

**RIDING TROWEL**

# **HDX780**

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## **SAFETY & OPERATIONS MANUAL**

Manual Part #: 069971 | Revision: B  
Language: English | Original Instructions



# RIDING TROWEL

## SAFETY & OPERATOR MANUAL

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**This manual covers the products listed below:**

**Part No.**

069600

**Description**

HDX780 Riding Trowel, HATZ 74HP Diesel T4, 12ft

### 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.

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Allen Products are covered under one or more of the following patent numbers:  
10,100,537; 9,068,301; 9,068,300; 8,360,680; 7,690,864; 7,114,876B1; 6,857,815B2; 6,582,153  
With other Patents Pending.

Printed in U.S.A.

# Limited Warranty & Limitation of Liability

## GENERAL INFORMATION

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.

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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**

### **SECTION 4 ACCESSORIES**

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Complete any warranty requirements as specified by the engine manufacturer in their instructions found inside the manual box located on the back of the riding trowel operator's seat.

Your engine and clutch 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.

## GENERAL INFORMATION

# Sound & Vibration Testing



### Sound Pressure Level Information:

Sound pressure is “A” weighted . Measured at the operators ear position while the ride-on trowel is operating at full throttle on concrete in a manner most often experienced in “normal ” circumstances. Sound pressure may vary depending upon the condition of the concrete. Hearing protection is always recommended.



### Vibration Level Information:

The vibration level indicated is the maximum RMS (Root Mean Square) velocity value obtained at the handle grip while operating the ride-on trowel on curing concrete in a manner most often experienced in “normal ” circumstances. Values were obtained from all three axes of motion. The values shown represent the maximum RMS value from these measurements.

Summary Data Of Sound And Vibration Testing			
Operator Ear SPL	Seat Vibration Average	Left Hand Vibration Average	Right Hand Vibration Average
- dB (A)	- m/sec <sup>2</sup>	- m/sec <sup>2</sup>	- m/sec <sup>2</sup>
This information was acquired from sound and vibration analysis tests conducted at Allen Engineering Corporation test facilities.			

PENDING INFORMATION

## Dealer Information & Ordering Parts

### GENERAL 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.

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

### **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.

The “PARTS & DECALS MANUAL” contain 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 & DECALS 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.

## GENERAL INFORMATION

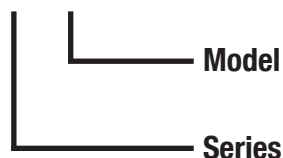
# Model & Serial Number / Unit Identification

### 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

HDX 780

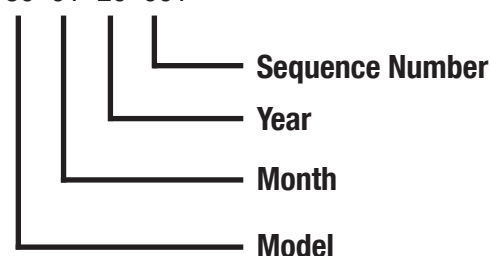


### Serial Number

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

780 01 20 001



### 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 rear lower left side of mainframe. Refer below for serial number and model number 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

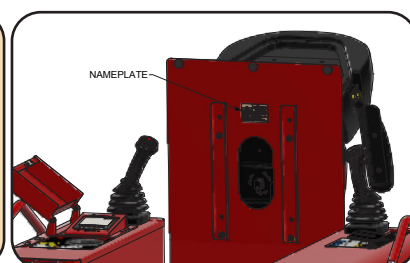
Model Number: \_\_\_\_\_

Serial Number: \_\_\_\_\_

Date Purchased: \_\_\_\_\_

Purchased From: \_\_\_\_\_

MODEL	 P.O. BOX 819   PARAGOULD, AR. 72450, USA 800.643.0095 (USA ONLY) 870.236.7751 800.643.0097 (USA ONLY) 870.236.3934 WWW.ALLENENG.COM
PART NUMBER	
POWER	
WEIGHT	
SERIAL NO.	
PRODUCTION DATE (MM.DD.YYYY)	

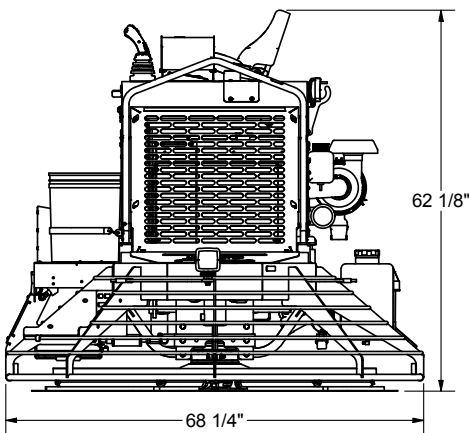
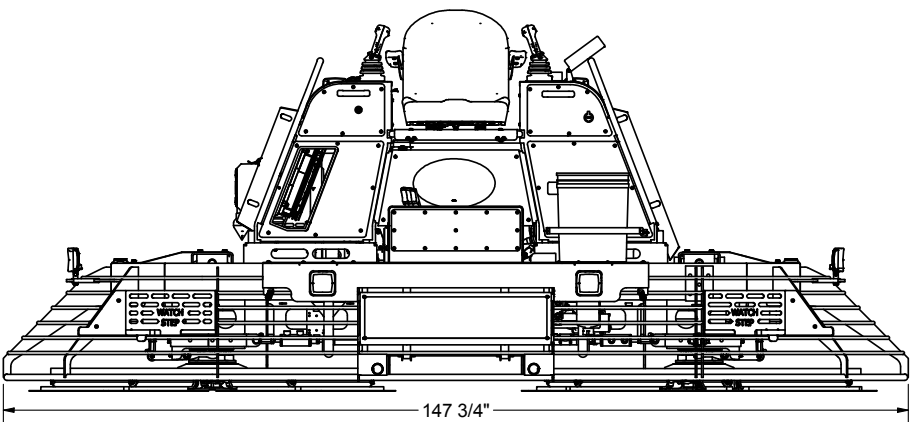


# Technical Specifications / Machine Dimension Detail

## GENERAL INFORMATION

### Machine Specifications

- Horse Power: ..... 74 HP
- Fuel Capacity:..... 13 Gal
- Retardant Capacity: ..... 6 Gal
- Steering System: ..... Hydraulic
- Hydraulic Capacity:..... 20.25 Gal
- Number of Operating Lights:..... 6
- Height: ..... 64-1/4"
- Length: ..... 147-3/4"
- Width: ..... 68-1/4"
- Dry Weight: ..... 2836 lbs
- Panning Width: ..... 140"
- Rotor Center Distance:..... 79.5"
- Rotor Diameter: ..... 60"
- Rotor Speed: ..... 10-135 RPM
- Lifting:..... 2-point, Top-Mounted



## GENERAL INFORMATION

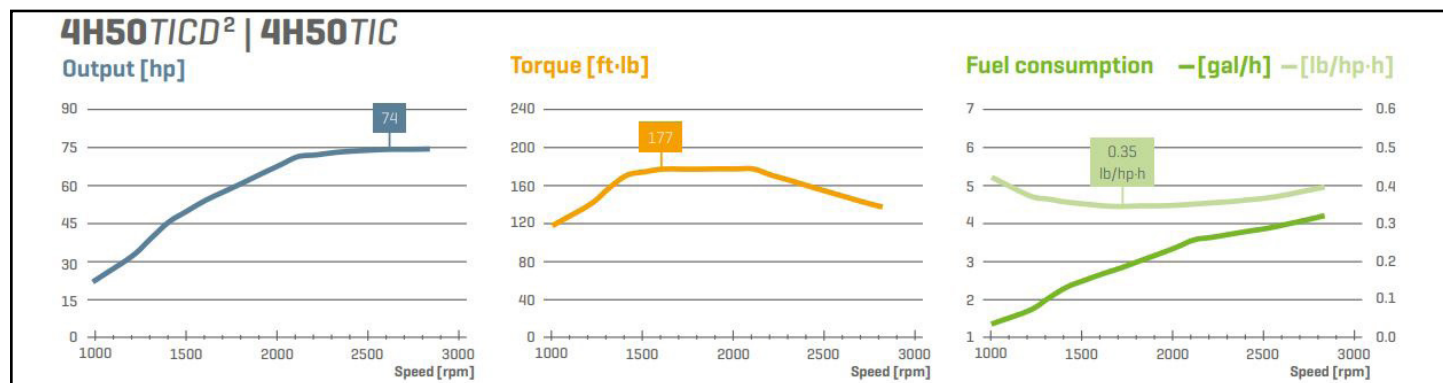
## Engine Specifications

### Hatz Engine Information

Model:	4H50TIC
Fuel Type:	Diesel
Horsepower [KW]:	74 [55]
Engine Idle RPM:	900
Engine Full RPM:	2800
Engine Type:	Liquid - Cooled
Number of Cylinders:	4
Bore x Stroke, in. [mm]:	3.3 x 3.5 [84 x 88]
Displacement (in <sup>3</sup> ):	119.10
Injection System:	Direct Injection
Injection Pressure [PSI]:	26,100.0
Compression Ratio:	17.5:1
Cooling System:	Liquid
Direction of Rotation Rev.:	Clockwise
Engine Oil Capacity in gallons:	1.85
Dry Weight, lbs:	562
Dimensions:	
• Length, in. [mm]:	36.5
• Width, in. [mm]:	27.0
• Height, in. [mm]:	31.8

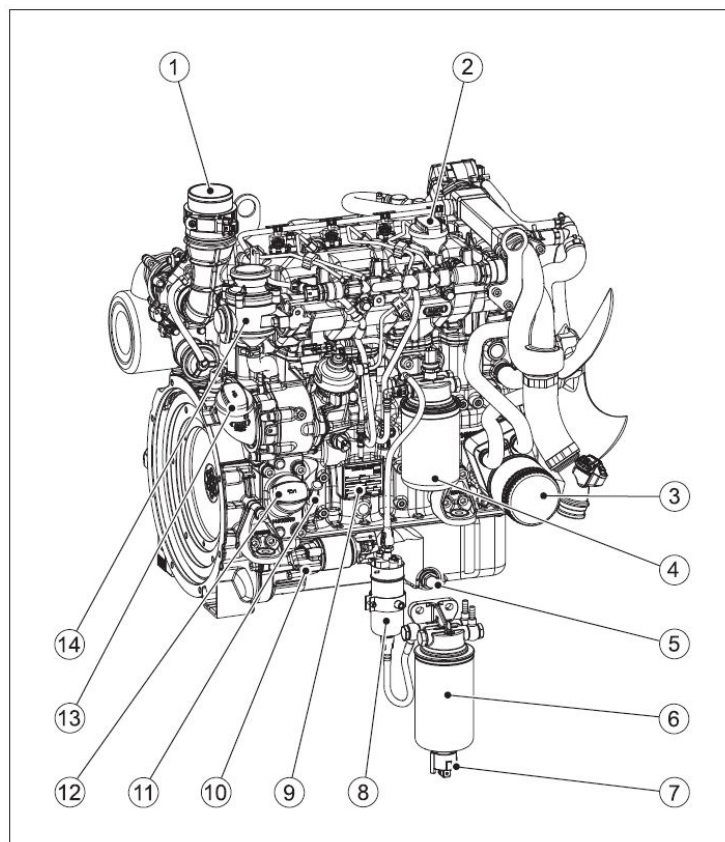
### Emission Certifications:

- EPA Non-Road LSI Tier 4 Certified
- EU Stage IIIB Certified



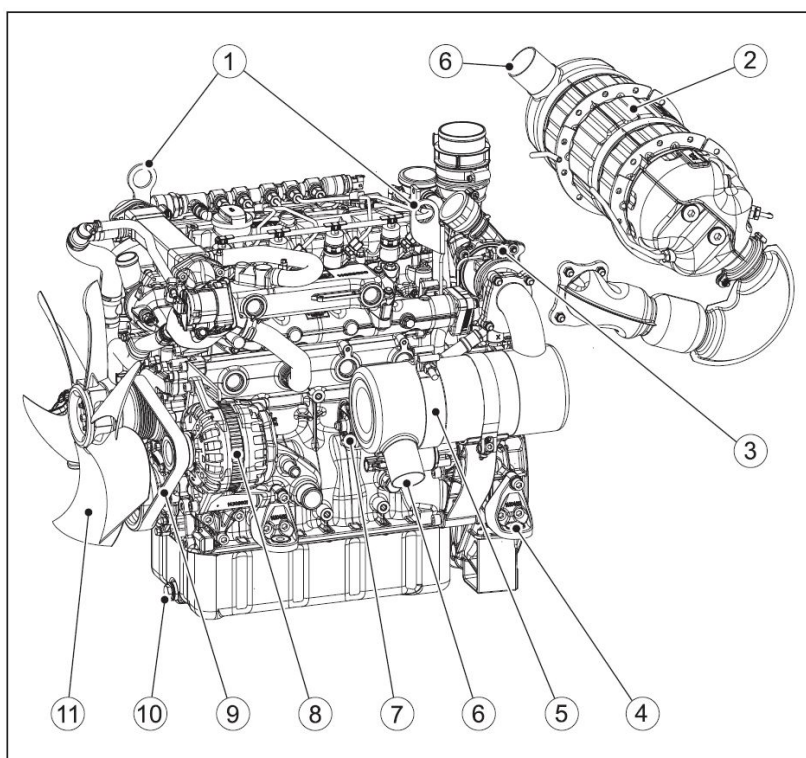
### Intake Side

REF. #	PART NAME
1	Intake Opening for Combustion Air
2	Oil Filler Plug, Top (Option)
3	Oil Filter
4	Main Fuel Filter
5	Side Oil Drain Screw
6	Fuel Pre-Filter
7	Drain Plug with Integrated Water Level Sensor
8	Electric Fuel Pump
9	Engine Type Plate
10	Starter (Low Mounting Position)
11	Dipstick
12	Oil Filler Plug, Bottom (Option)
13	Oil Filler Plug, Middle (Option)
14	Crankcase Ventilation



### Exhaust Side

REF. #	PART NAME
1	Lifting Eyes
2	DPF System (TICD Model Only)
3	Turbocharger
4	Engine Foot
5	Diesel Oxidation Catalytic Converter (TIC Model)
6	Exhaust Outlet
7	Starter (High Mounting Position)
8	Three Phase Alternator
9	Poly V-Belt
10	Oil Drain Screw, Front
11	Fan



# **SECTION 1 SAFETY**



### 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.

### 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.



### CALIFORNIA PROPOSITION 65 WARNING

Gasoline engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects and other reproductive harm.

## Safety-Alert Signs

This manual contains Safety-Alert Signs, as defined below, which must be followed to reduce the possibility of improper service damage to the equipment or personal injury. Read and follow all Safety-Alert Signs included in this manual.



**NOTE** defines an operating procedure, condition, etc. which is essential to highlight that contains useful or important information.



**EMERGENCY** is used for the identification of safety equipment, first aid, or emergency egress locations.



**NOTICE** used to convey safety information on labels and signs.



**CAUTION** is indicative of a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.



**WARNING** Indicative of a potentially hazardous situations that could result in death or serious injury



**DANGER** indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury







**⚠ WARNING      ⚠ ADVERTENCIA**



Operation of this equipment may create sparks that can start fires around dry vegetation. A spark arrestor may be required. The operator should contact local fire agencies for laws or regulations relating to fire prevention requirements.

El funcionamiento de este equipo puede producir chispas que pueden iniciar incendios en vegetación seca. Un supresor de chispas puede ser necesario. El operador debe comunicarse con las agencias locales de bomberos para las leyes o reglamentos relativos a los requisitos de prevención de incendios.

Some states require that in certain locations arrestors be used on internal combustion engines. A spark arrestor is a device designed to prevent the discharge of spark or flames from the engine exhaust. It is often required when operating equipment on forested land to prevent the risk of fires. Consult the engine distributor or local authorities and make sure that you comply with regulations regarding spark arrestors.

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

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.

## SECTION 1 SAFETY

# Operating Safety



Familiarity and proper training are required for the safe operation of this equipment! Equipment operated improperly or by untrained personnel can be dangerous! Read the operating instructions contained in both this manual and the engine manual and familiarize yourself with the location and proper use of all controls.

- **ALWAYS** read, understand, and follow procedures in the Operator's Manual before attempting to operate the equipment.



- **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.



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



- **NEVER** allow anyone to operate this equipment without proper training. People operating this equipment must be familiar with the risks and hazards associated with it.

- **NEVER** touch the engine or muffler while the engine is on or immediately after it has been turned off. These areas get hot and may cause burns.



- **NEVER** use accessories or attachments that are not recommended by AEC. Damage to equipment and injury to the user may result.

- **NEVER** operate the machine with the belt guard missing. Exposed drive belt and pulleys create potentially dangerous hazards that can cause serious injuries.



- **NEVER** leave machine running unattended.

- **DO NOT** run the machine indoors or in an enclosed area such as a deep trench unless adequate ventilation, through such items as exhaust fans or hoses, is provided. Exhaust gas from the engine contains poisonous carbon monoxide gas; exposure to carbon monoxide can cause loss of consciousness and may lead to death.



- **ALWAYS** remain aware of moving parts and keep hands, feet, and loose clothing away from the moving parts of the equipment.



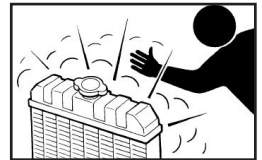
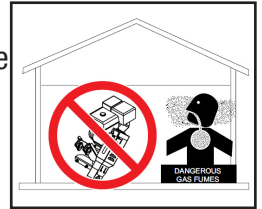
- **ALWAYS** close fuel valve on equipped engines when machine is not being operated.

- **ALWAYS** store the equipment properly when it is not being used. Equipment should be stored in a clean, dry location out of the reach of children.



Internal combustion engines present special hazards during operation and fueling. Read and follow the warning instructions in the engine owner's manual and the safety guidelines below. Failure to follow the warnings and safety guidelines could result in severe injury or death.

- **DO NOT** run the machine indoors or in an enclosed area such as a deep trench unless adequate ventilation, through such items as exhaust fans or hoses, is provided. Exhaust gas from the engine contains poisonous carbon monoxide gas; exposure to carbon monoxide can cause loss of consciousness and may lead to death.
- **DO NOT** smoke while operating the machine.
- **DO NOT** smoke when refueling the engine.
- **DO NOT** refuel a hot or running engine.
- **DO NOT** refuel the engine near an open flame.
- **DO NOT** spill fuel when refueling the engine.
- **DO NOT** run the engine near open flames.
- **ALWAYS** refill the fuel tank in a well-ventilated area.
- **ALWAYS** replace the fuel tank cap after refueling.
- **ALWAYS** keep the area around the muffler free of debris such as leaves, paper, cartons, etc. A hot muffler could ignite the debris and start a fire.










## SECTION 1 SAFETY

# Service Safety



Poorly maintained equipment can become a safety hazard! In order for the equipment to operate safely and properly over a long period of time, periodic maintenance and occasional repairs are necessary.

- **ALWAYS** disconnect the battery before servicing the equipment. 
- **DO NOT** attempt to clean or service the machine while it is running. Rotating parts can cause severe injury. 
- **DO NOT** crank a flooded engine with the spark plug removed on gasoline-powered engines. Fuel trapped in the cylinder will squirt out the spark plug opening. 
- **DO NOT** test for spark on gasoline-powered engines if the engine is flooded or the smell of gasoline is present. A stray spark could ignite the fumes. 
- **DO NOT** use gasoline or other types of fuels or flammable solvents to clean parts, especially in enclosed areas. Fumes from fuels and solvents can become explosive.
- **ALWAYS** turn engine off and remove key from machine before performing maintenance or making repairs.
- **ALWAYS** handle blades carefully. The blades can develop sharp edges which can cause serious cuts. 
- **ALWAYS** keep the area around the muffler free of debris such as leaves, paper, cartons, etc. A hot muffler could ignite the debris and start a fire.
- **ALWAYS** replace worn or damaged components with spare parts designed and recommended by AEC Corporation.
- **ALWAYS** disconnect the spark plug on machines equipped with gasoline engines, before servicing, to avoid accidental start-up.
- **ALWAYS** relieve all pressure in the air, oil and cooling systems before disconnecting any lines, fittings or related items. Escaping fluid under pressure has sufficient force to penetrate skin causing serious personal injury, DO NOT check for leaks your hands. 
- **ALWAYS** switch off the power supply at the battery disconnect before adjusting or maintaining the electrical equipment.
- **ALWAYS** keep the machine clean and labels legible. Replace all missing and hard-to read labels. Labels provide important operating instructions and warn of dangers and hazards.
- **ALWAYS** wear rubber gloves to avoid personal injury, when you treat fluids used in machine. In case of contact with skin, immediately wash off. 

**ALWAYS DO A THOROUGH INSPECTION OF THE SLINGS, CHAINS, AND HOOKS  
BEFORE ATTEMPTING TO LIFT THE MACHINE!**

OSHA has set forth guidelines which detail the use of Rigging Equipment for Material handling. This guideline is found under

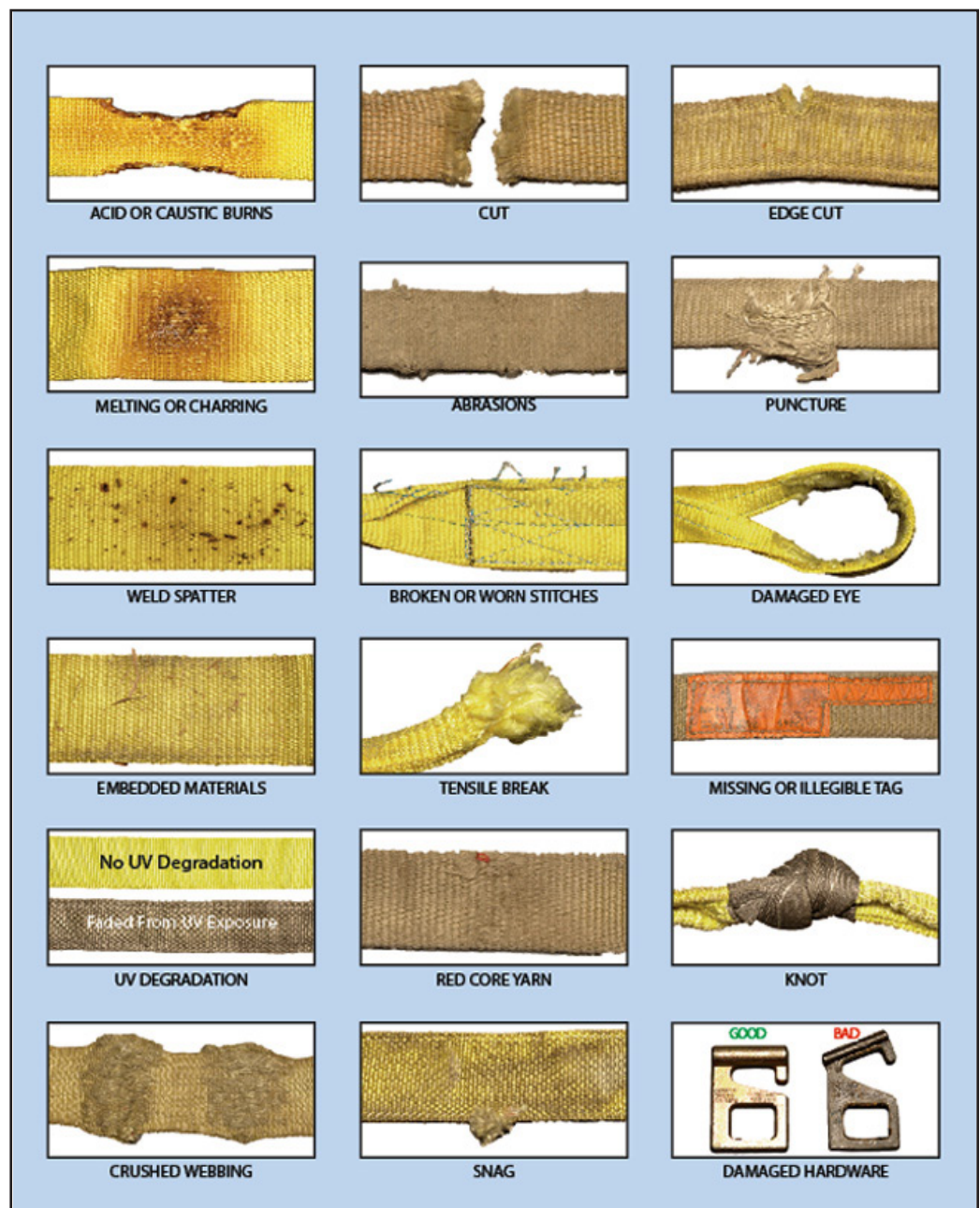
**OSHA Standard Number: 1926.251**

Please read and follow all guidelines found in this standard.

Removal from service.

**Synthetic web slings shall be immediately removed from service if any of the following conditions are present:**

OSHA 1926.251(e)(8)



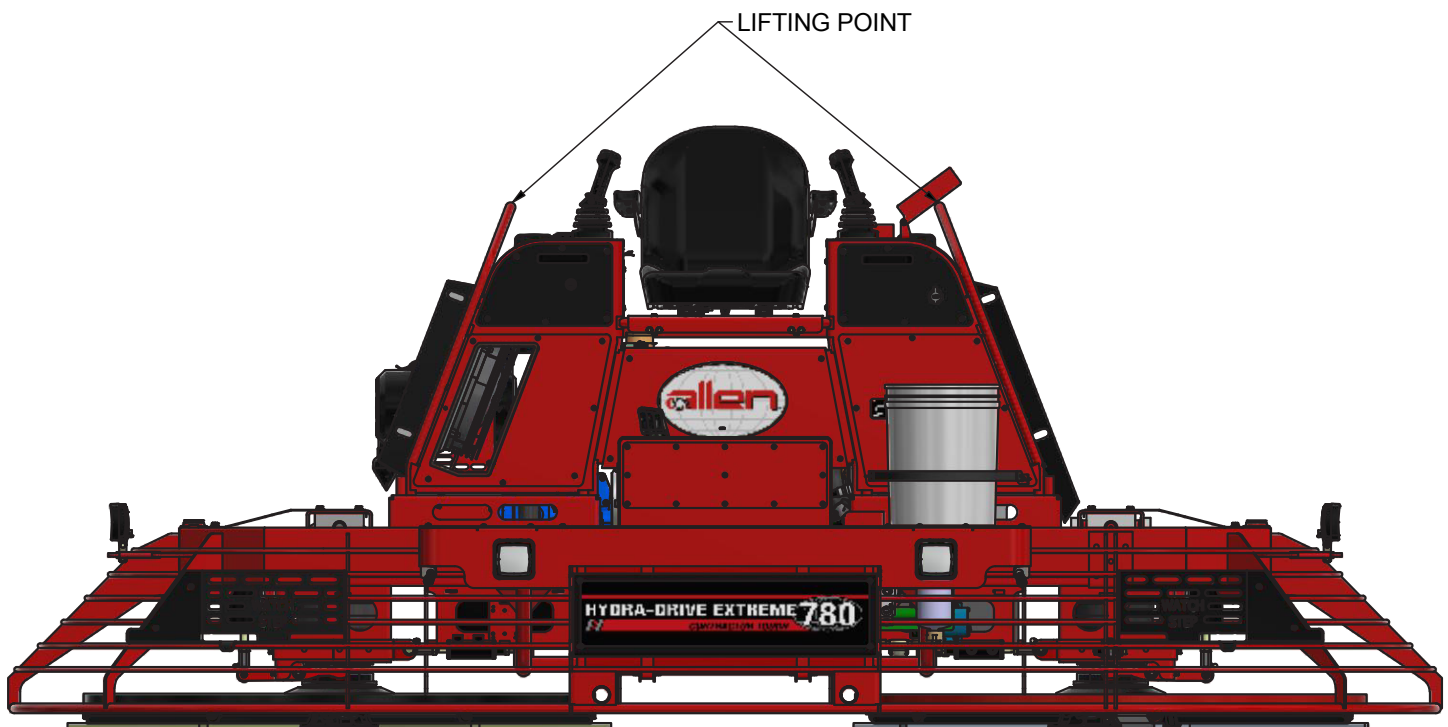
## SECTION 1 SAFETY

# Lifting Safety

- When lifting the machine, all personnel must be clear of the machine.
- **DO NOT** stand near or under the machine while it is being lifted.

### Lifting instructions using a hoist:

- An optional lifting harness is available for purchase. Part number 064798
- Place slings, chains or hooks through each lifting point on the machine. Use a sling or chains connected to a central lifting device. Ensure that all lifting devices have sufficient weight-bearing capacity.
- **ALWAYS** shutdown engine before transporting.



- Make sure the hitch and coupling of the towing vehicle are rated equal to, or greater than the trailer “gross vehicle weight rating.”
- **ALWAYS** inspect the hitch and coupling for wear. Never tow a trailer with defective hitches, couplings, chains, etc.
- Check the tire air pressure on both towing vehicle and trailer. Trailer tires should be inflated to 50 psi cold. Also check the tire tread wear on both vehicles.
- **ALWAYS** make sure the trailer is equipped with a safety chain.
- **ALWAYS** properly attach trailer’s safety chains to towing vehicle.
- **ALWAYS** make sure the vehicle and trailer directional, backup, brake and trailer lights are connected and working properly.
- DOT Requirements include the following:
  - Connect and test electric brake operation.
  - Secure portable power cables in cable tray with tie wraps.
- The maximum speed for highway towing is 55 MPH unless posted otherwise. Recommended off-road towing is not to exceed 15 MPH or less depending on type of terrain.
- Avoid sudden stops and starts. This can cause skidding, or jack-knifing. Smooth, gradual starts and stops will improve towing.
- Avoid sharp turns to prevent rolling.
- Trailer should be adjusted to a level position at all times when towing.
- Raise and lock trailer wheel stand in up position when towing.
- Place chock blocks underneath wheel to prevent rolling while parked.
- Place support blocks underneath the trailer’s bumper to prevent tipping while parked.
- Use the trailer’s swivel jack to adjust the trailer height to a level position while parked.
- Use tie downs to ensure machine does not move during transportation.

## SECTION 1 SAFETY

### Pan Installation Safety - Lifting Bridle

This section details the proper technique to utilize the lifting bridle system in a safe manner to install concrete finishing pans.

(NOTE: Images are for illustration purposes only)



**Use a lifting sling (bridle) with a capacity of at least 2:1 weight ratio for the equipment being hoisted.**

**[See section "ACCESSORIES" for appropriate lifting harness part number]**

1. Attach the lifting bridle to the machine shown in section "Lifting Safety"
2. Slowly lift the machine in a safe manner to a height that is required to safely install the pans. This is typically 6"-8" above floor level.
3. Carefully slide the pans under the machine making sure that you are aware of the corners on the blades as they are sharp.
4. Align the pans so that the clips will not be crushed when the machine is lowered back down.
5. Slowly lower the machine down onto the pans. Make sure the blades are going into the proper gaps. (Typically the pans can only be installed one way)
6. Once the machine is on securely on the ground with the pans underneath, remove the lifting bridle from the machine.
7. Start the machine and slowly increase the throttle until the blades begin turning and engaging the pans. The machine is now ready to finish the concrete utilizing the pans.



**NOTE:** Utilizing the lifting sling (bridle) and the dolly jacks are intended only for site transportation and the installation of pans and blades. DO NOT use them for regular maintenance without the additional use of jack stands to insure stability of the machine.

# Pan Installation Safety - Lifting Jacks

## SECTION 1 SAFETY

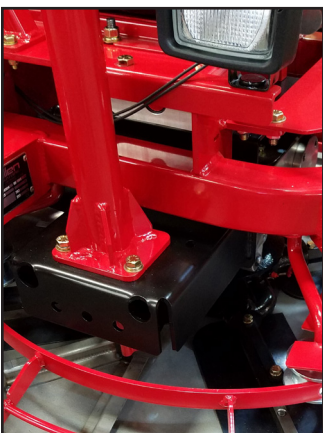
This section details the proper technique to utilize the Dolly Jack system in a safe manner to install concrete finishing pans.

(NOTE: Images are for illustration purposes only)

**Use the appropriate set of lifting jacks that are designed for the machine you are lifting.**  
**[See section "ACCESORIES" for appropriate dolly jack part number]**



1. Attach the front and rear dolly jacks into the machine at the receiving tube locations.
2. Slowly lift the machine in a safe manner to a height that is required to safely install the pans. This is typically 6"-8" above floor level.
3. Carefully slide the pans under the machine, making sure that you are aware of the corners of the blades as they are sharp.
4. Align the pans so that the clips will not be crushed when the machine is lowered back down.
5. Slowly lower the machine down onto the pans. Make sure the blades are going into the proper gaps. (Typically the pans can only be installed one way)
6. Remove the dolly jacks from the machine
7. Start the machine and slowly increase the throttle until the blades begin turning and engaging the pans. The machine is now ready to finish the concrete utilizing the pans.



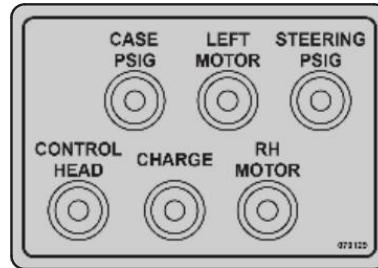
**NOTE:** Utilizing the lifting sling(bridle) and the dolly jacks are intended only for site transportation and the installation of pans and blades. DO NOT use them for regular maintenance without the additional use of jack stands to insure stability of the machine.

## SECTION 2 OPERATIONS

## Safety Decals



DECAL - Left Cup Holder  
PART #: 069102  
QTY: 1



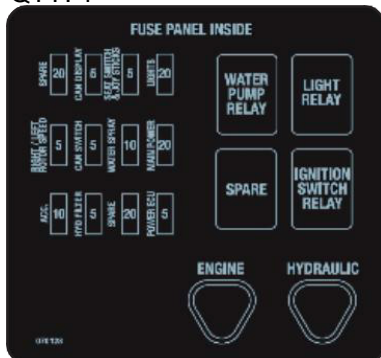
DECAL - Pressure Ports  
PART #: 070129  
QTY: 1



DECAL - Diesel Only  
PART #: 069104  
QTY: 1



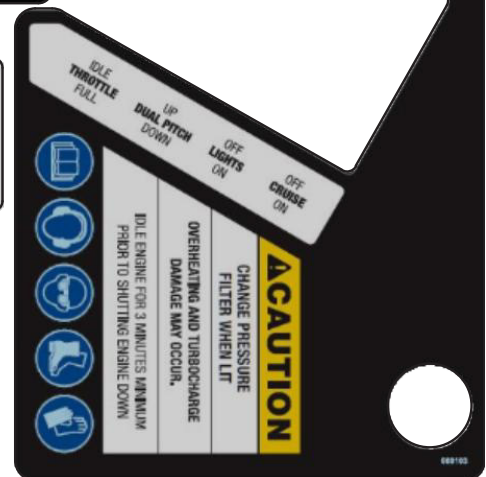
DECAL - Fuse Panel  
PART #: 070128  
QTY: 1



DECAL - Retardant Only  
PART #: 065655  
QTY: 1



DECAL - HYDR. PRESS.  
WARNING  
PART #: 070402  
QTY: 1



DECAL - Right Control Area  
PART #: 069103  
QTY: 1

DECAL - AEC Info / Warranty  
PART #: 068457  
QTY: 1



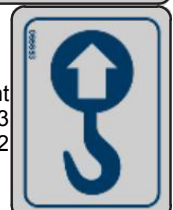
DECAL - Tie Down  
PART #: 068459  
QTY: 4



DECAL - Hydraulic Fluid  
PART #: 065668  
QTY: 2



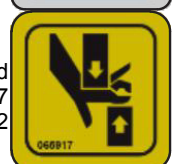
DECAL - Lifting Point  
PART #: 065653  
QTY: 2



DECAL - Drop Hazard  
PART #: 065656  
QTY: 2



DECAL - Pinch Hazard  
PART #: 065917  
QTY: 2



DECAL - T4 Compliant  
PART #: 070658  
QTY: 1



DECAL - PROP 65  
PART #: 069225  
QTY: 1

DECAL - Grease  
PART #: 066103  
QTY: 2



# **SECTION 2 OPERATION**



This machine is built with user safety in mind. However, it can present hazards if improperly operated and serviced. Follow operating instructions carefully.

If you have any questions about operating or servicing this equipment, please contact your Allen Engineering Dealer or AEC Customer Service at 800-643-0095 or 870-236-7751.

The HDX780 riding trowel is a modern high production machine. Finishing rate will vary depending on the operators skill and job conditions. This riding trowel has ten finishing blades.

The Super Heavy Duty (SHD) Gearboxes are designed to provide exceptional performance with low maintenance and trouble free use under some of the worst conditions.

All Allen Engineering HDX780 Riders are equipped with a safety shutdown switch and a low oil warning for added job safety and engine protection. Operating time between fuel refills is approximately 2-1/2 to 3 hours depending on rotor speeds.

### Before Starting Procedures

Before operation each day check for the following:

1. All guards, side screens and panels are in place
2. All safety and information signs are in place and legible
3. Engine, Gearbox, and Hydraulic Oil levels are correct.
4. Fuel level in fuel tank.
5. Check the battery level
6. Condition of air filter on engine.
7. Condition of riding trowel arms and blades.
8. Verify that daily maintenance of grease points have been performed.
9. Check operating controls for proper operation and adjustment
10. Check speed control operation before and after starting engine for proper operation
11. Check the steering left and right, for proper operation
12. Check for any hydraulic leaks
13. Remove any loose objects that could interfere with the operation of the trowel

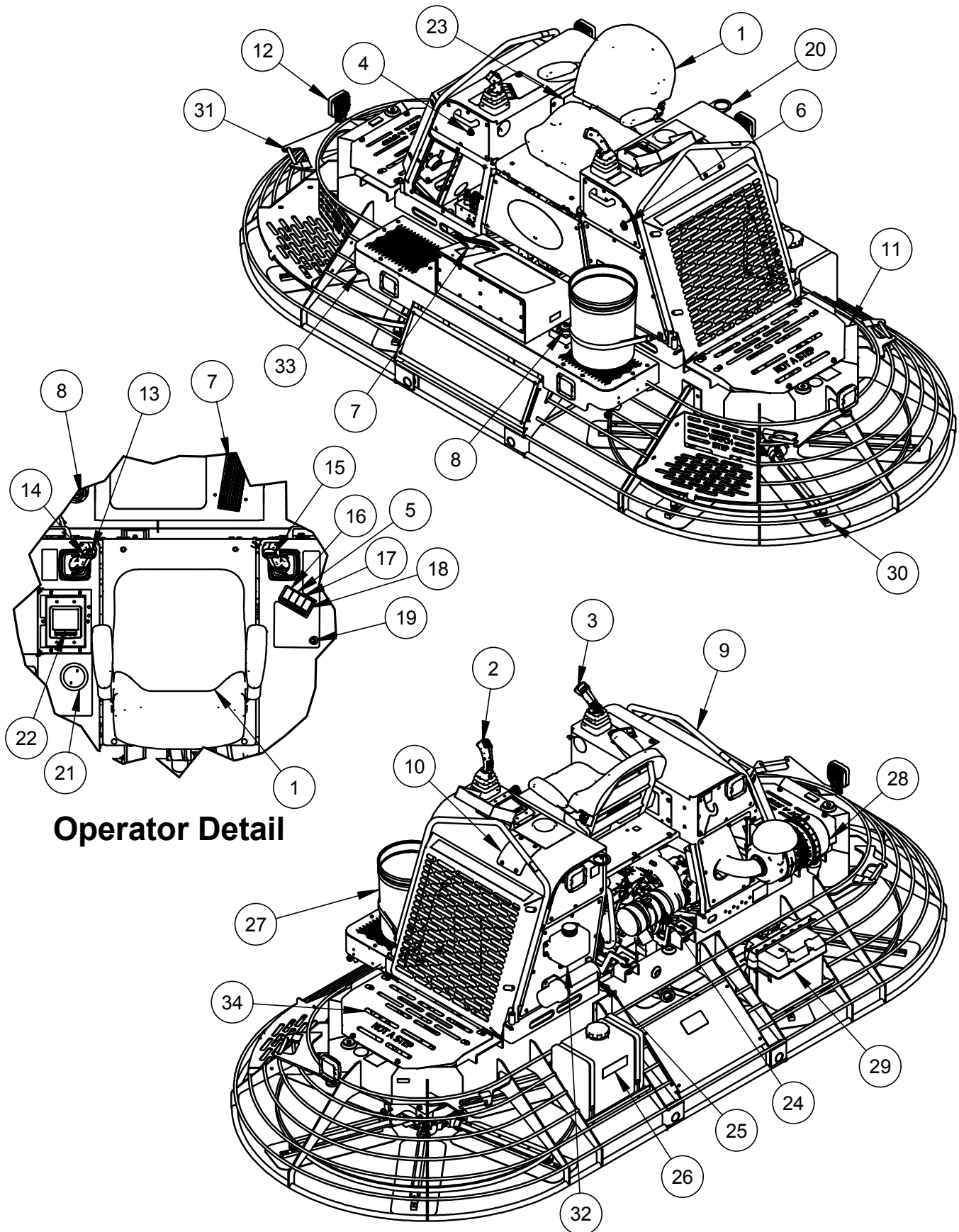
**Note:** If there is any indication that faulty equipment exists, shutdown safely, inform the proper authority and **DO NOT** operate the riding trowel until the problem has been fixed.

### Starting Procedures

Turn ignition switch key to the start-position, immediately release key when engine starts. Allow engine to warm up for 5 minutes before operating riding trowel.



Operating the starter for more than 5 seconds can damage the starter or engine. If engine fails to start release the switch and wait 15 seconds before operating starter again.



**Operator Detail**

1. Operator Seat - Rotors will not spin unless operator is seated. Seat is adjustable.
2. Left Joystick - Used to move the rider forward and backward
3. Right Joystick - Used to move the rider forward, backward, left & right.
4. Key Switch - Used to start that machine.
5. Dual Pitch Switch - Increases or decreases the pitch of both rotors simultaneously
6. USB - Dual USB plugs. 2.1A @ 5VDC MAX
7. Foot Control - Used to control rotor speed.
8. Fuel Tank - Holds 13 gal [49.2 L] of Diesel.
9. Lifting Point - Used to raise and lower the machine
10. Engine Coolant Access - Used to access the engine coolant
11. Hydraulic Fluid Reservoir - Where the hydraulic fluid is stored
12. Machine Lights - Used to illuminate the surrounding work area
13. Water Spray Button - (located on the left joystick) used to spray water on the work surface
14. Left Blade Pitch - switch used to change the pitch of the left blades
15. Right Blade Pitch - switch used to change the pitch of the right blades
16. Engine Speed Switch - Changes the engine speed from "Idle" to "Full"
17. Light Switch - Turns the machine LED lights on or off
18. Cruise Control Switch - Turns the machine cruise control on/off
19. High Oil Pressure - When lit, change oil filter
20. Tool Holder - Store hand tools here
21. Cup Holder - Holds your favorite beverage
22. Engine Module - Controls engine RPM, shows fuel level, controls/monitors multiple other features
23. Fuse Box - Holds electrical fuses and relays
24. Muffler - Used to control exhaust sound and direction
25. Manual Tube - Holds the machine safety and operations manual. (for Parts Manual see page 59)
26. Retardant Reservoir - Holds the retardant fluid
27. Water Bucket - Holds water for finishing
28. Air Filter - Filters the engine air
29. Battery - 12VDC, 700 Cold Crank Amperes (CCA)
30. Screed Blade - Used to smooth and finish concrete
31. Tie Down - Use these to secure the machine during transport.
32. Coolant Reservoir - Used for recovery of coolant when engine is hot
33. Spray Nozzle - Used to spray retardant on concrete
34. Machine Cover - Cover for rotors (**DO NOT STEP**)

## SECTION 2 OPERATIONS

# Trowel Operation

## Operating The Riding Trowel

To utilize your Allen Engineering **HDX780** rider to its fullest capacity the machine should be driven in the direction the operator is facing. This will finish the widest possible area while giving the operator an excellent view of the slab surface about to be troweled. When the machine reaches the end of the slab make a 180 degree turn and repeat the straight line of direction to the other end of the slab. To familiarize a new operator with the riding trowel the following steps should be taken.

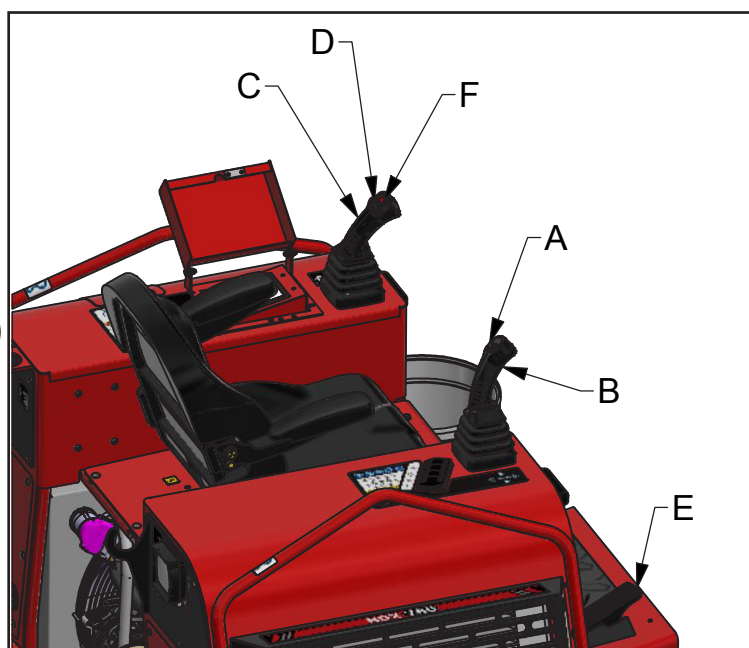


### NOTE

All items in this manual are describe from the operator "Sitting On Machine" or **SOM** for short.

### 1. Location of all Operating Controls

- A. Right Pitch Control
- B. Joystick (Forward & Reverse)
- C. Joystick (Left & Right, Forward & Reverse)
- D. Left Pitch Control
- E. Right Foot Pedal
- F. Retardant Spray Pushbutton

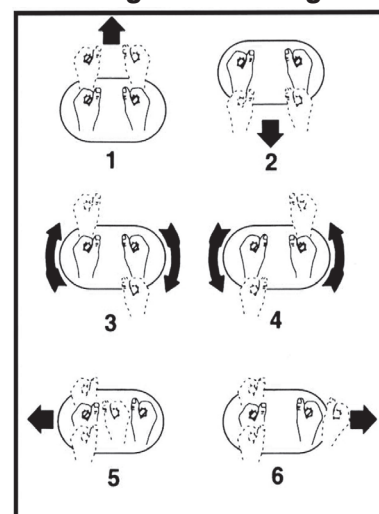


### 2. Steering the Riding Trowel

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. The same motion is required of the right joystick to move to the right.

Position .....	Action
1 .....	Forward
2 .....	Reverse
3 .....	Rotate Clockwise
4 .....	Rotate Counter-clockwise
5 .....	Sideways - Left
6 .....	Sideways - Right

### Steering Control Diagram



### 3. Stopping the Trowel

To stop the trowel's movement, let go of the joysticks [B] and [C]. They will return to their neutral position. Also release pressure on the right foot pedal [E].



*This machine is equipped with a seat kill switch mechanism. If in need of an emergency stop, simply turning the key off or raising off the seat even while holding the right foot pedal down, will stop the engine from running.*

### 4. With the operator in the seat, show him the functions of the joysticks [B] and [C] 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.



*After starting engine, fully engage the throttle. This allows the engine to warm up quicker and also engages the torque converter. At this time the machine's rotors will begin turning so long as foot pedal [E] is engaged.*



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

### 5. Engine Speed

The engine has two primary speed settings: Idle (1200 RPM) & Full (3400 RPM)

The engine will start at idle speed. This machine is equipped with a **Cold Weather Start** circuit, meaning that the engine RPM will not increase above idle speed until the hydraulic oil has reached an optimum temperature. The operator can activate the RPM toggle to **FULL** during this period, however the RPM will not increase until that optimum temperature is achieved.

There is a seat sensor on the machine that will not allow the engine RPM to go above idle speed if the operator is not seated. Therefore, the operator must be seated AND the Cold Weather Start circuit must be disengaged in order for to achieve full RPM speed.

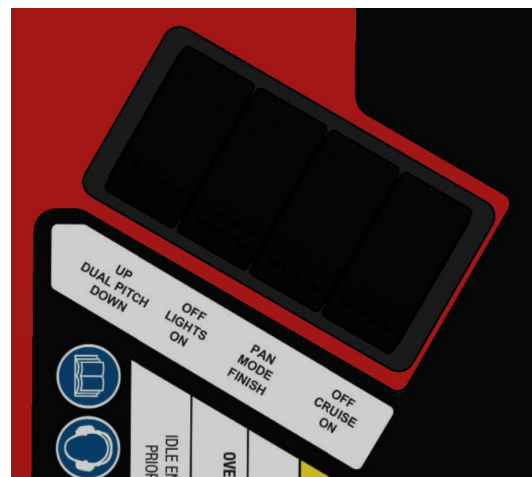
## SECTION 2 OPERATIONS

# Trowel Operation

### 6. Cruise Control

This machine comes standard with a cruise control function. The cruise will allow the operator to remove their foot off the foot pedal and still maintain rotor function.

To use the cruise control, enable the foot switch so that the rotors engage, then pull up on the cruise control button. To release the cruise control, press down on the center button on the cruise control then pull up slightly to disengage.








### 7. Pitch Adjustment

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

To change the pitch, the operator will use the rocker switch located at the top of either joystick. By pressing the rocker switch towards the inside, the pitch will decrease, pressing the switch toward the outside of the joystick will increase the pitch level. (see Figure 2.5).

**FIGURE 2.5**  
**Pitch Adjustment**

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

### 8. Enable Machine Blades

The machine trowel blades are enabled by the foot pedal (E). Hold down the pedal to enable the rotors to begin turning, release pressure off the pedal to stop the rotors.



The Murphy PowerView 380 features robust, multifunction displays for advanced monitoring of multiple electronic engines.

It's capable of monitoring multiple engines and machine parameters on an easy-to-read 3.8-inch (97mm) QVGA monochrome LCD. The display is capable of handling sophisticated engine diagnostics as well as basic engine alarm/shutdown. Customize the PV380 display using the PowerVision Configuration Studio®, an intuitive tool designed to make customization simple. Using the software tool, users can tailor basic graphics, designate screen layout and define custom parameters. The PV380 is equipped with

five tactile push buttons to quickly access a convenient menu. In addition, a back-lit and heated graphic display with LEDs indicate alarm or shutdown status.

### Flat Screen Display

A 3.8" QVGA monochrome LCD screen displays gauges, soft key commands and fault messages as well as menu options for setup and configuration.

### Soft Keys and Commands

The five tactile push buttons on the bottom of the display correspond to the options available for the screen being displayed.

### Alarms

Red and amber warning LEDs; set point triggered output for external piezo buzzer or shut-down relay.

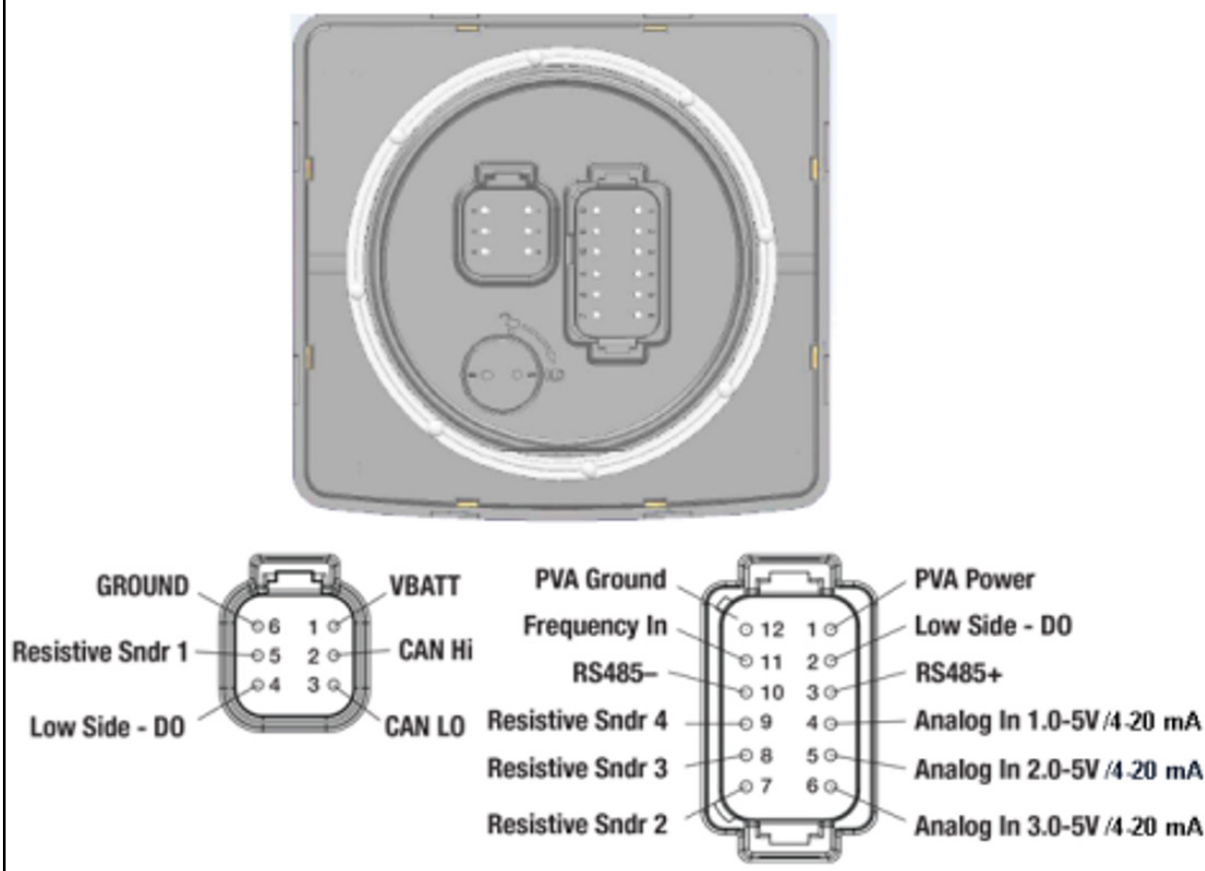
## SECTION 2 OPERATIONS

# Engine Control Unit (ECU)

### Specifications:

- AEC Part #: .....066227
- Display: ..... 3.8" Monochrome LCD
- Resolution:..... QVGA, 320 x 240 Pixels
- Orientation:..... Landscape
- Back-lighting: ..... LED, White
- Flash Memory:.....2Mb
- RAM: .....256kb
- Operating Voltage: .....6-36 VDC
- Power Consumption:.....10 Watt
- Communications: ..... CAN 2.0B & RS485 (Modbus)

### PV380 Connector Pin Outs (Back View)





**OPERATOR INTERFACE HOME SCREEN:** This screen (shown above) is the instrument cluster screen and is where you will start to navigate to all other menus.

**BUTTON ONE:** This button will swap the language between English and Spanish.

**BUTTON TWO:** This button will display the Engine Fault Codes and the I/O Status Screen. By selecting I/O status, you will then be able to see real time status of the Machine ID points, Seat Switch status, Cold Start status, Desired Engine Speed, and Run/Idle Status.

**BUTTON THREE:** This button will allow a person to change the screen brightness, screen contrast, units of measure, and language. Use button 1 to move the selection “UP”, use button 2 to move the selection “DOWN”, button 3 will verify the selection, use button 5 to return to the home screen.

**BUTTON FOUR:** Directs you to the Service Reminder screen. The first screen will give an overview of the current state of all the service reminders that are set. To cycle through/reset the reminders, press OK (button 3), then press the down arrow (button 1) and select “+” (button 3). This will reset the selected option back to the appropriate service interval. To cycle through the different service options, press “+” (button 3) when the selection arrow is at the top.

**BUTTON FIVE:** This will alternate the top row of readouts to provide more real time engine process data. The top row will either display an “Engine Torque / Load RPM” option or a “Cool Temp / Fuel Temp” option.

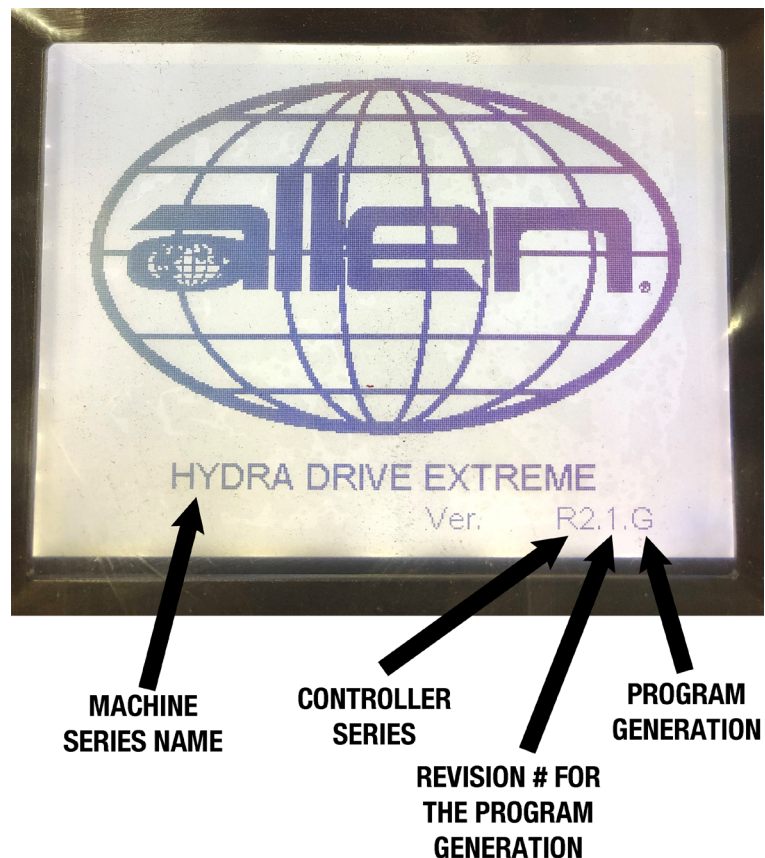
## SECTION 2 OPERATIONS

# Engine Control Unit (ECU)

### FUNCTIONS:

- Cold Start - When the hydraulic oil is too cold, the engine will automatically ramp up to “cold start” RPM to allow the machine to warm to an acceptable operating temperature. The status of this function can be viewed on the I/O Status screen under “OIL TEMP”.
- Run/Idle - The rocker switch to the right of the operator will toggle the machine between RUN RPM and IDLE RPM after the Hydraulic oil has reached temperature. The status of this function can be viewed in the IO STATUS Screen under “CC,RN”
- Seat Switch - The machine cannot be in RUN RPM unless the seat switch is made. If the operator stands up while in run RPM, the machine will return to IDLE RPM. The status of this function can be viewed in the IO STATUS screen under “SEAT SW”.
- Lift-Off - When lifting the machine off the slab, with no operator in the seat, someone can hold the Run/Idle Rocker to achieve a higher Engine RPM for 5 seconds and press the foot pedal while the machine is being pulled from the concrete.

The start up screen will display for 5 seconds once power is supplied to the control unit (the machine key is turned on). This screen will display the Allen logo, the Machine Series Name, and the relevant software information that is needed for troubleshooting



# **SECTION 3 SERVICE**

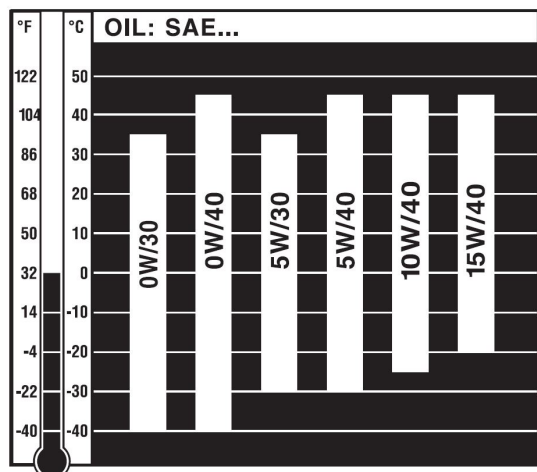
## SECTION 3 SERVICE

# Maintenance Schedule

### 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.

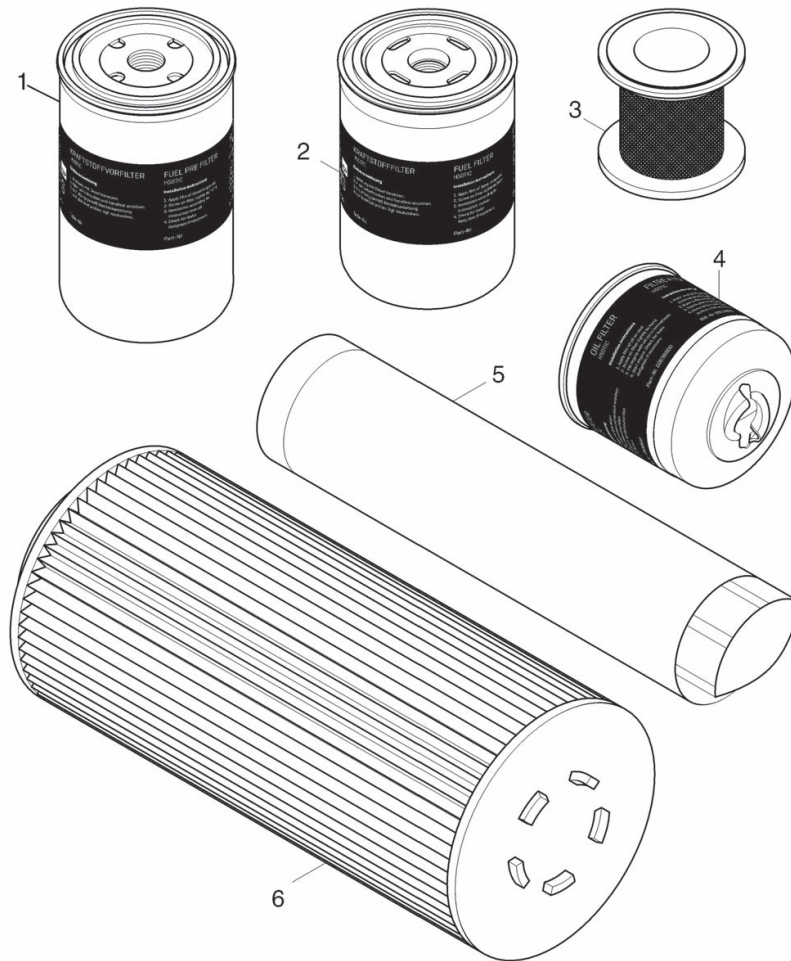
Maintenance Schedule						
Description	Daily	20 Hrs	200 Hrs	500 Hrs	1K Hrs	4K Hrs
INSPECT						
Inspect Engine Oil Level	X					
Inspect Hydraulic Oil	X					
Inspect Air Filters	X					
Inspect Radiator Fins	X					
Inspect Radiator Coolant	X					
Inspect for Leaks	X					
Check poly V-belt				X		
Inspect all Hardware		X				
Inspect Belts					X	
Inspect Wiring					X	
Inspect Battery					X	
Inspect Exhaust					X	
Inspect Coolant Hoses					X	
Inspect Catalyst					X	
ACTION						
Control Linkage Lubrications		X				
Change Engine Oil & Filter				X		
Change Hydraulic Oil			X			
Change Fuel Filters				X		
Change Oil Separator Element				X		
Change Air Filters				X		
Drain Water Separator				X		
Replace Fan Belt				X		
Clean Entire EGR System						X
Change Coolant						X



\*Replace Hydraulic Fluid with Hydraulic Oil 68 (DTE26) or Equivalent\*

### Engine Oil

- Change the type of engine oil according to the ambient temperature.
- When using oil of different brands from the previous one, be sure to drain all the previous oil before adding the new engine oil.
- For general use 15W/40 oil is recommended (6 Qts or up to ~7.4 Qts). Ensure that the engine oil meets Hatz engine oil specifications, see Engine Operator's Manual.



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

## **Battery Jump Start Procedure**

Occasionally it may be necessary to jump start a weak battery. If jump starting is necessary the following procedure is recommended to prevent starter damage, battery damage, and personal injury.

 **WARNING**

Jump starting a battery incorrectly can cause the battery to explode resulting in severe personal injury or death. Do not smoke or allow any ignition sources near the battery and do not start a frozen battery.

 **WARNING**

Electrical arcing can cause severe personal injury.  
Do not allow positive and negative cable ends to touch.

1. Use a battery of the same voltage (12V) as is used with your engine.
2. Attach one end of the positive booster cable (red) to the positive (+) terminal of the booster battery. Attach the other end to the terminal of your engine battery.
3. Attach one end of the negative booster cable (black) to the negative (-) terminal on the booster. Attach the other end of the negative cable to your engine battery.
4. Jump starting in any other manner may result in damage to the battery or the electrical system.

 **CAUTION**

Over cranking the engine can cause starter damage.  
Allow 5 minutes for starter to cool if engaged for more than 15 seconds.

 **CAUTION**

When using lights or high amperage draw accessories,  
idle the engine for a period of 20 minutes to bring the battery to charge state.

### Lift Lever Adjustment Procedure

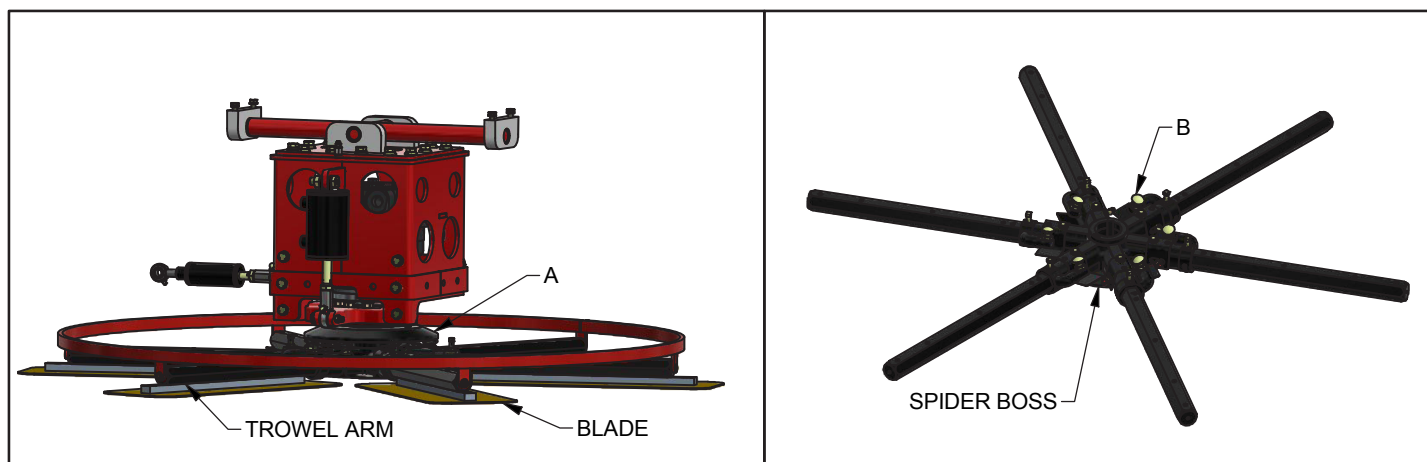
- Damage to and/or replacement of a trowel arm can change the adjustment of the lift lever. This can unbalance the trowel arms and cause the riding trowel to wobble during operation. To operate smoothly the lift lever on all trowel arms must be adjusted the same to ensure that the riding trowel is balanced correctly.
- Adjusting the trowel arms is accomplished by using the optional trowel arm alignment jig AEC PN 016863. The service manual that is included with the alignment jig describes in detail the steps to perform this procedure and to check the flatness and straightness of the trowel arms.



*Make sure that there is no pitch in the blades before attempting to remove a trowel arm.*

- The steps below described the general procedure to remove the trowel arms to be aligned.
  1. Block up pressure plate **[A]** using a wooden block.
  2. Remove stabilizer ring from spider assembly (only on available models).
  3. Remove blades from trowel arms.
  4. Loosen hex head cap screw **[B]** and remove it and the external star washer from the spider boss.
  5. Remove trowel arms from spider boss with lift levers in place.
  6. Clean flats on trowel arm before placing it in the trowel arm jig (PN 016863).
  7. Perform the alignment procedures as outlined in the alignment jig service manual (PN 047427).
  8. Re-attach trowel arm to spider boss and blades to trowel arms.
  9. Tighten down hex head cap screw to secure trowel arm in place.
  10. Reattach stabilizer ring (only on available models).

### PICTURES FOR REFERENCE ONLY



## SECTION 3 SERVICE

## Fault Codes

SPN Code	FMI Code	Fault Check Description	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
	4		If the signal is below the applicable threshold APP_uRaw2SRCLow_C (280mV) a signal range violation is detected after debouncing.	
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.	
	4		If the signal is below the applicable threshold APP_uRaw1SRCLow_C (740mV) a signal range violation is detected after the debouncing.	
	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_Syn-cAPP via the DSM.	
95	3	SRC High for Environment Pressure	The sensor raw value is lesser than or equal to FI_SRCFuelP.uMax_C	
	4	SRC low for Environment Pressure	The sensor raw value is lesser than or equal to FI_SRCFuelP.uMin_C	
	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
97	15	Water in Fuel Detected		Water in Fuel Detected
	17	Fuel Level Un-plausible		
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
	1	Minimum Oil Pressure Error in Plausibility Check	The oil pressure Oil_pSwmp is less than the threshold Oil_pMinP_mp.	
	3	Oil_uRawPSwmp < Oil_SRCPSwmp.uMax_C (4772mV)	Oil_uRawPSwmp > Oil_SRCPSwmp.uMax_C (4772mV)	
	4	Oil_uRawPSwmp < Oil_SRCPSwmp.uMin_C (234mV)	Oil_uRawPSwmp < Oil_SRCPSwmp.uMin_C (234mV)	
102	0	Physical Range Check high for air pressure at the upstream of intake valve sensor	If the signal Air_pSensPlntkVUs is greater than Air_PhysRngPlntkVUs.Max_C for a duration DDRC_DurDeb.Air_tiPhysRngHiPlntkVUsDebDef_C, then a physical range check high error is reported.	Over boost condition, Possible Blocked Waste Gate
	1	Physical Range Check low for air pressure at the upstream of intake valve sensor	If the signal Air_pSensPlntkVUs is less than Air_PhysRngPlntkVUs.Min_C for a duration DDRC_DurDeb.Air_tiPhysRngLoPlntkVUsDebDef_C, then a physical range check low error is reported.	Under Boost, Possible Turbo-Charger Defective
	3	Diagnostic fault check for SRC high in air pressure upstream of intake valve sensor	The sensor raw signal Air_uRawPlntkVUs (voltage) is above Air_SRCPlntkVUs.uMax_C	Wiring Harness or Component
	4	Diagnostic fault check for SRC low in air pressure upstream of intake valve sensor	The sensor raw signal Air_uRawPlntkVUs (voltage) is below Air_SRCPlntkVUs.uMin_C	

# Fault Codes

## SECTION 3 SERVICE

SPN Code	FMI Code	Fault Check Description	Fault Detection Condition	Possible Causes
105	0	Physical Range Check high for Charged Air cooler down stream temperature		Physical Range Check high for Charged Air cooler down stream temperature
	1	Physical Range Check low for Charged Air cooler down stream temperature		
	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
	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).	
107	3	SRC High for Controller Mode Switch		Wiring Harness or Component
	4	SRC Low for Controller Mode Switch		Wiring Harness or Component
	14	Error Path for Clog Detection in Air Filter		Air Filter Clogged / Sensor Value Okay?
108	0	Ambient Air Pressure Sensor Range Check Max-Error		
	1	Ambient Air Pressure Sensor Range Check Min-Error		
	3	Fault Check Max Signal Range Violated for Ambient Air Pressure Sensor		
	4	Fault Check Min Signal Range Violated for Ambient Air Pressure Sensor		
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
	1	Physical Range Check Low for CEngDsT	The sensed sensor signal CEngDsT_tSens is less than CEngDsT_PhysRng.Min_C	
	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.	
	4	The Sensor Raw Signal: CEngDsT_uRaw (Voltage) is Below CEngDsT_SRC.uMin_C (359mV)	The sensed raw voltage value CEngDsT_uRaw is less than CEngDsT_SRC.uMin_C.	
	15	Engine Coolant Temp Too High Plausibility Error	An "ERROR" is reported if the engine coolant temperature CEngDsT_t is greater than an threshold CEngDsT_tMaxT_C.	Less Cooling Water, Water Pump Defective, Water Cooler Blocked
	17	Defect Fault Check for Absolute Plausibility Test	coolant temperature did not reach the threshold temperature	Sensor Value Problem
	18	Defect Fault Check for Dynamic Plausibility Test	rise in coolant is not reached the minimum rise of coolant temperature	
111	17	Low Coolant Level Error	If the Coolant Level is Low, i.e. if the message CIntLv_st is set.	Low Coolant Level; Coolant Level Sensor Defective; Wiring Harness Defective

## SECTION 3 SERVICE

## Fault Codes

SPN Code	FMI Code	Fault Check Description	Fault Detection Condition	Possible Causes
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
	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.	
168	0	Physical Range Check High For Fuel Temperature	The sensor raw signal BattU_uRaw (voltage) is above BattU_uHiBatt_C.	High Engine Load with Low Fuel Level and High Ambient Temperature
	1	Physical Range Check Low For Fuel Temperature	The sensor raw signal BattU_uRaw (voltage) is below BattU_uLoBatt_C.	Very Cold Ambient Temperature
	3	SRC High for Fuel Temperature Sensor	The sensor raw signal BattU_uRaw (voltage) is above BattU_uSRCMa_C.	Wiring Harness or Component
	4	SRC Low for Fuel Temperature Sensor	The sensor raw signal BattU_uRaw (voltage) is below BattU_uSRCMin_C.	
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
	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
	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
	4	SRC Low for Fuel Temperature Sensor	The sensor raw signal FuelT_uRaw (voltage) is below FuelT_SRC.uMin_C (310mV).	
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	Too high load on engine; Sensor mis-adjusted or wiring harness
	1	Physical Range Check Low 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 Mis-adjusted or Wiring Harness
	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
	4	SRC Low for Oil Temperature	The sensor raw signal Oil_uRawTSwmp (voltage) is below Oil_SRCT.uMin_C (0mV)	
	15	Oil Temperature too High Plausibility Error	The Oil temperature Oil_tSwmp is greater than the threshold Oil_tMax-T_C .	oil extremely hot, maybe misuse of engine (tuning) wiring harness or component

# Fault Codes

## SECTION 3 SERVICE

SPN Code	FMI Code	Fault Check Description	Fault Detection Condition	Possible Causes
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 Mis-adjusted
	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 inplausible 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 inplausible 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
	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
652	3	General Short Circuit	Short Circuit of an Injector	Wiring Harness or Injector Cylinder
	3			
653	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
	5	Open Load	Open Load Error of an Injector (interruption of an electric connection)	Wiring Harness or Injector Load Drop Cylinder
677	3	Short Circuit to Battery Error		Wiring Harness or Component
	4	Short Circuit to Ground Error		
	5	No Load Error		
	6	Over Temperature Error on ECU Power-stage for Starter		Over Temperature Error on ECU Power-stage for Starter
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
	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.	
	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.	

## SECTION 3 SERVICE

## Fault Codes

SPN Code	FMI Code	Fault Check Description	Fault Detection Condition	Possible Causes
1076	5	Open Load of Metering Unit Input	Detecting on Open Load Fault in the Metering Unit	Wiring Harness or Component
	12	Over Temperature of Device Driver of metering Unit	Detection of a Metering Unit Power Stage Over-temperature	Output Stage of ECU Defect or Wiring Harness
	15	Short Circuit to Battery in the High Side of the MeUn		Wiring Harness or Component
	16	Short Circuit to Battery of Metering Unit Output	Detecting a Short Circuit Low Side to Battery Voltage in the Metering Unit	
	17	Short Circuit to Ground in the High Side of the MeUn		
	18	Short Circuit to Ground of Metering Unit Output	Detecting a Short Circuit Low Side to Ground in the Metering Unit	
1108	15	Diagnostic Fault Check to Report the Error Due to Cooling Injection in Over Run	Error in the plausibility of Current Energizing Time when Over Heat Protection Injection Active with maximum Permitted Energizing Time	ECU Internal Fault
	16	Diagnostic Fault Check to Report the Error Due to Over Run	The current energizing time is greater than the maximum permitted energizing time after overrun demand by the driver.	ECU Internal Fault
1109	11	Injection Cut Off Demand (ICO) for Shut Off Coordinator	<p>The un-debounced defect detection takes place in the standard ICO mode (EnglICO_stMode_C=0) with an ICO (Mo_stlCOMsg ) requested and an engine speed Epm_nEng greater than EnglICO_nCtOffStdICO_C (1700rpm).</p> <p>The un-debounced defective detection takes place in the comfortable ICO mode (EnglICO_stMode_C = 1) with requested ICO (Mo_stlCOMsg ) and an engine speed Epm_nEng greater than EnglICO_nCtOffCmftlCOHard_C (1700rpm).</p>	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
	4	SRC low for ECU temperature sensor	The Sensed raw voltage value TECU_uRaw_[%] is less than TECU_SRC%.uMin_C	
1244	3	Signal range check low error of pressure control valve AD-channel		Wiring Harness or Component
	4	signal range check high error of pressure control valve AD-channel		
	5	open load of pressure control valve output		
	11	Over speed detection in component engine protection		
	12	Over temperature of device driver of pressure control valve		
	15	Short circuit to battery in the high side of the pressure control valve		
	16	Short circuit to battery of pressure control valve output		
	17	Short circuit to ground in the high side of the pressure control valve		
	18	Short circuit to ground of the pressure control valve output		

# Fault Codes

## SECTION 3 SERVICE

SPN Code	FMI Code	Fault Check Description	Fault Detection Condition	Possible Causes
1769	11	Over-speed Detection in Component Engine Protection	Exceeding of the Engine-Speed Threshold EngPrt_nOvrSpd_C	Over-speed Caused By Driver
2791	13	DFC for Valve Position Sensor Voltage SRC High		
	14	DFC for Valve Position Sensor Voltage SRC Low		
	16	Permanent Governor Deviation for Valve	<p>The negative limit for the governor deviation EGRVlv_GovDvtMonCal.rDvtMin_C has been exceeded and the governor deviation has been persistent longer than the applicable time from EGRVlv_tiDebGovDvt-Def_CUR.</p> <ul style="list-style-type: none"> <li>- The control valve has not been detected as jammed.</li> <li>- The position governor is active.</li> <li>- The control valve is not set to a mechanical stop.</li> <li>- No system error is reported, i.e. the bit DINH_stFld.Fld_EGRVlvGovOn.5 is set.</li> </ul>	ECR Valve Dirty or Defective
	18	Permanent Governor Deviation for Value	<p>The negative limit for the governor deviation EGRVlv_GovDvtMonCal.rDvtMin_C has been exceeded and the governor deviation has been persistent longer than the applicable time from EGRVlv_tiDebGovDvt-Def_CUR.</p> <ul style="list-style-type: none"> <li>- The control valve has not been detected as jammed.</li> <li>- The position governor is active.</li> <li>- The control valve is not set to a mechanical stop.</li> <li>- No system error is reported, i.e. the bit DINH_stFld.Fld_EGRVlvGovOn.5 is set.</li> </ul>	EGR Value Dirty or Defective
	20	DFC for Valve Position Sensor Physical SRC High	$EGRVlv\_SensCal.uRawMaxOpn\_C / EGRVlv\_SensCal.uRawMaxClsd\_C < EGRVlv\_uRaw < EGRVlv\_SensCal.uMax\_C$	EGRVlv Mis-sadjusted or Dirty
	21	DFC for Valve Position Sensor Physical SRC Low	$EGRVlv\_SensCal.uRawMinClsd\_C / EGRVlv\_SensCal.uRawMinOpn\_C > EGRVlv\_uRaw > EGRVlv\_SensCal.uMin\_C$	
2802	11	EEP Read Error Based on the Error for more Blocks	If Selector Erase (Only Flash) Cannot be performed or successfully completed an error will be registered	ECM Fault
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 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 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 3.) ECU internal defect
3597	3	Short Circuit to Battery Error at Actuator Relay		ECU Internal Fault
	4			
3598	3			
	4			

## SECTION 3 SERVICE

## Fault Codes

SPN Code	FMI Code	Fault Check Description	Fault Detection Condition	Possible Causes
5324	11	Array of DFC's for Failure in i+1 <sup>th</sup> Glow Plug		Glowing Problems
5325	4	Array of DFC's for Short Circuit in i+1 <sup>th</sup> Glow Plug		
	11	Array of DFC's for Failure in i+1 <sup>th</sup> Glow Plug		
5326	4	Array of DFC's for Short Circuit in i+1 <sup>th</sup> Glow Plug		
	11	Array of DFC's for Failure in i+1 <sup>th</sup> Glow Plug		
5327	4	Array of DFC's for Short Circuit in i+1 <sup>th</sup> Glow Plug		
	11	Array of DFC's for Failure in i+1 <sup>th</sup> Glow Plug		
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.	
	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.	
	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.	
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	
20222	11	Diagnostic Fault Check to Report Errors in SPI-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	
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.	
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.	
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.	
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 MoFlnjDat_ctDebETErr >= MoFlnjDat_ctDebETErr_C (5 Events). In case of this the error is set. This diagnosis is processed in the 40ms interval.	
20227	11	Diagnostic Fault Check to Report the Error Due to Plausibility Between the Injection Begin v/s Injection Type	Implausible start of energizing 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.	

# Fault Codes

## SECTION 3 SERVICE

SPN Code	FMI Code	Fault Check Description	Fault Detection Condition	Possible Causes
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-11ZFCETCorMoFlnjDat_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.	
	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.	
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.	
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_stPi1ErrAct_mp MoFQntCor_stMl1ErrAct_mp and MoFQntCor_stPol2ErrAct_mp.	
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 and 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.	
20233	11	Diagnostic Fault Check to Report the Error Due to Torque Comparison	FStSys_stStrtRlsCAN_mp = TRUE).	
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.	
	20	Diagnosis of Lead Path Limitation Forced by ECU Monitoring Level2	The setpoint path of the air system (PthLead_trqInrLead ) is limited by the limitation torque (EngTrqPtd_trqLim) of the functional control unit monitoring.	
	21	Diagnosis of set Path Limitation Forced by ECU Monitoring Level 2	The quantity setpoint path (PthLead_trqInrSet) is limited by the limitation torque (EngTrqPtd_trqLim ) of the functional control unit monitoring.	
20238	3	Diagnostic Fault Check to Report "ABE Active" Due to over-voltage detection	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 over-voltage a defect detection takes place.	
	4	Diagnostic Fault Check to Report "ABE Active" due to under-voltage detection	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 BattU_u keeps greater than OCWDA_uBattMin_C (8V) longer than the debounce time OCWDA_CTUBATTMX(100ms).	
	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_ctDebSOPNotActv = 0) and an active WDA wire a defect detection takes place.	

## SECTION 3 SERVICE

## Fault Codes

SPN Code	FMI Code	Fault Check Description	Fault Detection Condition	Possible Causes
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 BattU_u keeps greater than OCWDA_uBattMin_C (8V) longer than the debounce time OCWDA_CTUBATTMX (100ms).	ECU Internal Fault
20251	11	Visibility of Software Resents 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.	
	20		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.	
	21		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.	
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.	
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
		Short Circuit to Battery on Out2 Error for H-Bridge	Short Circuit to Battery at Out2 of TLE7209/CJ230 Error	
	4	Short Circuit to Ground on Out1 Error for H-Bridge	Short Circuit to Ground at Out1 of TLE7209/CJ230 Error	
		Short Circuit to Ground on Out2 Error for H-Bridge	Short Circuit to Ground at Out2 of TLE7209/CJ230 Error	
	5	Open Load Error for Power-stage	Open Load Error Monitoring for TLE7209/CJ230	Wiring Harness Component for ECU Internal Fault
	12	Over Temperature Error for H-Bridge	Over Temperature Error Monitoring for TLE7209/CJ230	
20288	2	DFC for Coding Error when Different Coding Words were Received in a coding cycle		Glowing Problems
		No Load Error for Low Voltage System		
	3	Short Circuit to Battery Error for Low Voltage System		
	4	Short Circuit to Ground Error for Low Voltage System		
	5	Over Temperature Error on ECU Power-stage for Glow Plug Low voltage System		
	14	DFC for T30 Missing Error in GCU-T		
	21	DFC for Coding Error when Selected Coding is not working		
	22	DFC for faulty Diagnostic Data Transmission or Protocol Error		
	23	DFC for glow Module Error in GCU-T		

# Fault Codes

## SECTION 3 SERVICE

SPN Code	FMI Code	Fault Check Description	Fault Detection Condition	Possible Causes
20290	3	Diagnostic Fault Check to Report the Error in Over-Voltage Monitoring	Irreversible error bit 2 set in MoCSOP_st ( counter MoCSOP_ctDebPSDia >= MoCSOP_ctDebPSDia_C (2 Events) during over voltage detection of the SOP test).	ECU Internal Fault
	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.	
	20	DFC to set a Torque Limitation once an Error in Detected Before MoCSOP'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_MoCSOPInjDiagDeb are blocking) then only the test flag of every MoCSOP DFC will be set. Besides the error bits of DFC_MoCSOPErrNoChk will be set.	
	21	Wrong Set Response Time	Irreversible error bit 8 set in MoCSOP_st ( counter MoCSOP_ctErrRespTime > MOCSOP_MM_RESPTIME_RESET_ERRORS(2) within the SOP test) and state MOCSOP_STEP_ERROR reached due to time out.	
	22	Too Many SPI Errors During CoCSOP Execution	Irreversible error bit 6 set in MoCSOP_st (counter MoCSOP_ctErrSPI >= MOCSOP_SPI_RESET_ERRORS(16) within the SOP test) and state MOCSOP_STEP_ERROR reached due to time out.	
	23	Diagnostic Fault Check to Report the Error in Under-voltage Monitoring	Irreversible error bit 3 set in MoCSOP_st ( counter MoCSOP_ctDebPSDia >= MoCSOP_ctDebPSDia_C during under voltage detection of the SOP test).	
		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 >= MoFlnjDat_numCyl_C (4) ) during the MM SOP test).	
	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.	
		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).	
		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).	
22040	19	Timeout Error on 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_tiTSC1TET0DebDef_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)	
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_tiErrDebDef_C (50ms)	Switch Defective or is Active for a Long time

## SECTION 3 SERVICE

## Fault Codes

SPN Code	FMI Code	Fault Check Description	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.	<ol style="list-style-type: none"> <li>1. Leakage in the high pressure section</li> <li>2. Injection nozzle stuck in open position</li> <li>3. Worn high pressure pump</li> <li>4. Worn injector (to high injector back flow quantity)</li> <li>5. Fuel filter clogged up</li> <li>6. PSP (electric pre-supply pump) output too low</li> </ol>
	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 <sup>3</sup> /s) an error will be detected.	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 an error will be detected.	<ol style="list-style-type: none"> <li>1. Metering unit is stuck in open position</li> <li>2. Zero delivery throttle clogged up</li> <li>3. Metering unit without power due to electrical error.</li> <li>4. Pressure after zero-delivery throttle too high.</li> </ol>
	2	If the rail pressure RailP_pFlt exceeds the limiting value Rail_MeUnMon.pFltMax_C (1.750.000 hPa) an error will be detected.	If the rail pressure RailP_pFlt exceeds the limiting value Rail_MeUnMon.pFltMax_C an error will be detected.	<ol style="list-style-type: none"> <li>1. Metering unit is stuck in open position</li> <li>2. Zero delivery throttle clogged up</li> <li>3. Metering unit without power due to electrical error.</li> <li>4. Pressure after zero-delivery throttle too high.</li> </ol>
	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_dvolMonMax_mp, an error will be detected.	Maladjusted rail pressure sensor, defective high pressure pump, leakage, Possible error in the low pressure stage, Back flow too low

# Fault Codes

## SECTION 3 SERVICE

SPN Code	FMI Code	Fault Check Description	Fault Detection Condition	Possible Causes
23614	0	Maximum Rail Pressure Exceeded		Maximum Rail Pressure Exceeded
	1	Maximum Rail Pressure Exceeded (Second Stage)		Maximum Rail Pressure Exceeded (Second Stage)
	20	Maximum Positive Deviation of Rail Pressure Exceeded		Maximum Positive Deviation of Rail Pressure Exceeded
	22	Maximum Negative Rail Pressure Deviation with Closed Pressure Control Valve Exceeded		Maximum negative Rail Pressure Deviation with Closed Pressure Control Valve Exceeded
23895	13	Check of Missing injector Adjustment Value Programming	Detection if the monitoring for missing or faulty programming of the injector adjustment values is active and: <ul style="list-style-type: none"> <li>the checksum of the injector adjustment code words is not correct or</li> <li>the basic correction quantity in at least one injector checkpoint has exceeded the admissible limits or</li> <li>no injector adjustment values could be read due to faulty EEPROM access.</li> </ul>	IMA not programmed
23896	13	Check Of Missing Injector Adjustment Value Programming		IMA Not Programmed
23897	13			
23898	13			
23906	3	Short Circuit to Battery of Pre-Supply Pump Output		Wiring Harness or Component
	4	Short Circuit to Ground of Pre-Supply Pump Output		
	5	Open Load of Pre-Supply Pump Output		Wiring harness or Component
	12	Over Temperature Error on ECU Powerstage for Pre-Supply Pump		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
	11	Function Monitoring: Fault in the Monitoring of the Start Control		ECU Internal Fault

This is not an exhaustive list of the error codes that are available. If an alternate code is shown that is not on this list, please contact Allen Engineering Service Department for details.

### **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.

# **SECTION 4 ACCESSORIES**

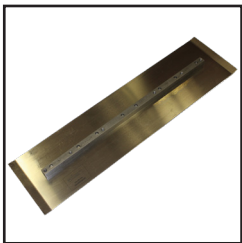
## SECTION 4 ACCESSORIES

### Popular Accessories



Trowel Blade, Combo, 8" X 23", Gold Series  
(only sold as set of 4)

Part Number: 041503G-4



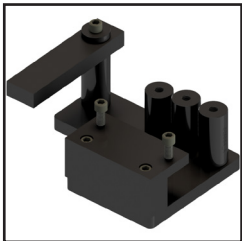
Trowel Blade, Finish, 6" X 23", Gold Series  
(only sold as set of 4)

Part Number: 047973G-4



Trowel Blade, Finish, 6" X 23", Plastic (Steel Reinforced)  
(only sold as set of 4)

Part Number: 048342-4



Trowel Arm Alignment Jig

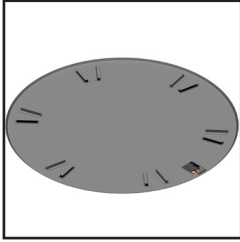
Part Number: 016863



Puller, Spider Service Tool, 6-Boss

Part Number: 048360

## Popular Accessories



Float Pan, Clip On, 62.5" O.D., Universal Flat, 45° Lip Angle, 6-Blade

Part Number: 047390



Float Pan, Safety Catch, 62.5" O.D., Universal Flat, 45° Lip Angle, 6-Blade

Part Number: 047438



Lifting Bridle, 6,000 Pound Max, 2-Point x 3 Foot

Part Number: 064798



Dolly Jacks are available for HDX riders to make mobilization easier. These tires are foam-filled to help support the added weight of the machine and to help prevent flats. (Comes in set of 2)

Part Number: 039578-F

# Parts Manual

## NOTICE

### Parts Manual

In order to provide a premier experience to our customers, we have moved the “Parts” section out of this manual and placed it in a separate “Parts & Decals Manual”. This will allow us to provide any changes or other important information quicker to you, the customer. See below for ways to access the “Parts & Decals Manual”.

### Mobile Device:

Scan this QR code with a compatible device (cellular phone, tablet, etc.)



### Computer:

Click the link below

[HDX780 Parts and Decals Manual](#)

### Mail:

A physical copy of the parts manual can also be mailed to you upon request. Please contact Allen Engineering service department and one can be sent to you.

Allen Engineering  
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Paragould, Ar.  
72451, USA

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Fax: 1.800.643.0097 (USA Only) / 1.870.236.3934

## Revision Detail

### MANUAL REVISION DETAIL

REVISION #	REVISION DATE	REVISION REFERENCE #	REVISION BY
-	02/20	Initial Release	MW
A	01/22	Updated Covers	MK
B	04/22	Engine Oil Information	MK



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