001



Unit Identification

Unit Identification Plate Location:

An identification plate listing the model number and the serial number is attached to each unit and is located on the right end of the front operator deck. See image below for serial number plate location. This plate should not be removed at any time.

Please record the information found on this plate below so it will be available should the identification plate become lost or damaged. When ordering parts or requesting service information, you will always be asked to specify the model and serial numbers of the machine.

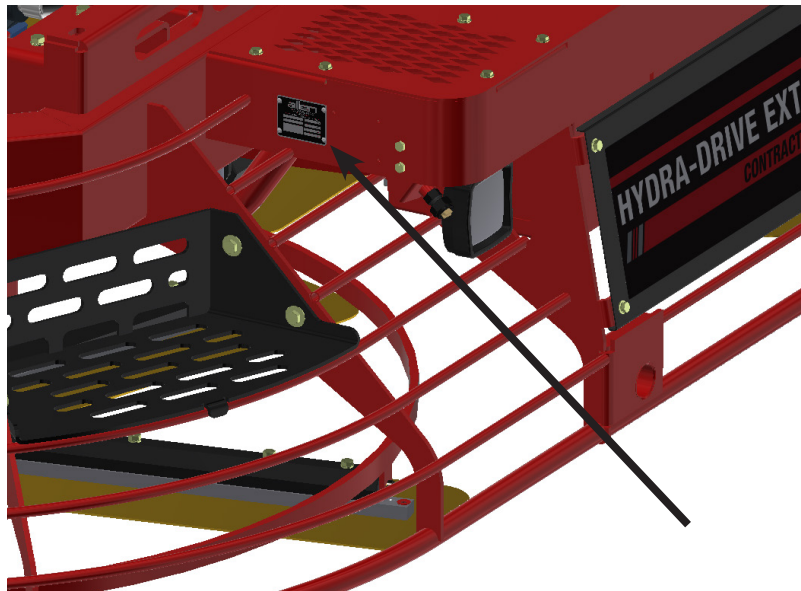
FILL IN FOR FUTURE REFERENCE

Model Number: _____

Serial Number: _____

Date Purchased: _____

Purchased From: _____



Technical Specifications

The HDX760 Riding Trowel is a 75 HP, 10 Ft riding trowel. This trowel utilizes a HATZ diesel engine that is categorized as Tier 4 final, and is in compliance with all emissions standards and regulations, including California. With these strict regulations being forced onto engine manufacturers, their engines now require very sophisticated systems to monitor and control these Tier 4 Final units. Now the machine builders can benefit from these features by accessing engine data over a CANBus communication network between the engine and the machine. The ECU on a HATZ engine is manufactured by Bosch, and is in compliance with CAN J1939 standards on their communications protocol. Over this CANBus, the engine and the machine can now communicate and share information, such as sending a desired engine RPM, and receiving an actual, real time engine RPM. In the HCU (Hydraulic Control Unit), a program has been written to receive and process data from the engine to be monitored in the BODAS Service as a troubleshooting tool. Also receiving process data on the CANBus from the engine is the display located to the left of the operator. On this display, the operator can view RPM, temperature, and other basic data, along with engine error codes.

SPECIFICATIONS

Engine:	Hatz 4H50TIC (T4F)
Horsepower Class:	74 hp (65kW)
Fuel Type:	Diesel
Drive System Hydraulic:	Bosch-Rexroth
Steering Control System:	Hydraulic Power
Blade Pitch Control Electric (Joystick Mounted):	Single or Dual Pitch capable
Panning Path Width:	117.6 in. (298.7 cm)
Rotors (Diameter):	57.6 in. (146.3 cm) 6-Blade Spiders
Maximum Rotor Speed:	145 rpm
Fuel Capacity:	11 gallons (41.6 L)
Retardant Capacity:	6 gallons (23 L)
(Joystick mounted Electric Spray Control)	
Hydraulic Fluid Capacity:	15 gallons (56.8 L)
Operating Lights:	6
Weight:	2,687 lbs. (1,219 kg)
Dimensions (L x W x H):	122.7 in. x 62.7 in. x 62 in. (311.6 cm x 159.3 cm x 157.5 cm)
Lifting:	2-Point Top-Mount System
'Intelli-Power' System (computer-controlled power and operations monitor and control)	
Hydraulic Control Unit (HCU)	<ul style="list-style-type: none">• Communicates with all pumps, motors, valves, etc. for performance & safety• Monitors the hydraulic filter to warn when clogged• Monitors hydraulic temperatures to prevent component damage
Engine Control Unit (ECU)	<ul style="list-style-type: none">• Works with HCU to maintain maximum efficiency and precise RPMs• Senses engine load and adjusts RPM to prevent engine bogging down and keep an effective rotor speed to the floor.• Minimizes fuel consumption• Prevents machine operation when hydraulic temperature is too cold to prevent hydraulic component damage.
Primary Pump	<ul style="list-style-type: none">• Closed loop with HCU control to ensure even flow and speed• System safety control to prevent cavitation• Operator safety by idling when operator is not in seat

Technical Specifications (cont'd)

Safety Features (Programming)

- **Engine Overload Protection (EOP)** - When the machine is doing work, and experiences a tight area on the concrete, the resistance from the concrete will cause the engine to bog down due to a greater power demand than the engine can provide. Since the ECU communicates with the HCU via CAN J1939, the hydraulic system knows the exact engine RPM at any given time. When the HCU sees the Engine RPM decrease due to extreme resistance on the Hydraulic system, the output signal to the Hydraulic pump will decrease by up to 35% of the desired motor speed to allow the engine to return to 2600 RPM. Once the engine returns to 2600 RPM, the output signal to the pump will increase at a controlled rate until it reaches the desired flow in reference to the input signal from the foot pedal.
- **Cold Start Mode** - When the machine is turned on, the operator will not be able to switch the machine into run mode until the temperature of the fluid going through the cooler reaches **65° F**. If the operator attempts to switch the engine to RUN speed when the fluid temp is below this set point, the machine will go into a cold start mode. The engine will run at 1750 RPM to dump fluid over the relief valve at a higher rate to raise the fluid temp faster. During this mode, the hydraulic system will be disabled.
- **Seat Switch Program** - When the machine is running, the seat switch must be engaged to enable any other functions on the machine. When the operator gets out of the seat with in RUN RPM mode, the engine will drop down to idle and all machine functions will be disabled.
- **Cavitation protection Program** - When the foot pedal is released suddenly, the inertia from the motors spinning can turn the rotor motors into pumps, creating a vacuum on the high pressure side of the system. Too much vacuum can cause cavitation. When this situation occurs, the controller decreases the output signal to the pump at the rate of 300 milliseconds from full signal to zero on a linear curve. This will decrease rotor speed to a stop at a controlled rate. Too slow of a deceleration rate is a safety risk if the operator wants to stop, and too fast of a deceleration rate can be hazardous to the hydraulic system.
- **Run Mode Protection Program** - The Torque curve of the HATZ engine is very low until it reaches 2000 RPM. In some cases, when the Engine is switch from idle to run, and the foot pedal is held down, the power demand from the hydraulic system will bog down the engine and it will shut the machine off. To avoid this, a program was written so the foot pedal is disabled until the Engine has be at the desired run speed for 2 seconds before the motors can spin.
- **Cruise control** - Cruise control is a great feature when you have large pours. When operating the machine, press the foot pedal until you find your desired rotor speed and press the cruise control switch to the right of the operator. This will force the controller to lock in the signal to the pump so the operator can remove their foot from the pedal. To disable the Cruise control, either press the cruise button, or press the foot pedal again. To better the safety of this function, the foot pedal signal to the controller must be at least 50% of full signal to enable this function. When the rotors are spinning at lower speeds, it is more difficult to steer the machine.
- **Dual Pitch** - In the program there are two ways to pitch the trowel blades. The rocker switches on the right and left joystick will pitch the right and left blades individually. The dual pitch function is located on the rocker switches to the right of the operator. One direction, both sides pitch up, and the reverse direction decreases the pitch.

Engine Specifications

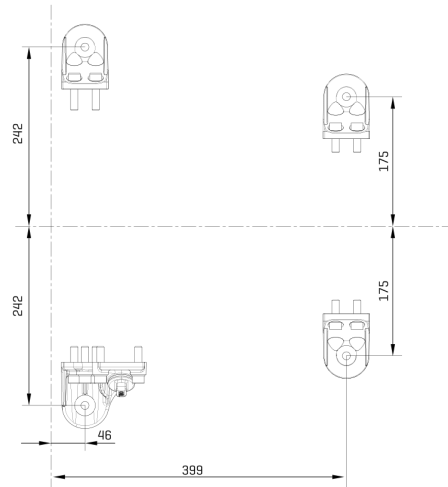
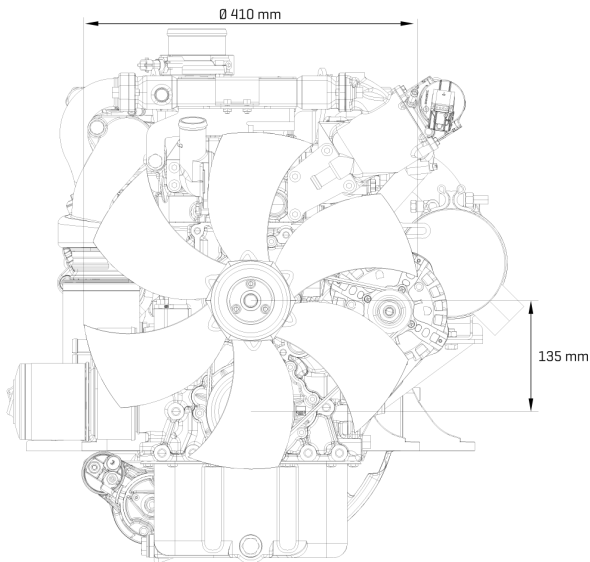
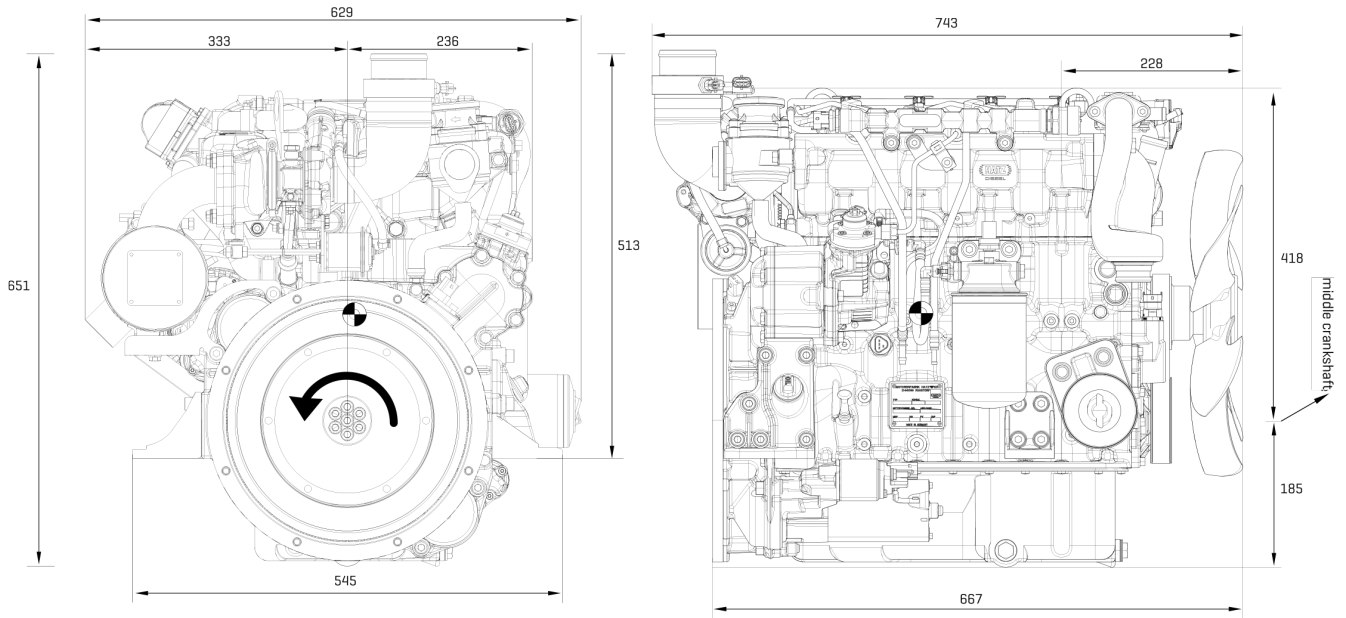
Hatz 4H50TIC

Technical data		4H50TIC .DPF	4H50TIC	4H50TI
Type	Water-cooled 4-cylinder turbo engine with BOSCH common rail OHW, 1800 bar, charge air cooling			
Exhaust emission after-treatment	EGR, DOC, DPF	EGR, DOC	—	
Bore x stroke (mm / inches)	84 x 88 / 3.31 x 3.46			
Displacement [l / cu.in.]	1.952 / 119.12			
Mean piston speed at 3000 rpm [m/s / ft/min]	8.8 / 1.732			
Compression ratio	17.5:1			
Lub. oil consumption, related to full load	max. 0.5 % of fuel consumption			
Oil filling	max [l / US qts]	7.0 / 7.4		
	min [l / US qts]	6.0 / 6.3		
Speed control				
• Lowest idle speed	900 r.p.m.			
• Static speed droop	adjustable [0, 3, 5, 10 %]			
Amount of combustion air at 2800 rpm approx. ¹⁾ [kg/h]	319			
Amount of cooling air at 2800 rpm approx. ¹⁾ [kg/h]	352			
Mass moment of inertia J [kgm ² / lb.ft ²]	J _{engine} 0.234 / 5.553			
Starter	12 V - 2.2 kW [-25°] — 24 V - 3.0 kW [-32°] ²⁾			
Alternator charging	14 V - 110 A / 28 V - 65 A			
Battery capacity [max]	12 V - 110 Ah / 450A DIN 24 V - 66 Ah / 300A DIN			
Weight	Weight [kg / lbs.]	173 / 381 [inclusive catalyst]		158 / 348
		255 / 562 [as Open Power Unit]		

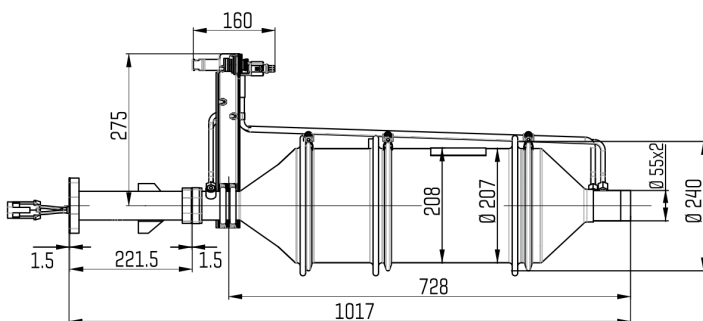
¹⁾ For other speeds there is a linear reduction in the air requirement. ²⁾ -40 °C with special approval possible.

Engine output [max]		4H50TIC .DPF	4H50TIC	4H50TI
	[r.p.m.]	kW / HP	kW / HP	kW / HP
Blocked ISO brake horsepower [IFN] for intermittent loading according to ISO 3046-1.	2800	55.0 / 74.8	55.0 / 74.8	62.0 / 84.3
	2600	54.9 / 74.6	54.9 / 74.6	62.0 / 84.3
	2300	54.0 / 73.4	54.0 / 73.4	61.2 / 83.2
	2000	50.3 / 68.4	50.3 / 68.4	55.3 / 75.2
	1800	45.2 / 61.5	45.2 / 61.5	49.7 / 67.6
	1500	37.1 / 50.4	37.1 / 50.4	40.8 / 55.5
Blocked ISO standard power output [no overload permissible] acc. to ISO 3046-1. For constant load [ICFN].	2800	49.5 / 67.3	49.5 / 67.3	—
	2600	49.4 / 67.2	49.4 / 67.2	—
	2300	48.6 / 66.1	48.6 / 66.1	—
	2000	45.2 / 61.5	45.2 / 61.5	—
	1800	40.7 / 55.3	40.7 / 55.3	—
	1500	33.4 / 45.4	33.4 / 45.4	—
Blocked ISO standard power output [no overloadpermissible] acc. to ISO 3046-1. For constant speed and constant load [ICFN]. - e.g. power generators	3000	50.0 / 68.0	50.0 / 68.0	50.0 / 68.0
	1800	36.4 / 49.5	36.4 / 49.5	36.4 / 49.5
	1500	28.7 / 39.0	28.7 / 39.0	28.7 / 39.0

Engine Dimensions Hatz 4H50TIC



Diesel particulate filter (DPF)



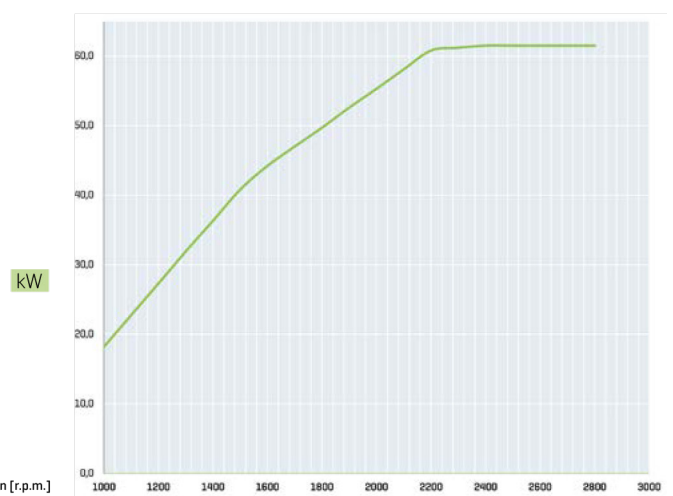
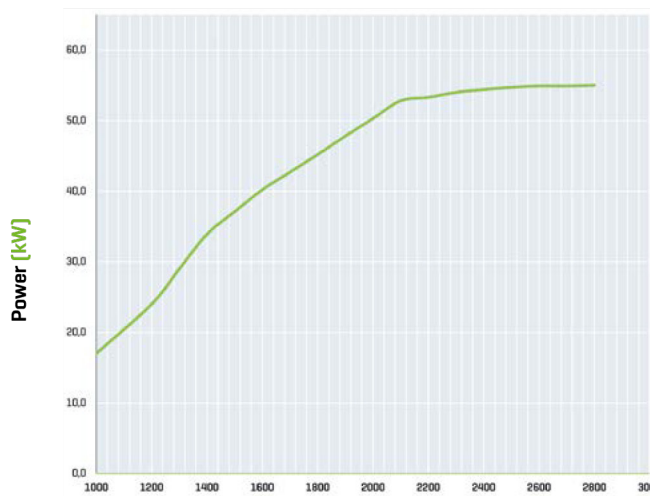
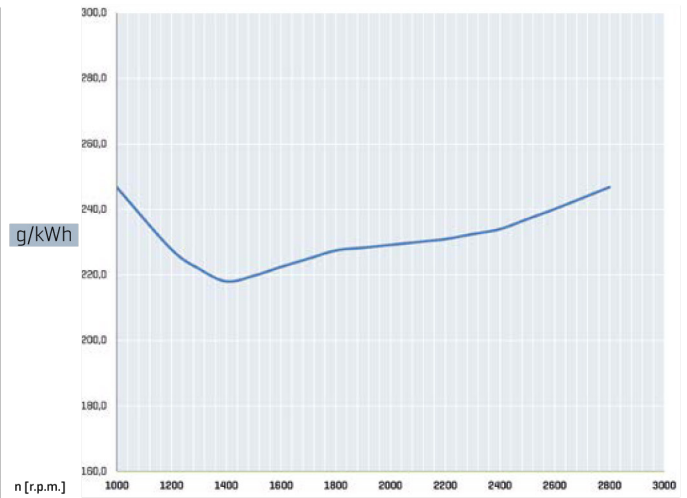
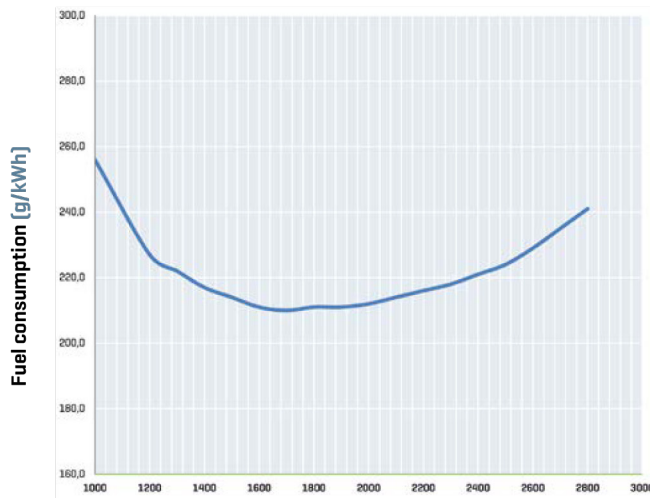
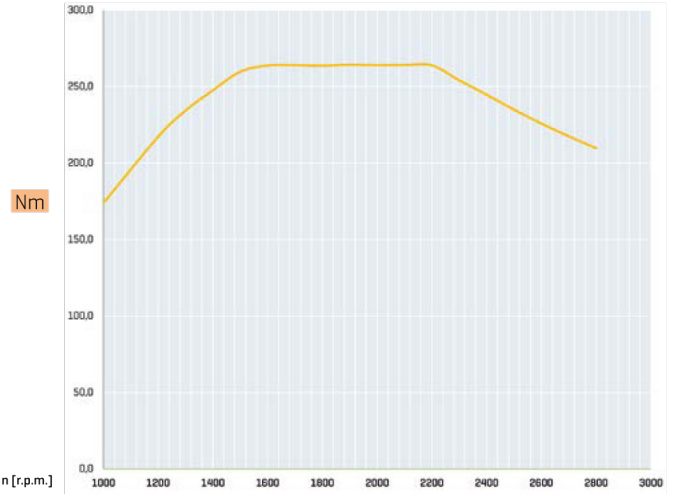
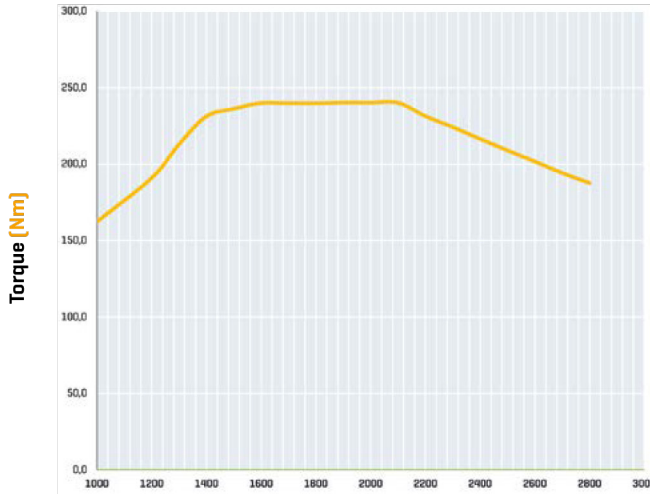
Spread at box dimensions ± 3 mm due to tolerance.
Drawings with detail and connection dimensions as PDF resp. DXF can be found at www.HATZ-DIESEL.com.

Engine Power Curves

Hatz 4H50TIC

4H50TIC, 4H50TIC DPF

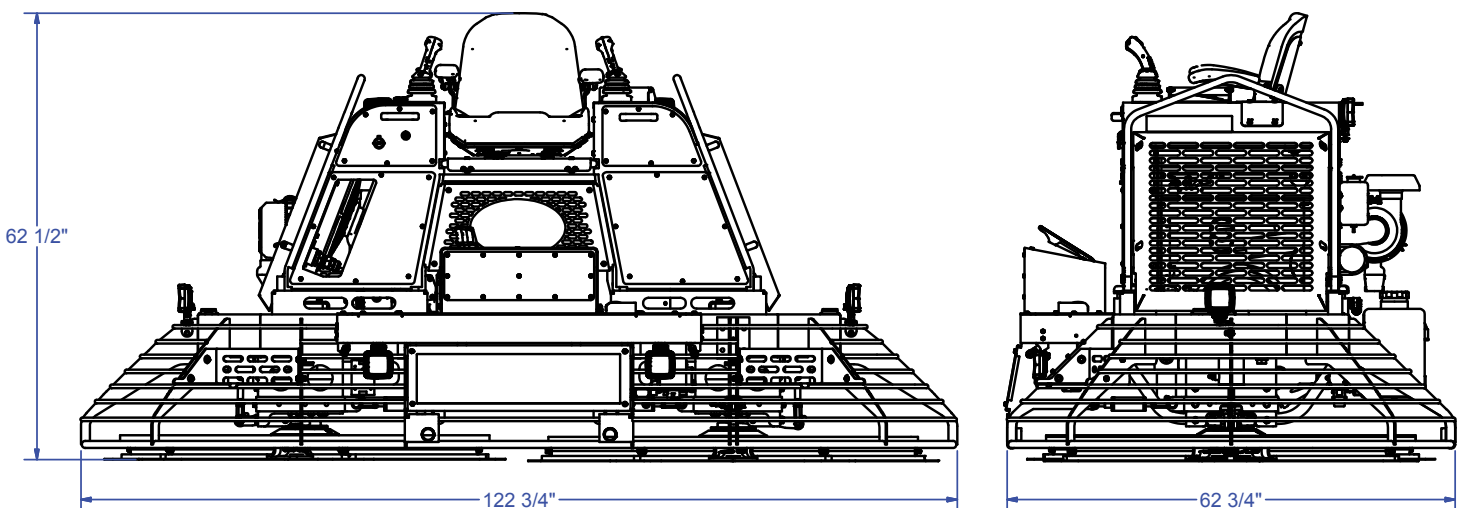
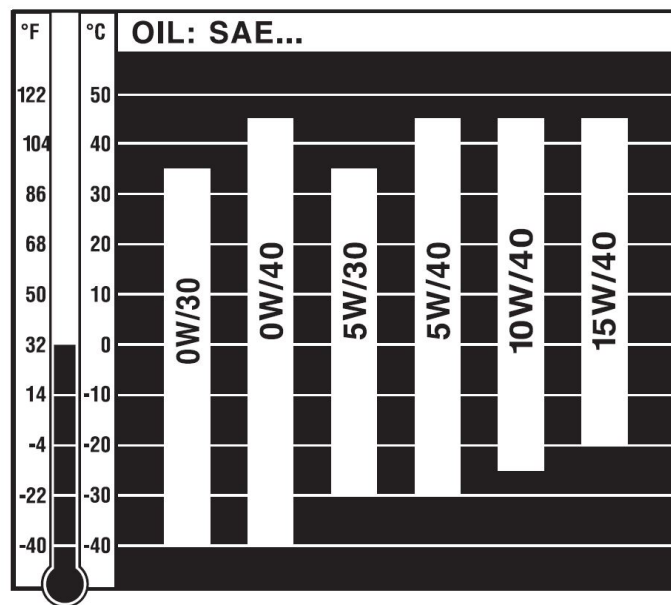
4H50TI



Engine Oil & Machine Dimensions

Engine Oil

- For general use 15W/40 oil is recommended (6 Qts or up to ~7.4 Qts), ensure that the oil meets the Hatz oil specifications listed on page 47.
- Change the type of engine oil according to the ambient temperature, see figure below.
- When using oil of different brands from the previous one, be sure to drain all the previous oil before adding the new engine oil.





WARNING



CALIFORNIA — Proposition 65 Warning

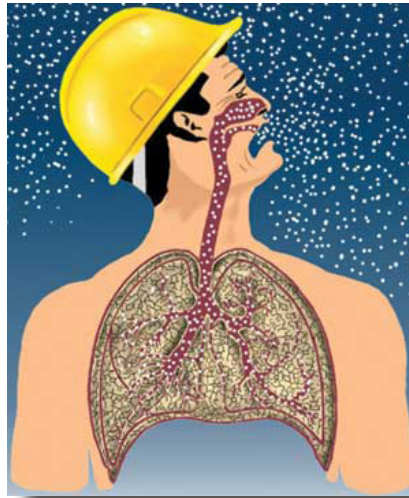
Engine exhaust and some of its constituents, and some dust created by power sanding, sawing, grinding, drilling and other construction activities contains chemicals known to the State of California to cause cancer, birth defects and other reproductive harm. Some examples of these chemicals are:

- Lead from lead-based paints.
- Crystalline silica from bricks.
- Cement and other masonry products.
- Arsenic and chromium from chemically treated lumber.

Your risk from these exposures varies, depending on how often you do this type of work. To reduce your exposure to these chemicals: **ALWAYS** work in a well ventilated area, and work with approved safety equipment, such as dust masks that are specially designed to filter out microscopic particles.

Federal Regulations Respiratory Hazards

SECTION 1 SAFETY



! WARNING

RESPIRATORY HAZARDS

Grinding/cutting/drilling of masonry, concrete, metal and other materials can generate dust, mists and fumes containing chemicals known to cause serious or fatal injury or illness, such as respiratory disease, cancer, birth defects or other reproductive harm. If you are unfamiliar with the risks associated with the particular process and/or material being cut or the composition of the tool being used, review the material safety data sheet and/or consult your employer, the material manufacturer/supplier, governmental agencies such as OSHA and NIOSH and other sources on hazardous materials. California and some other authorities, for instance, have published lists of substances known to cause cancer, reproductive toxicity, or other harmful effects.

Control dust, mist and fumes at the source where possible. In this regard use good work practices and follow the recommendations of the manufacturers or suppliers, OSHA/NIOSH, and occupational and trade associations. Water should be used for dust suppression when wet cutting is feasible. When the hazards from inhalation of dust, mists and fumes cannot be eliminated, the operator and any bystanders should always wear a respirator approved by NIOSH/MSHA for the materials being used.

! WARNING

SILICOSIS WARNING

Grinding/cutting/drilling of masonry, concrete, metal and other materials with silica in their composition may give off dust or mists containing crystalline silica. Silica is a basic component of sand, quartz, brick clay, granite and numerous other minerals and rocks. Repeated and/or substantial inhalation of airborne crystalline silica can cause serious or fatal respiratory diseases, including silicosis. In addition, California and some other authorities have listed respirable crystalline silica as a substance known to cause cancer. When cutting such materials, always follow the respiratory precautions mentioned above.

SECTION 1 SAFETY

Safety Information

Do not operate or service the equipment before reading the entire manual. Safety precautions should be followed at all times when operating this equipment. Failure to read and understand the safety messages and operating instructions could result in injury to yourself and others.

SAFETY NOTES

The four safety notes shown below will inform you about potential hazards that could injure you or others. The safety notes specifically address the level of exposure to the operator and are preceded by one of four words: DANGER, WARNING, CAUTION or NOTICE.



Indicates a hazardous situation which, if not avoided, **will** result in death or serious injury.



Indicates a hazardous situation which, if not avoided, **could** result in death or serious injury.









Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.



Addresses practices not related to personal injury.



Potential hazards associated with the operation of this equipment will be referenced with hazard symbols which may appear throughout this manual in conjunction with safety notes.

Symbol	Safety Hazard
	Lethal exhaust gas hazards
	Explosive fuel hazards
	Burn hazards
	Rotating parts/crush hazards
	Pressurized fluid hazards
	Hydraulic fluid hazards

SECTION 1 SAFETY

General Safety

- **NEVER** operate this equipment without proper protective clothing, shatterproof glasses, respiratory protection, hearing protection, steel-toed boots and other protective devices required by the job or city and state regulations.



- **ALWAYS** avoid wearing jewelry or loose fitting clothes that may snag on the controls or moving parts as this can cause serious injury.

- **NEVER** operate this equipment when not feeling well due to fatigue, illness or when under medication.



- **NEVER** operate this equipment under the influence of drugs or alcohol.



- **ALWAYS** clear the work area of any debris, tools, etc. that would constitute a hazard while the equipment is in operation.

- No one other than the operator is to be in the working area when the equipment is in operation.
- **DO NOT** use the equipment for any purpose other than its intended purposes or applications.
- This equipment should only be operated by trained and qualified personnel 18 years of age and older.
- Whenever necessary, replace nameplate, operation and safety decals when they become difficult to read.
- AEC does not assume responsibility for any accident due to equipment modifications. Unauthorized equipment modification will void all warranties.
- **NEVER** use accessories or attachments that are not recommended by AEC for this equipment. Damage to the equipment and/or injury to user may result.

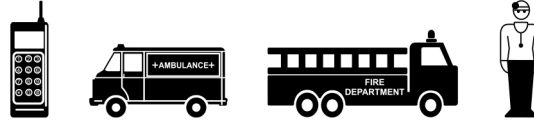
- **ALWAYS** know the location of the nearest fire extinguisher.



- **ALWAYS** know the location of the nearest first aid kit.



- **ALWAYS** know the location of the nearest phone or keep a phone on the job site. Also, know the phone numbers of the nearest ambulance, doctor and fire department. This information will be invaluable in the case of an emergency.



DANGER

- Engine fuel exhaust gases contain poisonous carbon monoxide. This gas is colorless and odorless, and can cause death if inhaled.
- The engine of this equipment requires an adequate free flow of cooling air. never operate this equipment in any enclosed or narrow area where free flow of the air is restricted. If the air flow is restricted it will cause injury to people and property and serious damage to the equipment or engine.
- **NEVER** operate the equipment in an explosive atmosphere or near combustible materials. An explosion or fire could result causing severe bodily harm or even death.



WARNING

- If applicable, never use your hand to find hydraulic leaks. Use a piece of wood or cardboard. Hydraulic fluid injected into the skin must be treated by a knowledgeable physician immediately or severe injury or death can occur.



- **ALWAYS** keep clear of rotating or moving parts while operating the riding trowel.



- **NEVER** disconnect any emergency or safety devices. These devices are intended for operator safety. Disconnection of these devices can cause severe injury, bodily harm or even death. Disconnection of any of these devices will void all warranties.

CAUTION

- **NEVER** allow passengers or riders on the riding trowel during operation.
- **NEVER** lubricate components or attempt service on a running machine.

SECTION 1 SAFETY

General Safety (cont'd)

NOTICE

- **ALWAYS** keep the machine in proper running condition.
- Fix damage to machine and replace any broken parts immediately.
- **ALWAYS** store equipment properly when it is not being used. Equipment should be stored in a clean, dry location out of the reach of children and unauthorized personnel.

WARNING

- **DO NOT** place hands or fingers inside engine compartment when engine is running.
- **NEVER** operate the engine with heat shields or guards removed.
- Keep fingers, hands hair and clothing away from all moving parts to prevent injury.
- **DO NOT** remove the engine oil drain plug while the engine is hot. Hot oil will gush out of the oil tank and severely scald any persons in the general area of the screed.



CAUTION

- **NEVER** touch the hot exhaust manifold, muffler or cylinder. Allow these parts to cool before servicing equipment.



NOTICE

- **NEVER** run engine without an air filter or with a dirty air filter. Severe engine damage may occur. Service air filter frequently to prevent engine malfunction.
- **NEVER** tamper with the factory settings of the engine or engine governor. Damage to the engine or equipment can result if operating in speed ranges above the maximum allowable.



DANGER

- **DO NOT** start the engine near spilled fuel or combustible fluids. Fuel is extremely flammable and its vapors can cause an explosion if ignited.
- **ALWAYS** refuel in a well-ventilated area, away from sparks and open flames.
- **ALWAYS** use extreme caution when working with flammable liquids.
- **DO NOT** fill the fuel tank while the engine is running or hot.
- **DO NOT** overfill tank, since spilled fuel could ignite if it comes into contact with hot engine parts or sparks from the ignition system.
- Store fuel in appropriate containers, in well-ventilated areas and away from sparks and flames.
- **NEVER** use fuel as a cleaning agent.
- **DO NOT** smoke around or near the equipment. Fire or explosion could result from fuel vapors or if fuel is spilled on a hot engine.



DANGER

- **DO NOT** drop the battery. There is a possibility that the battery will explode.
- **DO NOT** expose the battery to open flames, sparks, cigarettes, etc. The battery contains combustible gases and liquids. If these gases and liquids come into contact with a flame or spark, an explosion could occur.



WARNING

- **ALWAYS** wear safety glasses when handling the battery to avoid eye irritation. The battery contains acids that can cause injury to the eyes and skin.
- Use well-insulated gloves when picking up the battery.
- **ALWAYS** keep the battery charged. If the battery is not charged, combustible gas will build up.
- **DO NOT** charge battery if frozen. Battery can explode. When frozen, warm the battery to at least 61°F (16°C).

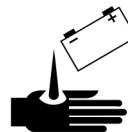


SECTION 1 SAFETY

General Safety (cont'd)

- **ALWAYS** recharge the battery in a well-ventilated environment to avoid the risk of a dangerous concentration of combustible gases.

- If the battery liquid (dilute sulfuric acid) comes into contact with clothing or skin, rinse skin or clothing immediately with plenty of water.



- If the battery liquid (dilute sulfuric acid) comes into contact with eyes, rinse eyes immediately with plenty of water and contact the nearest doctor or hospital to seek medical attention.

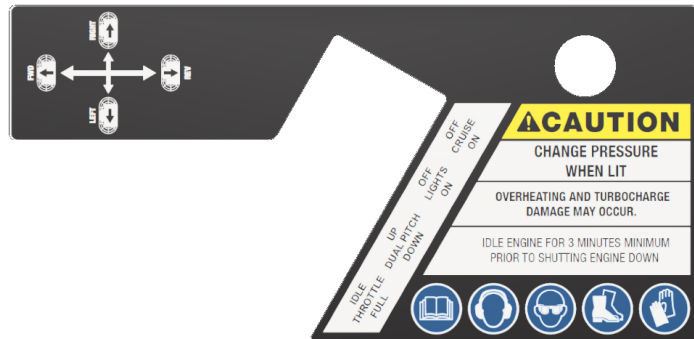
CAUTION

- **ALWAYS** disconnect the negative battery terminal before performing service on the equipment.
- **ALWAYS** keep battery cables in good working condition. Repair or replace all worn cables.
- Side slope operation is not permitted.
- Walk around the riding trowel before starting it to see if any items are worn, damaged, leaking, etc. that may make the riding trowel dangerous to operate.
- Stop and inspect the equipment if you strike an object. If necessary, make repairs before restarting.
- **ALWAYS** check that all controls are functioning properly immediately after start-up!
- **DO NOT** operate machine unless all controls operate correctly.

Decals

SECTION 1 SAFETY

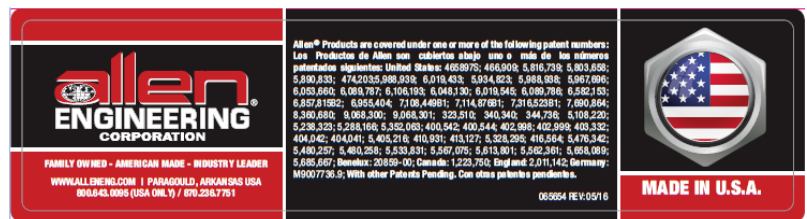
This decal notes to change pressure when lit. Also it indicates general safety icons, for example, hearing protection, safety glasses, etc.



This decal notates the engine coolant access location and that it could explode under pressure. It also discloses the California Proposition 65 warning.



This decal notates the patents that Allen Engineering Corporation holds.



This decal notates that retardant only should be put into the tank.



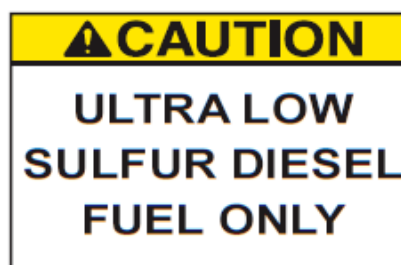
SECTION 1 SAFETY

Decals (cont'd)

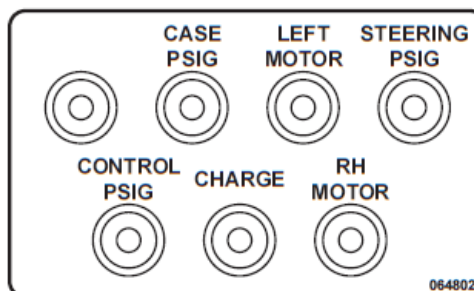
This decal notates the location of the manuals for the machine.



This decal notates that only low sulfur diesel is to be utilized in this machine.



This decal notates the identity of the test ports for the hydraulic systems on the machine.



This decal notates that only 68 weight hydraulic oil is to be used.



This decal notates the 2 year warranty AEC offers.



This decal notates that no personnel should be allowed under the machine during lifting procedures.



This decal notates that the pressure plate should be greased daily.

**GREASE PRESSURE
PLATE DAILY**

This decal notates the directional controls of the machine.



This decal notates the location of where to put hand tools on the machine.

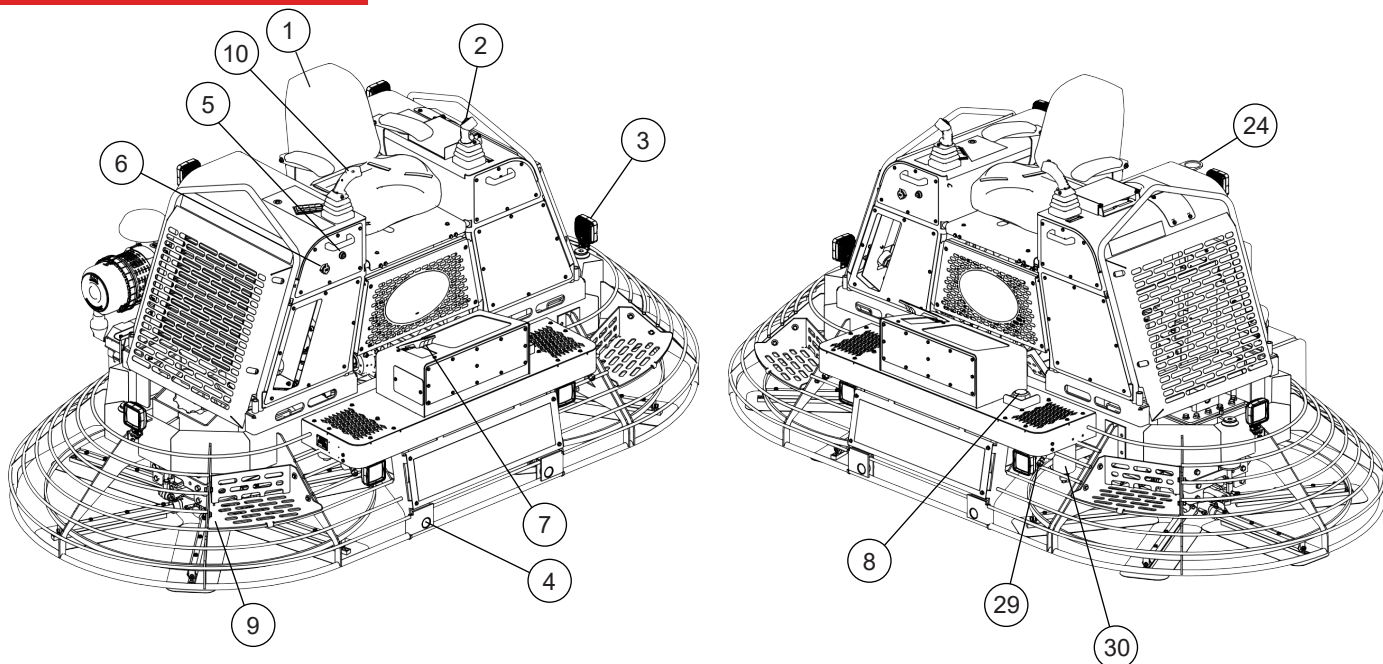


This decal notates the location of the fuses for the machine.

**FUSE
BOX
INSIDE**

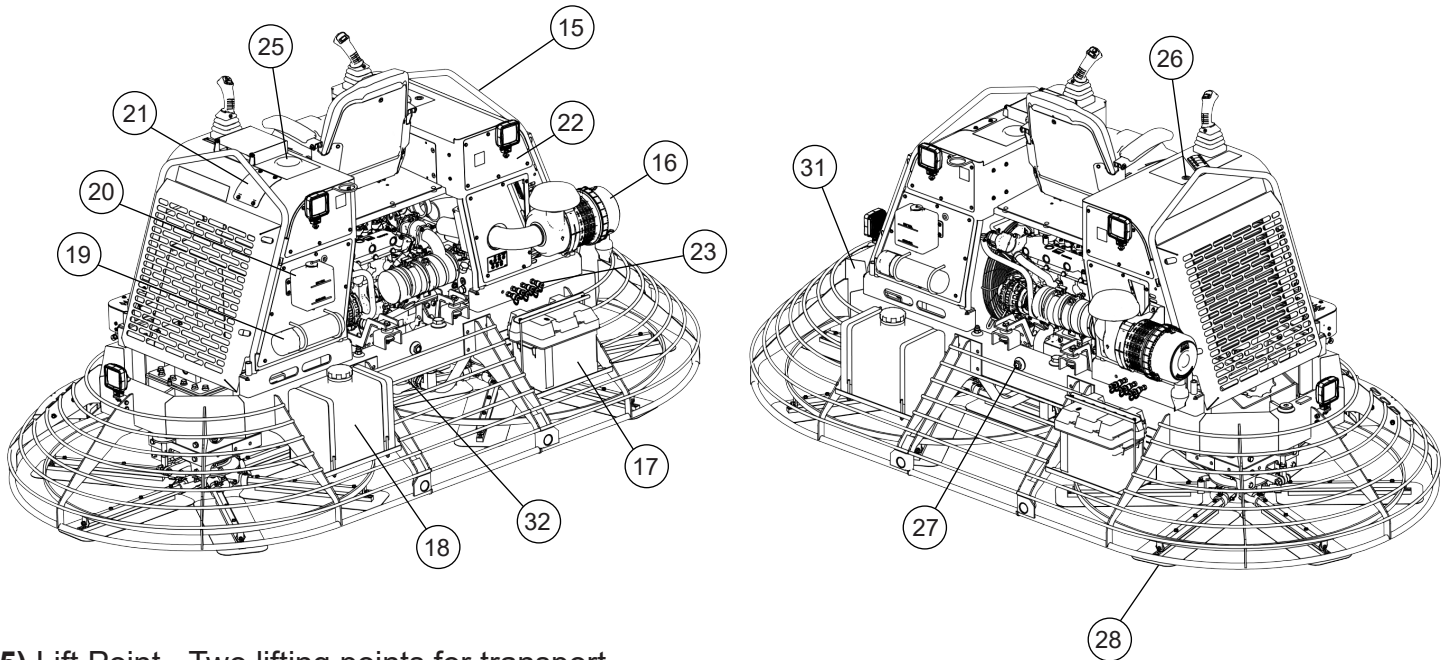
SECTION 2 OPERATIONS

Components



- 1) Seat - Rotors will not spin unless operator is seated. Seat is adjustable.
- 2) Spray Button - When pressed allows spray to flow through the spray nozzles located at the front of the machine.
- 3) Lights - Six low voltage LED lights are provided with this unit.
- 4) Dolly Jack Lifting Tubes - To assist in lifting the machine for site transport and installing pans.
- 5) Keyswitch - For starting the machine.
- 6) 12V Accessory - To aid in charging 12V devices.
- 7) Foot Control - Controls rotor speed.
- 8) Fuel Tank - Holds 11 gallons (41.6 liters).
- 9) Removable Step - To assist operator getting on the machine and changing blades.
- 10) Dolly Jack Lifting Tubes - To assist in lifting the machine for site transport and installing pans.
- 11) Light Switch - Controls LED light operation.
- 12) Idle/Full Throttle Switch - Controls engine RPM.
- 13) Dual Pitch Switch - Dual-Pitch control up/down switch.
- 14) Cruise Control Switch - Cruise control on/off switch.

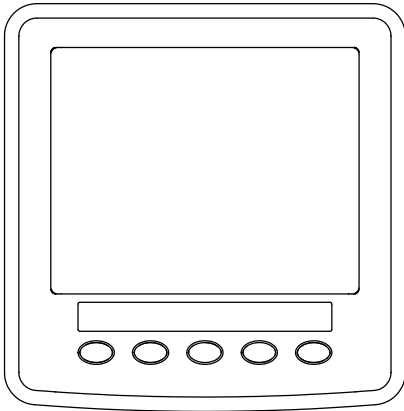




- 15) Lift Point** - Two lifting points for transport.
- 16) Air Cleaner** - Dual engine air filter elements.
- 17) Battery Box** - 12V Battery location.
- 18) Retardant Tank** - For utilizing the spray system.
- 19) Manual Tube** - Manuals for the machine are located here.
- 20) Engine Coolant Tank** - Overflow tank for the engine coolant.
- 21) Engine Coolant Access** - Removable panel for engine radiator access.
- 22) Fuse Panel** - Removable cover to access machine fuse panel.
- 23) Test Points** - Access for doing hydraulic system diagnostics.
- 24) Tool Holder** - For holding hand finishing tools (trowels, etc)
- 25) Cup Holder**
- 26) Warning Light** - Light for low oil
- 27) Sight Glass** - Hydraulic oil level indicator
- 28) Trowel Blade** - 8x23" Trowel blades (12 ea)
- 29) Spray Nozzles** - For spray retardant onto the slab.
- 30) High Pressure Filter** - Filters hydraulic fluid
- 31) Hydraulic Reservoir** - 15 gallons (56.8 liters) capacity
- 32) Y-Strainer** - Hydraulic filter

SECTION 2 OPERATIONS

Control Center Display

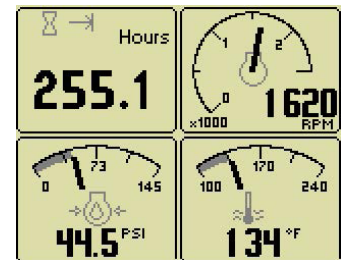


The CANplus™ 620 control panel is an economical platform for EPA Tier 3, EPA Tier 4 (interim), and EPA Tier 4 electronically governed diesel engines. Graphical gauge pages or a single large analog gauge are displayed on the 4.25" diagonal LCD. Virtually any SAE J1939 parameter reported by the ECU (Engine Control Unit) can be displayed including, but not limited to: RPM, coolant temperature, oil pressure, engine hours, voltage, exhaust emissions system state, and diagnostic codes. The transfective, backlit display is clearly readable in both bright sunlight as well as total darkness and housed in a rugged IP67 rated housing. The CP620, Tier 4 version includes two bright LEDs, controlled directly by the ECU to indicate Stop and Warning status.

General Operation

Turning the panel key switch to the run position energizes the ECU and displays a splash screen while the display performs a self-test.

Note: A self-test fault is indicated by the display beeping for longer than 1 second or any screen other than the gauge display. **Restore Defaults** in the **Configuration Menu** to clear the fault. Contact LOFA Industries for assistance if the problem persists.



After the splash screen disappears, the display shows readings on its virtual gauges. Initially the analog gauges are displayed but the display uses the screen last displayed on subsequent startups (see Last Screen Store for details).

If the ECU is preheating when the key switch is turned to the run position, the preheat popup window is displayed. Preheat time varies with atmospheric and engine conditions. The preheat popup window is closed when preheat is complete and the engine can be cranked.



Note: The ECU will not preheat unless conditions warrant. It may be possible to start the engine before preheat completes.

Turning the key switch to the start position cranks the engine and the switch returns to the run position when released. The key switch is also equipped with a mechanical start locking device to prevent cranking an already running engine. The key switch must be turned to the off position to reset the start locking before the engine can be cranked again.



Throttle Control

The throttle operators installed along with the configured engine speed parameters determines the requested engine speed. The actual engine speed is controlled by the ECU and is generally less than the request when the ECU is configured with the typical **droop governor**. Exact engine speed is possible if the ECU is configured with an **isochronous governor**.

Ramp Throttle

The standard **Ramp Throttle** uses a momentary rocker switch to adjust the requested engine speed. When first started, the requested engine speed is **Idle RPM**. Pressing and releasing the rabbit icon  increases the requested speed by the preset interval. Pressing and holding the rabbit icon causes the speed to accelerate to maximum speed within a few seconds. Similarly, pressing the turtle icon  decreases the requested speed.

Two-State Throttle

With the optional **Two-State Throttle**, a two position rocker switch selects the desired engine speed. Pressing the rabbit icon  requests the engine to immediately go to **Run RPM**. Pressing the turtle icon  requests the engine to immediately go to **Idle RPM**.

CANplus Display

Soft buttons simplify the operator interface by displaying a **button bar** above the buttons when any of the first 4 buttons (buttons 1 to 4 counting from the left) are pressed. Icons on the button bar represent the current function of each button. The button bar disappears after 5 seconds if no further buttons are pressed.

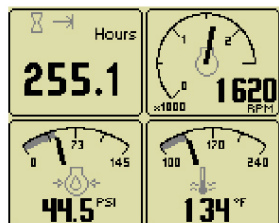
Analog Gauge Pages

Analog Gauge Pages provide four independent pages of analog gauges. Analog Gauge Pages are selected by pressing any of the first 4 buttons to show the top level button bar and then pressing button 1. The four gauge pages are selected by repeated pressing of button 1.

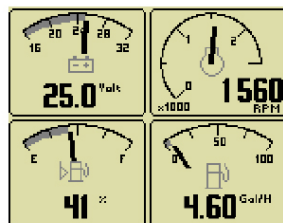
SECTION 2 OPERATIONS

Control Center Display (cont'd)

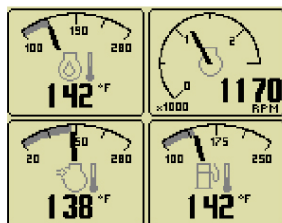
Default Gauge Pages



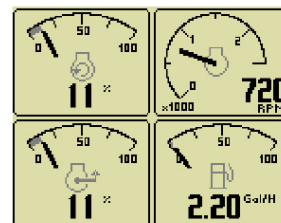
Page 1



Page 2



Page 3

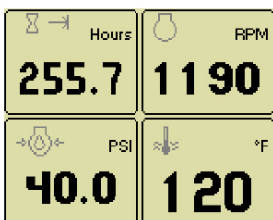


Page 4

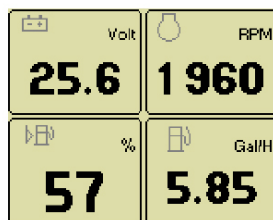
Note: Engine Hours are displayed as a digital value on **Analog Gauge Pages**. The default gauge pages show 13 selections since the tachometer is the upper right gauge of each page.

Digital Gauge Pages

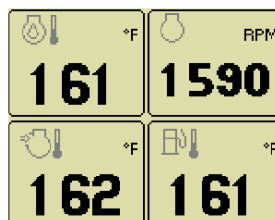
Digital Gauge Pages display the same data as the Analog Gauge Pages but in digital only format. Digital Gauge Pages are selected by pressing any of the first 4 buttons to show the top level button bar and then pressing button 2. The four gauge pages are selected by repeated pressing of button 2.



Page 1



Page 2



Page 3

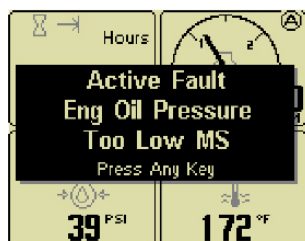


Page 4

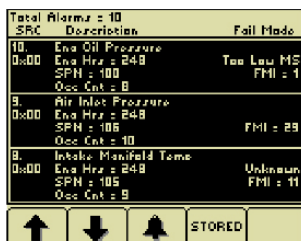
Note: Engine Hours are displayed as a digital value on **Analog Gauge Pages**. The default gauge pages show 13 selections since the tachometer is the upper right gauge of each page.

Active Faults

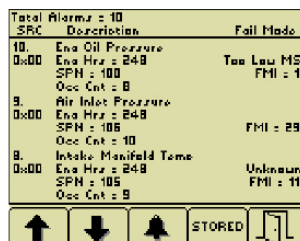
When a diagnostic message is received from the CANbus, a flashing popup shows the fault description and the beeper sounds. The fault description along with the SPN-FMI pair, source address, engine hours and the occurrence count are also added to the **Active Fault List**.



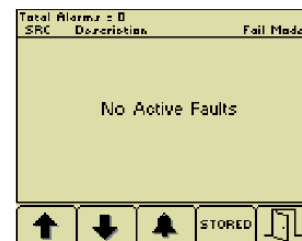
Fault Popup



Unacknowledged
Fault List



Acknowledged
Fault List



No Active Faults

Note: Standard J1939 abbreviations are used for faults. **MS** = Most Severe, **MOD**= Moderately Severe, **LS** = Least Severe.

Active Fault List

The **Active Fault List** is accessed by pressing any button while a fault popup is displayed. The fault list is highlighted and the beeper continues until faults are acknowledged by pressing button 3 . Once acknowledged, the fault list changes to normal text, the beeper is silenced and button 5 becomes available. The most recent fault is displayed at the top of the list. Fault changes may be viewed using buttons 1 and 2 if needed.

An active fault indicator (A) is displayed near the upper right corner of the display after the fault list is closed as long as a fault is active. The fault indicator is automatically removed and the fault list is cleared a few seconds after active fault messages stop.

The fault list can be reopened at any time by pressing any of the first 4 buttons and then pressing button 4 . If there are no active faults, a blank list is displayed with the message *No Active Faults*.

Inactive Faults

Inactive Faults (also called **stored** or **previously active faults**) are history save by the engine ECU and other devices on the CANbus. The fault history from all devices on the CANbus can be read by pressing button 4 from the *Active Faults* list. Any inactive faults are displayed with the same information available for active faults. If no stored faults are available, a blank list is displayed with the message *No Inactive Faults*. A popup displays *No Response From Engine* if no J1939 device responds to the inactive fault request.

Total Stored Alarms : 10		
SRC	Description	Fail Mode
10.	Eng Oil Pressure	
0x00	Eng Hrs : 248	Too Low MS
	SPN : 100	FMI : 1
	Occ Cnt : 8	
9.	Air Inlet Pressure	
0x00	Eng Hrs : 248	
	SPN : 106	FMI : 29
	Occ Cnt : 10	
8.	Intake Manifold Temp	
0x00	Eng Hrs : 248	Unknown
	SPN : 105	FMI : 11
	Occ Cnt : 9	

Inactive Fault List

Total Stored Alarms : 0		
SRC	Description	Fail Mode
No Inactive Faults		

No Inactive Faults

Total Stored Alarms : 0		
SRC	Description	Fail Mode
No Response From Engine		



No Response From Engine

Note: Inactive faults may be cleared using the engine diagnostic tool. Some ECUs will automatically clear inactive fault history.

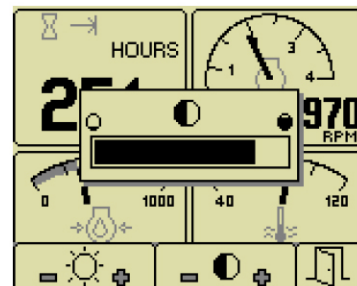
SECTION 2 OPERATIONS

Control Center Display (cont'd)

Adjusting Backlight and Contrast

When no menu bar is shown, pressing button 5 opens the lighting and contrast menu bar. The display backlight is adjusted by pressing buttons 1  and 2. Contrast is adjusted in the same manner using buttons 3  and 4.

Display contrast is temperature compensated to avoid adjustments for most temperature changes. The factory defaults can be restored by pressing and holding buttons 1 thru 4 simultaneously.

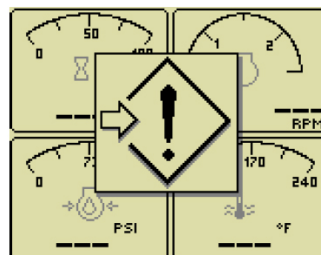


Service Required Popup

Users can set up to sixteen service timers in hours in the Configuration menu. The Service Required popup is displayed at power up when one or more service timers has expired. Pressing any button removes the popup. If no button is pressed the popup closes in approximately 5 seconds.



Service Required
Popup



Data Communications
Failure

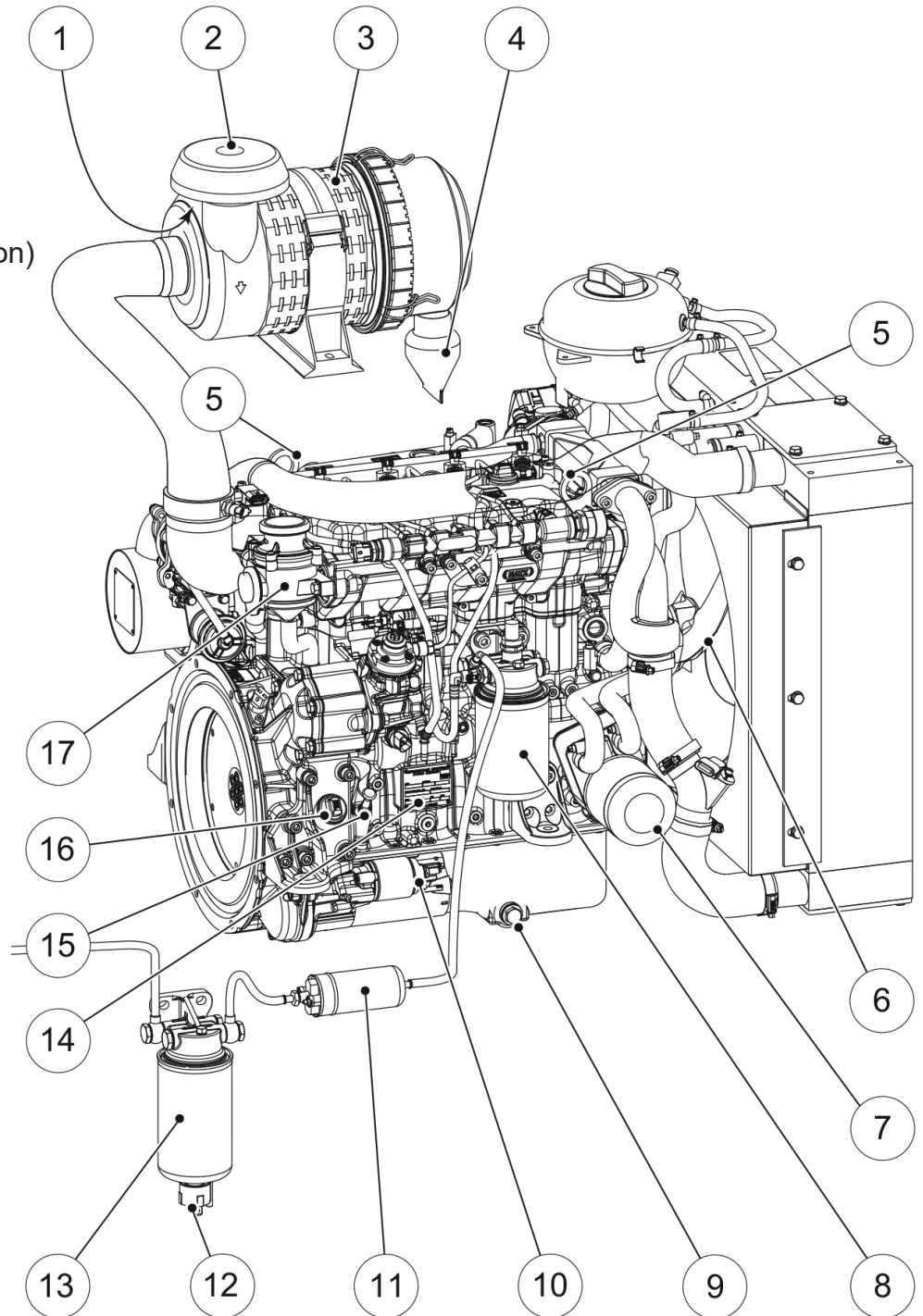
Data Communications Failure Icon

The data communications failure icon flashes if the display does not detect J1939 data. Communications failure can be caused by a configuration problem such as incorrect Engine Source address or a problem with the CANbus. Normal operation resumes once data is detected and the icon disappears.

Engine Components (Intake Side)

SECTION 2 OPERATIONS

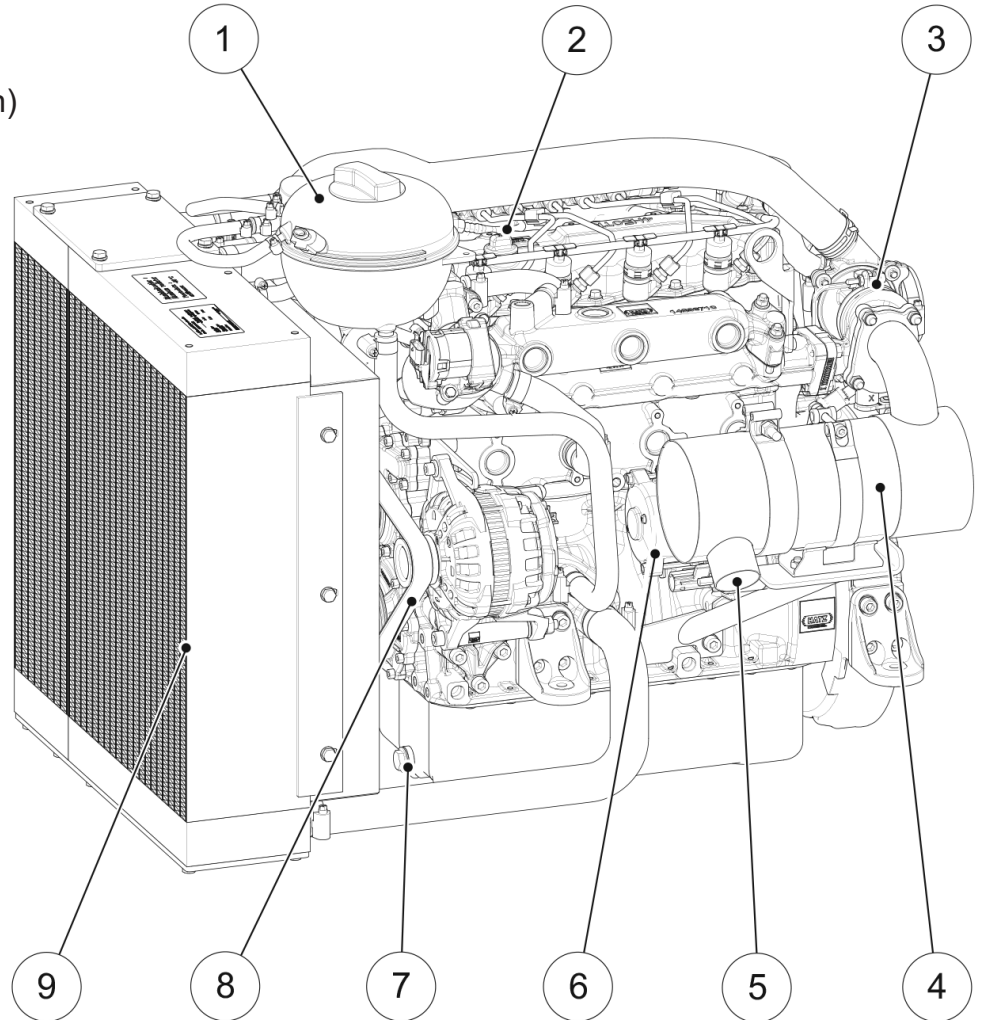
- 1 Intake opening for combustion air
- 2 Rain cap
- 3 Air filter (optional)
- 4 Dust discharge valve
- 5 Lifting eyes
- 6 Fan
- 7 Oil filter
- 8 Fuel fine filter
- 9 Side oil drain screw
- 10 Starter (low mounting position)
- 11 Electric fuel pump
- 12 Drain plug on fuel prefilter
- 13 Fuel prefilter
- 14 Engine type plate
- 15 Dipstick
- 16 Oil filler plug, bottom
- 17 Crankcase ventilation



SECTION 2 OPERATIONS

Engine Components (cont'd) (Exhaust Side)

- 1 Expansion tank for coolant (option)
- 2 Oil filler plug, top
- 3 Turbocharger
- 4 Oxidation catalytic converter
- 5 Exhaust outlet
- 6 Starter (high mounting position)
- 7 Oil drain screw, front
- 8 Poly v belt
- 9 Cooler



NOTICE

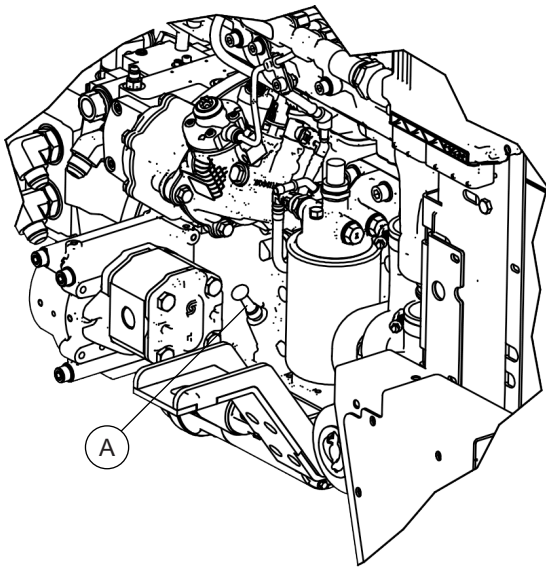
Read this section carefully for machine inspection instructions prior to operating the machine.

WARNING

Operation of this machine without proper training and understanding the controls could result in personal injury or severe damage to the trowel.

Engine Oil

- 1) Insure machine is on a level surface before doing any maintenance on it.
- 2) Pull the dipstick (A) from the holder on the engine (See below)



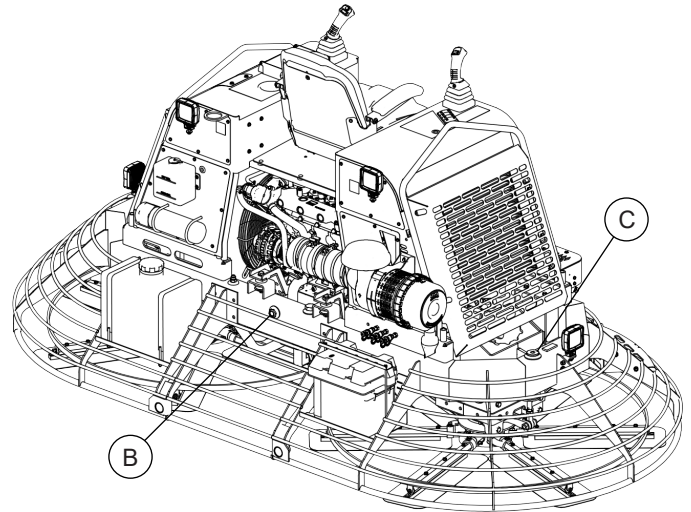
- 3) Examine the dipstick and determine whether or not the engine needs oil. The level should be between the upper and lower indicators on the dipstick.
- 4) If oil needs to be added, allow time for the oil to fill the oil pan prior to checking again.

CAUTION

DO NOT put too much oil in the engine.

Hydraulic Oil

- 1) Insure machine is on a level surface and the engine is stopped before doing any maintenance on it.
- 2) Physically check the hydraulic sight glass (B) for normal fluid level.



- 3) If oil needs to be added, allow time for the oil to cool down before adding more utilizing the fill plugs on either end of the frame (C). Use Conoco Megaflow AW Hydraulic Oil 68 or an equivalent.

CAUTION

Hydraulic oil can get extremely hot under normal operating conditions. Allow to cool before servicing machine.

CAUTION

Clean oil spills immediately as they are a trip hazard.

SECTION 2 OPERATIONS

Inspections (cont'd)

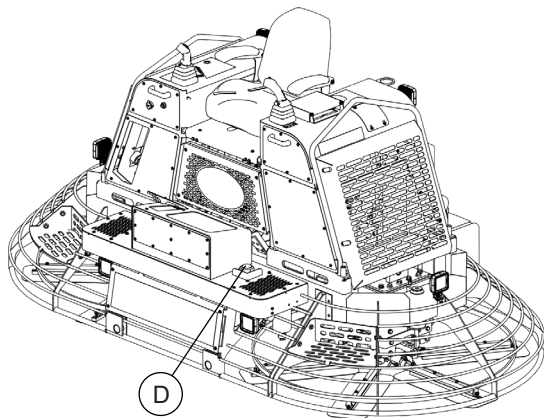
Engine Fuel

NEVER smoke when refueling, diesel fuel is extremely flammable.

DANGER

Fuel that has spilled on a hot engine can cause a fire or explosion. Clean spills immediately.

- 1) Insure machine is on a level surface before doing any maintenance on it.
- 2) The gauge for fuel is in the cap (D)
- 3) Fill to the appropriate amount and reinstall cap.
- 4) Clean up all fuel spills immediately.



NEVER smoke when refueling, diesel fuel is extremely flammable.

NEVER store machine with fuel in the tank when the machine will not be used for an extended period of time.

Poor quality fuel can drastically impact the performance of the machine and cause engine damage.

It is not recommended to use fuel additives.

Radiator/Antifreeze

Check radiator fluids daily.

Hydraulic Hoses and Fittings

Check for leaks daily to insure no hydraulic lines or fittings are losing hydraulic oil.

STARTING ENGINE

NEVER operate the trowel in a confined area or enclosed area that does not provide adequate ventilation and air flow.

DO NOT grab hold of the joysticks to lift yourself onto the trowel. Pulling on the joysticks will weaken them over time. **ALWAYS** use the grab handles to lift yourself on the trowel.

ALWAYS wear eye and hearing protection while operating trowel.

ALWAYS shut the engine down before performing maintenance service on the trowel.

NEVER place hands or feet inside the guard rings while the engine is running.

This trowel is equipped with a seat switch. The trowel will not start unless an operator is sitting in the seat. While the engine can be started or continue to run with the operator off the seat, the rotors will not rotate. The weight of an operator activates a switch within the seat allowing the rotors to turn.

It is recommended that the operation of the Seat Switch be checked prior to performing any operations. Doing this will insure that the switch is working properly for safe operation of the machine.

NEVER disable or disconnect the safety seat switch. It is installed for the operator's safety. Injury may result if it is disabled, disconnected or improperly maintained.

1 After sitting in the operator's seat, insert the key into the ignition switch.

2 Insert the starting key all the way and turn to position "I".

3 Leave the starting key at position "I" until you hear the fuel feed pump switches off (approx. 30 seconds).

4 Turn the starting key to position "II". The start procedure takes longer than normal as air is still in the fuel system.

5 As soon as the engine is running, release the starting key.

- The starting key springs back to position "I" and remains in this position during operation.

NOTE: There is air in the fuel system when starting the engine for the first time/after a filter change. The engine therefore starts in the emergency program (reduced power and speed).

6 Run the engine for approx. 2 minutes in the emergency program to make sure there is no more air in the fuel system.

7 Switch off the engine and leave it switched off for at least 2 minutes. At the next start the engine again runs in the normal program.

NOTE: You must wait at least 30 seconds between a shutdown and restart of the machine engine. If a restart is attempted before 30 seconds a fault (*****) will occur.

SECTION 2 OPERATIONS

Operations (cont'd)

ENGINE THROTTLE

The engine throttle has two primary speed settings: Idle, and Full RPM.

Idle RPM - 900

Full RPM - 2600

The engine will start at idle. If the hydraulic oil has not reached the **Cold Weather Startup** temperature of 65°F, the engine will remain at idle until that temperature is reached.

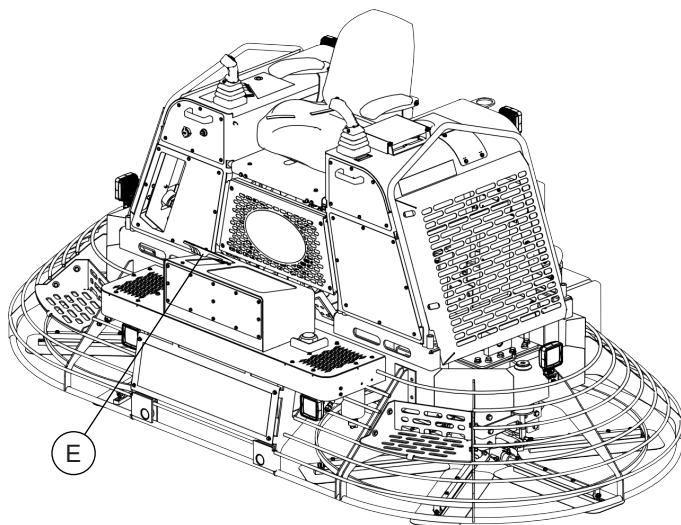
The operator can activate the RPM Toggle to **FULL** during this period, however the machine RPM will not go to full RPM until the oil temperature is reached.

The machine will idle back down if the operator is not seating in the seat. The operator must be in the seat and cold weather startup temperature must be reached before engine full rpm is available.



PUMP STROKE

Stroke is controlled by the foot pedal (**E**) input position from the stroke position sensor.



CRUISE CONTROL

Setting the Cruise Control will set and hold a set pump stroke position.

- 1) Press the cruise control toggle to engage the cruise control.
- 2) Press the cruise control switch again to disengage the cruise control.
- 3) The cruise control can also be disengaged by the operator resuming control of pump stroke by pressing the foot pedal after releasing.
- 4) Cruise control can be disengaged by:
 - Pressing the foot pedal after releasing.
 - Standing up from the operator's seat.
 - Toggling the cruise control toggle switch again.
 - The operator changes the engine speed with the engine RPM toggle switch.
 - Error code is received from engine.



SECTION 2 OPERATIONS

Operations (cont'd)

With the operator in the seat, show them the functions of the joysticks and how to start the machine.

A hard level concrete slab with water on the surface is an ideal place for an operator to practice with the machine. For practice pitch the blades up approximately 1/4 inch on the trailing edge. Start by making the machine hover in one spot and then practice driving the machine in a straight line and making 180 degree turns. Best control is achieved at full engine RPM.

DO NOT use excessive pressure on the joysticks. Excessive pressure does not increase the reaction time of the machine and can damage steering controls.

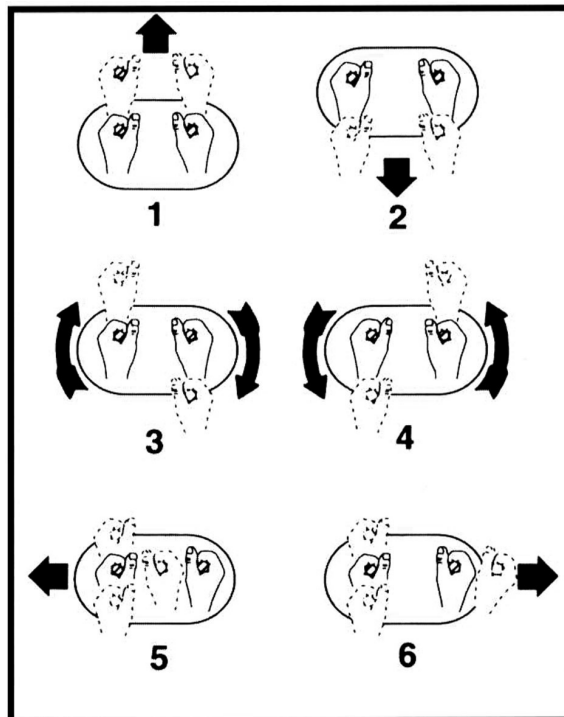
Stopping The Riding Trowel

To stop the trowel's movement, let go of the joysticks. They will return to their neutral position. Also release pressure on the foot pedal.

Steering The Riding Trowel

A slight "feathering motion" forward and backward with the left hand joystick is required to move the machine in a straight path to the left or right while operating the right hand joystick.


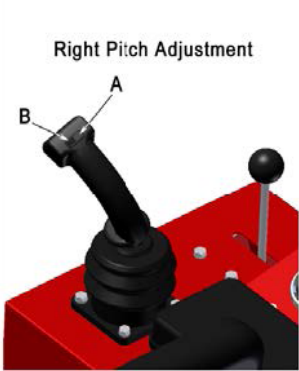
Position	Action
1	Forward
2	Reverse
3	Rotate clockwise
4	Rotate counter clockwise
5	Left sideways
6	Right sideways



Pitch Adjustment

Different pitch angles are needed as you work the different stages of the concrete. See the drawing below. When changing or setting pitch (angle of trowel blades), set the desired degree of pitch on the left side of the machine and then adjust the right side to match.

To increase the pitch, press the pitch control button (a) which is located on top of joystick towards the inside. To decrease the pitch, press the pitch control button (b) which is located on top of joystick towards the outside.

	Working Conditions of Concrete	Suggested Working Pitch
 <p>Left Pitch Adjustment</p>	Stage 1: Wet surface working stage	0°
	Stage 2: Wet plastic working stage	5°
 <p>Right Pitch Adjustment</p>	Stage 3: Plastic working stage	10°
	Stage 4: Semi-hard working stage	15°
	Stage 5: Hard finishing stage (Burnishing)	20°

Dual Pitch Adjustment

- When the front side of the switch is pressed, the pitch of the blades on both sides will increase at the same time.
- When the back side of the switch is pressed, the pitch of the blades on both sides will decrease at the same time



SECTION 3 SERVICE

Maintenance

Periodic Maintenance Schedule

The table below list basic trowel and engine maintenance. Refer to OEM engine manufacturer's Operation Manual for additional information on engine maintenance. A copy of the engine operator's manual was supplied with the machine when it was shipped.

Maintenance Schedule						
Description	Daily	20 Hrs	500 Hrs	1000 Hrs	3000 Hrs	4000 Hrs
Check engine oil level	✓					
Check air filters	✓					
Check radiator fins	✓		✓			
Check radiator coolant	✓					
Control linkage lubrications		✓				
Change engine oil			✓			
Change fuel filters			✓			
Check poly V-belt			✓			
Change oil seperator			✓			
Check all hardware			✓			
Change air filters			✓			
Drain water seperator			✓			
Replace poly V-belt					✓	
Clean entire EGR system						✓
Check for leaks	✓					
Inspect belts				✓		
Inspect wiring				✓		
Change coolant						✓
Inspect coolant hoses				✓		
Inspect battery				✓		
Inspect exhaust				✓		
Inspect catalyst				✓		

Engine Oil

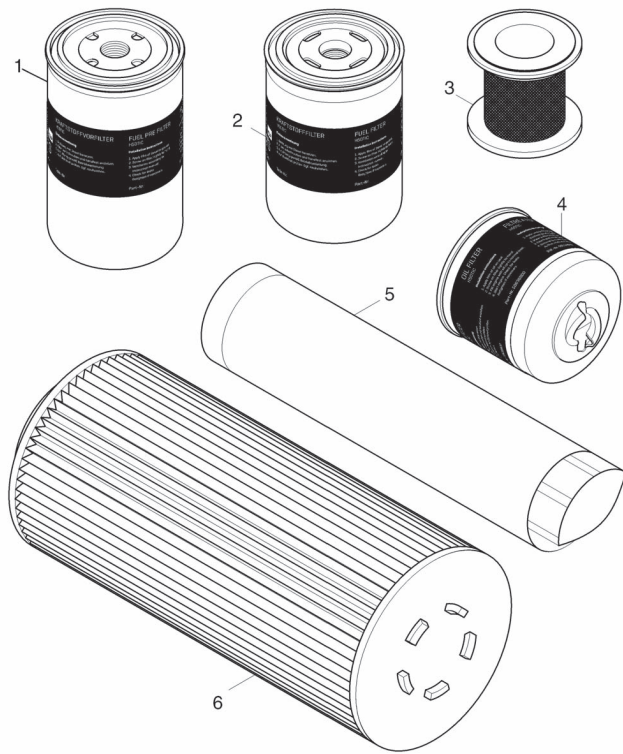
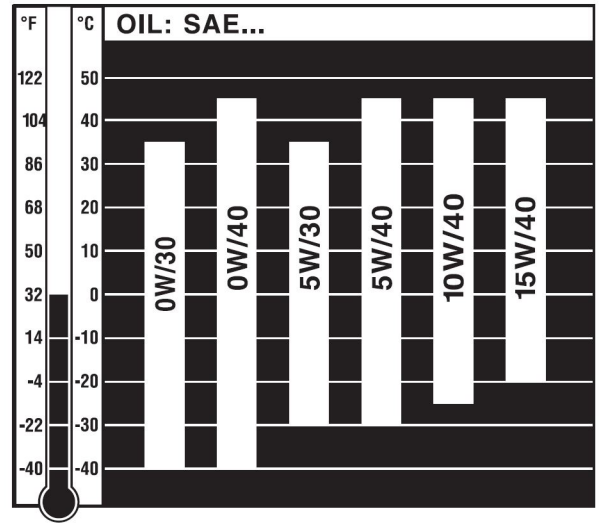
- For general use 15W/40 oil is recommended (6 Qts or up to ~7.4 Qts), ensure that the oil meets the specifications listed on page 47.
- Change the type of engine oil according to the ambient temperature, see "Oil: SAE" figure on page 47.
- When using oil of different brands from the previous one, be sure to drain all the previous oil before adding the new engine oil.

Engine Oil

Oil brands that meet the following specifications are suitable for Hatz Engines with a diesel oxidation catalyst (DOC) :

- ACEA E6 (Recomended)
- ACEA E9
- ACEA C3/C4 (HTHS \geq 3.5 mPA)
- API CK-4 or CJ-4

For more information see the Engine Operator's Manual



Replacement Filters			
Item	Part #	Description	Qty
1	065851	Pre-Fuel Filter	1
2	065852	Fuel Filter	1
3	065853	Oil Seperator	1
4	065854	Oil Filter	1
5	065855	Air Filter - Secondary	1
6	065856	Air Filter - Primary	1

SECTION 3 SERVICE

Hydraulic Filter Service (Y-Strainer/Charge)

DANGER

Hydraulic system service safety:

- **DO NOT** check for leaks with your hands.
- **Ensure that the machine is powered off and the hydraulic system is depressurized.** (There should be no pressure in the system as long as the machine it turned off.)
- If applicable, **DO NOT** service a hot machine. Allow the machine to cool before servicing hydraulic components.

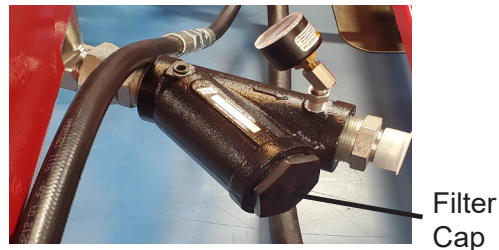
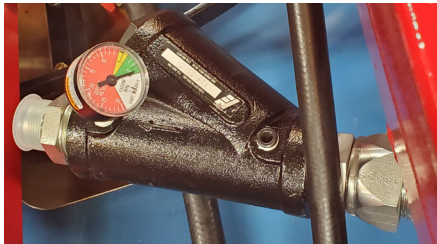
The filters status should be checked weekly or monthly. For the Charge Filter check to see if there is a notification on the display or from the light on the seat frame. Check the pressure gauge on the Y-Strainer filter.

Be sure to use a pan/container to catch any oil that drains when changing the filters, **fluid will drain from the filters.** Either tilt the machine to divert the oil or cap the ports or hoses while servicing the filter. **After changing the filter element make sure that the hydraulic oil is topped off**, the oil should be filled just above the sight glass. Do not overfill the mainframe tank.

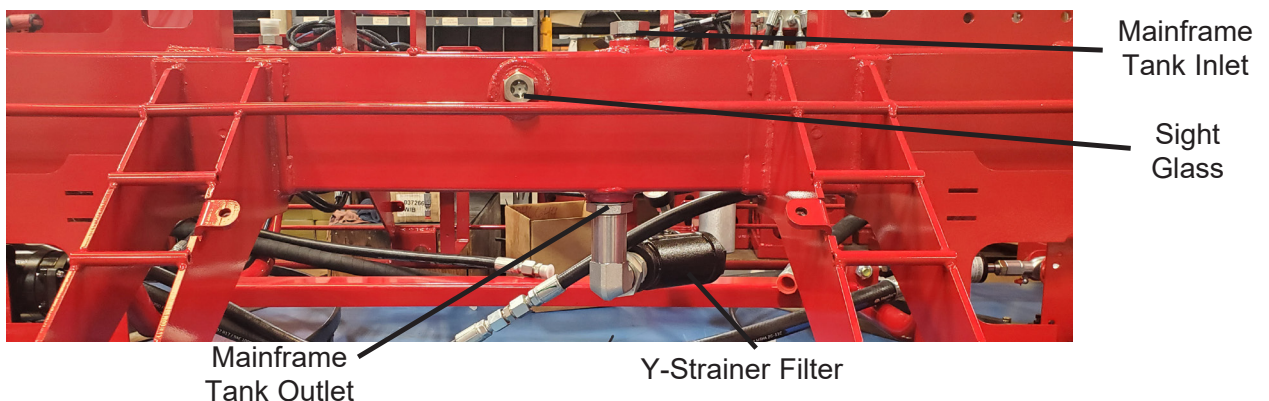
Replace Hydraulic Fluid with Hydraulic Oil 68 (DTE26) or Equivalent. The riding trowel is filled with Philips66 Megaflow AW Hydraulic Oil 68 at the factory.

Y-Strainer Filter

- Y-Strainer Filter. **This filter is located right at the mainframe tank outlet, and it has a pressure gauge to indicate how clogged the filter is. Change the Filter Element if the gauge needle is in the red section.**
- To change the filter element on the Y-Strainer filter, unscrew the hexagonal cap, indicated in the second picture.
- After the cap has been removed the filter element should be accessible. Unscrew/detach the filter element and replace it. Reassemble the filter and filter element in opposite order of disassembly. Filter part number 046472. Filter Element part number 046473



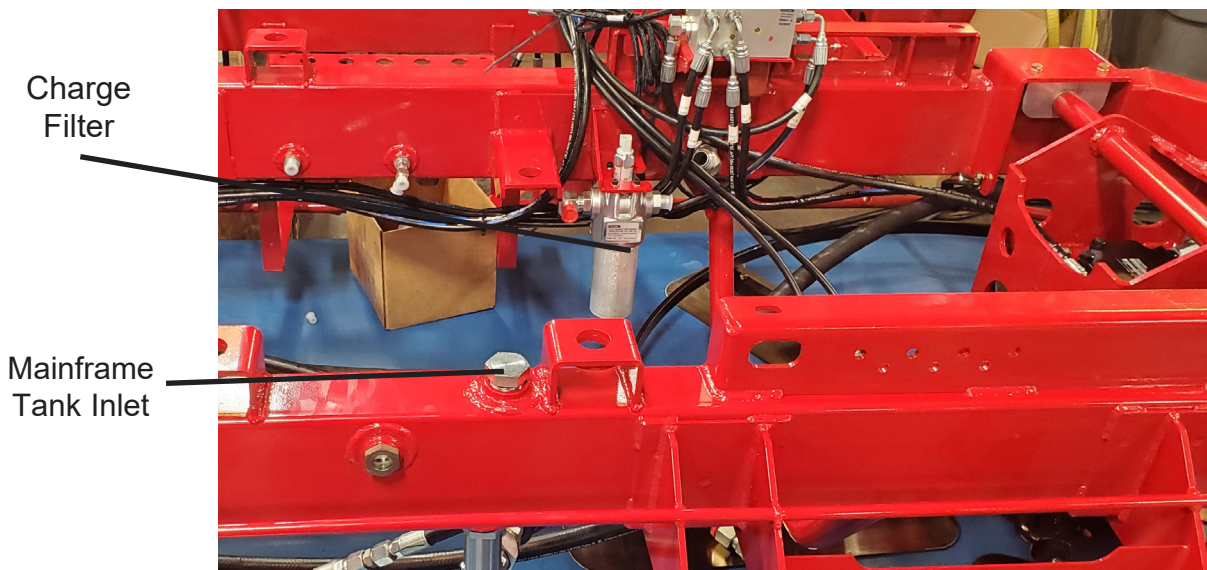
Rear view



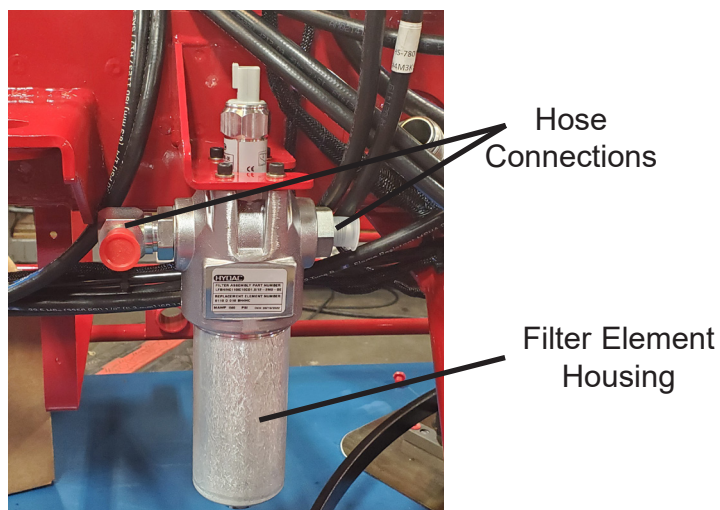
Charge Filter

- Charge Filter. This filter is attached to the mainframe. If this is clogged there will be a light in the right side of the seat frame and/or a signal from the diagnostics display (or Engine Control Unit display). Change the Filter Element if prompted by the display or the light on the seat frame.
- To change the filter element on the Charge filter, unfasten the lower cylindrical housing.
- After the lower housing has been removed the filter element should be accessible. Unscrew the filter element and replace it. Reassemble the filter and filter element in opposite order of disassembly. Filter part number 065141. Filter Element part number 043418.

Front



Rear



SECTION 3 SERVICE

Fault Codes

SPN	FMI	FaultCheckDescription	Fault detection condition	Possible Causes
29	3	Signal Range Check High for APP2	If the signal exceeds the applicable threshold APP_uRaw2SRCHigh_C (2388mV) a signal range violation is detected after the debouncing.	wiring harness or component
29	4	Signal Range Check Low for APP2	If the signal is below the applicable threshold APP_uRaw2SRCLow_C (280mV) a signal range violation is detected after debouncing.	wiring harness or component
91	3	Signal Range Check High for APP1	If the signal exceeds the applicable threshold APP_uRaw1SRCHigh_C (4775mV) a signal range violation is detected after debouncing.	wiring harness or component
91	4	Signal Range Check Low for APP1	If the signal is below the applicable threshold APP_uRaw1SRCLow_C (740mV) a signal range violation is detected after the debouncing.	wiring harness or component
91	11	In case of dual analog accelerator pedal, it is the plausibility check between APP1 and APP2 and in case of potentiometer switch accelerator pedal, it is the plausibility check between APP1 and idle switch	If the permitted maximum for the difference of both the input signals APP_uDiffMax_mp is exceeded this is reported in the DFC_st.DFC_SyncAPP via the DSM.	wiring harness or component
95	17	Low fuel pressure error monitoring	Engine speed Epm_nEng greater or equal to FI_nStrtMonFuelP_C, and Fuel pressure value FI_pFuelP is lesser than the curve output FI_pFuel-Spd_CUR	fuel tank empty, fuel filter blocked, wiring harness or pre supply pump itself defective
95	3	SRC High for Environment Pressure	The sensor raw value is lesser than or equal to FI_SRCFuelP.uMax_C	wiring harness or component
95	4	SRC low for Environment Pressure	The sensor raw value is lesser than or equal to FI_SRCFuelP.uMin_C	wiring harness or component
97	15	Water in fuel detected		Water in fuel detected.
97	17	Fuel Level unplausible		wiring harness or component

Fault Codes (cont'd)

SECTION 3 SERVICE

SPN	FMI	FaultCheckDescription	Fault detection condition	Possible Causes
100	0	Maximum oil pressure error in plausibility check	The oil temperature Oil_tSwmp is equal to or greater than the limit Oil_tLimP_C and the oil pressure Oil_pSwmp is greater than the threshold Oil_pMaxP_mp.	wiring harness or component
100	1	Minimum oil pressure error in plausibility check	The oil pressure Oil_pSwmp is less than the threshold Oil_pMinP_mp.	wiring harness or component
100	3	Oil_uRawPSwmp > Oil_SRCPSwmp.uMax_C (4772mV)	Oil_uRawPSwmp > Oil_SRCPSwmp.uMax_C (4772mV)	wiring harness or component
100	4	Oil_uRawPSwmp < Oil_SRCPSwmp.uMin_C (234mV)	Oil_uRawPSwmp < Oil_SRCPSwmp.uMin_C (234mV)	wiring harness or component
102	3	Diagnostic fault check for SRC high in air pressure upstream of intake valve sensor	The sensor raw signal Air_uRawPIntkVUs (voltage) is above Air_SRCPIntkVUs.uMax_C	wiring harness or component
102	4	Diagnostic fault check for SRC low in air pressure upstream of intake valve sensor	The sensor raw signal Air_uRawPIntkVUs (voltage) is below Air_SRCPIntkVUs.uMin_C	wiring harness or component
102	0	Physical Range Check high for air pressure at the upstream of intake valve sensor	If the signal Air_pSensPIntkVUs is greater than Air_PhysRngPIntkVUs.Max_C for a duration DDRC_DurDeb.Air_tiPhysRngHiPIntkVUsDebDef_C , then a physical range check high error is reported.	Over boost condition, maybe wastgate blocked
102	1	Physical Range Check low for air pressure at the upstream of intake valve sensor	If the signal Air_pSensPIntkVUs is less than Air_PhysRngPIntkVUs.Min_C for a duration DDRC_DurDeb.Air_tiPhysRngLoPIntkVUsDebDef_C , then a physical range check low error is reported.	Under boost, maybe turbo-charger defective

SECTION 3 SERVICE

Fault Codes (cont'd)

SPN	FMI	FaultCheckDescription	Fault detection condition	Possible Causes
102	0	Physical Range Check high for air pressure at the upstream of intake valve sensor	If the signal Air_pSensPIntkVUs is greater than Air_PhysRngPIntkVUs.Max_C for a duration DDRC_DurDeb.Air_tiPhysRngHiPIntkVUsDebDef_C , then a physical range check high error is reported.	Over boost condition, maybe wast-gate blocked
102	1	Physical Range Check low for air pressure at the upstream of intake valve sensor	If the signal Air_pSensPIntkVUs is less than Air_PhysRngPIntkVUs.Min_C for a duration DDRC_DurDeb.Air_tiPhysRngLoPIntkVUsDebDef_C , then a physical range check low error is reported.	Under boost, maybe turbocharger defective
105	3	The sensor raw signal Air_uRawTCACDs (voltage) is above Air_SRCTCACDs.uMax_C (4803mV).	The sensor raw signal Air_uRawTCACDs (voltage) is above Air_SRCTCACDs.uMax_C (4803mV).	wiring harness or component
105	4	The sensor raw signal Air_uRawTCACDs (voltage) is above Air_SRCTCACDs.uMax_C (318mV).	The sensor raw signal Air_uRawTCACDs (voltage) is above Air_SRCTCACDs.uMax_C (318mV).	wiring harness or component
105	0	Physical Range Check high for Charged Air cooler down stream temperature		Physical Range Check high for Charged Air cooler down stream temperature
105	1	Physical Range Check low for Charged Air cooler down stream temperature		Physical Range Check low for Charged Air cooler down stream temperature
107	14	Error path for Clog Detection in Air filter		air filter clogged/ sensor value ok?
107	3	SRC High for Controller Mode Switch		wiring harness or component
107	4	SRC low for Controller Mode Switch		wiring harness or component
108	0	Ambient air pressure sensor range chack max-error		wiring harness or component

Fault Codes (cont'd)

SECTION 3 SERVICE

SPN	FMI	FaultCheckDescription	Fault detection condition	Possible Causes
108	1	Ambient air pressure sensor range check min-error		wiring harness or component
108	3	fault check max signal range violated for ambient air pressure sensor		wiring harness or component
108	4	fault check min signal range violated for ambient air pressure sensor		wiring harness or component
110	15	Engine coolant temperature too high plausibility error	An "ERROR" is reported if the engine coolant temperature CEngDsT_sT_t is greater than an threshold CEngDsT_tMaxT_C.	less cooling water, water pump defective, water cooler blocked
110	17	defect fault check for Absolute plausibility test	coolant temperature did not reach the threshold temperature	sensor value problems
110	18	defect fault check for dynamic plausibility test	rise in coolant is not reached the minimum rise of coolant temperature	sensor value problems
110	0	Physical Range Check high for CEngDsT	The sensed sensor signal CEngDsT_tSens is greater than CEngDsT_PhysRng.Max_C	wiring harness or component
110	1	Physical Range Check low for CEngDsT	The sensed sensor signal CEngDsT_tSens is less than CEngDsT_PhysRng.Min_C	wiring harness or component
110	3	The sensor raw signal CEngDsT_uRaw (voltage) is above CEngDsT_SRC.uMax_C (4957mV).	The sensor raw signal CEngDsT_uRaw (voltage) is above CEngDsT_SRC.uMax_C.	wiring harness or component
110	4	The sensed raw voltage value CEngDsT_uRaw is less than CEngDsT_SRC.uMin_C (359mV).	The sensed raw voltage value CEngDsT_uRaw is less than CEngDsT_SRC.uMin_C.	wiring harness or component
111	17	low coolant level error	If the coolant level is low, i.e. if the message ClntLv_st is set.	-Low coolant level -coolant level sensor defective - wiring harness defctive
157	3	Sensor voltage above upper limit	If the raw sensor voltage RailP_uRaw exceeds the limiting value RailP_SRC.uMax_C (4662,30mV) a fault will be detected. If the uncorrected raw sensor voltage RailP_uRawNoCor_mp exceeds the limiting value RailP_AdcMaxVal_C (4900mV) a fault will be detected.	wiring harness or component

SECTION 3 SERVICE

Fault Codes (cont'd)

SPN	FMI	FaultCheckDescription	Fault detection condition	Possible Causes
157	4	Sensor voltage below lower limit	If the raw sensor voltage RailP_uRaw falls below the limiting value RailP_SRC.uMin_C (250mV) a fault will be detected.	wiring harness or component
167	17	Engine will not start after shutdown	-	Not waiting 30 seconds between engine cycles
168	0	High Battery Voltage indication	The sensor raw signal BattU_uRaw (voltage) is above BattU_uHiBatt_C.	alternator defective or Battery with voltage >12V is used for jump start
168	1	Low Battery voltage indication	The sensor raw signal BattU_uRaw (voltage) is below BattU_uLoBatt_C.	Battery voltage low --> discharged or defective, alternator defective
168	3	The sensor raw signal BattU_uRaw (voltage) is above BattU_uSRCMax_C (4521mV).	The sensor raw signal BattU_uRaw (voltage) is above BattU_uSRCMax_C.	Battery voltage upper limit
168	4	The sensor raw signal BattU_uRaw (voltage) is below BattU_uSRCMin_C (950mV).	The sensor raw signal BattU_uRaw (voltage) is below BattU_uSRCMin_C.	Battery voltage below limit
174	0	Physical Range Check high for fuel temperature	The sensed sensor signal FuelT_tSens is greater than FuelT_PhysRng.Max_C	high engine load with low fuel level and high ambient temperature
174	1	Physical Range Check low for fuel temperature	The sensed sensor signal FuelT_tSens is less than FuelT_PhysRng.Min_C	very cold ambient temperature
174	3	SRC high for fuel temperature sensor	The sensor raw signal voltage FuelT_uRaw is above FuelT_SRC.uMax_C (4933mV).	wiring harness or component
174	4	SRC low for fuel temperature sensor	The sensor raw signal FuelT_uRaw (voltage) is below FuelT_SRC.uMin_C (310mV).	wiring harness or component
175	15	Oil temperature too high plausibility error	The Oil temperature Oil_tSwmp is greater than the threshold Oil_tMaxT_C .	oil extremely hot, maybe misuse of engine (tuning) wiring harness or component
175	0	Physical Range Check high for Oil Temperature	If the signal Oil_tSensSwmp is greater than Oil_PhysRngT.Max_C for a duration DDRC_DurDeb.OilT_tiPhysRngHiTDebDef_C , then a physical range check high error is reported	1) Too high load on engine 2) Sensor misadjusted or wiring harness

Fault Codes (cont'd)

SECTION 3 SERVICE

SPN	FMI	<i>FaultCheckDescription</i>	Fault detection condition	Possible Causes
175	1	Physical Range Check low for Oil Temperature	If the signal Oil_tSensSwmp is smaller than Oil_PhysRngT.Min_C for a duration DDRC_DurDeb. OilT_tiPhysRngLoTDebDef_C , then a physical range check low error is reported	Sensor misadjusted or wiring harness
175	3	SRC High for Oil Temperature	The sensor raw signal Oil_uRawTSwmp (voltage) is above Oil_SRCT.uMax_C (5200.4mV)	wiring harness or component
175	4	SRC low for Oil Temperature	The sensor raw signal Oil_uRawTSwmp (voltage) is below Oil_SRCT.uMin_C (0mV)	wiring harness or component
190	8	In between of several camshaft revolutions there are too many or too less camshaft edges present or the distance or the series of the camshaft edges is unplausible. The defect debounce counter EpmCaS_ctErrSigDef is incremented at each implausible camshaft revolution, reaches the counter the threshold EpmCaS_numErrSigDef_C the error is set. If the monitoring range is left, the debounce counter is reseted.	In between of several camshaft revolutions there are too many or too less camshaft edges present or the distance or the series of the camshaft edges is unplausible. The defect debounce counter EpmCaS_ctErrSigDef is incremented at each implausible camshaft revolution, reaches the counter the threshold EpmCaS_numErrSigDef_C the error is set. If the monitoring range is left, the debounce counter is reseted.	tone wheel defective
190	12	In between of several crankshaft revolutions there is not any camshaft edge present. The defect debounce counter EpmCaS_ctNoSig reaches the threshold EpmCaS_numNoSigDef_C. If the monitoring range is left, the debounce counter is reseted.	In between of several crankshaft revolutions there is not any camshaft edge present. The defect debounce counter EpmCaS_ctNoSig reaches the threshold EpmCaS_numNoSigDef_C. If the monitoring range is left, the debounce counter is reseted.	wiring harness or component
190	2	DFC for camshaft offset angle exceeded	DFC for camshaft offset angle exceeded	wiring harness or camshaft sensor defect or wrong mounting position or tone wheel misadjusted

SECTION 3 SERVICE

Fault Codes (cont'd)

SPN	FMI	FaultCheckDescription	Fault detection condition	Possible Causes
652	3	general short circuit	Short circuit of an injector	wiring harness or injector cylinder.
653	5	open load	Open load error of an injector (interruption of an electric connection)	wiring harness or injector load drop cylinder
653	3	general short circuit	Short circuit of an injector	wiring harness or injector cylinder.
654	5	open load	Open load error of an injector (interruption of an electric connection)	wiring harness or injector load drop cylinder
654	3	general short circuit	Short circuit of an injector	wiring harness or injector cylinder.
677	6	Over temperature error on ECU powerstage for Starter		Over temperature error on ECU powerstage for Starter
677	4	Short circuit to ground error		wiring harness or component
677	5	No load error		wiring harness or component
677	3	Short circuit to battery error		wiring harness or component
976	3	Diagnostic fault check for max error of COM message	The sensed raw value PTOSwt_uRaw is more than PTOSwt_SRC.uMax_C when MoFPTO_swtsigSelCalMsg is equal to 0.	wiring harness or component
976	4	Diagnostic fault check for min error of COM message	The sensed raw value PTOSwt_uRaw is less than PTOSwt_SRC.uMin_C when MoFPTO_swtsigSelCalMsg is equal to 0.	wiring harness or component
976	2	Diagnostic fault check non plausibility of COM message	The sensed raw value PTOSwt_uSens is less than the minimum threshold MoFPTO_uThresCalMsgA[n] or PTOSwt_uSens is more than the maximum threshold MoFPTO_uThresCalMsgA[n+1] (wherein n=0,2,4,6), whenever MoFPTO_swtsigSelCalMsg is equal to 0.	wiring harness or component
1076	5	open load of metering unit output	Detecting an open load fault in the metering unit	wiring harness or component
1076	15	short circuit to battery in the high side of the MeUn		wiring harness or component
1076	17	short circuit to ground in the high side of the MeUn		wiring harness or component

Fault Codes (cont'd)

SECTION 3 SERVICE

SPN	FMI	FaultCheckDescription	Fault detection condition	Possible Causes
1076	12	over teperature of device driver of metering unit	Detection of a metering unit power stage overtemperature	output stage of ECU defect or wiring harness
1076	16	short circuit to battery of metering unit output	Detecting a short circuit low side to battery voltage in the metering unit	wiring harness or component
1076	18	short circuit to ground of metering unit output	Detecting a short circuit low side to ground in the metering unit	wiring harness or component
1108	16	Diagnostic fault check to report the error due to Over Run	The current energising time is greater than the maximum permitted energising time after overrun demand by the driver.	ECU internal fault
1108	15	Diagnostic fault check to report the error due to cooling injection in Over Run	Error in the plausibility of current energising time when Over Heat Protection injection active with maximum permitted energising time	ECU internal fault
1109	11	Injection cut off demand (ICO) for shut off coordinator	The un-debounced defect detection takes place in the standard ICO mode EngICO_stMode_C=0) with an ICO (Mo_stlCOMsg) requested and an engine speed Epm_nEng greater than EngICO_nCtOffStdICO_C (1700rpm). The un-debounced defective detection takes place in the comfortable ICO mode (EngICO_stMode_C = 1) with requested ICO (Mo_stlCOMsg) and an engine speed Epm_nEng greater than EngICO_nCtOffCmftlCOHard_C (1700rpm).	ECU internal defect
1136	3	SRC high for ECU temperature sensor	The Sensed raw voltage value TECU_uRaw_[%] is greater than TECU_SRC%.uMax_C	ECU internal fault
1136	4	SRC low for ECU temperature sensor	The Sensed raw voltage value TECU_uRaw_[%] is less than TECU_SRC%.uMin_C	ECU internal fault

SECTION 3 SERVICE

Fault Codes (cont'd)

SPN	FMI	FaultCheckDescription	Fault detection condition	Possible Causes
1244	12	over teperature of device driver of pressure control valve		wiring harness or component
1244	5	open load of pressure control valve output		wiring harness or component
1244	15	short circuit to battery in the high side of the pressure control valve		wiring harness or component
1244	17	short circuit to ground in the high side of the pressure control valve		wiring harness or component
1244	16	short circuit to battery of pressure control valve output		wiring harness or component
1244	18	short circuit to ground of the pressure control valve output		wiring harness or component
1244	4	signal range check high error of pressure control valve AD-channel		wiring harness or component
1244	3	signal range check low error of pressure control valve AD-channel		wiring harness or component
1769	11	Overspeed detection in component engine protection	Exceeding of the engine-speed threshold EngPrt_nOvrSpd_C.	overspeed caused by driver
2791	18	Permanent governor deviation for valve	<p>The negative limit for the governor deviation EGRVlv_GovDvtMon-Cal.rDvtMax_C has been exceeded and</p> <ul style="list-style-type: none"> - The governor deviation has been persistent longer than the applicable time from EGRVlv_tiDebGovDvtDef_CUR. - The control valve has not been detected as jammed. - The position governor is active. - The control valve is not set to a mechanical stop. - No system error is reported, i.e. the bit DINH_stFld.Fld_EGRVlvGovOn.5 is set. 	EGR valve dirty or defective

Fault Codes (cont'd)

SECTION 3 SERVICE

SPN	FMI	FaultCheckDescription	Fault detection condition	Possible Causes
2791	16	Permanent governor deviation for valve	The negative limit for the governor deviation EGRVlv_GovDvtMon-Cal.rDvtMin_C has been exceeded and - The governor deviation has been persistent longer than the applicable time from EGRVlv_tiDebGovDvtDef_CUR. - The control valve has not been detected as jammed. - The position governor is active. - The control valve is not set to a mechanical stop. - No system error is reported, i.e. the bit DINH_stFld.Fld_EGRVlvGovOn.5 is set.	EGR valve dirty or defective
2791	13	DFC for valve position sensor voltage SRC high	The sensor raw signal EGRVlv_uRaw (voltage) is above EGRVlv_SRC.uMax_C (4622mV) .	wiring harness or component
2791	14	DFC for valve position sensor voltage SRC low	The sensor raw signal EGRVlv_uRaw (voltage) is below EGRVlv_SRC.uMin_C (384mV).	wiring harness or component
2791	20	DFC for valve position sensor physical SRC high	$EGRVlv_SensCal.uRawMaxOpn_C / EGRVlv_SensCal.uRawMaxClsd_C < EGRVlv_uRaw < EGRVlv_SensCal.uMax_C$	EGRVlv missadjusted or dirty
2791	21	DFC for valve position sensor physical SRC low	$EGRVlv_SensCal.uRawMinClsd_C / EGRVlv_SensCal.uRawMinOpn_C > EGRVlv_uRaw > EGRVlv_SensCal.uMin_C$	EGRVlv missadjusted or dirty
2802	11	EEP Read Error based on the error for more blocks	If sector erase (only Flash) cannot be performed or successfully completed an error will be registered.	ECU internal fault

SECTION 3 SERVICE

Fault Codes (cont'd)

SPN	FMI	FaultCheckDescription	Fault detection condition	Possible Causes
3509	2	Error Sensor supplies 1	The sensor supply voltage is monitored by an HW comparator. If the sensor supply voltage lies outside of the switching thresholds a fault is output. The detection thresholds are defined by the hardware and cannot be calibrated.	1.) wiring harness 2.) component defect: APP2 (Accelerator Pedal 2 sensor) A/C compressor pressure sensor DPF pressure sensor Clutch sensor BPA sensor (Boost pressure actuator position sensor) EGR valve position sensor Throttle plate position sensor Neutral gear detection sensor Break boost vacuum pressure sensor 3.) ECU internal defect
3510	2	Error Sensor supplies 2	The sensor supply voltage is monitored by an HW comparator. If the sensor supply voltage lies outside of the switching thresholds a fault is output. The detection thresholds are defined by the hardware and cannot be calibrated.	1.) wiring harness 2.) component defect: APP1 (Accelerator Pedal 1 sensor) CaS (Camshaft sensor) BPS (Boost pressure sensor) RDS (Rail pressure sensor) Analogue oil pressure sensor Engine cylinder pressure sensors 3.) ECU internal defect
3511	2	Error Sensor supplies 3	The sensor supply voltage is monitored by an HW comparator. If the sensor supply voltage lies outside of the switching thresholds a fault is output. The detection thresholds are defined by the hardware and cannot be calibrated.	1.) wiring harness 2.) component defect: Crankshaft position sensor Rail pressure sensor 3.) ECU internal defect
3597	3	Short circuit to battery error at actuator relay		ECU internal fault
3597	4	Short circuit to ground error at actuator relay		ECU internal fault
3598	3	Short circuit to battery error at actuator relay		ECU internal fault
3598	4	Short circuit to ground error at actuator relay		ECU internal fault
5324	11	Array of DFCs for failure in i+1th Glow Plug		glowing problems

Fault Codes (cont'd)

SECTION 3 SERVICE

SPN	FMI	FaultCheckDescription	Fault detection condition	Possible Causes
5325	11	Array of DFCs for failure in i+1th Glow Plug		glowing problems
5325	4	Array of DFCs for short circuit in i+1th Glow Plug		glowing problems
5326	11	Array of DFCs for failure in i+1th Glow Plug		glowing problems
5326	4	Array of DFCs for short circuit in i+1th Glow Plug		glowing problems
5327	11	Array of DFCs for failure in i+1th Glow Plug		glowing problems
5327	4	Array of DFCs for short circuit in i+1th Glow Plug		glowing problems
20201	19	SPI/COM-Errors of the Cy320	When any peripheral monitoring function reports an error	ECU internal fault
20220	2	Diagnostic fault check to report the NTP error in ADC monitoring	Error in the check with the no-load test pulse operation.	ECU internal fault
20220	11	Diagnostic fault check to report the ADC test error	Implausible ADC test errors It is checked whether MoCADC_ctDebTst >= MoCADC_ctDebTst_C (15 Events). If yes the error is set. The diagnosis is carried out in the 40-ms interval.	ECU internal fault
20220	14	Diagnostic fault check to report the error in Voltage ratio in ADC monitoring	It is checked whether MoCADC_ctDebVltgRatio >= MoCADC_ctDebVltgRatio_C (15 Events). If yes the error is set. The diagnosis is carried out in the 40-ms interval.	ECU internal fault
20221	11	Diagnostic fault check to report errors in query-/response-communication	If there is no active shut-off path test (MoCSOP_stRdyMsg == TRUE) and the error counter MoCCom_ctErrMM or MoCCom_ctErrFC is >= MOCCOM_MM_STATUS_LIMIT_ERRORS (5) there is an undebounced defect detection	ECU internal fault

SECTION 3 SERVICE

Fault Codes (cont'd)

SPN	FMI	FaultCheckDescription	Fault detection condition	Possible Causes
20222	11	Diagnostic fault check to report errors in SPI-communication	If the error counter MoCCom_ctErrSPI is greater than 0 and there is no active shut-off path test (MoCSOP_stRdyMsg != FALSE) there is an undebounced defect detection.	ECU internal fault
20223	11	Diagnostic fault check to report multiple error while checking the complete ROM-memory	If multiple errors are detected while testing the complete ROM-memory (irreversible error bit 2 in MoCMem_st is set) there is an undebounced defect detection.	ECU internal fault
20224	11	Diagnostic fault check to report the accelerator pedal position error	Implausible accelerator pedal voltage. The two voltage values (ADC_VAL1 ADC_VAL2) detected by the accelerator pedal are not plausible to each other.	ECU internal fault
20225	11	Diagnostic fault check to report the engine speed error	Implausible engine speed. The engine speed value calculated in level 2 (MoFESpd_nEngL2_mp) and Epm_nEngLRes (engine speed from level 1) are not plausible to each other.	ECU internal fault
20226	11	Diagnostic fault check to report the plausibility error between level 1 energizing time and level 2 information	Implausible injection quantity. It is tested if MoFInjDat_ctDebETErr >= MoFInjDat_ctDebETErr_C (5 Events). In case of this the error is set. This diagnosis is processed in the 40ms interval.	ECU internal fault

Fault Codes (cont'd)

SECTION 3 SERVICE

SPN	FMI	FaultCheckDescription	Fault detection condition	Possible Causes
20227	11	Diagnostic fault check to report the error due to plausibility between the injection begin v/s injection type	Implausible start of energising angles. It is tested if MoFlnjDat_ctDebPhiErr >= MoFlnjDat_ctDebPhiErr_C (5 Events). In case of this the error is set. This diagnosis is processed in the 40ms interval.	ECU internal fault
20228	11	Diagnostic fault check to report the error due to non plausibility in ZFC	Implausible energising times. The energising times of the zero fuel quantity calibration ZFC MoFlnjDat_tiPi-11ZFCETCor MoFlnjDat_tiPi12ZFCETCor and MoFlnjDat_tiPi13ZFCETCor are tested on their plausible value ranges.	ECU internal fault
20229	11	Diagnosis fault check to report the demand for normal mode due to an error in the Pol2 quantity	Implausible Pol2 efficiencies. The efficiency of Pol2 MoFMode_facPol2Eff_mp is tested of its plausible value range. Or an unplausibility is detected during monitoring of the operation mode resp. ramp time counter transgression.	ECU internal fault
20229	14	Diagnosis fault check to report the error to demand for an ICO due to an error in the Pol2 shut-off	Error in the Pol2 shut-off. The quantity MoFQntCor_qPol2 is tested of its shut-off value in normal mode.	ECU internal fault
20230	11	Diagnosis fault check to report the error to demand for an ICO due to an error in the Pol3 efficiency factor	Implausible Pol3 efficiencies. The efficiency of Pol3 MoFlnjDat_facPol3EffSet is tested of its plausible value range.	ECU internal fault

SECTION 3 SERVICE

Fault Codes (cont'd)

SPN	FMI	FaultCheckDescription	Fault detection condition	Possible Causes
20231	11	Diagnostic fault check to report the error due to injection quantity correction	Implausible wave correction parts of the injection quantity correction. The plausibility is displayed by the measuring points MoFQntCor_st-Pil1ErrAct_mp MoFQntCor_st-MI1ErrAct_mp and MoFQntCor_stPol2ErrAct_mp.	ECU internal fault
20232	11	Diagnostic fault check to report the plausibility error in rail pressure monitoring	The rail pressure of level 1 is checked after a calibratable ramp debounce of MoFRailP_ctRmp_C (240ms) in case of a SRC error. If the value lies outside a calibratable window an irreversible error is detected an reported to the DSM after an error debouncing of MoFRailP_ctDebErr_C (760ms). Also in case of a rail pressure gradient error reported by the level 1 the error is reported after a debounce time MoFRailP_ctDebGradMax_C (2550ms). Additionally the error will be reported after a debounce time MoFRailP_ctDebGradMax_C if level 2 detects a gradient error and level 1 is not reporting it.	ECU internal fault
20233	11	Diagnostic fault check to report the error due to torque comparison	FStSys_stStrtRIsCAN_mp = TRUE).	ECU internal fault
20234	11	Diagnosis of curr path limitation forced by ECU monitoring level 2	The setpoint path of the rail pressure control (PthLead_trqInrCurr) is limited by the limitation torque (EngTrqPtd_trqLim) of the functional control unit monitoring.	ECU internal fault

Fault Codes (cont'd)

SECTION 3 SERVICE

SPN	FMI	<i>FaultCheckDescription</i>	Fault detection condition	Possible Causes
20234	20	Diagnosis of lead path limitation forced by ECU monitoring level 2	The setpoint path of the air system (PthLead_trqInrLead) is limited by the limitation torque (EngTrqPtd_trqLim) of the functional control unit monitoring.	ECU internal fault
20234	21	Diagnosis of set path limitation forced by ECU monitoring level 2	The quantity setpoint path (Pth-Lead_trqInrSet) is limited by the limitation torque (EngTrqPtd_trqLim) of the functional control unit monitoring.	ECU internal fault
20238	11	Diagnostic fault check to report "WDA active" due to errors in query-/response communication	In the case of a non active shut-off path test (MoCSOP_stActMsg == FALSE) whose debounce OCWDA_CTDEBSOPNOTACTV* 10ms has expired (counter OCWDA_ct-DebSOPNotActv = 0) and an active WDA wire a defect detection takes place.	ECU internal fault
20238	4	Diagnostic fault check to report "ABE active" due to undervoltage detection	In the case of a non active shut-off path test (MoCSOP_stActMsg == FALSE) whose debounce OCWDA_CTDEBSOPNOTACTV* 10ms has expired (counter OCWDA_ct-DebSOPNotActv = 0) and an active ABE wire due to undervoltage there is an undebounced defect detection after the battery voltage Bat-tU_u keeps greater than OCWDA_uBattMin_C (8V) longer than the debounce time OCWDA_CTUBATTMX(100ms).	ECU internal fault

SECTION 3 SERVICE

Fault Codes (cont'd)

SPN	FMI	FaultCheckDescription	Fault detection condition	Possible Causes
20238	3	Diagnostic fault check to report "ABE active" due to overvoltage detection	In the case of a non active shut-off path test (MoCSOP_stActMsg == FALSE) whose debounce OCWDA_CT-DEBSOPNOTACTV* 10ms has expired (counter OCWDA_ctDebSOPNotActv = 0) and an active ABE wire due to overvoltage a defect detection takes place.	ECU internal fault
20238	14	Diagnostic fault check to report "WDA/ABE active" due to unknown reason	In the case of a non active shut-off path test (MoCSOP_stActMsg == FALSE) whose debounce OCWDA_CTDEBSOPNOTACTV* 10ms has expired (counter OCWDA_ctDebSOPNotActv = 0) and an active ABE wire due to undervoltage there is an undebounced defect detection after the battery voltage BatU_u keeps greater than OCWDA_uBattMin_C (8V) longer than the debounce time OCWDA_CTUBATTMX (100ms).	ECU internal fault
20251	11	Visibility of SoftwareResets in DSM	The evaluation of the reset reason will be done after every reset. Depending on the configured visibility of the current reset one of the fault checks in the array will be set.	ECU internal fault
20251	20	Visibility of SoftwareResets in DSM	The evaluation of the reset reason will be done after every reset. Depending on the configured visibility of the current reset one of the fault checks in the array will be set.	ECU internal fault

Fault Codes (cont'd)

SECTION 3 SERVICE

SPN	FMI	FaultCheckDescription	Fault detection condition	Possible Causes
20251	21	Visibility of SoftwareResets in DSM	The evaluation of the reset reason will be done after every reset. Depending on the configured visibility of the current reset one of the fault checks in the array will be set.	ECU internal fault
20276	11	Diagnostic fault check to report the remote accelerator pedal position error	Implausible accelerator pedal voltage. The two voltage values (ADC_VAL1, ADC_VAL2), detected by the accelerator pedal, are not plausible to each other. If RMTAPP with LIS is used, defect is detected if there is a implausibility with LIS and RMTAPP1 voltage.	ECU internal fault
20282	5	Open load error for powerstage	Open Load error Monitoring for TLE7209/CJ230	wiring harness or component
20282	3	Short circuit to battery on Out1 error for H-bridge	Short Circuit to Battery at Out1 of TLE7209/CJ230 error	wiring harness or component
20282	3	Short circuit to battery on Out2 error for H-bridge	Short Circuit to Battery at Out2 of TLE7209/CJ230 error	wiring harness or component
20282	4	Short circuit to ground on Out1 error for H-bridge	Short Circuit to Ground at Out1 of TLE7209/CJ230 error	wiring harness or component
20282	4	Short circuit to ground on Out2 error for H-bridge	Short Circuit to Ground at Out2 of TLE7209/CJ230 error	wiring harness or component
20282	12	Over temperature error for H-bridge	Over Temperature error Monitoring for TLE7209/CJ230	wiring harness component or ECU internal fault
20288	21	DFC for coding error when selected coding is not working		glowing problems
20288	22	DFC for faulty diagnostic data transmission or protocol error		glowing problems
20288	2	DFC for coding error when different coding words were received in a coding cycle		glowing problems
20288	2	No load error for Low Voltage System		glowing problems
20288	5	Over temperature error on ECU powerstage for Glow plug Low Voltage System		glowing problems

SECTION 3 SERVICE

Fault Codes (cont'd)

SPN	FMI	FaultCheckDescription	Fault detection condition	Possible Causes
20288	3	Short circuit to battery error for Low Voltage System		glowing problems
20288	4	Short circuit to ground error for Low Voltage System		glowing problems
20288	14	DFC for T30 missing error in GCU-T		glowing problems
20288	23	DFC for glow module error in GCU-T		glowing problems
20290	11	Loss of synchronization sending bytes to the MM from CPU.	Irreversible error bit 5 set in MoCSOP_st (counter MoCSOP_ctErrMMRespByte > MOCSOP_MM_RESPBYTE_RESET_ERROR(10) within the SOP test) and state MOCSOP_STEP_ERROR reached due to time out.	ECU internal fault
20290	20	DFC to set a torque limitation once an error is detected before MoC-SOP's error reaction is set	If an error was found by the SOP test but additionally the injector diagnose reported an error (Fld_Mo-CSOPInjDiagErr or Fld_MoC-SOPInjDiagDeb are blocking) then only the test flag of every MoC-SOP DFC will be set. Besides the error bits of DFC_MoCSOPErrorNoChk will be set.	ECU internal fault
20290	21	Wrong set response time	Irreversible error bit 8 set in MoC-SOP_st (counter MoCSOP_ctErrrRespTime > MOCSOP_MM_RESPTIME_RESET_ERRORS(2) within the SOP test) and state MOCSOP_STEP_ERROR reached due to time out.	ECU internal fault
20290	22	Too many SPI errors during MoC-SOP execution.	Irreversible error bit 6 set in MoC-SOP_st (counter MoCSOP_ctErrSPI >= MOCSOP_SPI_RESET_ERRORS(16) within the SOP test) and state MOCSOP_STEP_ERROR reached due to time out.	ECU internal fault

Fault Codes (cont'd)

SECTION 3 SERVICE

SPN	FMI	<i>FaultCheckDescription</i>	Fault detection condition	Possible Causes
20290	23	Diagnostic fault check to report the error in undervoltage monitoring	Irreversible error bit 3 set in MoCSOP_st (counter MoCSOP_ctDebPSDia >= MoCSOP_ctDebPSDia_C during under voltage detection of the SOP test).	ECU internal fault
20290	23	Diagnostic fault check to report that WDA is not working correct	Irreversible error bit 1 set in MoCSOP_st (for example counter MoCSOP_ctDebSOPTst >= MoCSOP_ctDebSOPTst_C (66 Events) or (MoCSOP_ctDebPSDia < MoCSOP_ctDebPSDia_C (2 Events)) AND (MoCSOP_ctCylNum >= MoFInjDat_numCyl_C (4)) during the MM SOP test).	ECU internal fault
20290	25	OS timeout in the shut off path test. Failure setting the alarm task period.	Irreversible error bit 7 set in MoCSOP_st (counter MoCSOP_ctErrOSTimeout > MOCSOP_MM_OSTIMEOUT_RESET_ERRORS(2) within the SOP test) and state MOCSOP_STEP_ERROR reached due to time out.	ECU internal fault
20290	25	Diagnostic fault check to report that the positive test failed	Irreversible error bit 10 set in MoCSOP_st (bit MOCSOP_RSLTRDY_BP(0) of the return value from InjVlv_SOPTst() set to one, and bit MOCSOP_SUCCESS_BP(1) set to zero).	ECU internal fault
20290	25	Diagnostic fault check to report the timeout in the shut off path test	Irreversible error bit 0 set in MoCSOP_st (counter MoCSOP_ctDebSOPTst > MoCSOP_ctDebSOPTst_C (66 Events) during SOP test).	ECU internal fault

SECTION 3 SERVICE

Fault Codes (cont'd)

SPN	FMI	FaultCheckDescription	Fault detection condition	Possible Causes
20290	3	Diagnostic fault check to report the error in overvoltage monitoring	Irreversible error bit 2 set in MoC-SOP_st (counter MoCSOP_ct-DebPSDia >= MoCSOP_ctDeb-PSDia_C (2 Events) during over voltage detection of the SOP test).	ECU internal fault
22040	19	Timeout Error of CAN-Receive-Frame TSC1TE	Timeout of TSC1_TE message. The message is not received for 40 ms (TimeoutCount = 4, selected task cycle = 10 ms, FRMSCH_RXMODE1) and the defect debouncing time DDRC_DurDeb.Com_tiTSC1TETODebDef_C is passed and the TSC1 message is enabled and there is no busoff (i.e Com_stSAEJ1939RxEnbl[12].6 is set to 1)	CAN transmitter DPF System
22058	19	Reported SPI and COM-Errors of a Cy146		ECU internal fault
23350	4	short circuit	Short circuit in injection bank 0 (all injectors of the same bank can be affected)	wiring harness or injector short circuit.
23352	4	short circuit	Short circuit in injection bank 1 (all injectors of the same bank can be affected)	wiring harness or injector short circuit.
23354	12	CY33X is defect	Chip error in the CY33x power stage component	ECU internal fault
23550	12	Defective T50 switch	The debounced signal is high (T50_st == 1) for a period longer than DDRC_DurDeb.T50_tiErr-DebDef_C (50ms)	switch defective or is active for a long time

Fault Codes (cont'd)

SECTION 3 SERVICE

SPN	FMI	FaultCheckDescription	Fault detection condition	Possible Causes
23613	0	maximum positive deviation of rail pressure exceeded	If the rail pressure governor deviation Rail_pDvt exceeds the limiting value based on the engine speed Rail_pMeUnDvtMax_CUR an error will be detected.	1.) Leakage in the high pressure section 2.) injection nozzle stuck in open position 3.) worn high pressure pump 4.) worn injector (to high injector backflow quantity) 5.) fuel filter clogged up 6.) PSP (electric pre-supply pump) output too low
23613	24	leakage is detected based on fuel quantity balance	If the high pressure pump delivery quantity (MeUn_dvolSet) exceeds the plausibility limit of the volume flow balance (evaluated over the product life and supplemented to include tolerances) Rail_dvolMon-Max_mp, an error will be detected.	Maladjusted rail pressure sensor, defective high pressure pump, leakage, Possible error in the low pressure stage, Backflow too low
23613	1	If the rail pressure governor deviation Rail_pDvt falls below the limiting value Rail_pMeUnDvtMin_CUR and if the CP3 delivery quantity MeUn_dvolSet falls to the threshold Rail_MeUnMon.dvolSetMin_C (-350 mm ³ /s) an error will be detected.	If the rail pressure governor deviation Rail_pDvt falls below the limiting value Rail_pMeUnDvt-Min_CUR and if the CP3 delivery quantity MeUn_dvolSet falls to the threshold Rail_MeUnMon.dvolSet-Min_C an error will be detected.	1.) Metering unit is stuck in open position 2.) zero delivery throttle clogged up 3.) metering unit without power due to electrical error. 4.) pressure after zero-delivery throttle too high.
23613	2	If the rail pressure RailP_pFit exceeds the limiting value Rail_MeUnMon.pFitMax_C (1.750.000 hPa) an error will be detected.	If the rail pressure RailP_pFit exceeds the limiting value Rail_MeUnMon.pFitMax_C an error will be detected.	1.) Metering unit is stuck in open position 2.) zero delivery throttle clogged up 3.) metering unit without power due to electrical error. 4.) pressure after zero-delivery throttle too high. 5.) very last action: change ECU
23614	20	maximum positive deviation of rail pressure exceeded		maximum positive deviation of rail pressure exceeded
23614	22	maximum negative rail pressure deviation with closed pressure control valve exceeded		maximum negative rail pressure deviation with closed pressure control valve exceeded
23614	0	maximum rail pressure exceeded		maximum rail pressure exceeded

SECTION 3 SERVICE

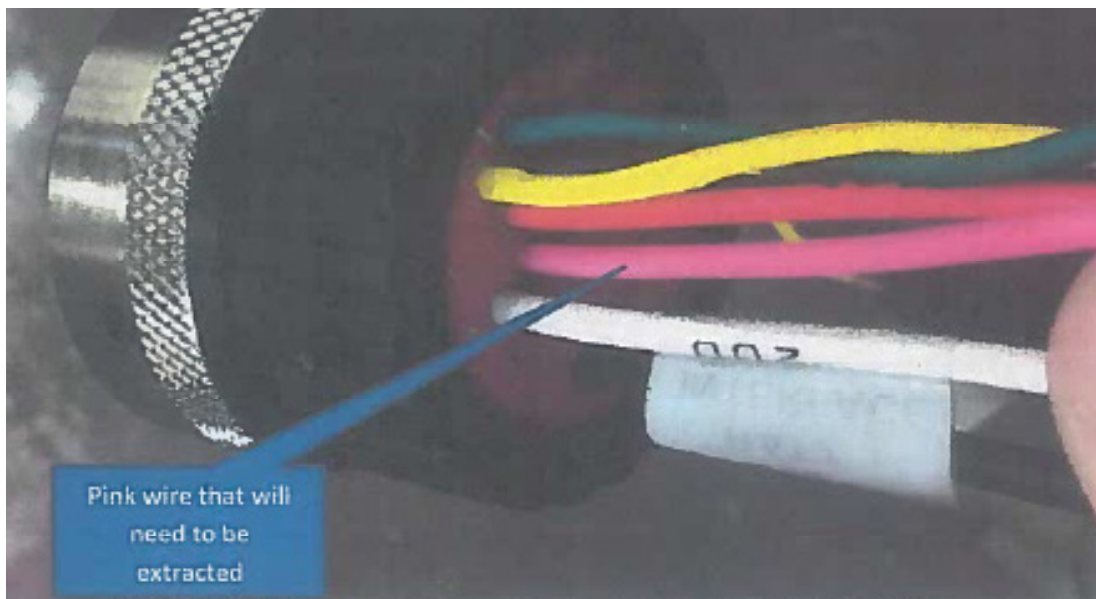
Fault Codes (cont'd)

SPN	FMI	FaultCheckDescription	Fault detection condition	Possible Causes
23614	1	maximum rail pressure exceeded (second stage)		maximum rail pressure exceeded (second stage)
23895	13	check of missing injector adjustment value programming	<p>Detection if the monitoring for missing or faulty programming of the injector adjustment values is active and:</p> <ul style="list-style-type: none"> • the checksum of the injector adjustment code words is not correct or • the basic correction quantity in at least one injector checkpoint has exceeded the admissible limits or • no injector adjustment values could be read due to faulty EEPROM access. 	IMA not programmed
23896	13	check of missing injector adjustment value programming		IMA not programmed
23897	13	check of missing injector adjustment value programming		IMA not programmed
23898	13	check of missing injector adjustment value programming		IMA not programmed
23906	5	open load of pre-supply pump output		wiring harness or component
23906	12	Over temperature error on ECU powerstage for Pre supply pump		ECU internal fault
23906	3	short circuit to battery of pre-supply pump output		wiring harness or component
23906	4	short circuit to ground of pre-supply pump output		wiring harness or component
24000	11	function monitoring: fault in the monitoring of the start control		ECU internal fault
24000	0	Error path SPN1 matching of DM1DCU message	The error is set in this DFC if received SPN number match with Com_numDM1DCUSPN1_CA	CAN transmitter

1. If you notice a Fatal Alarm, Fail Mode Alternator Voltage on you Can plus 620 On Board Diagnostic monitor this is more than likely due to an update from Hatz engine company removing a diode out of the alternator circuit. Work instructions have been created to resolve this issue to get your machine back up and running.



2. You will need a terminal release tool to extract the pink wire form the connector. Pictured above is the Tool set used at AEC to extract the Pink wire from connector PN#4461.



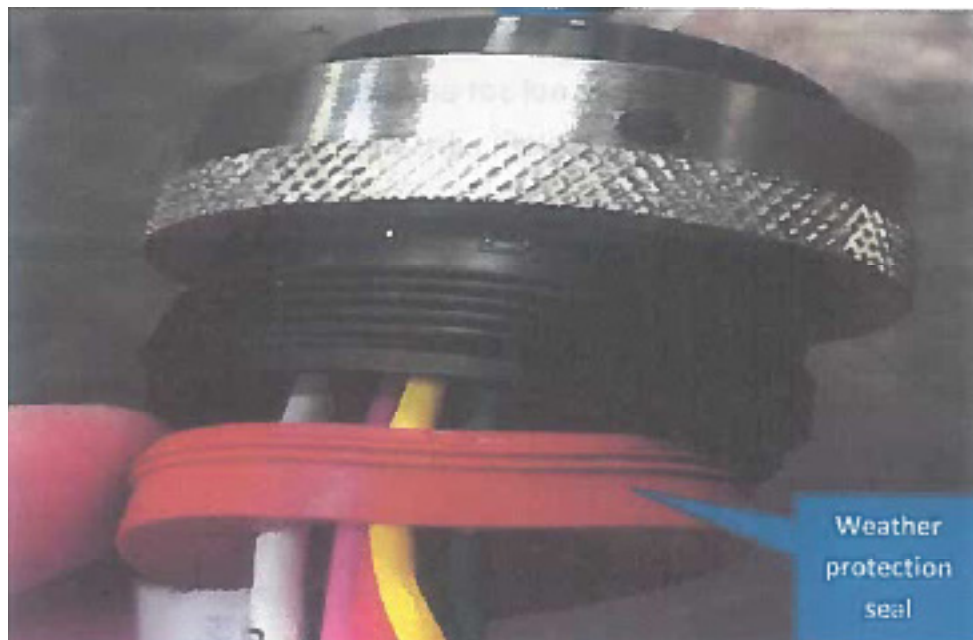
3. Pictured is the Pink wire at the bottom end of the connector.

SECTION 3 SERVICE

Fail Mode Alternator cont.



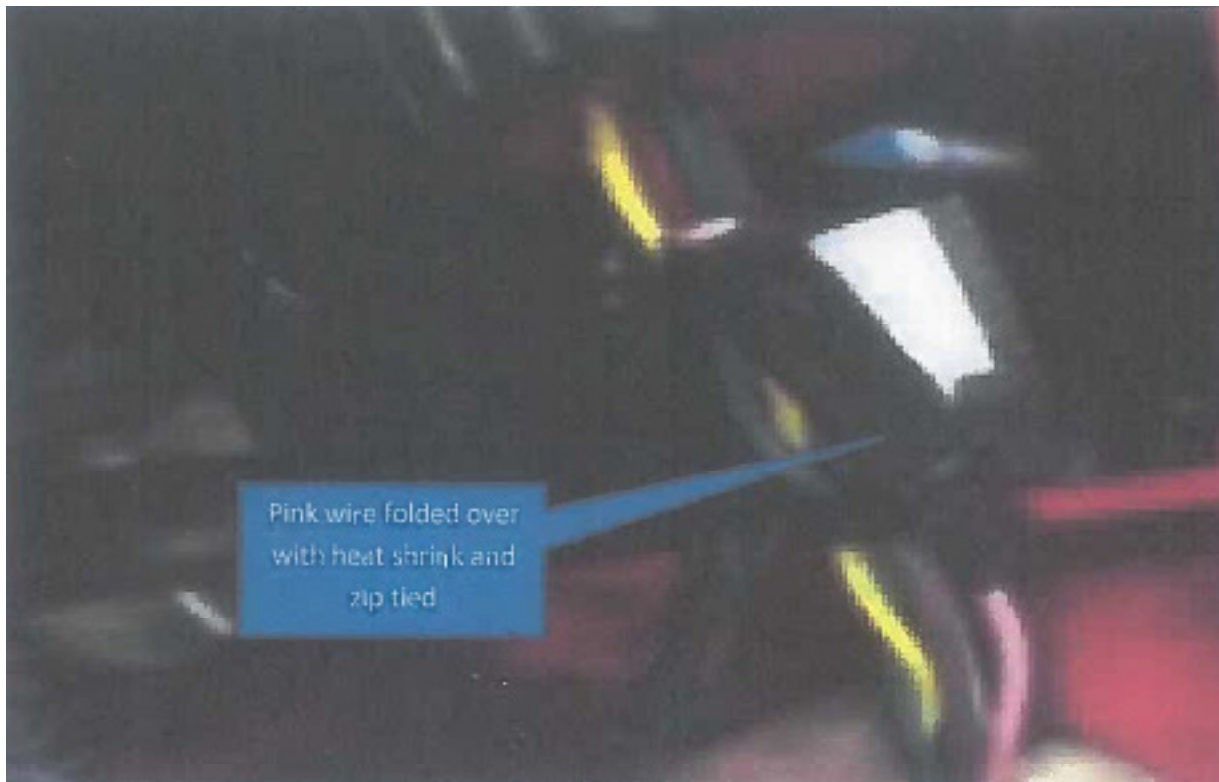
4. Unscrew weather protector seal cap to remove brown weather protector seal.



5. After unscrewing cap to access weather protection seal, pull the seal back.



6. Remove extraction tool that has the letter "d" engraved in the side of the handle from the Terminal release tool set and place over Pink wire terminal pin by following the wire and pushing the wire through the bottom of the connector.



7. After removing the Pink wire from the connector, fold the pink wire over and cut off a piece of shrink tube and place it over the wire and heat shrink tube to seal it tightly over the wire and zip tie it to other wires to avoid wiring from arching against metal.

SECTION 3 SERVICE

Specifics with Tier 4 Engines

Tier 4 Engine Specifics Do's and Don'ts

- Do not pressure wash engine or top of seat frame
- Do no cycle key switch quickly. This can cause data reading errors with the engine and hydraulic modules
- Take time when starting machine or machine changes in running commands. This will allow all modules to take the correct amount of time to communicate.
- Do not let machine run at idle after warm up any longer than 15 minutes. If you are going to bae away from the machine any longer than this turn machine off. Extended idle time WILL cause EGR issues.
- Do not turn machine off at top rpm. Set machine back to idle for a couple of minutes to allow the turbo to cool down before turning off.
- Use pre filtered clean fuel only that's free of any water or contamination.
- Do not use aftermarket filters. Non Hatz filters not recommended for use on Hatz engines. -use only Hatz Original filters on engine
- Do not miss regular recommended maintenance intervals. See Hatz owner's manual.
- Use only AEC approved filters on hydraulics
- Do not run machine with high pressure filter light displayed.
- Use only Hatz approved coolant. See Hatz owner manual.
- Use oil with an API rating of CJ-4 or better. The use of oil not meeting this standard will reduce the life of the DOC catalyst.
- The engine is programmed to go into limp mode in the case of a fault code. Pay close attention to any fault codes and do not ignore them. Immediate engine damage can occur.

Machine Cleaning Procedure

When cleaning the machine, please adhere to the following information to ensure proper cleaning and to keep the machine in the best condition possible.

Power Washing Procedure:

NOTICE

- Ensure that the water pressure is below 2000 PSI (14 MPa)
- Always keep the water temperature below 180°F (80°C)
- Use a spray nozzle with at minimum 40° wide spray angle
- Keep the nozzle at least 1 foot (300mm) away from the machine
- Avoid spraying water on the engine and electronic components. Examples include electronic displays, lights, switches, wiring, etc. The electronic components may be damaged if water is sprayed on them.
- Keep a perpendicular angle (90°) when cleaning over a decal.
 - Holding nozzle of a pressure washer at an angle different from 90° may lift the decal from the machine.
- Recommended using a safe cement dissolver, **BACK-SET** or similar, to remove hardened concrete.
- It is **NOT** recommended to use chemicals such as:
 - Muriatic Acid
 - Hydrochloric Acid
 - Hydrofluoric Acid
 - Sulfuric Acid
 - Phosphoric Acid
- To prevent build-up of concrete on the machine, use **BODY GUARD** or similar protection wax.

Filter Cleaning Procedure:

- Remove air filters and blow out with compressed air, **NOT** to exceed 80 PSI.



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