



Doosan Infracore

## COMPRESSOR TRAINING

Medium compressors



## MEDIUM COMPRESSORS RANGE



- 14/85 13.8 bar (200 psi), 8.5 m<sup>3</sup>/min (300 cfm)
- 10/105 – HP375 10.3 bar (150 psi), 10.3 m<sup>3</sup>/min (365 cfm)
- 9/110 – XP375 8.6 bar (125 psi), 10.6 m<sup>3</sup>/min (375 cfm)
- 7/120 – P425 7.0 bar (100 psi), 12.0 m<sup>3</sup>/min (425 cfm)
  
- 14/115 – VHP400 14 bar (200 psi), 11.3 m<sup>3</sup>/min (400 cfm)
- 10/125 – HP450 10.3 bar (150 psi), 12.7 m<sup>3</sup>/min (450 cfm)
- 7/170 – P600 7 bar (100 psi), 17.0 m<sup>3</sup>/min (600 cfm)
- 12/150 12 bar, 15 m<sup>3</sup>/min



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## SUMMARY

- The compressor can be divided in the following subsystems
  - [ENGINE & AIREND](#)
  - [LUBRICATION & COOLING SYSTEM](#)
  - [AIR FLOW REGULATION SYSTEM](#)
  - [SEPARATION SYSTEM](#)
  - [BLOWDOWN SYSTEM](#)
  - [INSTRUMENT/CONTROL PANEL](#)
  - [ELECTRICAL WIRING](#)



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## ENGINE (14/85 - 7/120)

- 4IRD5AE
- 4 cylinders
- 4.5L displacement (106 x 127)
- 93kW (125hp) @ 2400 rpm
- 20 - 30% torque rise
- Turbocharged and after-cooled
- Stanadyne DE10 electronic injection pump
- Gear-driven auxiliary power take-off (37kW)
- Emission certified
- 24 Volt Electrics



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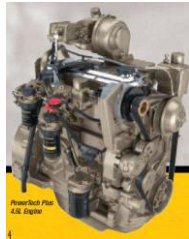
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## ENGINE (14/85 - 7/120)

- 4IRD5AE – 4045 HF 285
- 4 cylinders
- 4.5L displacement (106 x 127)
- 93kW (125hp) @ 2200 rpm
- HPCR Common Rail
- Turbocharged and after-cooled
- Emission Tier III certified
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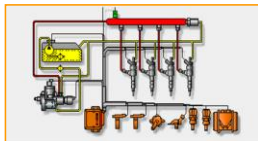
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## ENGINE Tier 3 (14/85 - 7/120)

- 4IRD5AE – 4045 HF 285



HPCR



Electronic rotary pump

Electronic Injector (EI)



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### ENGINE (14/115 – 7/170)

- 6IRF8TE -
- 6 cylinders
- 6.8L displacement (106 x 127)
- 126kW (170hp) @2400 rpm
- 20 - 30% torque rise
- Turbocharged
- Stanadyne DE10 electronic injection pump
- Gear-driven auxiliary power take-off (37kW)
- Emission certified
- 24 Volt Electrics



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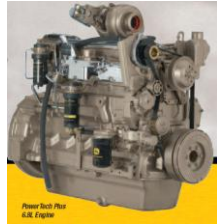
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### ENGINE Tier 3 (14/115 – 7/170)

- 6IRF8AE – 6068 HF 285
- 6 cylinders
- 6.8L displacement (106 x 127)
- 129kW (173hp) @2200 rpm
- HPCR Common Rail
- Turbocharged
- Emission Tier III certified
- 24 Volt Electrics



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### ENGINE Tier 3 (12/150)

- 6IRF8AE – Cummins QSB 6.7
- 6 cylinders
- 6.7L displacement
- 220hp(164Kw)@2000 rpm
- Bosch HPCR – 1600bar
- Turbocharged
- Emission Tier III certified
- 24 Volt Electrics



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## 178.5mm AIREND

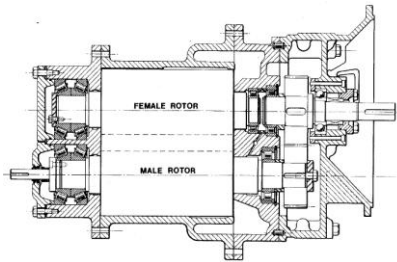
- Casing houses two screw-type rotors mounted on ball and roller bearings.
- Diesel engine drives the male rotor through heavy-duty coupling.
- Mechanical seal used to seal the shaft.
- Gear sets allow to change rotor speed and therefore air output.
 

– 7/120	36084234	Ratio 1.355
– 9/110	36084226	Ratio 1.255
– 10/105	36084218	Ratio 1.163
– 14/85	36084119	Ratio 0.963
– 7/170	35093665	Ratio 1.767
– 10/125	36083988	Ratio 1.465
– 14/115	36083996	Ratio 1.255



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## 178.5mm AIREND



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## AIREND (14/85 – 7/170)



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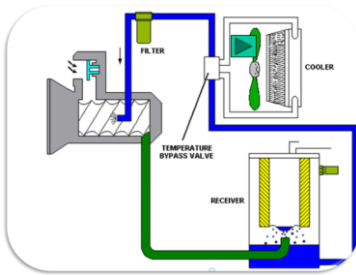
## COMPRESSOR LUBRICATING SYSTEM

- Functions of the oil system:
  - Lubricating the rotors, airend bearings and mechanical seals
  - Sealing the clearances between the airend rotors
  - Cooling of the airend. Heat is generated during air compression.
- The oil flows due to the air pressure. No oil pump is required.



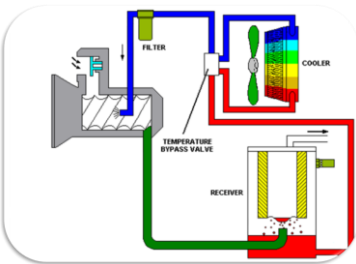
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## LUBRICATION & COOLING



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## LUBRICATION & COOLING



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## LUBRICATION & COOLING

- The Separator tank is also the reservoir of compressor oil.
- Pressure in the tank is forcing the oil through the system.



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## LUBRICATION & COOLING

- Cool box design with pusher type fan.



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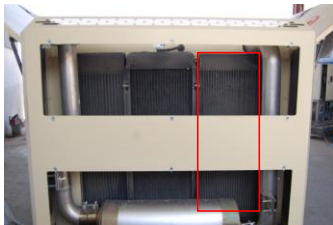
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## LUBRICATION & COOLING



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## LUBRICATION & COOLING

- Compressor oil filter, 10 micron rating.



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## LUBRICATION & COOLING

- Allows to regulate the oil temperature around 85°C.
- Keeping the oil hot enough allows to reduce the water condensation in the compressor.
- Never remove the thermostat as this would by-pass the oil cooler!



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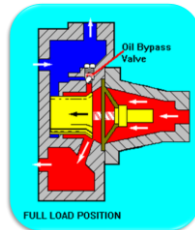
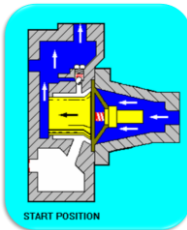
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## LUBRICATION & COOLING



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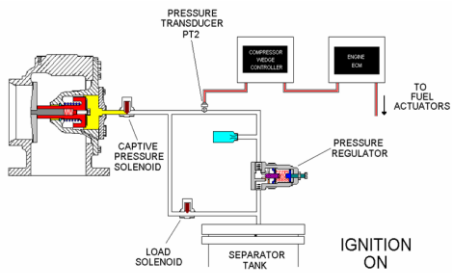
## AIR REGULATION SYSTEM

- The air regulation system continuously adjusts the production of compressed air to the consumption by controlling the engine speed and unloader valve.
- The unloader is pneumatically controlled through the pressure regulator. The fuel pump throttle is electrically controlled by the wedge controller.



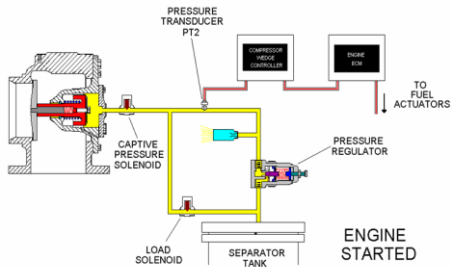
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## REGULATION SCHEMATIC



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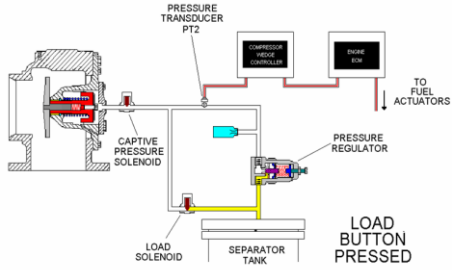
## REGULATION SCHEMATIC



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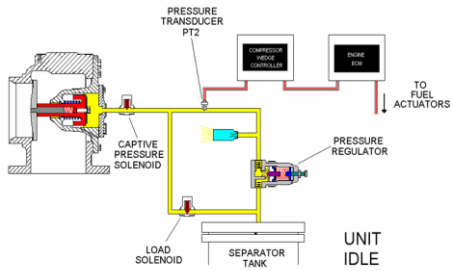
## REGULATION SCHEMATIC



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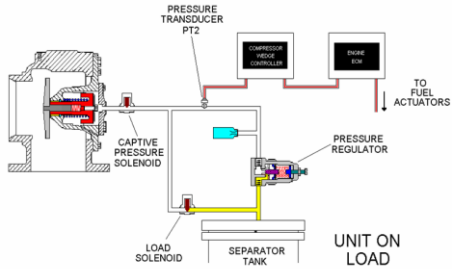
## REGULATION SCHEMATIC



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## REGULATION SCHEMATIC



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## CAPTIVE SOLENOID

- A captive pressure solenoid is fitted to ALL models to aid starting.
- On shutdown solenoid traps air behind the unloader piston. This keeps unloader closed during cranking, hence reducing load on engine.



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## ORIFICE

- Continuously bleeds air from the regulation circuit.
- If blocked, unloader valve would never be able to open after start up and airend low oil pressure warning would register.
- Size of orifice greatly affects regulation characteristic and should not be adjusted.
- Located near airend.



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## WEDGE CONTROLLER

- The WEDGE is located inside the machine above the fuel tank.



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## WEDGE CONTROLLER

- WEDGE Controller is the heart of the machine monitor and control system.
- It is an Intel micro-controller based unit with analog and digital inputs and outputs.
- One of the function is to monitor regulator and discharge pressure, and varies engine speed to maintain air pressure at desired set point.



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## LOAD SOLENOID

- Situated on the separator tank.



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## LOAD BUTTON



- The load button is a momentary action switch.
- It operates the load solenoid adjacent to the pressure regulator.
- Prior to being pressed the solenoid allows the air to by-pass the regulator.



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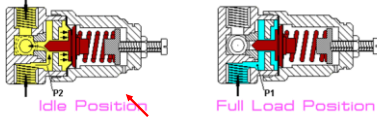
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## REGULATOR VALVE - OPERATION

- Needle valve actuated by diaphragm and held closed by a spring.
- Controlled pressure preset in factory, can be adjusted by means of adjusting screw.
- Pin hole allows to determine diaphragm condition.

P1 - AIR PRESSURE LESS THAN SPRING PRESSURE  
P2 - AIR PRESSURE GREATER THAN SPRING PRESSURE



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## REGULATOR VALVE

- Situated on top of the separator tank.
- Range 0 – 200 PSI
- 36896892 DS



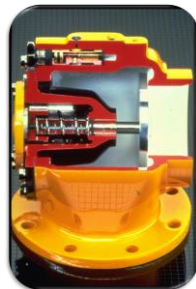
36896892 SEETRU has been superseded by the DS component

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## UNLOADER VALVE

- Valve actuated by piston with diaphragm.
- Spring keeps valve normally opened, pressure on piston makes the valve close.
- Also acts as check valve to avoid oil going to filters during shut down.

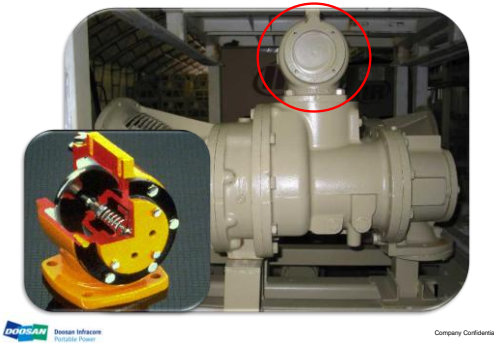


Tip: Pin hole allows to determine if diaphragm has failed!

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## UNLOADER VALVE



## PRESSURE TRANSDUCER, PT1

- Situated on the pressure vessel
- Measures system pressure

-Range 0 – 500 PSI  
-1/8" – 27 NPT



## PRESSURE TRANSDUCER, PT2

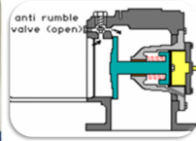
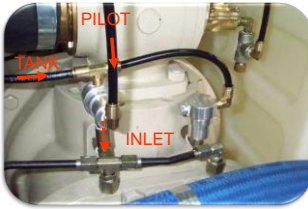
- Situated near the unloader valve,
- Measures regulation system pressure

-Range 0 – 100 PSI  
-1/8" – 27 NPT



## ANTI RUMBLE VALVE

- Allows some compressed air from the receiver tank to return to the inlet at idle to prevent a too great vacuum at the inlet.
- Obsolete design      Current design



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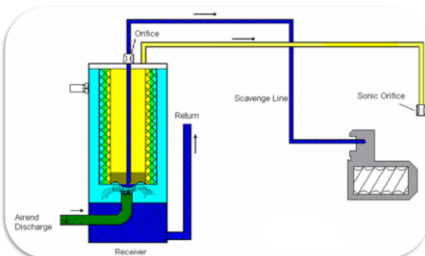
## SEPARATION SYSTEM

- Functions of the separation system:
  - Removing the oil contained in the compressed air
- Most of the oil is removed from the air through a specially shaped baffle in the separator tank.
- The remaining oil is removed by the separator element.

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## SEPARATION SCHEMATIC



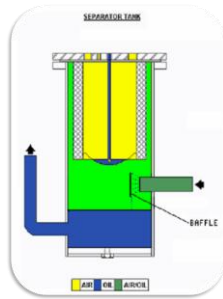
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## SEPARATOR/RECEIVER TANK



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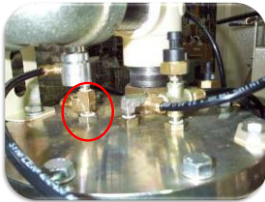
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## SCAVENGE LINE

- Orifice is located in the elbow connector.
- It is designed to scavenge the oil while limiting the loss of air flow.
- Check valve prevents oil reverse flow during shutdown.



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## SCAVENGE LINE

- Returns to compressor oil filter.
- Look for clogged scavenge lines in case of oil carry over!



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## SAFETY VALVE

- Valve is on the oil side of the element where pressure is maximum when the separator element is blocked.



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## MIN. PRESSURE VALVE

- Maintains a min. pressure (~5bar) in the receiver to:
  - keep the oil flowing.
  - limit pressure drop across the separator.
- Continuous operation at min pressure results in oil carry over due to insufficient scavenge flow.



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## BLOW DOWN SYSTEM

- The blow down system allows to relieve the pressure from the separator tank automatically or manually if required.

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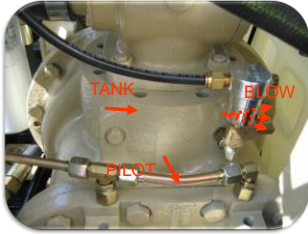
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## AUTO BLOWDOWN

- Normally closed valve.
- Pilot is high pressure at inlet that appears when compressor is stops and unloader check valve closes.



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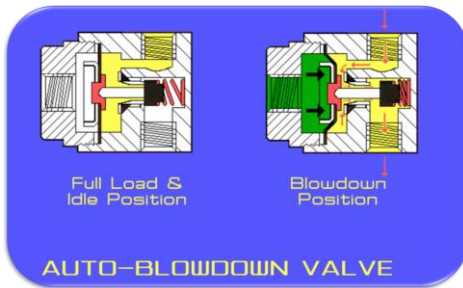
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## AUTO BLOWDOWN VALVE



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## INSTRUMENT/CONTROL PANEL

- Interface between user and compressor.
- Provides control, monitoring and diagnostics functions.

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## INSTRUMENT/CONTROL PANEL



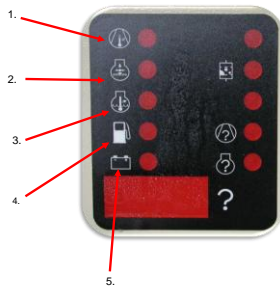
## INSTRUMENT/CONTROL PANEL

- The WEDGE is located inside the machine above the fuel tank.



## INSTRUMENT/CONTROL PANEL

1. HIGH COMPRESSOR TEMP.  
Indicates shutdown due to high comp. Temp.
2. LOW ENGINE OIL PRESSURE.  
Indicates shutdown due to low oil P.
3. HIGH ENGINE COOLANT TEMP.  
Indicates shutdown due to high water Temp.
4. LOW FUEL LEVEL.  
Indicates shutdown due to low fuel level.
5. LOW BATTERY VOLTS.  
Indicates battery/charging system needs service.



## WEDGE CONTROLLER

- First function of the WEDGE is to scan all analog and digital inputs at a fixed interval. The inputs are scanned every 50 milliseconds. The values are then compared against min. and max. values and an ALERT or SHUTDOWN is issued.
- Second function is to monitor discharge pressure, and varies engine speed to maintain air pressure at desired set point.
- Third function to retrieve diagnostic info from the engine.



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## INSTRUMENT/CONTROL PANEL



- RESTRICTED AIR FILTER.**  
Alarm indicator. Indicates eng/comp air filter need service.
- COMPRESSOR MALFUNCTION.**  
Indicates shutdown due to compressor system fault. Refer to fault code list.  
Relayed to front panel
- ENGINE MALFUNCTION.**  
Engine fault. Refer to engine fault codes.  
Relayed to front panel.
- FAULT CODE & DIAGNOSTICS DISPLAY.**  
Refer to fault code and parameters lists.



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## CPRSR MALFUNCTION LIGHT

- 1,2-digits codes
- Extract of wedge fault code reference table v1.7



ALERT				SHUTDOWN			
	CODE	LIGHT (BLINKS)	Machine ID	CODE	LIGHT (STEADY)	DELAY (sec)	Machine ID
Engine Speed < Min. RPM				1	CPRSR Mal	30	All
Engine Speed > Max. RPM				2	CPRSR Mal	30	All
Engine Crank Time Exceeded				3	CPRSR Mal	0	All
Engine Oil Temperature > 252 deg F	5	CPRSR Mal	5-5				
Engine Manifold Temperature > 180 deg F	6	CPRSR Mal	5-7				
Water In Fuel	8	CPRSR Mal	5-5				
Engine Not Responding to Throttle Cmd	10	CPRSR Mal	All				
Too Many Start Attempts during Autostart				11	CPRSR Mal	0	All

Note: CAN derived data



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## ENGINE MALFUNCTION LIGHT

- 3,4-digits codes
- Extract of IR engine fault code reference table



Displayed	Code Definition
29	Analog Throttle (A) Input
100	Engine Oil Pressure
105	Manifold Air Temperature
110	Engine Coolant Temperature
111	Loss of Coolant Temperature
158	ECU Power Down Error
174	Fuel Temperature
190	Engine Overspeed
620	Sensor Supply Voltage

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## DEDICATED LIGHTS

- No code
- Light state table, v1.7

Note: CAN derived data



ALERT				SHUTDOWN			
	CODE	LIGHT (BLINKS)	Machine ID		CODE	LIGHT (STEADY)	Machine ID
Oil/Fuel Level		Fuel Level	5-6			Fuel Level	8
Air Filter Restriction		Solid Filter	All				
Low Battery Voltage		Battery Charging Condition	All				
Engine Oil Pressure < 16 PSI		Low Engine Oil Pressure	All				
Low Coolant Level		Engine Coolant Level	5, 1, 5, 6				
Engine Coolant Temp > + 215 deg F		High Engine Temp	All				
Engine Coolant Temp > + 220 deg F						High Engine Temp	10
IG Filter Restriction						IG Filter Restriction	3 (S-E)
High Discharge Temp. (RT2 > 247 deg F)						High Comp. Temp.	3 All

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## WEDGE DISPLAY

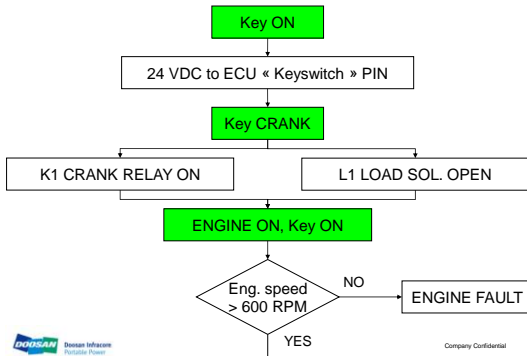
- Accessed by pressing the scroll switch.
- Number appears first and after three seconds parameter will be displayed.

Number	Parameter	Comments
2	RPM	F/W sensor
3	RPM Filtered	
4	Reg system pressure	
5	Sep tank pressure	
6	Discharge temperature	
7	Sep tank temperature	
8	Throttle output	(Hz)
9	Machine type	**
10	Engine coolant temp	from CAN
11	Engine oil temp	from CAN
12	Engine oil pressure	from CAN
13	Intake Manifold temp	from CAN
14	RPM	from CAN
15	Fault code list	Engine code
16	Throttle Position	
17	Boost Pressure	
18	Engine Hours	
19	Load @ Speed	

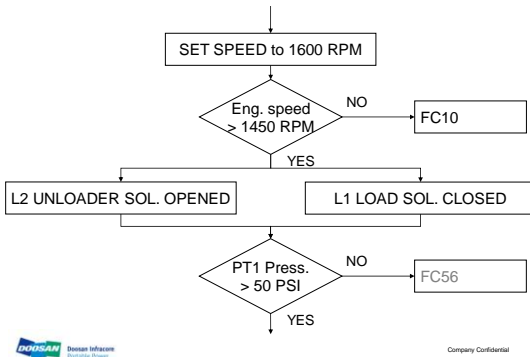
\*\* 1 = CU XHP Viking, 2 = CAT EMU LP, 3 = CAT EMU HP, 4 = XHP CAT Viking, 5 = CU EMU LP, 6 = CU EMU HP, 7 = P426 Deere, 8 = WW600 Deere

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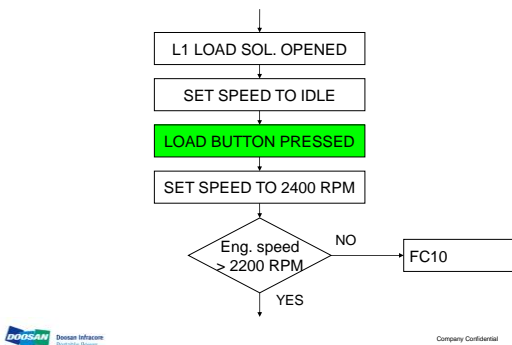
### WEDGE OPERATION – STARTUP 1



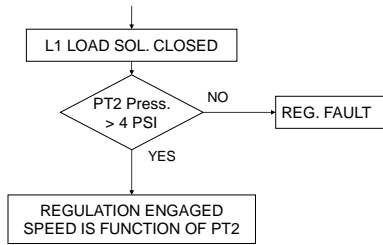
### WEDGE OPERATION – STARTUP 2



### WEDGE OPERATION – STARTUP 3



## WEDGE OPERATION – STARTUP 4



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## WEDGE MACHINE ID

Disconnect the fuel level gauge before the process and reconnect when completed.

### FOR WEDGE software above v1.60

- 1. Determine machine ID.
- 2. Turn ignition "ON". Machine must not be operating.
- 3. Toggle the "scroll" switch until number "19" is reached. Push and hold, the number "20" will appear. Continue to hold the switch. After 1 second, the current machine ID will appear. Continue to hold for 9 more seconds and a blinking "--" will appear. Release the switch.



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## WEDGE MACHINE ID

- 5. Toggle the switch, the display will show "0". Toggle until the proper machine ID appears, then stop the toggle sequence.
- 6. Wait around 10 sec. until the controller performs a reset function. At reset, the controller display first goes blank, then all 10 LED's light, the display shows all 8's, then the installed software version and finally goes blank. The engine oil pressure and alternator LED begin flashing. At this point the controller has stored the machine ID selected in step 5.
- 7. Check the setting. Reconnect the fuel level gauge.



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## WEDGE DISPLAY UNITS

- To determine which units the WEDGE has been configured for:
  - 1. With the machine power off (Key turned OFF)
  - 2. Press and hold the "Service Air" Switch
  - 3. Turn the key switch directly to the crank position.
  - 4. Hold these switch positions until the 4 digit LED display on the WEDGE goes blank.
  - 5. Release "Service Air" switch, release key switch to "ON".
  - 6. Units will be displayed for 2 seconds as:
    - 'PSI' for Deg F, PSI
    - 'Bar' for Deg C, Bars
    - 'H9C' for Deg C, Kg/cm2
    - 'HPA' for Deg C, KPa
- To change the units setting:
  - 1. With the WEDGE showing the current setting, press and release the "Scroll" switch until the desired setting appears on the display.
  - 2. Once it appears, do not release the "Scroll" switch. Hold it in the ON position until the WEDGE restarts. This will select units selection that was displayed.
  - 3. Release the "Scroll" switch. The compressor is ready to start.



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## PDA SERVICE TOOL

- Plugs on connector near wedge controller.
- Features:
  - Extract shut down / alarm history
  - Read controller fault codes
  - Read/capture SAE J1939 engine data
  - Flash controller software
- Controller software can also be flashed from a PC.
  - Refer to TSB CMP-2007-004



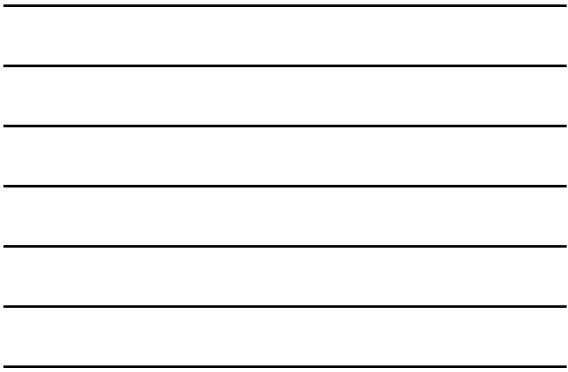
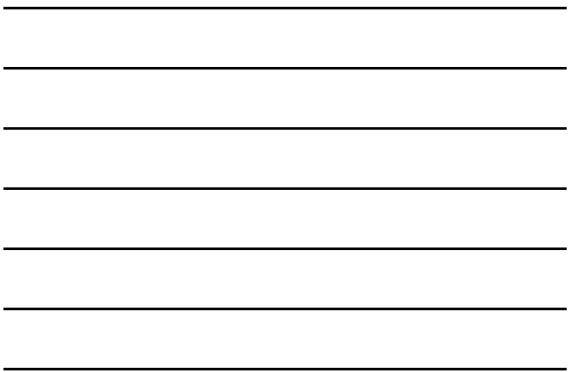
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## ELECTRICAL WIRING

- [System Diagram](#)
- [General Machine Wiring Schematic](#)
- [Control Panel Wiring Schematic](#)
- Refer to Zenith Electrical/Electronic service manual for troubleshooting and additional information.



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- Mounted in the side of the separator tank

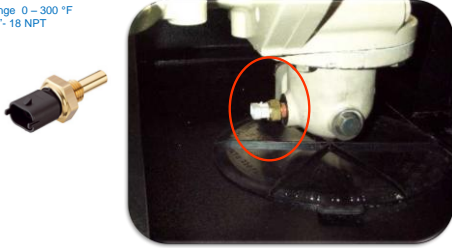




## RT2 – AIR DISCHARGE TEMP

- Mounted in the airend discharge piping

-Range 0 – 300 °F  
-3/8"-18 NPT



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## THERMISTOR

- Plugged between two wedge pins via main harness.
- Resistance varies with temperature.
- Temperature range : -35°C – 125°C
- Troubleshooting:
  - Check thermistor by plugging the Thermistor Simulator Plug IR#22073878. The reading should be 0°C +/- 3°C. If correct, replace thermistor
  - If NOT, disconnect P1 wedge connector and measure resistance between P1-4 and P1-6. The reading should be 33,2 Kohms +/- 1%. If NOT correct replace Wedge
  - If correct check the harness and connectors.



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## PT1 – SEPARATOR TANK PRESSURE

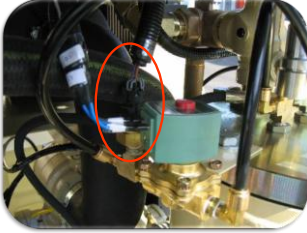
- Mounted near the separator tank.
- Transducer range: 0 – 15 bar (0 – 225 psig)



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## PT2 – REGULATION PRESSURE

- Mounted after the pressure regulator.
- Transducer range: 0 – 7 bar (0 – 100 psig)



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## PRESSURE TRANSDUCER

- PT1 and PT2 are gauge pressure transducers.
- The WEDGE provides 5 VDC excitation voltage to pin B (+5V) and pin A (GND).
- The pressure signal on pin C connects to the WEDGE input. The signal range is .45 to 4.5 volts.
- Troubleshooting:
  - Connect a gauge in parallel with the transducer and use the Wedge diagnostics to display the reading of PT1. If the gauge does NOT track the reading replace the transducer.

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## SW – AIR FILTER RESTRICTION

- Normally open switches
- Close when the air filter restriction reaches 20 inches of water.
- The switches provide a ground connection to an input on the WEDGE controller.
- Troubleshooting:
  - Disconnect the switch and simulate it with another switch or jumper plugged on the harness. The alarm should register.
  - If NOT check the harness and connectors.

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## SW – FUEL SENDER SHUTDOWN

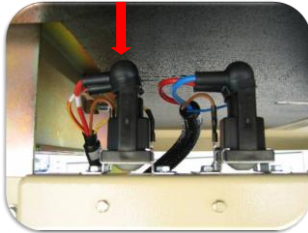
- Normally open switch
- Close when the fuel level is low.
- The switches provide a ground connection to an input on the WEDGE controller.
- Troubleshooting:
  - The Level switch can be checked with the sender removed from the tank. Use an ohmmeter to verify switch operation. Tilting the sender tube back and forth should activate the switch.



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## K1 – START RELAY

- The WEDGE drives the engine starter through the auxiliary start relay, K1.
- K1 is mounted on the lifting rail above the wedge controller.



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## K – START RELAY

- Troubleshooting:
  - If the starter will not engage during a crank cycle, check the voltage at the coil of K1 during the crank cycle. It should be 14 - 22VDC.
  - If voltage is not at K1, check for voltage back through the ESTOP jumper and to the WEDGE.
  - If voltage is at K1 coil, verify voltage is sent to the starter solenoid by K1 contact.
  - Voltage available at the starter solenoid during a no-crank condition indicates a starter problem.



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## MACHINE WIRING HARNESS

- Links the wedge controller to:
  - The engine controller
  - The compressor sensors
  - The actuators
  - The control panel
  - AND the engine sensors
- The **engine** sensors are link to the **engine** controller via the **machine** harness.



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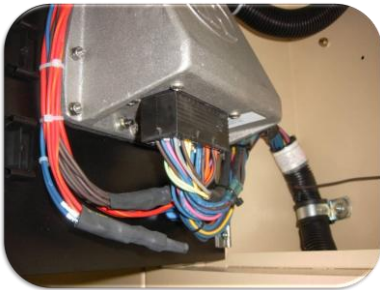
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## CONNECTOR P1 - WEDGE



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## K2 – INLET AIR HEATER RELAY



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## Maintenance General

- Fuel Quality → SULFUR content
  - Recommended Sulfur content is less than 0.10% ( 1000ppm ).
  - If Sulfur is between 0.10 and 0.50 % we strongly suggest decreasing oil maintenance intervals based on oil sampling data.
- Fuel Quality → Solid contaminants
  - Fuel used should meet EN590 or ASTM D975 specification
  - Dirty fuel will damage vital fuel system components , causing machine downtime and expensive repairs.
  - If Biofuel is used it should be conform to JD specs. ( consult engine manual)



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## Options TIER 3

- Aftercooler W/ Waterseparator
- Central Drains
- Dual Pressure Regulation
- Adjustable Height Towbar
- Extended Towbar
- Ext / Adj Towbar
- Full Gauge Panel
- 4 in 1 Gauge
- Tacho
- Galvanneal enclosure
- Hose Reel Assy – Single – Double
- Hose Reel Lubricator
- IQ filter
- IQ Differential Pressure Gauge



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