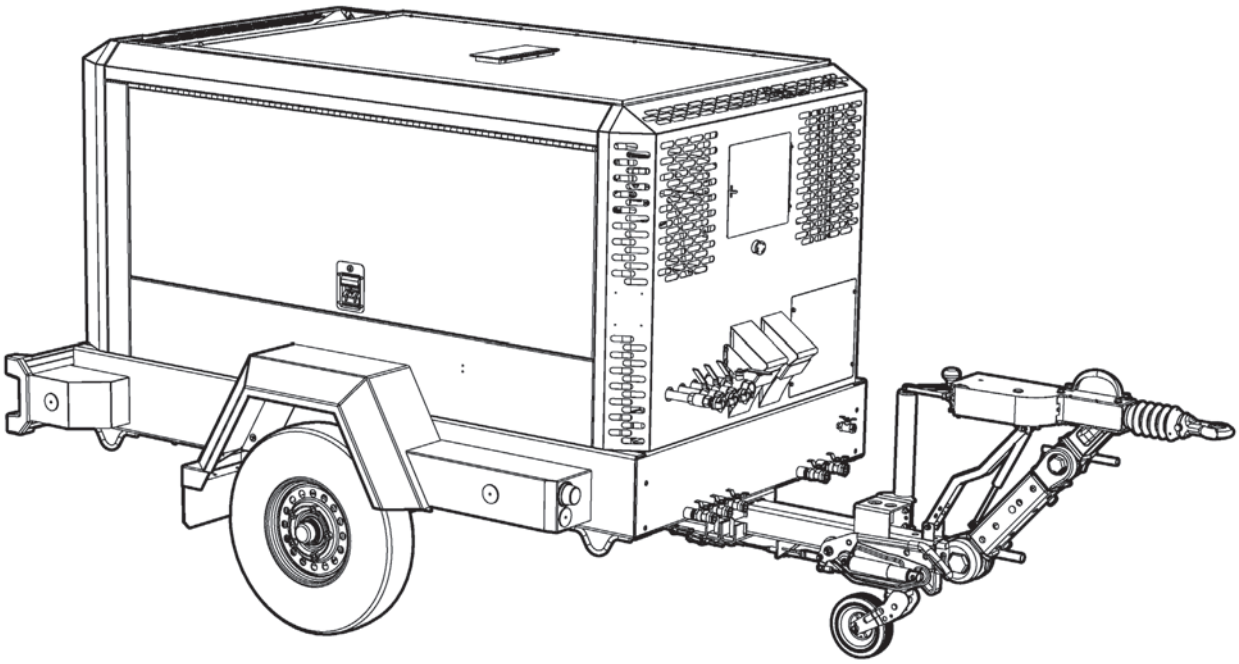
DOOSAN

Portable Power

7/124-10/104, 10/124-14/114, 14/84

OPERATION & MAINTENANCE MANUAL

Original Instruction



This manual contains important safety information and must be made available to personnel who operate and maintain this machine.

SERIAL No:	660200 ->

46692958_en_D_03/19

Machine models represented in this manual may be used in various locations world-wide. Machines sold and shipped into European Union Territories require that the machine display the CE Mark and conform to various directives. In such cases, the design specification of this machine has been certified as complying with EC directives. Any modification to any part is absolutely prohibited and would result in the CE Certification and marking being rendered invalid. A declaration of that conformity follows:

CE

DOOSAN

1) **EC Declaration of Conformity**

2) Original declaration

3) **We:**
Doosan International USA, Inc
1293 Glenway Drive
Statesville
North Carolina 28625-9218
USA

4) **Represented in EC by:**
Doosan Bobcat EMEA s.r.o.
U Kodetky 1810
Dobris, 263 12
Czech Republic

5) **Hereby declare that, under our sole responsibility the product(s)**

6) Machine description: Portable Screw Compressor

7) Machine Model: 7/20; 7/26E; 7/31E; 7/41; 7/53; 7/53R; 7/73-10/53; 7/124-10/104; 10/124-14/114; 14/84; 7/205; 10/175; 12/205; 12/155; 14/145; 9/305; 9/275-12/255; 17/245; 21/225

8) Commercial name: 7/20; 7/26E; 7/31E; 7/41; 7/53; 7/53R; 7/73-10/53; 7/124-10/104; 10/124-14/114; 14/84; 7/205; 10/175; 12/205; 12/155; 14/145; 9/305; 9/275-12/255; 17/245; 21/225

9) VIN / Serial number: T K 4

10) **is (are) in conformity with the relevant provisions of the following EC Directive(s), Regulation(s)**

11) 2006/42/EC The Machinery Directive
12) 2014/30/EU The Electromagnetic Compatibility Directive
13) 2000/14/EC The Noise Emission Directive
14) 2014/68/EU The Pressure Equipment Directive
15) 2014/29/EU The Simple Pressure Vessels Directive
16) (EU) 2016/1628 The emission of engines for no-road mobile machinery
31) 2014/35/EU The Low Voltage Equipment Directive
17) and their amendments

18) **Conformity with the Noise Emission Directive 2000/14/EC**

19) Directive 2000/14/EC, Annex VI, Part I
20) Notified body: VINCOTTE sa/nv, 1800 Vilvoorde, Belgium. Nr 0026

21) Machine		23) Measured sound power level	24) Guaranteed sound power level	21) Machine		23) Measured sound power level	24) Guaranteed sound power level
22) Type	kW			22) Type	kW		
7/20	17,5	**96L$_{WA}$**	**97L$_{WA}$**	**7/205; 10/175; 12/155; 14/145**	173	**98L$_{WA}$**	**99L$_{WA}$**
7/26E	21,3	**97L$_{WA}$**	**98L$_{WA}$**				
7/31E	25,9	**97L$_{WA}$**	**98L$_{WA}$**	**12/205**	209	**99L$_{WA}$**	**100L$_{WA}$**
7/41	35	**98L$_{WA}$**	**98L$_{WA}$**	**9/305**	222	**99L$_{WA}$**	**100L$_{WA}$**
7/53; 7/53R	36	**97L$_{WA}$**	**98L$_{WA}$**	**9/275-12/255**	231		
7/73-10/53	55	**96L$_{WA}$**	**98L$_{WA}$**	**17/245; 21/225**	242		
7/124-10/104; 14/84	97	**98L$_{WA}$**	**99L$_{WA}$**				
10/124-14/114	122						

25) **Conformity with the Pressure Equipment directive 2014/68/EU**

26) We declare that this product has been assessed according to the Pressure Equipment Directive 2014/68/EU and, in accordance with the terms of this Directive, has been excluded from the scope of this Directive. It may carry "CE" marking in compliance with other applicable EC directives.

Jan Moravec
27) Engineering Director
28) Issued at Dobris, Czech Republic
29) Date

30) **The technical documentation for the machinery is available from:**
Doosan Bobcat EMEA s.r.o. (DBEM), U Kodetky 1810, 263 12 Dobris, Czech Republic

ABBREVIATIONS & SYMBOLS

####	Contact the company for serial number
->####	Up to Serial No.
####->	From Serial No.
*****	Not illustrated
†	Option
WDG	Generator option
AR	As required
HA	High ambient machine
S.R.G.	Site running gear
H.R.G.	High speed running gear

bg	Bulgarian
cs	Czech
da	Danish
de	German
el	Greek
en	English
es	Spanish
et	Estonian
fi	Finnish
fr	French
hu	Hungarian
it	Italian
lt	Lithuanian
lv	Latvian, Lettish
mt	Maltese
nl	Dutch
no	Norwegian
pl	Polish
pt	Portuguese
ro	Romanian
ru	Russian
sk	Slovak
sl	Slovenian
sv	Swedish
zh	Chinese

2 FOREWORD

The contents of this manual are considered to be proprietary and confidential to and should not be reproduced without the prior written permission of the company.

Nothing contained in this document is intended to extend any promise, warranty or representation, expressed or implied, regarding the products described herein. Any such warranties or other terms and conditions of sale of products shall be in accordance with the standard terms and conditions of sale for such products, which are available upon request.

This manual contains instructions and technical data to cover all routine operation and scheduled maintenance tasks by operation and maintenance staff. Major overhauls are outside the scope of this manual and should be referred to an authorised service department.

The design specification of this machine has been certified as complying with EC directives. As a result:

a) Any machine modifications are strictly prohibited, and will invalidate EC certification.
b) A unique specification for USA/Canada is adopted and tailored to the territory.

All components, accessories, pipes and connectors added to the compressed air system should be:

- of good quality, procured from a reputable manufacturer and, wherever possible, be of a type approved by the company.
- clearly rated for a pressure at least equal to the machine maximum allowable working pressure.
- compatible with the compressor lubricant/coolant.
- accompanied with instructions for safe installation, operation and maintenance.

Details of approved equipment are available from the company Service departments.

The use of repair parts / lubricants / fluids other than those included within the approved parts list may create hazardous conditions over which the company has no control. Therefore the company cannot be held responsible for equipment in which non-approved repair parts are installed.

The company reserves the right to make changes and improvements to products without notice and without incurring any obligation to make such changes or add such improvements to products sold previously.

The intended uses of this machine are outlined below and examples of unapproved usage are also given, however the company cannot anticipate every application or work situation that may arise.

IF IN DOUBT CONSULT SUPERVISION.

This machine has been designed and supplied for use only in the following specified conditions and applications:

- Compression of normal ambient air containing no known or detectable additional gases, vapours. or particles
- Operation within the ambient temperature range specified in the *GENERAL INFORMATION* section of this manual.

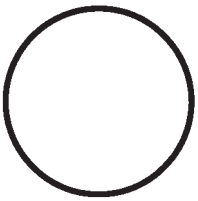
The use of the machine in any of the situation types listed in table 1:-

a) Is not approved,
b) May impair the safety of users and other persons, and
c) May prejudice any claims made against the company.

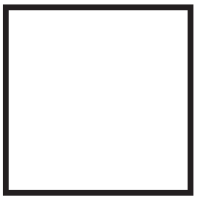
TABLE 1
Use of the machine to produce compressed air for: a) direct human consumption b) indirect human consumption, without suitable filtration and purity checks.
Use of the machine outside the ambient temperature range specified in the *GENERAL INFORMATION SECTION* of this manual.
This machine is not intended and must not be used in potentially explosive atmospheres, including situations where flammable gases or vapours may be present.
Use of the machine fitted with non approved components / lubricants / fluids.
Use of the machine with safety or control components missing or disabled.

The company accepts no responsibility for errors in translation of this manual from the original English version.

GRAPHIC FORM AND MEANING OF ISO SYMBOLS



Prohibition / Mandatory



Information / Instructions

Warning

WARNING: Electrical shock risk

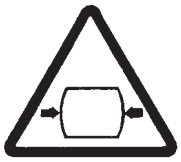
WARNING - Pressurised component or system.

WARNING - Hot surface.

WARNING - Pressure control.

WARNING - Corrosion risk.

WARNING - Air/gas flow or Air discharge.



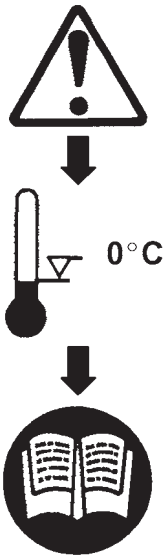
WARNING - Pressurised vessel.

WARNING - Hot and harmful exhaust gas.

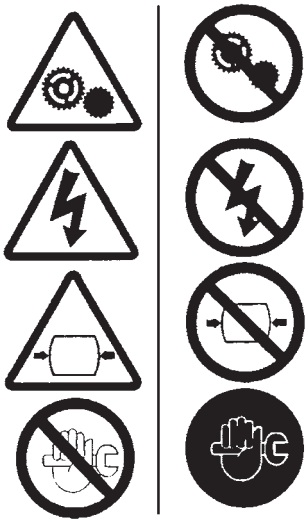
WARNING - Flammable liquid.

WARNING - Maintain correct tyre pressure. (Refer to the GENERAL INFORMATION section of this manual).

WARNING - Before connecting the tow bar or commencing to tow consult the Operation & Maintenance manual.



WARNING - For operating temperature below 0°C (32°F), consult the Operation & Maintenance manual.



WARNING - Do not undertake any maintenance on this machine until the electrical supply is disconnected and the air pressure is totally relieved.

WARNING - Consult the Operation & Maintenance manual before commencing any maintenance.

Do not breathe the compressed air from this machine.

Do not remove the Operating and Maintenance manual and manual holder from this machine.

Do not stack.

Do not operate the machine without the guard being fitted.

Do not stand on any service valve or other parts of the pressure system.

Do not operate with the doors or enclosure open.

Do not use fork lift truck from this side.

Do not exceed the trailer speed limit.

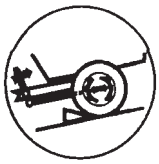
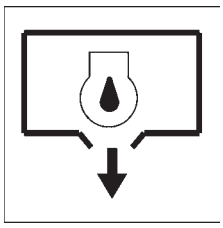
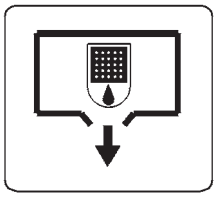
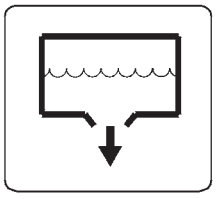
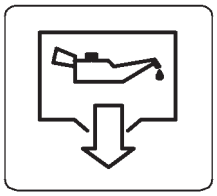
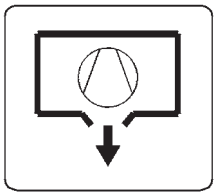
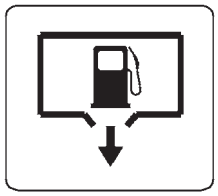
No naked lights.

Do not open the service valve before the air hose is attached.

Use fork lift truck from this side only.

Emergency stop.

Tie down point

		
Lifting point.	On (power).	Off (power).
		
Read the Operation & Maintenance manual before operation or maintenance of this machine is undertaken.	When parking use prop stand, handbrake and wheel chocks.	Compressor oil filling
		
Diesel fuel No open flame.	Parking brake.	Rough Service Designation. Wet Location Operation.
		
Engine oil sump drain	Separator tank drain.	Engine coolant drain.
		
Engine oil drain.	Compressor coolant drain.	Fuel tank drain.
		
Operational status of the engine emission filter.	Engine emissions system temperature may be high.	Disable active regeneration of the engine emission filter.

Start and stop device.

Mandatory action:
Hearing protection must be worn.

Lashing point (Tie down).

Prohibition: Do not start.

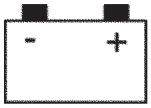
WARNING - Maintenance work in progress.

Engine oil.

Fuel level/point.

Pressure control.

Malfunction.



Battery charging condition.

Low pressure.

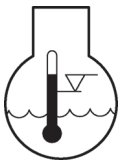
High pressure.

Engine malfunction.

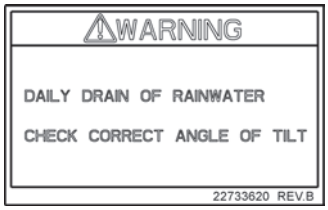
High compressor temperature.

Compressor malfunction.

Low engine oil pressure.

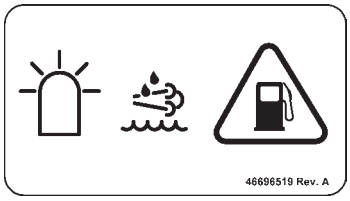


High engine temperature.



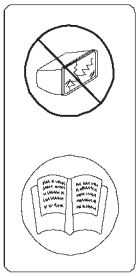
WARNING - Daily drain of rainwater. Check correct angle of tilt.

Ultra low sulphur diesel fuel only
(15ppm sulphur maximum).



Low DEF and fuel warning beacon.

DEF drain.



Replace any cracked protective shield.

WARNINGS

Warnings call attention to instructions which must be followed precisely to avoid injury or death.

CAUTIONS

Cautions call attention to instructions which must be followed precisely to avoid damaging the product, process or its surroundings.

NOTES

Notes are used for supplementary information.

General Information

Never operate unit without first observing all safety warnings and carefully reading the operation and maintenance manual shipped from the factory with this machine.

Ensure that the operator reads and *understands* the decals and consults the manuals before maintenance or operation.

Ensure that the Operation and Maintenance manual, and the manual holder, are not removed permanently from the machine.

Ensure that maintenance personnel are adequately trained, competent and have read the Maintenance Manuals.

Ensure that ice and snow do no block the cooling air inlets.

Use hearing protectors when the machine is running.

Make sure that all protective covers are in place and that the canopy/ doors are closed during operation.

The specification of this machine is such that the machine is not suitable for use in flammable gas risk areas. If such an application is required then all local regulations, codes of practice and site rules must be observed. To ensure that the machine can operate in a safe and reliable manner, additional equipment such as gas detection, exhaust spark arrestors, and intake *(shut-off)* valves may be required, dependant on local regulations or the degree of risk involved.

A weekly visual check must be made on all fasteners/fixing screws securing mechanical parts. In particular, safety-related parts such as coupling hitch, drawbar components, road-wheels, and lifting bail should be checked for total security.

All components which are loose, damaged or unserviceable, must be rectified without delay.

Air discharged from this machine may contain carbon monoxide or other contaminants which will cause serious injury or death. Do not breathe this air.

This machine produces loud noise with the doors open or service valve vented. Extended exposure to loud noise can cause hearing loss. Always wear hearing protection when doors are open or service valve is vented.

Never inspect or service unit without first disconnecting battery cable(s) to prevent accidental starting.

Do not use petroleum products (solvents or fuels) under high pressure as this can penetrate the skin and result in serious illness. wear eye protection while cleaning unit with compressed air to prevent debris from injuring eye(s).

Rotating fan blade can cause serious injury. Do not operate without guard in place.

Use care to avoid contacting hot surfaces (engine exhaust manifold and piping, air receiver and air discharge piping, etc.).

Ether is an extremely volatile, highly inflammable gas. When it is specified as a starting aid, use sparingly. DO NOT USE ETHER IF THE MACHINE HAS GLOW PLUG STARTING AID OR ENGINE DAMAGE WILL RESULT.

Never operate unit with guards, covers or screens removed. Keep hands, hair, clothing, tools, blow gun tips, etc. well away from moving parts.

Compressed air

Compressed air can be dangerous if incorrectly handled. Before doing any work on the unit, ensure that all pressure is vented from the system and that the machine cannot be started accidentally.

Ensure that the machine is operating at the rated pressure and that the rated pressure is known to all relevant personnel.

All air pressure equipment installed in or connected to the machine must have safe working pressure ratings of at least the machine rated pressure.

If more than one compressor is connected to one common downstream plant, effective check valves and isolation valves must be fitted and controlled by work procedures, so that one machine cannot accidentally be pressurised / over pressurised by another.

Compressed air must not be used for a direct feed to any form of breathing apparatus or mask.

High Pressure Air can cause serious injury or death. Relieve pressure before removing filler plugs/caps, fittings or covers.

Air pressure can remain trapped in air supply line which can result in serious injury or death. Always carefully vent air supply line at tool or vent valve before performing any service.

The discharged air contains a very small percentage of compressor lubricating oil and care should be taken to ensure that downstream equipment is compatible.

If the discharged air is to be ultimately released into a confined space, adequate ventilation must be provided.

When using compressed air always use appropriate personal protective equipment.

All pressure containing parts, especially flexible hoses and their couplings, must be regularly inspected, be free from defects and be replaced according to the Manual instructions.

Avoid bodily contact with compressed air.

The safety valve located in the separator tank must be checked periodically for correct operation.

Whenever the machine is stopped, air will flow back into the compressor system from devices or systems downstream of the machine unless the service valve is closed. Install a check valve at the machine service valve to prevent reverse flow in the event of an unexpected shutdown when the service valve is open.

Disconnected air hoses whip and can cause serious injury or death. Always attach a safety flow restrictor to each hose at the source of supply or branch line in accordance with OSHA Regulation 29CFR Section 1926.302(b).

Never allow the unit to sit stopped with pressure in the receiver-separator system.

Materials

The following substances *may* be produced during the operation of this machine:

- brake lining dust
- engine exhaust fumes

AVOID INHALATION

Ensure that adequate ventilation of the cooling system and exhaust gases is maintained at all times.

The following substances are used in the manufacture of this machine and *may* be hazardous to health if used incorrectly:

- compressor lubricant
- engine lubricant
- preservative grease
- rust preventative
- diesel fuel
- battery electrolyte

AVOID INGESTION, SKIN CONTACT AND INHALATION OF FUMES.

Should compressor lubricant come into contact with the eyes, then irrigate with water for at least 5 minutes.

Should compressor lubricant come into contact with the skin, then wash off immediately.

Consult a physician if large amounts of compressor lubricant are ingested.

Consult a physician if compressor lubricant is inhaled.

Never give fluids or induce vomiting if the patient is unconscious or having convulsions.

Safety data sheets for compressor and engine lubricants should be obtained from the lubricant supplier.

Never operate the engine of this machine inside a building without adequate ventilation. Avoid breathing exhaust fumes when working on or near the machine.

This machine may include such materials as oil, diesel fuel, antifreeze, brake fluid, oil/air filters and batteries which may require proper disposal when performing maintenance and service tasks. Contact local authorities for proper disposal of these materials.

Battery

A battery contains sulphuric acid and can give off gases which are corrosive and potentially explosive. Avoid contact with skin, eyes and clothing. In case of contact, flush area immediately with water.

DO NOT ATTEMPT TO SLAVE START A FROZEN BATTERY SINCE THIS MAY CAUSE IT TO EXPLODE.

Exercise extreme caution when using booster battery. To jump battery, connect ends of one booster cable to the positive (+) terminal of each battery. Connect one end of other cable to the negative (-) terminal of the booster battery and other end to a ground connection away from dead battery (to avoid a spark occurring near any explosive gases that may be present). After starting unit, always disconnect cables in reverse order.

Radiator

Hot engine coolant and steam can cause injury. Ensure that the radiator filler cap is removed with due care and attention.

Do not remove the pressure cap from a HOT radiator. Allow radiator to cool down before removing pressure cap.

Generator sets

The generator set is designed for safety in use. However, the responsibility for safe operation rests with those who install, use and maintain it. The following safety precautions are offered as a guide, which, if conscientiously followed, will minimise the possibility of accidents throughout the useful life of this equipment.

Emergency Stop Controls

Important Note:- In addition to the key operated emergency stop control on the main control panel, a second control is provided at the socket control panel in the event of electrical hazards associated with generator operation. Use this second control to immediately isolate all electrical power to all sockets, then use the key control to stop the engine.

Operation of the generator must be in accordance with recognised electrical codes and local health and safety codes.

The generator set should be operated by those who have been trained in its use and delegated to do so, and who have read and understand the operator's manual. *Failure to follow the instructions, procedures and safety precautions in the manual may increase the possibility of accidents and injuries.*

Do not start the generator set unless it is safe to do so. Do not attempt to operate the generator set with a known unsafe condition. Fit a danger notice to the generator set and render it inoperative by disconnecting the battery and disconnecting all ungrounded conductors so others who may not know of the unsafe condition will not attempt to operate it until the condition is corrected.

An earth point is provided beneath the socket outlets.

The generator set should only be used with the earth point connected directly to the general earth/ground mass. An earth spike kit is available as an optional extra for this purpose (refer to the *parts catalogue*).

WARNING: DO NOT OPERATE THE MACHINE UNLESS IT HAS BEEN SUITABLY EARTHED.

Generator sets must be connected to the load only by trained and qualified electricians who have been delegated to do so, and when required by applicable regulations, their work should be inspected, and accepted by the inspection agency having authority, prior to attempting to operate the generator set.

Do not make contact with electrically energised parts of the generator set and/or interconnecting cables or conductors with any part of the body or with any non-insulated conductive object.

Make sure the generator set is effectively grounded in accordance with all applicable Regulations prior to attempting to make or break load connections and prior to attempting operation.

Do not attempt to make or break electrical connections to generator sets standing in water or on wet ground.

Prior to attempting to make or break electrical connections at the generator set, stop the engine, disconnect the battery and disconnect and lock out the ungrounded conductors at the load end.

Keep all parts of the body and any hand-held tools or other conductive objects, away from exposed live parts of the generator set engine electrical system. Maintain dry footing, stand on insulating surfaces and do not contact any other portion of the generator set when making adjustments or repairs to exposed live parts of the generator set engine electrical system.

Replace the generator set terminal compartment cover as soon as connections have been made or broken. Do not operate the generator set without the terminal cover secured firmly in place.

Close and lock all access doors when the generator set is left unattended.

Do not use extinguishers intended for Class A or Class B fires on electrical fires. Use only extinguishers suitable for class *BC* or class *ABC* fires.

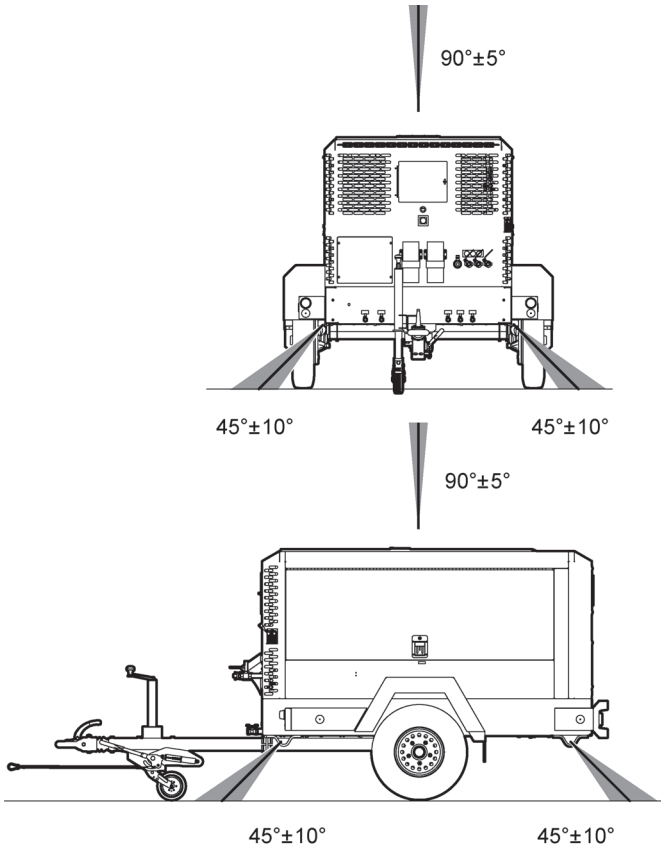
Keep the towing vehicle or equipment carrier, generator set, connecting cables, tools and all personnel at least 3 metres from all power lines and buried power cables, other than those connected to the generator set.

Attempt repairs only in clean, dry, well lighted and ventilated areas.

Connect the generator set only to loads and/or electrical systems that are compatible with its electrical characteristics and that are within it's rated capacity.

Transport

When loading or transporting machines ensure that the specified lifting and tie down points are used and cables or chains are within safe limits.



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When loading or transporting machines ensure that the towing vehicle, its size, weight, towing hitch and electrical supply are all suitable to provide safe and stable towing at speeds either, up to the legal maximum for the country in which it is being towed or, as specified for the machine model if lower than the legal maximum.

Ensure that the maximum trailer weight does not exceed the maximum gross weight of the machine (by limiting the equipment load), limited by the capacity of the running gear.

NOTE: Gross mass (on data plate) is for the basic machine and fuel only, excluding any fitted options, tools, equipment and foreign materials.

Before towing the machine, ensure that:-

- the tyres and towing hitch are in a serviceable condition.
- the canopy is secure.
- all ancillary equipment is stored in a safe and secure manner.
- the brakes and lights are functioning correctly and meet necessary road traffic requirements.
- break–away cables/safety chains are connected to the towing vehicle.

The machine must be towed in a level attitude (the maximum permissable drawbar angle is between 0° and +5° from horizontal) in order to maintain correct handling, braking and lighting functions. This can be achieved by correct selection and adjustment of the vehicle towing hitch and, on variable height running gear, adjustment of the drawbar.

To ensure full braking efficiency, the front (towing eye) section must always be set level.

When adjusting variable height running gear:-

- Ensure front (towing eye) section is set level
- When raising towing eye, set rear joint first, then front joint.
- When lowering towing eye, set front joint first, then rear joint.

After setting, fully tighten each joint by hand and then tighten further to the next pin. Refit the pin.

When parking always use the handbrake and, if necessary, suitable wheel chocks.

Make sure wheels, tyres and tow bar connectors are in safe operating condition and tow bar is properly connected before towing.

Safety chains / connections and their adjustment

The legal requirements for the joint operation of the breakaway cable and safety chains are as yet unidentified by 71/320/EEC or UK regulations. Consequently we offer the following advice / instructions.

Where brakes only are fitted:

a) Ensure that the breakaway cable is securely coupled to the handbrake lever and also to a substantial point on the towing vehicle.

b) Ensure that the effective cable length is as short as possible, whilst still allowing enough slackness for the trailer to articulate without the handbrake being applied.

Where brakes and safety chains are fitted:

a) Loop the chains onto the towing vehicle using the towing vehicle hitch as an anchorage point, or any other point of similar strength.

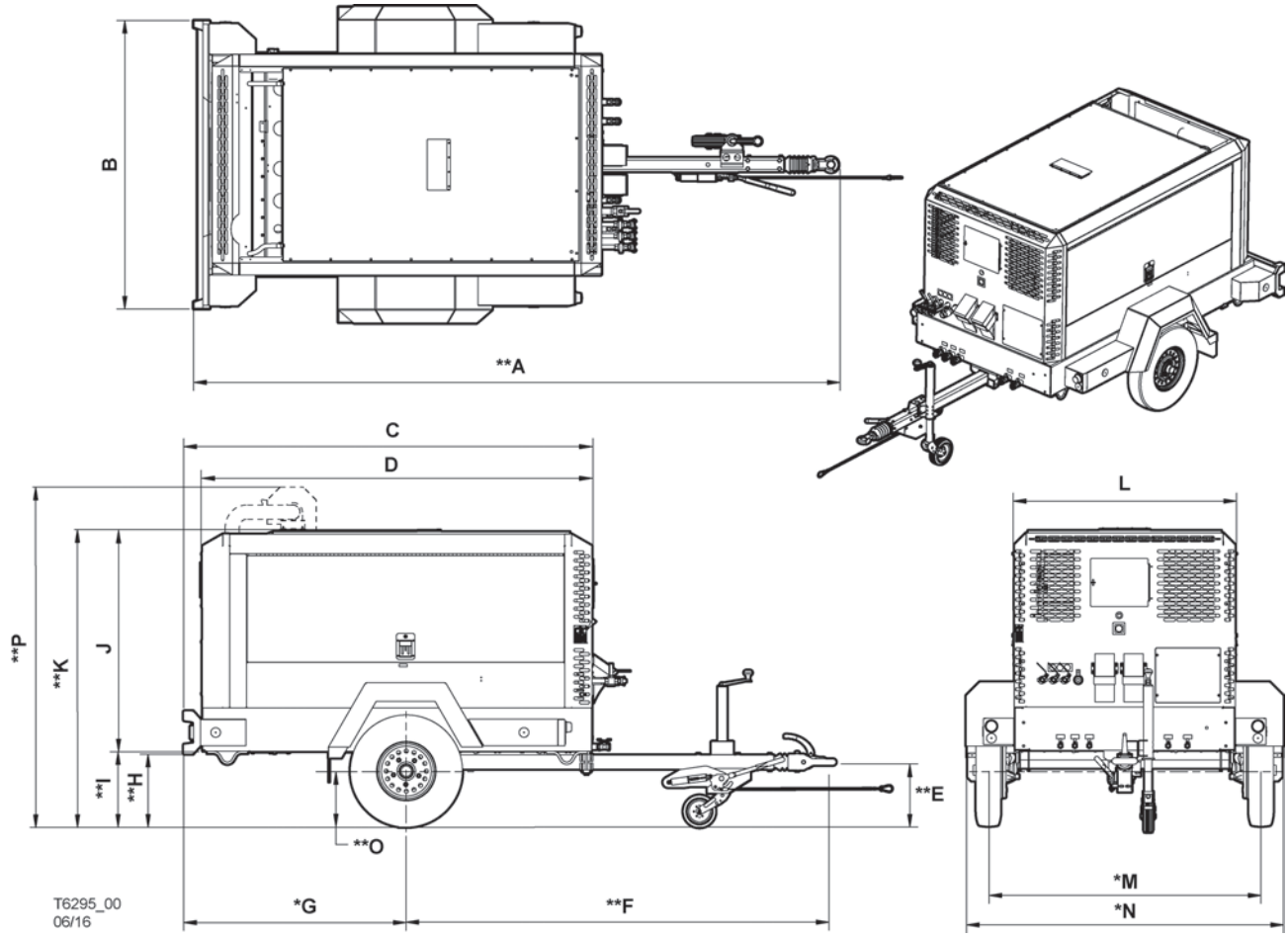
b) Ensure that the effective chain length is as short as possible whilst still allowing normal articulation of the trailer and effective operation of the breakaway cable.

Where safety chains only are fitted:

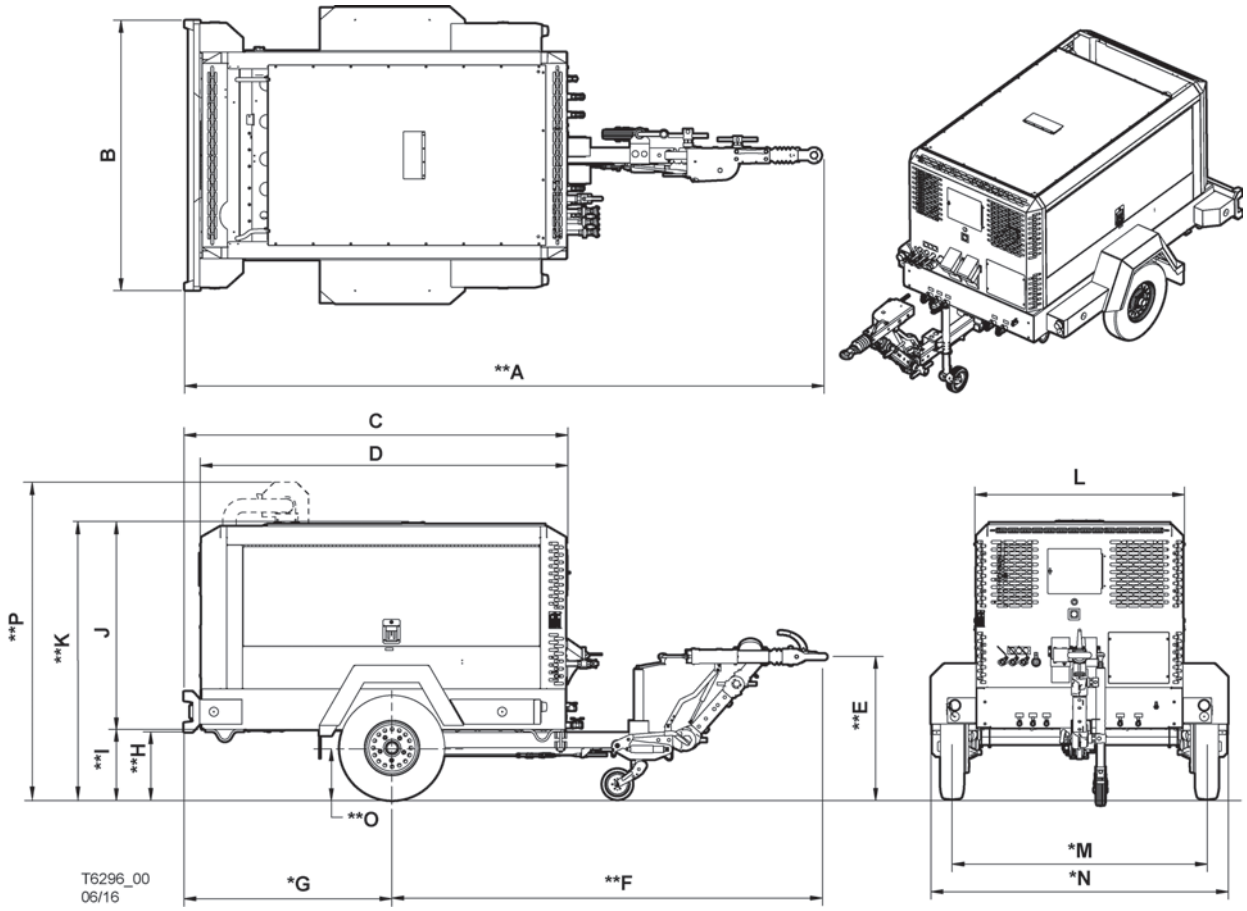
a) Loop the chains onto the towing vehicle using the towing vehicle hitch as an anchorage point, or any other point of similar strength.

b) When adjusting the safety chains there should be sufficient free length in the chains to allow normal articulation, whilst also being short enough to prevent the towbar from touching the ground in the event of an accidental separation of the towing vehicle from the trailer.

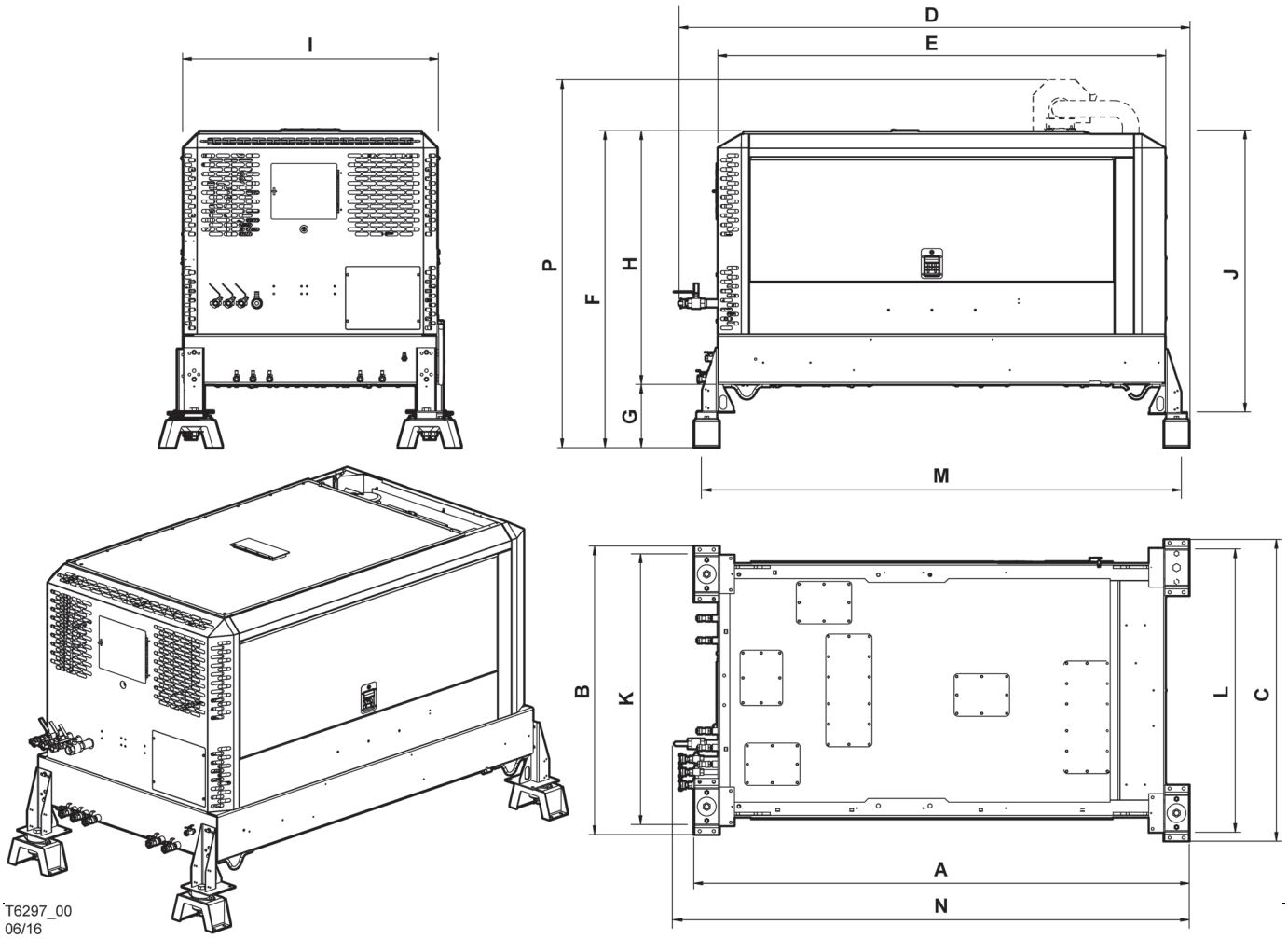
Fixed Height Running Gear (Braked)



Variable Height Running Gear (Braked)



LRG (Less Running Gear)



DIMENSIONS																
MODEL	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**J**	**K**	**L**	**M**	**N**	**O**	**P**
Fixed Height Braked	4003 MIN 4060 MAX	1798	2541	2424	400	2592 MIN 2609 MAX	1375	435	460	1370	1830	1374	1692	1975	350	2130
Variable Height Braked	4443 MIN 4220 MAX	1798	2541	2424	405 MIN 930 MAX	2791 MIN 3014 MAX	1375	435	460	1370	1830	1374	1692	1975	350	2130
LRG (Less Running Gear) plus skids	2685	1563	1634	2765	2424	1720	343	1380	1374	1537	1468	1539	2760	2780	-	2020
ALL DIMENSIONS IN MLLIMETRES																
Dimensions marked with * are subject to a 10mm tolerance																
Dimensions marked with ** are subject to a 40mm tolerance																

MODEL		7/124	10/104	10/124	14/114	14/84
COMPRESSOR						
Actual free air delivery.	m^3/min/ cfm	12,0/ 425	10,6/ 375	12,7/ 450	11,3/ 400	8,5/ 300
Normal operating discharge pressure.	bar/ psi	6,9/ 100	10,3/ 150	10,3/ 150	13,8/ 200	13,8/ 200
Maximum allowable pressure	bar/ psi	8,6/ 125	12,1/ 175	12,1/ 175	15,5/ 225	15,5/ 225
Safety valve setting	bar/ psi	17,2/ 250	17,2/ 250	17,2/ 250	17,2/ 250	17,2/ 250
Maximum pressure ratio (absolute)		7,9:1	11,3:1	11,3:1	14,8:1	14,8:1
Operating ambient temperature range	°C/ °F	-10 to +46/ 14 to 115	-10 to +46/ 14 to 115	-10 to +46/ 14 to 115	-10 to +46/ 14 to 115	-10 to +46/ 14 to 115
Maximum discharge temperature	°C/ °F	120/ 248	120/ 248	120/ 248	120/ 248	120/ 248
COMPRESSOR						
Cooling system.	Oil Injection					
Oil capacity.	Litre/ gallon	40/ 10,6	40/ 10,6	40/ 10,6	40/ 10,6	40/ 10,6
Maximum oil system temperature	°C/ °F	120/ 248	120/ 248	120/ 248	120/ 248	120/ 248
Maximum oil system pressure	bar/ psi	8,6/ 125	10,3/ 150	10,3/ 150	15,5/ 225	15,5/ 225
LUBRICATING OIL SPECIFICATION (for the specified ambient temperatures).	**SEE 'COMPRESSOR LUBRICATION' IN THE MAINTENANCE SECTION.**					

LUBRICATING OIL SPECIFICATION
(for the specified ambient temperatures).

ABOVE -23°C(-9°F)

Recommended: PRO-TEC

Approved: SAE 10W, API CF-4/CG-4

PRO-TEC compressor fluid is factory-fitted, for use at all ambient temperatures above -23°C (-9°F).

NOTE: Warranty may be extended only by continuous use of PRO-TEC and Doosan oil filters and separators.

No other oil/fluids are compatible with PRO-TEC.

No other oils/fluids should be mixed with PRO-TEC because the resulting mixture could cause damage to the airend.

In the event that PRO-TEC is not available and / or the end user needs to use an approved single grade engine oil, the complete system including separator / receiver, cooler and pipework must be flushed clear of the first fill fluid and new Doosan oil filters installed.
When this has been completed, the following oils are approved:

for ambient temperatures above -23°C (-9°F),
SAE 10W, API CF-4/CG-4

Safety data sheets can be obtained on request from your Doosan dealership.

For temperatures outside the specified ambient range, consult the company.

ENGINE

Type/model.	
7/124 - 10/104, 14/84	Cummins / QSB4,5 130 HP
10/124 - 14/144	Cummins / QSB4,5 163 HP
Number of cylinders.	4
Oil capacity.	11 litres (2,9 US GAL)
Speed at full load.	
7/124 - 10/104	2200 - 1950 revs min-1 (RPM)
10/124 - 14/144	2350 - 2100 revs min-1 (RPM)
14/84	2100 revs min-1 (RPM)
Speed at idle.	1500 revs min-1 (RPM)
Electrical system.	24V negative earth
Power available at 2200 revs min-1	
7/124 - 10/104, 14/84 (QSB4,5 130 HP)	97 kW (130 HP)
Power available at 2500 revs min-1	
10/124 - 14/144 (QSB4,5 163 HP)	122 kW (163 HP)
Fuel tank capacity	238 litres (63 US GAL)
Oil specification	Refer to engine section
Coolant capacity	22 litres (5,8 US GAL)
DEF tank capacity	19 litres (5 US GAL)

INFORMATION ON AIRBORNE NOISE (CE regions)

- The A-weighted emission sound pressure level

- 83 dB (A), uncertainty 1 dB (A)

- The A-weighted emission sound power level

- 99 dB (A), uncertainty 1 dB (A)

The operating conditions of the machinery are in compliance with ISO 3744:2010 and EN ISO 2151:2008

FIXED HEIGHT RUNNING GEAR
Braked version

Working weight.	2460 kg (5644 Lbs)
Maximum weight.	2700 kg (5952 Lbs)
Maximum horizontal towing force.	26,9 kN (5931 Lbs)
Maximum vertical coupling load (nose weight).	150 kg (331 Lbs)

VARIABLE HEIGHT RUNNING GEAR
Braked version

Working weight.	2530 kg (5578 Lbs)
Maximum weight.	2700 kg (5952 Lbs)
Maximum horizontal towing force.	27 kN (5953 Lbs)
Maximum vertical coupling load (nose weight).	150 kg (331 Lbs)

WHEELS AND TYRES

Number of wheels.	2 x 5.5J x 16,0
Tyre size.	225/75 R16C
Tyre pressure.	5,25 bar (76 psi)

TOWING SPEED

Maximum towing speed.	100 km/h (62 mph)

Further information may be obtained by request through the customer services department.

COMMISSIONING

Upon receipt of the unit, and prior to putting it into service, it is important to adhere strictly to the instructions given below in *PRIOR TO STARTING*.

Ensure that the operator reads and *understands* the decals and consults the manuals before maintenance or operation.

Ensure that the position of the *emergency stop* device is known and recognised by its markings. Ensure that it is functioning correctly and that the method of operation is known.

Before towing the unit, ensure that the tyre pressures are correct (refer to the *GENERAL INFORMATION* section of this manual) and that the handbrake is functioning correctly (refer to the *MAINTENANCE* section of this manual). Before towing the unit during the hours of darkness, ensure that the lights are functioning correctly (where fitted).

Ensure that all transport and packing materials are discarded.

Ensure that the correct fork lift truck slots or marked lifting / tie down points are used whenever the machine is lifted or transported.

When selecting the working position of the machine ensure that there is sufficient clearance for ventilation and exhaust requirements, observing any specified minimum dimensions (to walls, floors etc.).

Adequate clearance needs to be allowed around and above the machine to permit safe access for specified maintenance tasks.

Ensure that the machine is positioned securely and on a stable foundation. Any risk of movement should be removed by suitable means, especially to avoid strain on any rigid discharge piping.

Attach the battery cables to the battery(s) ensuring that they are tightened securely. Attach the negative cable before attaching the positive cable.

WARNING: All air pressure equipment installed in or connected to the machine must have safe working pressure ratings of at least the machine rated pressure, and materials compatible with the compressor lubricant (refer to the *GENERAL INFORMATION* section).

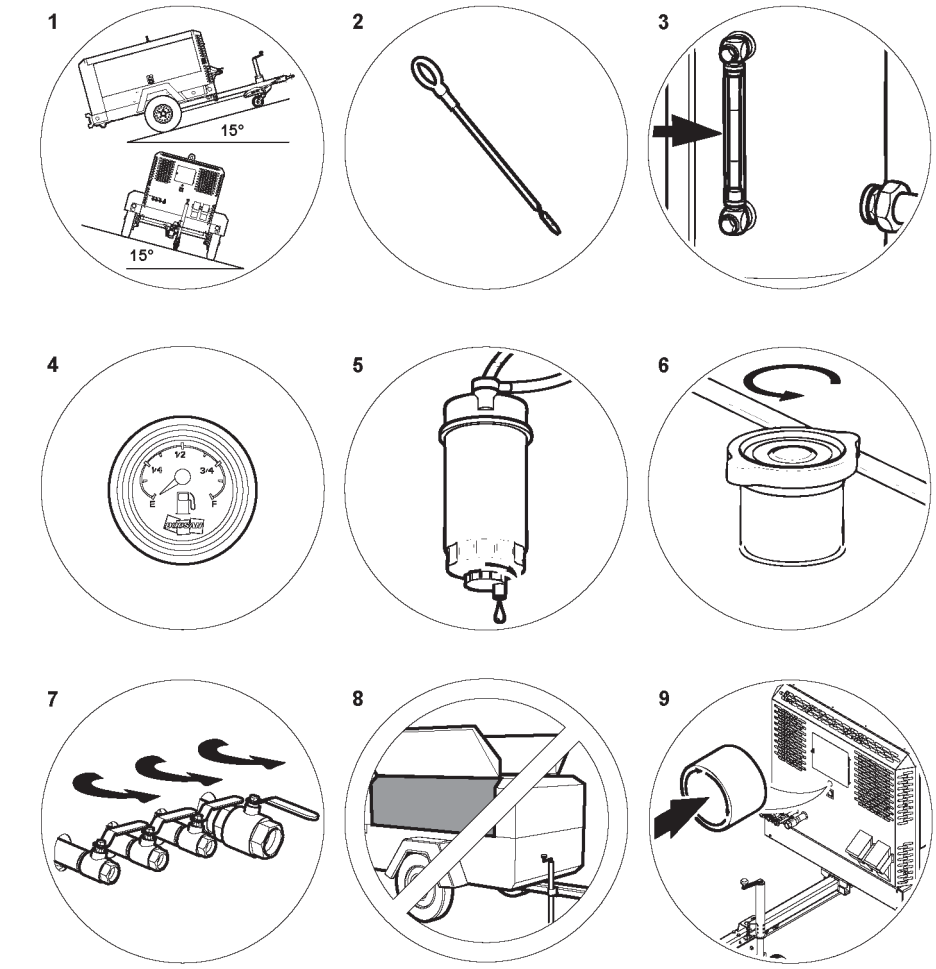
WARNING: If more than one compressor is connected to one common downstream plant, effective check valves and isolation valves must be fitted and controlled by work procedures, so that one machine cannot accidentally be pressurised / over pressurised by another.

WARNING: If flexible discharge hoses are to carry more than 7 bar pressure then it is recommended that safety retaining wires are used on the hoses.

Lifting

The central lifting bail allows the compressor to be lifted from a single point. Use hoist or crane capable of lifting compressor weight (See General Data).

WARNING: Falling off the compressor can cause serious injury or death. Use ladder and hand holds to access lifting bail.



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PRIOR TO STARTING

1. Place the unit in a position that is as level as possible. The design of the unit permits a 15 degree lengthways and sideways limit on out of level operation. It is the engine, not the compressor, that is the limiting factor.

When the unit has to be operated out of level, it is important to keep the engine oil level near the high level mark (with the unit level).

CAUTION: *Do not overfill either the engine or the compressor with oil.*

2. Check the engine lubrication oil in accordance with the operating instructions in the *Engine Operator's Manual.*
3. Check the compressor oil level in the sight glass located on the separator tank.
4. Check the diesel fuel level. A good rule is to top up at the end of each working day. This prevents condensation from occurring in the tank.

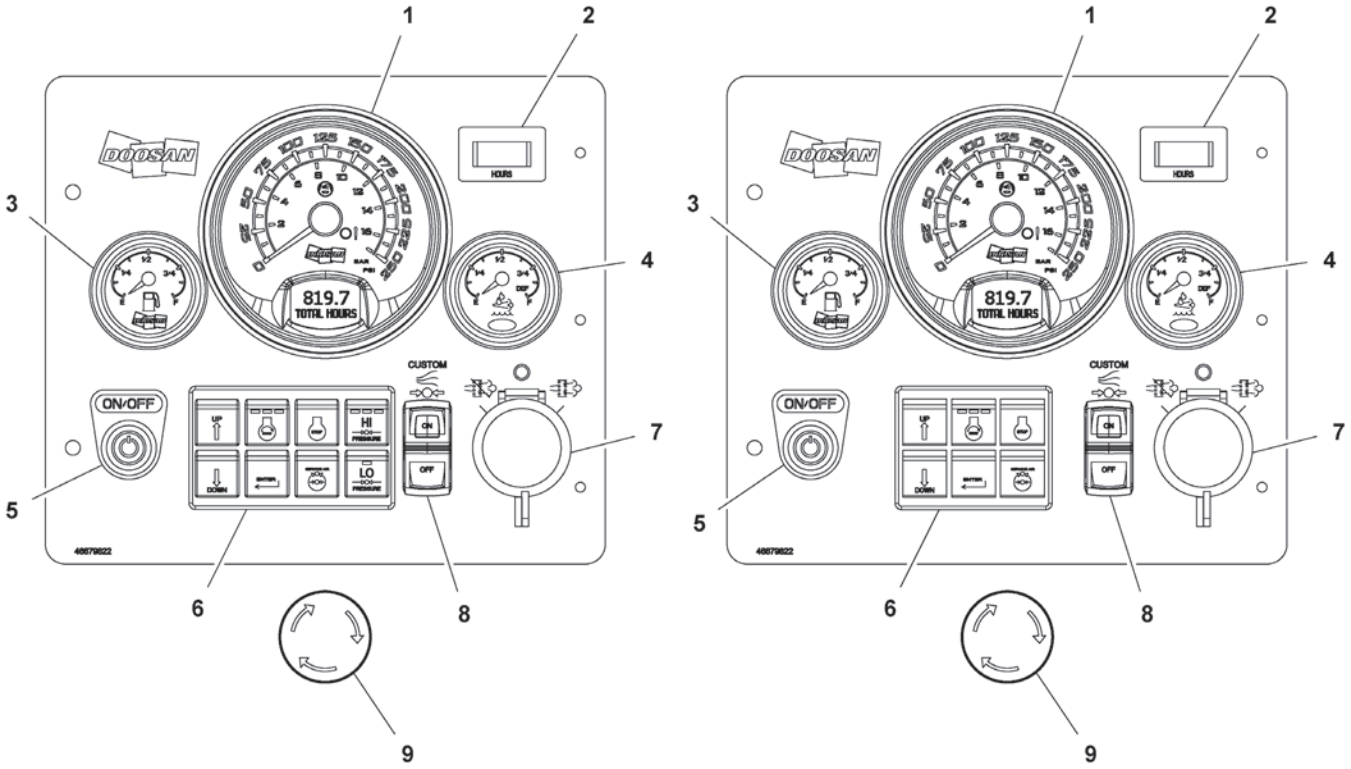
CAUTION: *When refuelling:-*
- *switch off the engine.*
- *do not smoke.*
- *extinguish all naked lights.*
- *do not allow the fuel to come into contact with hot surfaces.*
- *wear personal protective equipment.*

5. Drain the fuel filter water separator of water, ensuring that any released fuel is safely contained.
6. Check the radiator coolant level (with the unit level).
7. Open the service valve(s) to ensure that all pressure is relieved from the system. Close the service valve(s) when all pressure is relieved.

8. ***CAUTION:*** *Do not operate the machine with the canopy/doors in the open position as this may cause overheating and operators to be exposed to high noise levels.*

9. Check that the emergency stop switch is not engaged. Pull knob to release if necessary.
10. Close the manual relief valve inside the unit, on the top of the separator tank.

When starting or operating the machine in temperatures below or approaching 0°C (32°F), ensure that the operation of the regulation system, the unloader valve, the safety valve, and the engine are not impaired by ice or snow, and that all inlet and outlet pipes and ducts are clear of ice and snow.



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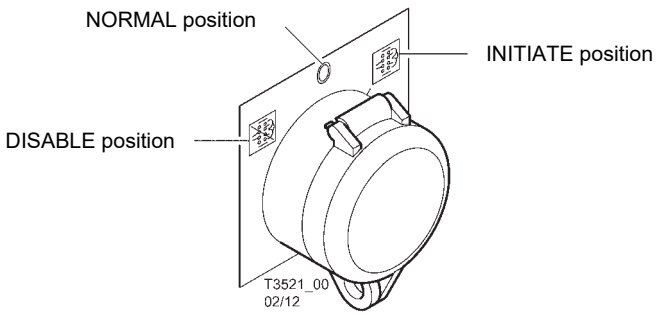
CONTROLS AND GAUGES

The operating controls and instruments are arranged on or below the control panel as shown above. A description of each device is as follows:

1. **MidPort Display:** Indicates compressor and engine operating parameters including diagnostic fault codes and compressor pressure.
2. **Hourmeter:** Indicates machine operating hours.
3. **Fuel Level Gauge:** Indicates level of fuel in tank.
4. **DEF Level Gauge:** Indicates level of DEF in tank.
5. **Main Power Button:** Used to start and shutdown the compressor control system and gauge panel.
6. **KeyPad:** Used to start, shutdown and operate the compressor.
7. **Exhaust System Cleaning Switch:** Provides operator control of the Exhaust Cleaning System



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	**Normal Position:** Allows automatic exhaust system cleaning to take place as needed.
	**Disable Position:** Inhibits automatic and manual cleaning of the exhaust system.
	**Initiate Position:** Requests manual (non-mission) cleaning of the exhaust system.

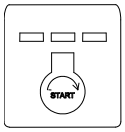
8. **Custom Pressure Switch:** Used to activate the custom pressure mode. This feature is not available on all machines.
9. **Emergency Stop Switch:** Used to stop the machine in the event of an emergency.

MidPort

Navigation

The Navigation and Function selection buttons are situated on the keypad located below the display. This keypad provides the operator interface with compressor systems as described below.

STOP: Shutdown the compressor.

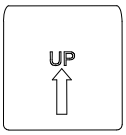


START: Initiates engine cranking.

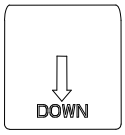
SERVICE AIR: Allows operator to load compressor after warm-up.

HI PRESSURE: Allows operator to switch to high pressure mode.

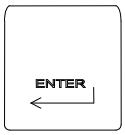
LO PRESSURE: Allows operator to switch to low pressure mode.



UP: Pressing and releasing the UP Button scrolls up through parameter lists and menu choices or increases a value one item/unit at a time. Pressing and holding the UP Button continuously scrolls up through parameter lists, menu choices, or increases a value until the end of the parameter list, menu choices, or maximum parameter value is reached.



DOWN: The DOWN Button functions identical to the UP Button with the exception that its direction for all displays, menu choices, and values is down or decreasing.



ENTER: Pressing and releasing this button provides enter functionality when the display requires you to choose a menu item, parameter selection, or value input. Pressing and holding this switch for approximately three seconds while any of the Main Screens are displayed brings up the Main Menu. Pressing the ENTER Button after an alert or fault has been displayed acknowledges the message and the display unit returns to the Default Screen.

QUICKVIEW SCREENS (ENGINE AND COMPRESSOR PARAMETERS)

The Quick View Screens allow for easy viewing of up to 18 commonly used parameters by pressing the UP and DOWN Buttons. Pressing the UP and DOWN Buttons continuously loops through the Quick View Screens (i.e., when the last screen is reached pressing the DOWN Button displays the first screen and vice versa).

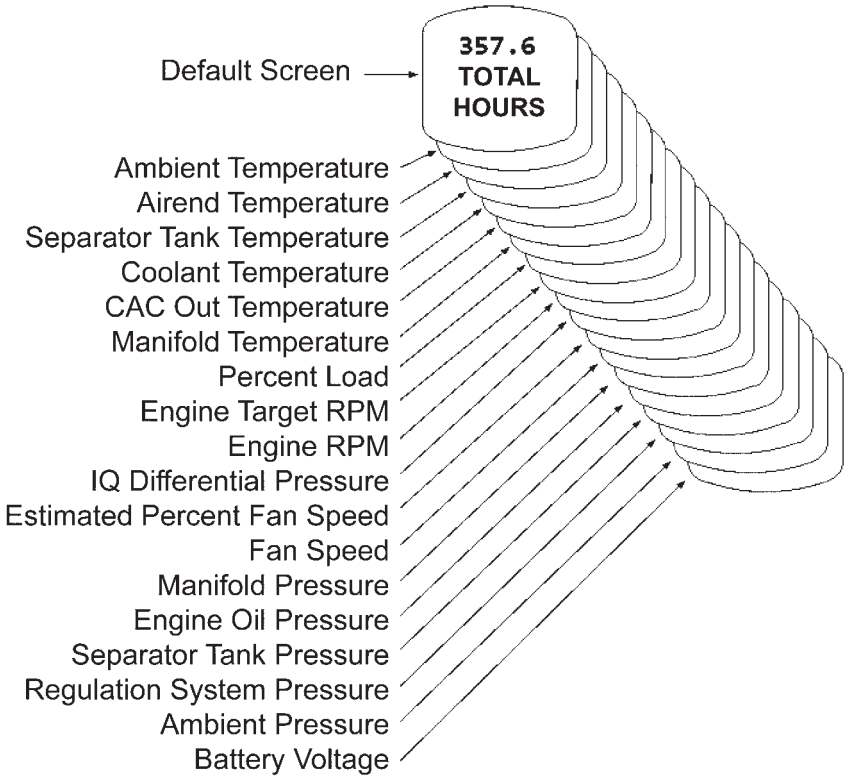


Figure 6

Note 1: Only the parameters that are available from the engine or compressor will be displayed.

Note 2: Unit times out after 3 minutes of inactivity and returns to the Default Screen of Engine Hours.

Note 3: Pressing the Enter Button while viewing a Quickview Screen will return to the Default Screen of Engine Hours.

FAULT AND ALERT

If a FAULT occurs, the display unit will display the SPN, FMI, OC, and description for Engine Fault or the CPR Code and Description for Compressor Error. An engine fault will be displayed only when the engine is shutdown. The Fault has to be acknowledged by the user by pressing the ENTER Button. The unit does not time out in the fault display. After 60 seconds, if the Fault is still active, the fault display will appear again on the screen and will remain until acknowledged by the user. This will continue to occur as long as the Fault is active. **See Figure 1.**

Displayed in case of a engine related fault:

SPN = Suspect Parameter Number = identifies the item for which a diagnostic code is being displayed.

FMI = Failure Mode Identifier = defines the type of failure detected in the subsystem identified by the SPN.

OC = occurrence = amount of times this failure has occurred.

Displayed in case of a compressor related fault:

CPR Code = one, two or three digit number identifying the component or system fault.

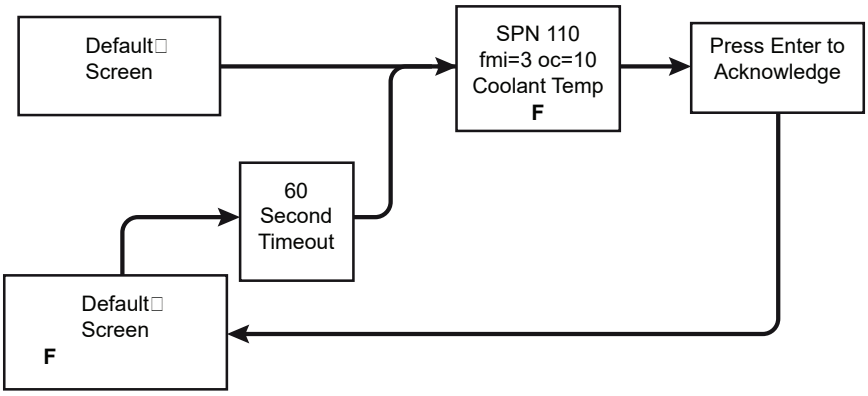


Figure 1

When present, an ALERT with the number of alert conditions will popup on the screen, the user will press the UP or DOWN Button to display the alert, or press the ENTER Button to acknowledge an alert has occurred. If there are multiple alerts, pressing the DOWN Button will scroll through the various alerts. All Faults and Alerts will be displayed until the engine shuts down and then the most severe Fault will be displayed as a Fault. Pressing the ENTER Button after the Alert has been displayed, acknowledges the message and the display unit returns to the Default Screen of Engine Hours. **See Figure 2**

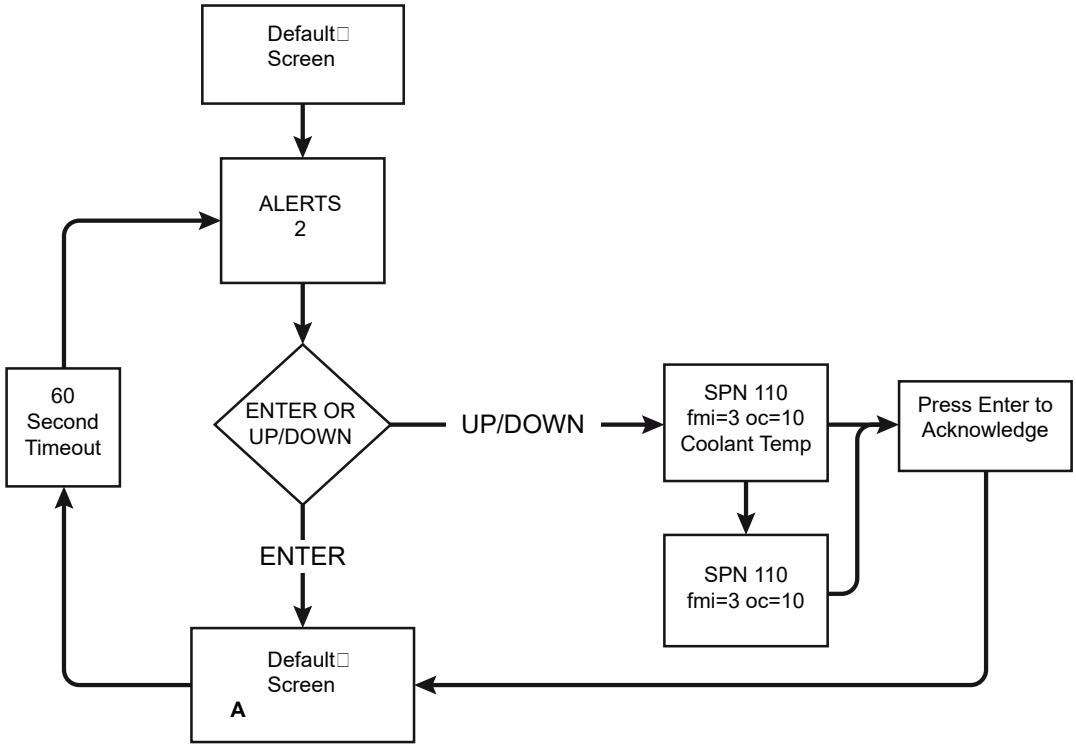


Figure 2

SERVICE INTERVAL

Service will popup on the screen after one of the two hour service channels has decremented to 5 hours. The user will press the UP or DOWN Button to display the service channels or press the ENTER Button to acknowledge a service has occurred. Pressing the ENTER Button after the service channels have been displayed, acknowledges the message and the display unit returns to the default screen. If service is between 5 and 0 hours or it remains at 0 hours, the SERVICE DUE display will appear every hour. To disable, the user can reset the hours to the OFF position by decreasing the value to OFF. **See Figure 3**.

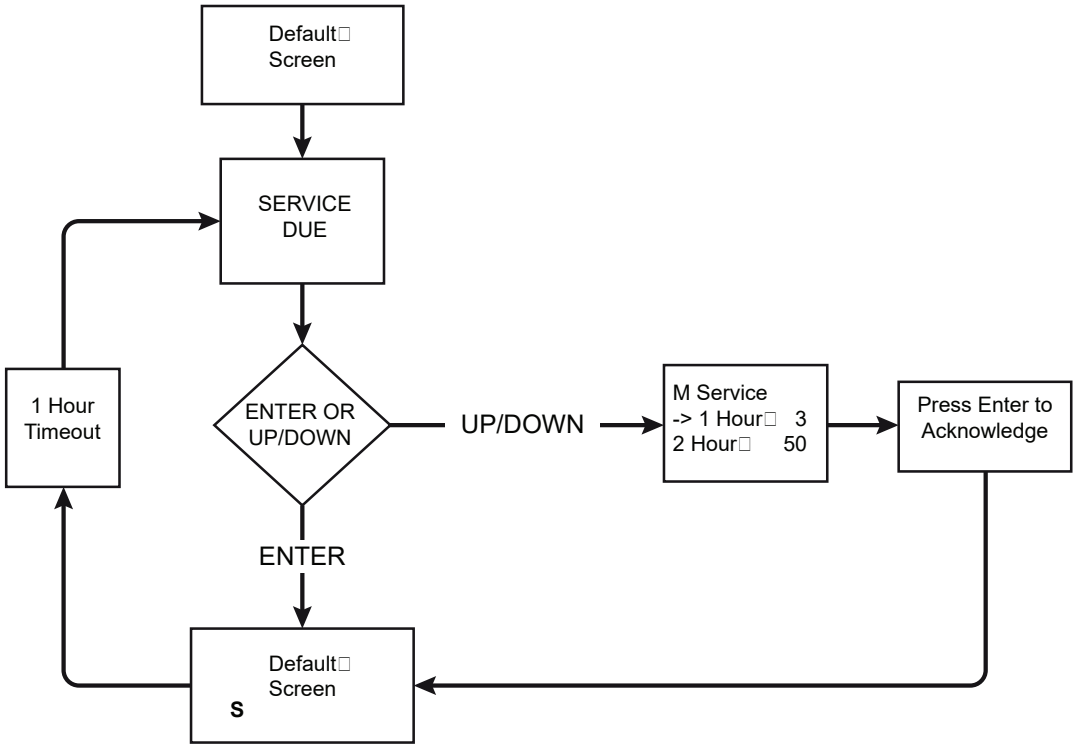


Figure 3

The service intervals can be changed by pressing the ENTER Button while on the default screen that displays the engine hours. Using the UP or DOWN Buttons to highlight the desired interval and press the ENTER Button to select. Use the UP and DOWN Buttons to increase or decrease the number of hours. Hours will decrement with every hour on the engine. Use the DOWN Button to highlight the Main Screen menu item and press the ENTER Button to return to the Default Screen of Engine Hours. **See Figure 4.**

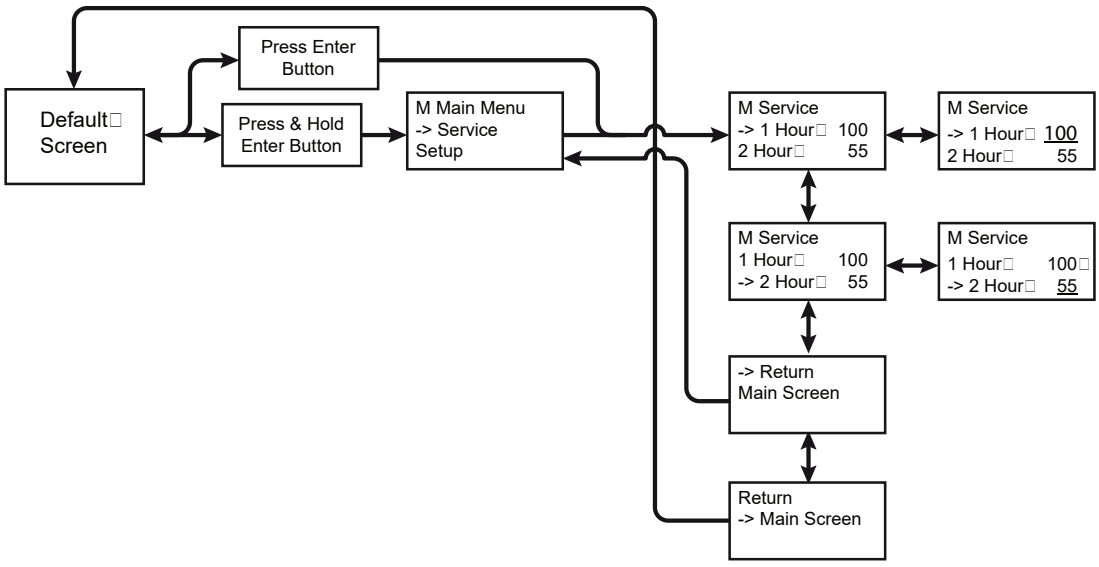


Figure 4

LANGUAGES AND UNITS

The MidPort is user configured to display in English, Spanish, or French languages and in either English or Metric units. The Language and Display units can be changed by accessing the Setup Menu. To access the Setup Menu, press and hold the ENTER Button while the Default Screen of Engine Hours is displayed until the Main Menu appears. Scroll to the Setup option using the DOWN Button then press the ENTER Button. Use the DOWN or UP Buttons to highlight the chosen unit and PRESS the ENTER Button to select. To return to the Default Screen of Engine Hours, use the DOWN Button to highlight the Main Screen menu item and press the ENTER Button. **See Figure 5.**

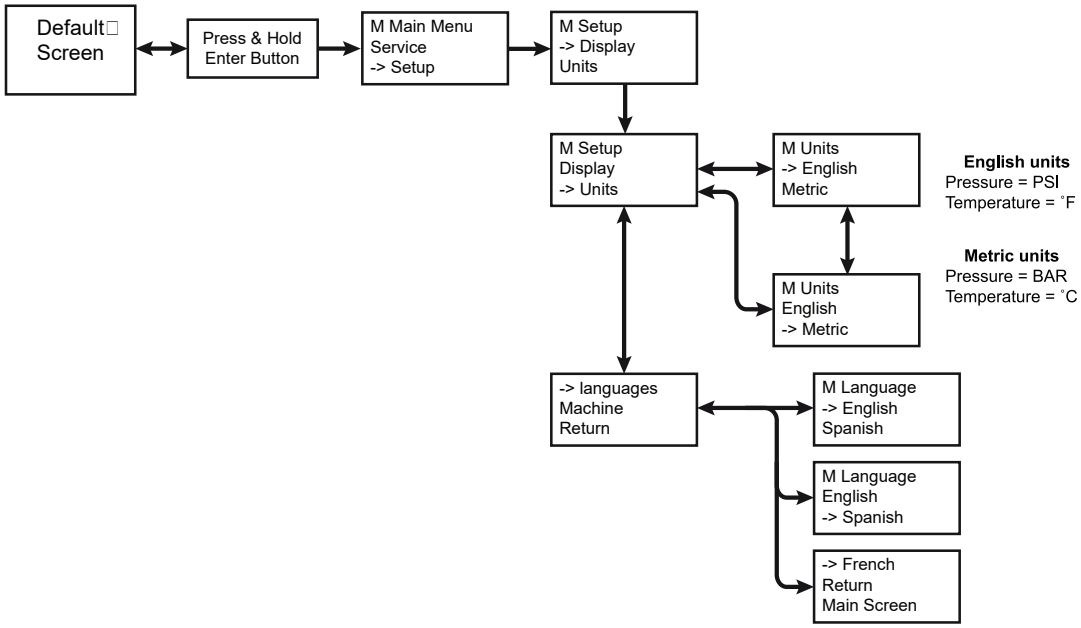


Figure 5

DISPLAY SETUP

The Display Menu functions give users the ability to configure the LCD. Options for configuring the display include intensity, contrast, and viewing mode. To access the Display Menu:

1. Press and hold the ENTER Button while the Default Screen of Engine Hours is displayed until the Main Menu appears.
2. Scroll to the Setup option using the DOWN Button and press the ENTER Button.
3. Scroll to the Display option using the DOWN Button and press the ENTER Button.
4. Use the DOWN or UP Buttons to highlight and the ENTER Button to select the desired display setting. **See Figure 7**.
5. To return to the Default Screen of Engine Hours, use the DOWN Button to highlight the Main Screen menu item and press the ENTER Button. **Note:** Main Screen menu item returns the user back to the Default Screen of Engine Hours.

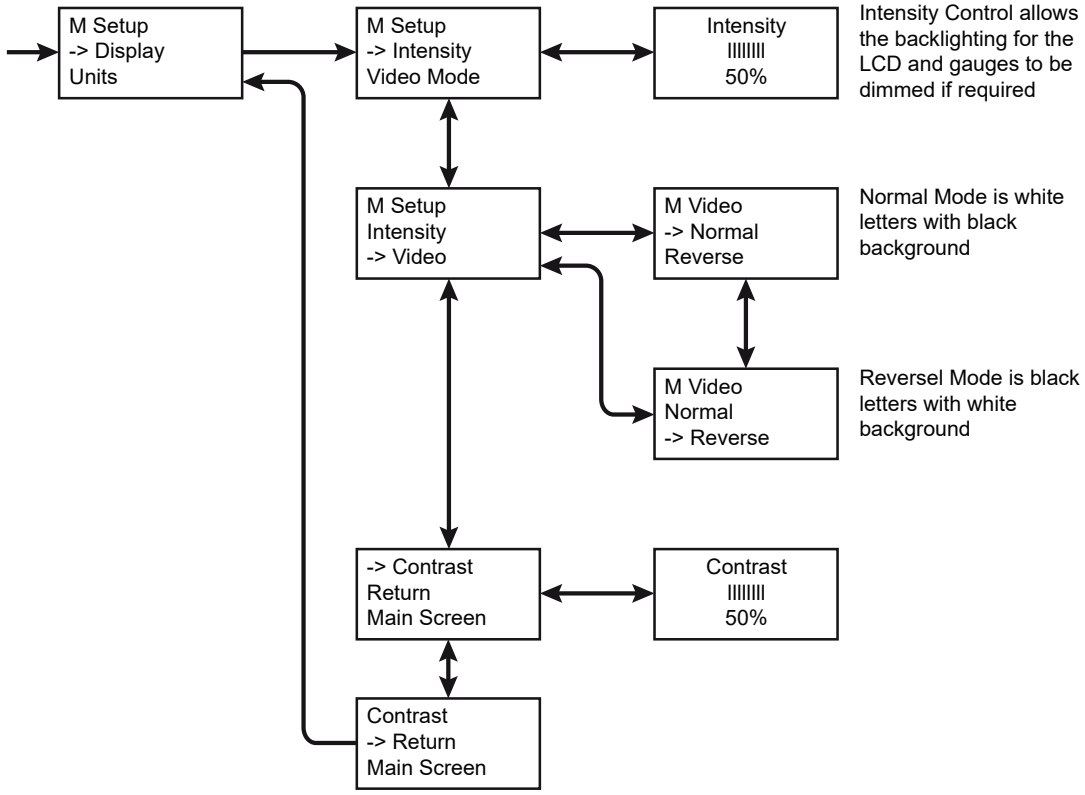


Figure 7

AUTO POWER OFF

The Compressor Control System has a power save feature designed to prevent drain on the batteries when the compressor engine is not running. If the Control Panel is powered ON and the engine has not run for 3 minutes (above 45°F (7°C) or 15 minutes at or below 45°F (7° C)), the control system will automatically power OFF. Power can be restored by pressing the Main Power Button.

In the event of a fault, this feature is not active and the power will remain on until the fault has been acknowledged or the control system is manually powered off.

WAIT TO START

When the Main Power Button is pressed, the display will initialise and the Wait to Start message will be displayed. While the Wait to Start message is displayed, the engine will receive heat from the intake heater if required. It is best to start the engine immediately after the Wait to Start message changes to Engine Total Hours.

LCD Display	Display Name	Description	Type
CPR CODE 1 LOW ENGINE SPEED	Low Engine Speed	Engine speed less than 1100 RPM for 30 seconds.	FAULT
CPR CODE 2 HIGH ENGINE SPEED	High Engine Speed	Engine speed greater than rated RPM for 30 seconds.	FAULT
CPR CODE 3 WAIT 30 SEC RETRY START	Engine Crank Timeout	Engine crank attempt longer than 15 seconds above 50°F or longer than 30 seconds below 32°F.	FAULT
CPR CODE 4 OUT OF FUEL	Out of Fuel	Fuel level in tank below usable limit.	FAULT
CPR CODE 10 ENG SPEED RESPONSE	Engine Speed Response	Engine target idle speed not met within 10 seconds after loading compressor.	ALERT
CPR CODE 11 A/S ATTEMPT EXCEEDED	Autostart Attempts Exceeded	Compressor not started after 3 crank attempts.	FAULT
CPR CODE 12 FUEL LEVEL LOW	Low Fuel Level	Fuel level in tank approaching empty.	ALERT
CPR CODE 16 HIGH ENGINE TEMP	High Engine Temperature	Engine coolant temperature high (Engine derate begins).	ALERT
CPR CODE 17 HIGH ENGINE TEMP	High Engine Temperature (Shutdown)	Engine coolant temperature greater than 231°F (Engine Shutdown).	FAULT
CPR CODE 18 LOW OIL PRESSURE	Low Oil Pressure	Low engine oil pressure.	FAULT
CPR CODE 19 HIGH FUEL TEMP	High Fuel Temperature	Engine fuel temperature greater than 180°F (Engine derate).	ALERT
CPR CODE 28	Incorrect Engine ECU Calibration	Engine ECU has a different calibration that what is expected (Engine will not crank).	ALERT
CPR CODE 29 ENGINE SHUTDOWN??	Engine Shutdown Unknown	Engine stopped without an engine diagnostic code.	FAULT
CPR CODE 30 HIGHAIREND TEMP	High Airend Discharge Temperature	Airend discharge temperature greater than or equal to 248°F.	FAULT
CPR CODE 32 AIREND DISC TEMP SENSOR	Airend Discharge Temperature Sensor	Airend discharge temperature sensor reading out of range.	FAULT
CPR CODE 33 SEP TANK PRES SENSOR	Separator Tank Pressure Sensor	Separator tank pressure sensor reading out of range.	FAULT
CPR CODE 34 HIGH PRES AT START	High Separator Pressure at Start	Separator tank pressure greater than 20 psi at crank attempt.	ALERT
CPR CODE 35 HIGH SEP TANK PRES	High Separator Tank Pressure	Air pressure in the separator tank exceeded limit.	FAULT
CPR CODE 36 SAFETY VALVE OPEN	Safety Value Open	Safety relief valve on separator tank opened.	FAULT
CPR CODE 38 AIR FILTERS RESTRICTED	Intake Air Filters Restricted	Intake filters restricting air flow.	ALERT

LCD Display	Display Name	Description	Type
CPR CODE 39 LOW SYSTEM VOLTAGE	Low System Voltage / Alternator Not Charging	Electrical system voltage below 25.5VDC.	ALERT
CPR CODE 42 FUEL LEVEL SENSOR	Fuel Level Sensor	Fuel level sensor reading out of range.	ALERT
CPR CODE 43 LOW SEP TANK PRES	Low Separator Tank Pressure	Separator tank pressure below 40 psi after compressor is loaded.	FAULT
CPR CODE 44 HIGH IQ FILTERS RSTR	High IQ Filter Restriction	IQ filters restricting air flow.	ALERT
CPR CODE 50 HIGH SEP TANK TEMP	High Separator Tank Temperature	Separator tank temperature greater than or equal to 248°F.	FAULT
CPR CODE 51 COMPRESSOR ID INVALID	Compressor ID Invalid	The Titan controller and Engine Tachometer with MiniPort display do not have a valid compressor ID.	FAULT
CPR CODE 52 IQ FILTERS RESTRICTED	IQ Filler Restricted	IQ filters restricted past usable level.	FAULT
CPR CODE 53 SEP TANK TEMP SENSOR	Separator Tank Temperature Sensor	Separator tank temperature sensor reading out of range.	FAULT
CPR CODE 54 REG SYSTEM PRES SENSOR	Regulation System Pressure Sensor	Regulation system pressure sensor reading out of range.	FAULT
CPR CODE 55 E-STOP ACTIVATED	Emergency Stop Activated	Emergency Stop button has been activated.	FAULT
CPR CODE 58 AMBIENT TEMP SENSOR	Ambient Temperature Sensor	Ambient temperature sensor reading out of range.	ALERT
CPR CODE 61 IQ FILTER PRES ERROR	IQ Filter Pressure Error	IQ filter outlet pressure reading higher than inlet pressure.	ALERT
CPR CODE 63 IQ DIFF PRES SENSOR	IQ Differential Pressure Sensor	IQ differential pressure sensor reading out of range.	ALERT
CPR CODE 64 SEE MANUAL	IQ Pressure Sensor	IQ pressure sensor reading out of range.	ALERT
CPR CODE 71 ENG ECM COMMS	Engine ECM Communication	Communication between Titan controller and engine ECM not functional.	FAULT
CPR CODE 73 AUTOSTART CTRL COMMS	Auto Start Controller Communication	Communication between Titan controller and AutoStart controller not functional.	ALERT
CPR CODE 75 IQ TCU CTRL COMMS	IQ TCU Controller Communication	Communication between Titan controller and OTC controller not functional.	ALERT
CPR CODE 76 CPR CTRL COMMS	Compressor Controller Communication	Communication between Titan controller and Engine Tachometer with MiniPort display not functional.	ALERT
CPR CODE 77 KEYPAD COMMS	Keypad Communication	Communication between Titan controller and Keypad not functional.	FAULT
CPR CODE 138 SEE MANUAL	CAN temperature prevent loading	Load button is disabled when separator tank temperature is below -10 deg C.	ALERT
CPR CODE 141 SEE MANUAL	Low DEF level	0% DEF level initiate engine shutdown after 1 minute.	FAULT
CPR CODE 143 SEE MANUAL	Inducement active	Engine inducement active, see engine diagnostic code.	ALERT

ENGINE DIAGNOSTIC CODES				
J1939 SPN	**J1939 FMI**	**Cummins Code**	**J1939 SPN Description**	**Cummins Description**
95	16	2372	Engine Fuel Filter Differential Pressure	Fuel Filter Differential Pressure - Data Valid But Above Normal Operating Range - Moderately Severe Level
97	15	418	Water In Fuel Indicator	Water in Fuel Indicator - Data
97	3	428	Water In Fuel Indicator	Water in Fuel Indicator Sensor Circuit - Voltage above normal, or shorted to high source
97	4	429	Water In Fuel Indicator	Water in Fuel Indicator Sensor Circuit - Voltage below normal, or shorted to low source
97	16	1852	Water In Fuel Indicator	Water in Fuel Indicator - Data Valid But Above Normal Operating Range - Moderately Severe Level
98	1	253	Engine Oil Level	Engine Oil Level - Data valid but below normal operational range - Most Severe Level
98	17	471	Engine Oil Level	Engine Oil Level - Data Valid
98	0	688	Engine Oil Level	Engine Oil Level - Data valid but above normal operational range - Most Severe Level
100	3	135	Engine Oil Pressure	Engine Oil Rifle Pressure 1 Sensor Circuit - Voltage above normal, or shorted to high source
100	4	141	Engine Oil Pressure	Engine Oil Rifle Pressure 1 Sensor Circuit - Voltage below normal, or shorted to low source
100	18	143	Engine Oil Pressure	Engine Oil Rifle Pressure Data Valid But Below Normal Operating Range - Moderately Severe Level
100	1	415	Engine Oil Pressure	Engine Oil Rifle Pressure Data valid but below normal operational range - Most Severe Level
100	2	435	Engine Oil Pressure	Engine Oil Rifle Pressure Data erratic, intermittent or incorrect
101	16	555	Engine Crankcase Pressure	Crankcase Pressure - Data Valid But Above Normal Operating Range - Moderately Severe Level
101	0	556	Engine Crankcase Pressure	Crankcase Pressure - Data valid but above normal operational range - Most Severe Level
101	3	1843	Engine Crankcase Pressure	Crankcase Pressure Circuit Voltage above normal, or shorted to high source
101	4	1844	Engine Crankcase Pressure	Crankcase Pressure Circuit Voltage below normal, or shorted to low source
101	2	1942	Engine Crankcase Pressure	Crankcase Pressure - Data erratic, intermittent or incorrect
101	15	1974	Engine Crankcase Pressure	Crankcase Pressure - Data Valid But Above Normal
102	3	122	Engine Intake Manifold #1Pressure	Intake Manifold 1 Pressure Sensor Circuit - Voltage above normal, or shorted to high source
102	4	123	Engine Intake Manifold #1Pressure	Intake Manifold 1 Pressure Sensor Circuit - Voltage below normal, or shorted to low source
102	16	124	Engine Intake Manifold #1Pressure	Intake Manifold 1 Pressure Data Valid But Above Normal Operating Range - Moderately Severe Level
102	18	125	Engine Intake Manifold #1 Pressure	Intake Manifold 1 Pressure Data Valid But Below Normal Operating Range - Moderately Severe Level
102	2	2973	Engine Intake Manifold #1Pressure	Intake Manifold 1 Pressure Data erratic, intermittent or incorrect
102	10	3361	Engine Intake Manifold #1Pressure	Intake Manifold 1 Pressure Abnormal rate of change
103	16	595	Engine Turbocharger 1 Speed	Turbocharger 1 Speed - Data Valid But Above Normal Operating Range - Moderately Severe Level
103	2	686	Engine Turbocharger 1 Speed	Turbocharger 1 Speed - Data erratic, intermittent or incorrect
103	18	687	Engine Turbocharger 1 Speed	Turbocharger 1 Speed - Data Valid But Below Normal Operating Range - Moderately Severe Level
103	15	2288	Engine Turbocharger 1 Speed	Turbocharger 1 Speed - Data Valid But Above Normal Operating Range - Least Severe Level
104	18	3917	Engine Turbocharger Lube Oil Pressure 1	Engine Turbocharger Lube Oil Pressure - Data Valid But Below Normal Operating Range - Moderately Severe Level
105	3	153	Engine Intake Manifold 1Temperature	Intake Manifold 1 Temperature Sensor Circuit - Voltage above normal, or shorted to high source

ENGINE DIAGNOSTIC CODES - CONTINUED				
J1939 SPN	**J1939 FMI**	**Cummins Code**	**J1939 SPN Description**	**Cummins Description**
105	4	154	Engine Intake Manifold 1Temperature	Intake Manifold 1 Temperature Sensor Circuit - Voltage below normal, or shorted to low source
105	0	155	Engine Intake Manifold 1Temperature	Intake Manifold 1 Temperature - Data valid but above normal operational range - Most Severe Level
105	2	436	Engine Intake Manifold 1Temperature	Intake Manifold 1 Temperature - Data erratic, intermittent or incorrect
105	16	488	Engine Intake Manifold Temperature	Intake Manifold 1 Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level
105	15	2964	Engine Intake Manifold #1Temperature	Intake Manifold 1 Temperature - Data Valid But Above Normal Operating Range - Least Severe Level
105	18	3385	Engine Intake Manifold 1Temperature	Intake Manifold 1 Temperature - Data Valid But Below Normal Operating Range - Moderately Severe Level
107	16	3341	Engine Air Filter 1 Differential Pressure	Engine Air Filter Differential Pressure - Data Valid But Above Normal Operating Range - Moderately Severe Level
107	15	5576	Engine Air Filter 1 Differential Pressure	Engine Air Filter Differential Pressure - Data Valid But Above Normal Operating Range - Least Severe Level
108	3	221	Barometric Pressure	Barometric Pressure Sensor Circuit - Voltage above normal, or shorted to high source
108	4	222	Barometric Pressure	Barometric Pressure Sensor Circuit - Voltage above normal, or shorted to low source
108	2	295	Barometric Pressure	Barometric Pressure - Data erratic, intermittent or incorrect
109	3	231	Engine Coolant Pressure	Coolant Pressure Sensor Circuit - Voltage above normal, or shorted to high source
109	4	232	Engine Coolant Pressure	Coolant Pressure Sensor Circuit - Voltage below normal, or shorted to low source
109	18	233	Engine Coolant Pressure	Coolant Pressure - Data Valid But Below Normal Operating Range - Moderately Severe Level
110	3	144	Engine Coolant Temperature	Engine Coolant Temperature 1 Sensor Circuit - Voltage above normal, or shorted to high source
110	4	145	Engine Coolant Temperature	Engine Coolant Temperature 1 Sensor Circuit - Voltage below normal, or shorted to low source
110	16	146	Engine Coolant Temperature	Engine Coolant Temperature -Data Valid But Above Normal Operating Range - Moderately Severe Level
110	0	151	Engine Coolant Temperature	Engine Coolant Temperature Data valid but above normal operational range - Most Severe Level
110	2	334	Engine Coolant Temperature	Engine Coolant Temperature Data erratic, intermittent or incorrect
110	14	1847	Engine Coolant Temperature	Engine Coolant Temperature Special Instructions
110	31	2646	Engine Coolant Temperature	Engine Coolant Temperature Condition Exists
110	31	2659	Engine Coolant Temperature	Engine Coolant Temperature Condition Exists
110	18	2789	Engine Coolant Temperature	Engine Coolant Temperature -Data Valid But Below Normal Operating Range - Moderately Severe Level
110	15	2963	Engine Coolant Temperature	Engine Coolant Temperature -Data Valid But Above Normal Operating Range - Least Severe Level
111	3	195	Engine Coolant Level	Coolant Level Sensor 1 Circuit - Voltage above normal, or shorted to high source
111	4	196	Engine Coolant Level	Coolant Level Sensor 1 Circuit - Voltage below normal, or shorted to low source
111	18	197	Engine Coolant Level	Coolant Level - Data Valid But Below Normal Operating Range - Moderately Severe Level
111	1	235	Engine Coolant Level	Coolant Level - Data valid but below normal operational range - Most Severe Level
111	2	422	Engine Coolant Level	Coolant Level - Data erratic, intermittent or incorrect
111	17	2448	Engine Coolant Level	Coolant Level - Data Valid But

ENGINE DIAGNOSTIC CODES - CONTINUED				
J1939 SPN	**J1939 FMI**	**Cummins Code**	**J1939 SPN Description**	**Cummins Description**
111	18	3366	Engine Coolant Level	Coolant Level - Data Valid But Below Normal Operating Range - Moderately Severe Level
111	9	3613	SAE J1939 Multiplexing PGN Timeout	SAE J1939 Multiplexing PGN Timeout Error - Abnormal update rate
111	19	3614	SAE J1939 Multiplexing PGN Timeout	Coolant Level Sensor Received Network Data in Error
111	17	5167	Engine Coolant Level	Coolant Level - Data Valid But Below Normal Operating Range - Least Severe Level
157	0	449	Engine Injector Metering Rail 1Pressure	Injector Metering Rail 1 Pressure - Data valid but above normal operational range - Most Severe Level
157	3	451	Engine Injector Metering Rail 1Pressure	Injector Metering Rail 1 Pressure Sensor Circuit Voltage above normal, or shorted to high source
157	4	452	Engine Injector Metering Rail 1Pressure	Injector Metering Rail 1 Pressure Sensor Circuit Voltage below normal, or shorted to low source
157	16	553	Engine Injector Metering Rail 1Pressure	Injector Metering Rail 1 Pressure - Data Valid But Above Normal Operating Range - Moderately Severe Level
157	2	554	Engine Injector Metering Rail 1Pressure	Injector Metering Rail 1 Pressure - Data erratic, intermittent or incorrect
157	18	559	Engine Injector Metering Rail 1Pressure	Injector Metering Rail 1 Pressure - Data Valid But Below Normal Operating Range - Moderately Severe Level
157	7	755	Engine Injector Metering Rail 1Pressure	Injector Metering Rail 1 Pressure - Mechanical system not responding or out of adjustment
157	1	2249	Engine Injector Metering Rail 1Pressure	Injector Metering Rail 1 Pressure - Data valid but below normal operational range - Most Severe Level
157	15	4727	Engine Injector Metering Rail 1Pressure	Injector Metering Rail 1 Pressure - Data Valid But Above Normal Operating Range - Least Severe Level
168	18	441	Battery Potential / Power Input 1	Battery 1 Voltage - Data Valid But Below Normal Operating Range - Moderately Severe Level
168	16	442	Battery Potential / Power Input 1	Battery 1 Voltage - Data Valid But Above Normal Operating Range - Moderately Severe Level
168	17	3724	Battery Potential / Power Input 1	Battery 1 Voltage - Data Valid But Below Normal Operating Range - Least Severe Level
171	3	249	Ambient Air Temperature	Ambient Air Temperature Sensor 1 Circuit - Voltage above normal, or shorted to high source
171	4	256	Ambient Air Temperature	Ambient Air Temperature Sensor 1 Circuit - Voltage below normal, or shorted to low source
171	2	2398	Ambient Air Temperature	Ambient Air Temperature Data erratic, intermittent or incorrect
171	9	3531	Ambient Air Temperature	Ambient Air Temperature Abnormal update rate
171	19	3532	Ambient Air Temperature	Ambient Air Temperature Received Network Data In Error
174	16	261	Engine Fuel Temperature 1	Engine Fuel Temperature Data Valid But Above Normal Operating Range - Moderately Severe Level
174	3	263	Engine Fuel Temperature 1	Engine Fuel Temperature Sensor 1 Circuit - Voltage above normal, or shorted to high source
174	4	265	Engine Fuel Temperature 1	Engine Fuel Temperature Sensor 1 Circuit - Voltage below normal, or shorted to low source
174	0	266	Engine Fuel Temperature 1	Engine Fuel Temperature Data valid but above normal operational range - Most Severe Level
174	2	535	Engine Fuel Temperature 1	Engine Fuel Temperature Data erratic, intermittent or incorrect
175	3	212	Engine Oil Temperature 1	Engine Oil Temperature Sensor 1 Circuit - Voltage above normal, or shorted to high source
175	4	213	Engine Oil Temperature 1	Engine Oil Temperature Sensor 1 Circuit - Voltage below normal, or shorted to low source
175	0	214	Engine Oil Temperature 1	Engine Oil Temperature - Data valid but above normal operational range - Most Severe Level
175	16	421	Engine Oil Temperature 1	Engine Oil Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level

ENGINE DIAGNOSTIC CODES - CONTINUED				
J1939 SPN	**J1939 FMI**	**Cummins Code**	**J1939 SPN Description**	**Cummins Description**
175	2	425	Engine Oil Temperature 1	Engine Oil Temperature - Data erratic, intermittent or incorrect
188	16	3715	Engine Speed At Idle, Point 1(Engine Configuration)	Engine Speed At Idle - Data Valid But Above Normal Operating Range - Moderately Severe Level
188	18	3716	Engine Speed At Idle, Point 1(Engine Configuration)	Engine Speed At Idle - Data Valid But Below Normal Operating Range - Moderately Severe Level
190	0	234	Engine Speed	Engine Crankshaft Speed/Position - Data valid but above normal operational range - Most Severe Level
190	2	689	Engine Speed	Engine Crankshaft Speed/Position - Data erratic, intermittent or incorrect
190	16	1992	Engine Speed	Engine Crankshaft Speed/Position - Data Valid But Above Normal Operating Range - Moderately Severe Level
190	2	2321	Engine Speed	Engine Crankshaft Speed/Position - Data erratic, intermittent or incorrect
190	16	2468	Engine Speed	Engine Crankshaft Speed/Position - Data Valid But Above Normal Operating Range - Moderately Severe Level
191	16	349	Transmission Output Shaft Speed	Transmission Output Shaft Speed - Data Valid But Above Normal Operating Range -Moderately Severe Level
191	18	489	Transmission Output Shaft Speed	Transmission Output Shaft Speed - Data Valid But Below Normal Operating Range -Moderately Severe Level
191	9	3328	Transmission Output Shaft Speed	Transmission Output Shaft Speed - Abnormal update rate
191	19	3418	Transmission Output Shaft Speed	Transmission Output Shaft Speed - Received Network Data In Error
237	13	4517	Vehicle Identification Number	Vehicle Identification Number Out of Calibration
237	31	4721	Vehicle Identification Number	Vehicle Identification Number Condition Exists
237	2	4722	Vehicle Identification Number	Vehicle Identification Number Data erratic, intermittent or incorrect
251	2	319	Real Time Clock	Real Time Clock - Data erratic, intermittent or incorrect
411	2	1866	Engine Exhaust Gas Recirculation 1 Differential Pressure	Exhaust Gas Recirculation Differential Pressure - Data erratic, intermittent or incorrect
411	3	2273	Engine Exhaust Gas Recirculation 1 Differential Pressure	Exhaust Gas Recirculation Differential Pressure Sensor Circuit - Voltage above normal, or shorted to high source
411	4	2274	Engine Exhaust Gas Recirculation 1 Differential Pressure	Exhaust Gas Recirculation Differential Pressure Sensor Circuit - Voltage below normal, or shorted to low source
412	2	1867	Engine Exhaust Gas Recirculation 1 Temperature	Exhaust Gas Recirculation Temperature - Data erratic, intermittent or incorrect
412	3	2375	Engine Exhaust Gas Recirculation 1 Temperature	Exhaust Gas Recirculation Temperature Sensor Circuit Voltage above normal, or shorted to high source
412	4	2376	Engine Exhaust Gas Recirculation 1 Temperature	Exhaust Gas Recirculation Temperature Sensor Circuit Voltage below normal, or shorted to low source
412	15	2961	Engine Exhaust Gas Recirculation 1 Temperature	Exhaust Gas Recirculation Temperature - Data Valid But Above Normal Operating Range - Least Severe Level
412	16	2962	Engine Exhaust Gas Recirculation 1 Temperature	Exhaust Gas Recirculation Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level
441	14	292	Auxiliary Temperature 1	Auxiliary Temperature Sensor Input 1 - Special Instructions
441	3	293	Auxiliary Temperature 1	Auxiliary Temperature Sensor Input 1 Circuit - Voltage above normal, or shorted to high source
441	4	294	Auxiliary Temperature 1	Auxiliary Temperature Sensor Input 1 Circuit - Voltage below normal, or shorted to low source
442	3	3765	Auxiliary Temperature 2	Auxiliary Temperature Sensor Input 2 Circuit - Voltage above normal, or shorted to high source
442	4	3766	Auxiliary Temperature 2	Auxiliary Temperature Sensor Input 2 Circuit - Voltage below normal, or shorted to low source
521	2	4526	Brake Pedal Position	Brake Pedal Position - Data erratic, intermittent or incorrect
558	2	431	Accelerator Pedal 1 Low Idle Switch	Accelerator Pedal or Lever Idle Validation Switch - Data erratic, intermittent or incorrect

ENGINE DIAGNOSTIC CODES - CONTINUED				
J1939 SPN	**J1939 FMI**	**Cummins Code**	**J1939 SPN Description**	**Cummins Description**
558	13	432	Accelerator Pedal 1 Low Idle Switch	Accelerator Pedal or Lever Idle Validation Switch Circuit - Out of Calibration
558	19	3527	Accelerator Pedal 1 Low Idle Switch	Accelerator Pedal or Lever Idle Validation Switch - Received Network Data In Error
558	9	3528	Accelerator Pedal 1 Low Idle Switch	Accelerator Pedal or Lever Idle Validation Switch - Abnormal update rate
563	9	3488	Anti-Lock Braking (ABS) Active	Anti-Lock Braking (ABS) Controller - Abnormal update rate
563	31	4215	Anti-Lock Braking (ABS) Active	Anti-Lock Braking (ABS) Active - Condition Exists
596	7	3839	Cruise Control Enable Switch	Cruise Control Enable Switch Mechanical system not responding or out of adjustment
596	2	3841	Cruise Control Enable Switch	Cruise Control Enable Switch Data erratic, intermittent or incorrect
596	13	3842	Cruise Control Enable Switch	Cruise Control Enable Switch Out of Calibration
597	3	769	Brake Switch	Brake Switch Circuit - Voltage above normal, or shorted to high source
597	4	771	Brake Switch	Brake Switch Circuit - Voltage below normal, or shorted to low source
599	2	2721	Cruise Control Set Switch	Cruise Control Set Switch Data erratic, intermittent or incorrect
611	2	523	System Diagnostic Code #1	Auxiliary Intermediate (PTO) Speed Switch Validation - Data erratic, intermittent or incorrect
612	2	115	System Diagnostic Code #2	Engine Magnetic Speed/Position Lost Both of Two Signals - Data erratic, intermittent or incorrect
625	9	291	Proprietary Data link	Proprietary Data link Error (OEM/Vehicle Data link) -Abnormal update rate
626	18	487	Engine Start Enable Device 1	Start Enable Device 1 Canister Empty (Ether Injection) - Data Valid But Below Normal Operating Range
626	3	2738	Engine Start Enable Device 1	Start Enable Device 1 Circuit (Ether Injection) - Voltage above normal, or shorted to high source
626	4	2739	Engine Start Enable Device 1	Start Enable Device 1Circuit (Ether Injection) - Voltage below normal, or shorted to low source
629	12	111	Controller #1	Engine Control Module Critical Internal Failure - Bad intelligent device or component
629	12	343	Controller #1	Engine Control Module Warning Internal Hardware Failure - Bad intelligent device or component
629	31	2661	Controller #1	At Least One Unacknowledged Most Severe Fault - Condition Exists
629	31	2662	Controller #1	At Least One Unacknowledged Moderately Severe Fault Condition Exists
630	12	3697	Engine Control Module Calibration Memory	Engine Control Module Calibration Memory - Bad intelligent device or component
633	31	2311	Engine Fuel Actuator 1 Control Command	Electronic Fuel Injection Control Valve Circuit Condition Exists
639	9	285	J1939 Network #1, Primary Vehicle Network (previously SAE J1939 Data Link)	SAE J1939 Multiplexing PGN Timeout Error - Abnormal update rate
639	13	286	J1939 Network #1, Primary Vehicle Network (previously SAE J1939 Data Link)	SAE J1939 Multiplexing Configuration Error - Out of Calibration
639	2	426	J1939 Network #1, Primary Vehicle Network (previously SAE J1939 Data Link)	J1939 Network #1 - Data erratic, intermittent or incorrect
639	9	427	J1939 Network #1, Primary Vehicle Network (previously SAE J1939 Data Link)	SAE J1939 Data link -Abnormal update rate
640	14	599	Engine External Protection Input	Auxiliary Commanded Dual Output Shutdown - Special Instructions

ENGINE DIAGNOSTIC CODES - CONTINUED				
J1939 SPN	**J1939 FMI**	**Cummins Code**	**J1939 SPN Description**	**Cummins Description**
641	13	1898	Engine Variable Geometry Turbocharger Actuator #1	VGT Actuator Controller - Out of Calibration
641	15	1962	Engine Variable Geometry Turbocharger Actuator #1	VGT Actuator Driver Over Temperature (Calculated) Data Valid But Above Normal Operating Range - Least Severe Level
641	11	2198	Engine Variable Geometry Turbocharger Actuator #1	VGT Actuator Driver Circuit -Root Cause Not Known
641	7	2387	Engine Variable Geometry Turbocharger Actuator #1	VGT Actuator Driver Circuit (Motor) - Mechanical system not responding or out of adjustment
641	13	2449	Engine Variable Geometry Turbocharger Actuator #1	VGT Actuator Controller - Out of Calibration
641	12	2634	Engine Variable Geometry Turbocharger Actuator #1	VGT Actuator Controller - Bad intelligent device or component
641	31	2635	Engine Variable Geometry Turbocharger Actuator #1	VGT Actuator Driver Circuit Condition Exists
641	9	2636	Engine Variable Geometry Turbocharger Actuator #1	VGT Actuator Driver Circuit Abnormal update rate
644	2	237	Engine External Speed Command Input	External Speed Command Input (Multiple Unit Synchronization) - Data erratic, intermittent or incorrect
647	4	245	Engine Fan Clutch 1 Output Device Driver	Fan Control Circuit - Voltage below normal, or shorted to low source
647	3	2377	Engine Fan Clutch 1 Output Device Driver	Fan Control Circuit - Voltage above normal, or shorted to high source
649	3	5271	Engine Exhaust Back Pressure Regulator Control Circuit	Engine Exhaust Back Pressure Regulator Control Circuit Voltage Above Normal, or Shorted to High Source
649	4	5272	Engine Exhaust Back Pressure Regulator Control Circuit	Engine Exhaust Back Pressure Regulator Control Circuit Voltage Below Normal, or Shorted to Low Source
649	5	5273	Engine Exhaust Back Pressure Regulator Control Circuit	Engine Exhaust Back Pressure Regulator Control Circuit - Current Below Normal or Open Circuit
651	5	322	Engine Injector Cylinder #01	Injector Solenoid Driver Cylinder 1 Circuit - Current below normal or open circuit
651	7	1139	Engine Injector Cylinder #01	Injector Solenoid Driver Cylinder 1 - Mechanical system not responding or out of adjustment
652	5	331	Engine Injector Cylinder #02	Injector Solenoid Driver Cylinder 2 Circuit - Current below normal or open circuit
652	7	1141	Engine Injector Cylinder #02	Injector Solenoid Driver Cylinder 2 - Mechanical system not responding or out of adjustment
653	5	324	Engine Injector Cylinder #03	Injector Solenoid Driver Cylinder 3 Circuit - Current below normal or open circuit
653	7	1142	Engine Injector Cylinder #03	Injector Solenoid Driver Cylinder 3 - Mechanical system not responding or out of adjustment
654	5	332	Engine Injector Cylinder #04	Injector Solenoid Driver Cylinder 4 Circuit - Current below normal or open circuit
654	7	1143	Engine Injector Cylinder #04	Injector Solenoid Driver Cylinder 4 - Mechanical system not responding or out of adjustment
655	5	323	Engine Injector Cylinder #05	Injector Solenoid Driver Cylinder 5 Circuit - Current below normal or open circuit
655	7	1144	Engine Injector Cylinder #05	Injector Solenoid Driver Cylinder 5 - Mechanical system not responding or out of adjustment
656	5	325	Engine Injector Cylinder #06	Injector Solenoid Driver Cylinder 6 Circuit - Current below normal or open circuit
656	7	1145	Engine Injector Cylinder #06	Injector Solenoid Driver Cylinder 6 - Mechanical system not responding or out of adjustment
657	5	1548	Engine Injector Cylinder #7	Injector Solenoid Driver Cylinder 7 Circuit - Current below normal or open circuit
658	5	1549	Engine Injector Cylinder #8	Injector Solenoid Driver Cylinder 8 Circuit - Current below normal or open circuit

ENGINE DIAGNOSTIC CODES - CONTINUED				
J1939 SPN	**J1939 FMI**	**Cummins Code**	**J1939 SPN Description**	**Cummins Description**
659	5	1622	Engine Injector Cylinder #9	Injector Solenoid Driver Cylinder 9 Circuit - Current below normal or open circuit
660	5	1551	Engine Injector Cylinder #10	Injector Solenoid Driver Cylinder 10 Circuit - Current below normal or open circuit
661	5	1552	Engine Injector Cylinder #11	Injector Solenoid Driver Cylinder 11 Circuit - Current below normal or open circuit
662	5	1553	Engine Injector Cylinder #12	Injector Solenoid Driver Cylinder 12 Circuit - Current below normal or open circuit
663	5	1554	Engine Injector Cylinder #13	Injector Solenoid Driver Cylinder 13 Circuit - Current below normal or open circuit
664	5	1555	Engine Injector Cylinder #14	Injector Solenoid Driver Cylinder 14 Circuit - Current below normal or open circuit
665	5	1556	Engine Injector Cylinder #15	Injector Solenoid Driver Cylinder 15 Circuit - Current below normal or open circuit
666	5	1557	Engine Injector Cylinder #16	Injector Solenoid Driver Cylinder 16 Circuit - Current below normal or open circuit
677	3	584	Engine Starter Motor Relay	Starter Relay Driver Circuit Voltage above normal, or shorted to high source
677	4	585	Engine Starter Motor Relay	Starter Relay Driver Circuit Voltage below normal, or shorted to low source
697	3	2557	Auxiliary PWM Driver #1	Auxiliary PWM Driver 1 Circuit - Voltage above normal, or shorted to high source
697	4	2558	Auxiliary PWM Driver #1	Auxiliary PWM Driver 1 Circuit - Voltage below normal, or shorted to low source
701	14	4734	Auxiliary I/O #01	Auxiliary Input/Output 1 Special Instructions
702	3	527	Auxiliary I/O #02	Auxiliary Input/Output 2 Circuit - Voltage above normal, or shorted to high source
702	5	4724	Auxiliary I/O #02	Auxiliary Input/Output 2 Circuit - Current below normal or open circuit
702	6	4725	Auxiliary I/O #02	Auxiliary Input/Output 2 Circuit - Current above normal or grounded circuit
703	3	529	Auxiliary I/O #03	Auxiliary Input/Output 3 Circuit - Voltage above normal, or shorted to high source
723	7	731	Engine Speed 2	Engine Speed / Position Camshaft and Crankshaft Misalignment - Mechanical system not responding or out of adjustment
723	2	778	Engine Speed 2	Engine Camshaft Speed / Position Sensor - Data erratic, intermittent or incorrect
723	2	2322	Engine Speed 2	Engine Camshaft Speed / Position Sensor - Data erratic, intermittent or incorrect
729	3	2555	Engine Intake Air Heater Driver #1	Engine Intake Air Heater 1 Circuit - Voltage above normal, or shorted to high source
729	4	2556	Engine Intake Air Heater Driver #1	Engine Intake Air Heater 1 Circuit - Voltage below normal, or shorted to low source
748	9	3641	Transmission Output Retarder	Transmission Output Retarder - Abnormal update rate
862	3	3733	Crankcase breather Heater Circuit	Crankcase Breather Filter Heater Circuit - Voltage above normal, or shorted to high source
862	4	3734	Crankcase breather Heater Circuit	Crankcase Breather Filter Heater Circuit - Voltage below normal, or shorted to low source
974	3	133	Remote Accelerator Pedal Position	Remote Accelerator Pedal or Lever Position Sensor 1 Circuit - Voltage above normal, or shorted to high source
974	4	134	Remote Accelerator Pedal Position	Remote Accelerator Pedal or Lever Position Sensor 1 Circuit - Voltage below normal, or shorted to low source
974	19	288	Remote Accelerator Pedal Position	SAE J1939 Multiplexing Remote Accelerator Pedal or Lever Position Sensor System - Received Network Data In Error
1072	3	2182	Engine (Compression) Brake Output #1	Engine Brake Actuator Driver 1 Circuit - Voltage above normal, or shorted to high source

ENGINE DIAGNOSTIC CODES - CONTINUED				
J1939 SPN	**J1939 FMI**	**Cummins Code**	**J1939 SPN Description**	**Cummins Description**
1072	4	2183	Engine (Compression) Brake Output #1	Engine Brake Actuator Driver 1 Circuit - Voltage below normal, or shorted to low source
1073	4	2363	Engine (Compression) Brake Output #2	Engine Brake Actuator Driver Output 2 Circuit - Voltage below normal, or shorted to low source
1073	3	2367	Engine (Compression) Brake Output #2	Engine Brake Actuator Driver Output 2 Circuit - Voltage above normal, or shorted to high source
1075	3	2265	Engine Electric Lift Pump for Engine Fuel Supply	Electric Lift Pump for Engine Fuel Supply Circuit - Voltage above normal, or shorted to high source
1075	4	2266	Engine Electric Lift Pump for Engine Fuel Supply	Electric Lift Pump for Engine Fuel Supply Circuit - Voltage below normal, or shorted to low source
1081	7	3494	Engine Wait to Start Lamp	Engine Wait to Start Lamp Mechanical system not responding or out of adjustment
1081	9	3555	Engine Wait to Start Lamp	Engine Wait to Start Lamp Abnormal update rate
1081	19	3556	Engine Wait to Start Lamp	Engine Wait to Start Lamp Received Network Data In Error
1081	31	4252	Engine Wait to Start Lamp	Engine Wait to Start Lamp Condition Exists
1109	0	3931	Engine Protection System Approaching Shutdown	Engine Protection System Approaching Shutdown - Data valid but above normal operational range - Most
1112	4	2365	Engine (Compression) Brake Output #3	Engine Brake Actuator Driver Output 3 Circuit - Voltage below normal, or shorted to low source
1112	3	2368	Engine (Compression) Brake Output #3	Engine Brake Actuator Driver 3 Circuit - Voltage above normal, or shorted to high source
1127	7	3683	Engine Turbocharger 1 Boost Pressure	Engine Turbocharger 1 Boost Pressure - Mechanical system not responding or out of adjustment
1136	3	697	Engine ECU Temperature	Engine ECU Temperature Sensor Circuit - Voltage above normal, or shorted to high source
1136	4	698	Engine ECU Temperature	Engine ECU Temperature Sensor Circuit - Voltage below normal, or shorted to low source
1136	2	699	Engine ECU Temperature	Engine ECU Temperature -Data erratic, intermittent or incorrect
1172	3	691	Engine Turbocharger 1 Compressor Intake Temperature	Turbocharger 1 Compressor Intake Temperature Circuit Voltage above normal, or shorted to high source
1172	4	692	Engine Turbocharger 1 Compressor Intake Temperature	Turbocharger 1 Compressor Intake Temperature Circuit Voltage below normal, or shorted to low source
1172	2	693	Engine Turbocharger 1 Compressor Intake Temperature	Turbocharger 1 Compressor Intake Temperature - Data erratic, intermittent or incorrect
1172	9	3369	Engine Turbocharger 1 Compressor Intake Temperature	Turbocharger 1 Compressor Intake Temperature Sensor - Abnormal update rate
1172	19	3371	Engine Turbocharger 1 Compressor Intake Temperature	Turbocharger 1 Compressor Intake Temperature Sensor Received Network Data In Error
1176	18	629	Engine Turbocharger 1 Compressor Intake Pressure	Turbocharger 1 Compressor Intake Pressure - Data Valid But Below Normal Operating Range - Moderately
1176	3	741	Engine Turbocharger 1 Compressor Intake Pressure	Turbocharger 1 Compressor Intake Pressure Circuit Voltage above normal, or shorted to high source
1176	4	742	Engine Turbocharger 1 Compressor Intake Pressure	Turbocharger 1 Compressor Intake Pressure Circuit Voltage below normal, or shorted to low source
1176	2	743	Engine Turbocharger 1 Compressor Intake Pressure	Turbocharger 1 Compressor Intake Pressure - Data erratic, intermittent or incorrect
1176	1	3348	Engine Turbocharger 1 Compressor Intake Pressure	Turbocharger 1 Compressor Intake Pressure - Data valid but below normal operational range - Most Severe Level
1176	9	3372	Engine Turbocharger 1 Compressor Intake Pressure	Turbocharger 1 Compressor Intake Pressure - Abnormal update rate
1176	19	3373	Engine Turbocharger 1 Compressor Intake Pressure	Turbocharger 1 Compressor Intake Pressure - Received Network Data In Error
1194	13	3298	Anti-theft Encryption Seed Present Indicator	Anti-theft Encryption Seed Out of Calibration
1195	2	269	Anti-theft Password Valid Indicator	Antitheft Password Valid Indicator - Data erratic, intermittent or incorrect

ENGINE DIAGNOSTIC CODES - CONTINUED				
J1939 SPN	**J1939 FMI**	**Cummins Code**	**J1939 SPN Description**	**Cummins Description**
1209	3	2373	Engine Exhaust Gas Pressure 1	Exhaust Gas Pressure Sensor 1 Circuit - Voltage above normal, or shorted to high source
1209	4	2374	Engine Exhaust Gas Pressure 1	Exhaust Gas Pressure Sensor 1 Circuit - Voltage below normal, or shorted to low source
1209	2	2554	Engine Exhaust Gas Pressure 1	Exhaust Gas Pressure 1 Data erratic, intermittent or incorrect
1209	16	2764	Engine Exhaust Gas Pressure 1	Exhaust Gas Pressure 1 Data Valid But Above Normal Operating Range - Moderately Severe Level
1213	9	3535	Malfunction Indicator Lamp	Malfunction Indicator Lamp Abnormal update rate
1231	2	3329	J1939 Network #2	J1939 Network #2 - Data erratic, intermittent or incorrect
1235	2	3331	J1939 Network #3	J1939 Network #3 - Data erratic, intermittent or incorrect
1239	16	4726	Engine Fuel Leakage 1	Engine Fuel Leakage - Data Valid But Above Normal Operating Range - Moderately Severe Level
1267	3	338	Idle Shutdown Vehicle Accessories Relay Driver Circuit	Idle Shutdown Vehicle Accessories Relay Driver Circuit - Voltage above normal, or shorted to high source
1267	4	339	Idle Shutdown Vehicle Accessories Relay Driver Circuit	Idle Shutdown Vehicle Accessories Relay Driver Circuit - Voltage below normal, or shorted to low source
1322	31	1718	Engine Misfire for Multiple Cylinders	Engine Misfire for Multiple Cylinders - Condition Exists
1323	31	1654	Engine Misfire Cylinder #1	Engine Misfire Cylinder 1 Condition Exists
1324	31	1655	Engine Misfire Cylinder #2	Engine Misfire Cylinder 2 Condition Exists
1325	31	1656	Engine Misfire Cylinder #3	Engine Misfire Cylinder 3 Condition Exists
1326	31	1657	Engine Misfire Cylinder #4	Engine Misfire Cylinder 4 Condition Exists
1327	31	1658	Engine Misfire Cylinder #5	Engine Misfire Cylinder 5 Condition Exists
1328	31	1659	Engine Misfire Cylinder #6	Engine Misfire Cylinder 6 Condition Exists
1347	4	271	Engine Fuel Pump Pressurizing Assembly #1	Engine Fuel Pump Pressurizing Assembly 1 Circuit - Voltage below normal, or shorted to low source
1347	3	272	Engine Fuel Pump Pressurizing Assembly #2	Engine Fuel Pump Pressurizing Assembly 1 Circuit - Voltage above normal, or shorted to high source
1347	7	281	Engine Fuel Pump Pressurizing Assembly #3	Engine Fuel Pump Pressurizing Assembly 1 Mechanical system not responding or out of adjustment
1349	3	483	Engine Injector Metering Rail 2 Pressure	Injector Metering Rail 2 Pressure Sensor Circuit Voltage above normal, or shorted to high source
1349	4	484	Engine Injector Metering Rail 2 Pressure	Injector Metering Rail 2 Pressure Sensor Circuit Voltage below normal, or shorted to low source
1377	2	497	Engine Synchronization Switch	Multiple Unit Synchronization Switch - Data erratic, intermittent or incorrect
1378	31	649	Engine Oil	Engine Oil Change Interval Condition Exists
1383	31	611	Engine was Shut Down Hot	Engine Shut Down Hot Condition Exists
1387	3	1539	Auxiliary Pressure #1	Auxiliary Pressure Sensor Input 1 Circuit - Voltage above normal, or shorted to high source
1387	4	1621	Auxiliary Pressure #1	Auxiliary Pressure Sensor Input 1 Circuit - Voltage below normal, or shorted to low source
1388	14	296	Auxiliary Pressure #2	Auxiliary Pressure Sensor Input 2 - Special Instructions
1388	3	297	Auxiliary Pressure #2	Auxiliary Pressure Sensor Input 2 Circuit - Voltage above normal, or shorted to high source
1388	4	298	Auxiliary Pressure #2	Auxiliary Pressure Sensor Input 2 Circuit - Voltage below normal, or shorted to low source
1563	2	1256	Incompatible Monitor/Controller	Control Module Identification Input State Error - Data erratic, intermittent or incorrect
1563	2	1257	Incompatible Monitor/Controller	Control Module Identification Input State Error - Data erratic, intermittent or incorrect
1569	31	3714	Engine Protection Torque Derate	Engine Protection Torque Derate - Condition Exists
1590	2	784	Adaptive Cruise Control Mode	Adaptive Cruise Control Mode - Data erratic, intermittent or incorrect

ENGINE DIAGNOSTIC CODES - CONTINUED				
J1939 SPN	**J1939 FMI**	**Cummins Code**	**J1939 SPN Description**	**Cummins Description**
1623	9	3186	Tachograph output shaft speed	Tachograph Output Shaft Speed - Abnormal update rate
1623	19	3213	Tachograph output shaft speed	Tachograph Output Shaft Speed - Received Network Data In Error
1623	13	5248	Tachograph Output Shaft Speed	Tachograph Output Shaft Speed - Out of Calibration
1632	14	2998	Engine Torque Limit Feature	Engine Torque Limit Feature Special Instructions
1632	31	5193	Engine Torque Limit Feature	Engine Torque Limit Feature Condition Exists
1639	0	4789	Fan Speed	Fan Speed - Data Valid but Above Normal Operational Range - Most Severe Level
1639	1	4791	Fan Speed	Fan Speed - Data Valid but Below Normal Operational Range - Most Severe Level
1668	2	4437	J1939 Network #4 - Data erratic	J1939 Network #4 - Data erratic, intermittent or incorrect
1675	31	3737	Engine Starter Mode	Engine Starter Mode Overcrank Protection -Condition Exists
1761	4	1668	Aftertreatment 1 Diesel Exhaust Fluid Tank Level	Aftertreatment 1 Diesel Exhaust Fluid Tank Level Sensor Circuit - Voltage below normal, or shorted to low source
1761	3	1669	Aftertreatment 1 Diesel Exhaust Fluid Tank Level	Aftertreatment 1 Diesel Exhaust Fluid Tank Level Sensor Circuit Voltage above normal, or shorted to high source
1761	1	1673	Aftertreatment 1 Diesel Exhaust Fluid Tank Level	Aftertreatment 1 Diesel Exhaust Fluid Tank Level - Data valid but below normal operational range Most Severe Level
1761	2	1699	Aftertreatment 1 Diesel Exhaust Fluid Tank Level	Aftertreatment 1 Diesel Exhaust Fluid Tank Level Sensor - Data erratic, intermittent or incorrect
1761	17	3497	Aftertreatment 1	Aftertreatment 1 Diesel
1761	18	3498	Aftertreatment 1	Aftertreatment 1 Diesel
1761	5	4679	Aftertreatment 1 Diesel Exhaust Fluid Tank Level	Aftertreatment 1 Diesel Exhaust Fluid Tank Level Sensor Circuit - Current below normal or open circuit
1761	13	4732	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature	Aftertreatment 1 Diesel Exhaust Fluid Tank Level Sensor - Out of Calibration
1761	6	4738	Aftertreatment 1Diesel Exhaust Fluid Tank Level	Aftertreatment 1 Diesel Exhaust Fluid Tank Level Sensor Circuit - Current above normal or grounded circuit
1761	11	4739	Aftertreatment 1 Diesel Exhaust Fluid Tank Level	Aftertreatment 1 Diesel Exhaust Fluid Tank Level Sensor - Root Cause Not Known
1761	10	4769	Aftertreatment 1 Diesel Exhaust Fluid Tank Level	Aftertreatment 1 Diesel Exhaust Fluid Tank Level Sensor - Abnormal Rate of Change
1800	16	2263	Battery 1 Temperature	Battery Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level
1800	18	2264	Battery 1 Temperature	Battery Temperature - Data Valid But Below Normal Operating Range - Moderately Severe Level
1818	31	3374	ROP Brake Control active	Roll Over Protection Brake Control Active - Condition Exists
2006	9	5133	Source Address 6	Source Address 6 - Abnormal Update Rate
2623	3	1239	Accelerator Pedal #1 Channel 2	Accelerator Pedal or Lever Position Sensor 2 Circuit Voltage above normal, or shorted to high source
2623	4	1241	Accelerator Pedal #1 Channel 2	Accelerator Pedal or Lever Position Sensor 2 Circuit Voltage below normal, or shorted to low source
2629	15	2347	Engine Turbocharger 1 Compressor Outlet Temperature	Turbocharger Compressor Outlet Temperature (Calculated) - Data Valid But Above Normal Operating Range
2630	3	2571	Engine Charge Air Cooler 1 Outlet Temperature	Engine Charge Air Cooler Outlet Temperature - Voltage above normal, or shorted to high source
2630	4	2572	Engine Charge Air Cooler 1 Outlet Temperature	Engine Charge Air Cooler Outlet Temperature - Voltage below normal, or shorted to low source
2630	2	3478	Engine Charge Air Cooler 1 Outlet Temperature	Engine Charge Air Cooler Outlet Temperature - Data erratic, intermittent or incorrect
2633	7	3616	Engine Variable Geometry Turbocharger (VGT) 1 Nozzle Position	Engine VGT Nozzle Position Mechanical system not responding or out of adjustment
2634	3	1776	Power Relay	Power Relay Driver Circuit Voltage above normal, or shorted to high source

ENGINE DIAGNOSTIC CODES - CONTINUED				
J1939 SPN	**J1939 FMI**	**Cummins Code**	**J1939 SPN Description**	**Cummins Description**
2634	4	1777	Power Relay	Power Relay Driver Circuit Voltage below normal, or shorted to low source
2789	15	2346	Engine Turbocharger 1 Calculated Turbine Intake Temperature	Turbocharger Turbine Intake Temperature - Data Valid But Above Normal Operating Range - Least Severe
2789	16	2451	Engine Turbocharger 1 Calculated Turbine Intake Temperature	Turbocharger Turbine Intake Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level
2791	9	1893	Engine Exhaust Gas Recirculation 1 (EGR1) Valve Control	EGR Valve Control Circuit Abnormal update rate
2791	13	1896	Engine Exhaust Gas Recirculation 1 (EGR1) Valve Control	EGR Valve Controller - Out of Calibration
2791	15	1961	Engine Exhaust Gas Recirculation 1 (EGR1) Valve Control	EGR Valve Control Circuit Over Temperature - Data Valid But Above Normal Operating Range - Least Severe Level
2791	5	2349	Engine Exhaust Gas Recirculation 1 (EGR1) Valve Control	EGR Valve Control Circuit Current below normal or open circuit
2791	6	2353	Engine Exhaust Gas Recirculation 1 (EGR1) Valve Control	EGR Valve Control Circuit Current above normal or grounded circuit
2791	7	2357	Engine Exhaust Gas Recirculation 1 (EGR1) Valve Control	EGR Valve Control Circuit Mechanical system not responding or out of adjustment
2797	13	2765	Engine Injector Group 1	Engine Injector Bank 1 Barcodes - Out of Calibration
2884	9	3735	Engine Auxiliary Governor Switch	Engine Auxiliary Governor Switch - Abnormal update rate
2978	9	3838	Estimated Engine Parasitic Losses - Percent Torque	Estimated Engine Parasitic Losses - Percent Torque -Abnormal update rate
3031	4	1677	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature Sensor - Voltage below normal, or shorted to low source
3031	3	1678	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature Sensor - Voltage above normal, or shorted to high source
3031	2	1679	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature - Data erratic, intermittent or incorrect
3031	9	4572	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature - Abnormal Update Rate
3031	5	4682	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature Sensor Circuit Current below normal or open circuit
3031	13	4731	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature Sensor - Out of Calibration
3031	6	4736	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature Sensor Circuit Current above normal or grounded circuit
3031	11	4737	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature	Aftertreatment 1 Diesel Exhaust Fluid Tank Temperature - Root Cause Not Known
3060	18	3243	Engine Cooling System Monitor	Engine Cooling System Monitor - Data Valid But Below Normal Operating Range -Moderately Severe Level
3216	4	1885	Aftertreatment 1 Intake NOx	Aftertreatment 1 Intake NOx Sensor Circuit - Voltage below normal, or shorted to low source
3216	2	3228	Aftertreatment 1 Intake NOx	Aftertreatment 1 Intake NOx Sensor - Data erratic, intermittent or incorrect
3216	9	3232	Aftertreatment 1 Intake NOx	Aftertreatment 1 Intake NOx Sensor - Abnormal update rate
3216	13	3718	Aftertreatment 1 Intake NOx	Aftertreatment 1 Intake NOx Out of Calibration
3216	10	3725	Aftertreatment 1 Intake NOx	Aftertreatment 1 Intake NOx Sensor - Abnormal rate of change
3216	16	3726	Aftertreatment 1 Intake NOx	Aftertreatment 1 Intake NOx Data Valid But Above Normal Operating Range - Moderately Severe Level
3216	20	3748	Aftertreatment 1 Intake NOx	Aftertreatment 1 Intake NOx Sensor - Data not Rational Drifted High
3217	2	1861	Aftertreatment 1 Intake O2	Aftertreatment Intake Oxygen Sensor - Data erratic, intermittent or incorrect
3218	2	3682	Aftertreatment 1 Intake Gas Sensor Power Status	Aftertreatment 1 Intake NOx Sensor Power Supply - Data erratic, intermittent or incorrect

ENGINE DIAGNOSTIC CODES - CONTINUED				
J1939 SPN	**J1939 FMI**	**Cummins Code**	**J1939 SPN Description**	**Cummins Description**
3226	2	1694	Aftertreatment 1 Outlet NOx	Aftertreatment 1 Outlet NOx Sensor - Data erratic, intermittent or incorrect
3226	4	1887	Aftertreatment 1 Outlet NOx	Aftertreatment 1 Outlet NOx Sensor Circuit - Voltage below normal, or shorted to low source
3226	9	2771	Aftertreatment 1 Outlet NOx	Aftertreatment 1 Outlet NOx Sensor - Abnormal update rate
3226	10	3545	Aftertreatment 1 Outlet NOx	Aftertreatment 1 Outlet NOx Sensor - Abnormal rate of change
3226	13	3717	Aftertreatment 1 Outlet NOx	Aftertreatment 1 Outlet NOx Sensor - Out of Calibration
3226	20	3749	Aftertreatment 1 Outlet NOx	Aftertreatment 1 Outlet NOx Sensor - Data not Rational Drifted High
3227	9	2683	Aftertreatment 1 Outlet O2	Aftertreatment Outlet Oxygen Sensor Circuit - Abnormal update rate
3228	2	3681	Aftertreatment 1 Outlet Gas Sensor Power Status	Aftertreatment 1 Outlet NOx Sensor Power Supply - Data erratic, intermittent or incorrect
3249	17	2742	Aftertreatment 1 Exhaust Gas Temperature 2	Aftertreatment Exhaust Gas Temperature 2 - Data Valid But Below Normal Operating Range - Least Severe Level
3249	18	2743	Aftertreatment 1 Exhaust Gas Temperature 2	Aftertreatment Exhaust Gas Temperature 2 - Data Valid But Below Normal Operating Range - Moderately Severe Level
3251	3	1879	Aftertreatment 1 Diesel Particulate Filter Differential Pressure	Aftertreatment Diesel Particulate Filter Differential Pressure Sensor Circuit -Voltage above normal
3251	4	1881	Aftertreatment 1 Diesel Particulate Filter Differential Pressure	Aftertreatment Diesel Particulate Filter Differential Pressure Sensor Circuit -Voltage below normal
3251	2	1883	Aftertreatment 1 Diesel Particulate Filter Differential Pressure	Aftertreatment Diesel Particulate Filter Differential Pressure Sensor - Data erratic, intermittent or incorrect
3251	16	1921	Aftertreatment 1 Diesel Particulate Filter Differential Pressure	Aftertreatment Diesel Particulate Filter Differential Pressure - Data Valid But Above Normal Operating Range
3251	0	1922	Aftertreatment 1 Diesel Particulate Filter Differential Pressure	Aftertreatment Diesel Particulate Filter Differential Pressure - Data valid but above normal Operating Range
3251	15	2639	Aftertreatment 1 Diesel Particulate Filter Differential Pressure	Aftertreatment Diesel Particulate Filter Differential Pressure - Data valid but above normal Operating Range
3255	9	4145	Aftertreatment 2 Intake NOx	Aftertreatment 2 Intake NOx Sensor - Abnormal update rate
3265	9	3988	Aftertreatment 2 Outlet NOx	Aftertreatment 2 Outlet NOx Abnormal Update Rate

ENGINE DIAGNOSTIC CODES - CONTINUED				
J1939 SPN	**J1939 FMI**	**Cummins Code**	**J1939 SPN Description**	**Cummins Description**
3353	3	4953	Alternator 1 Status	Alternator 1 Status - Voltage Above Normal, or Shorted to High Source
3353	4	4954	Alternator 1 Status	Alternator 1 Status - Voltage Below Normal, or Shorted to Low Source
3361	2	2976	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Temperature - Data erratic, intermittent or incorrect
3361	3	3558	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Voltage above normal, or shorted to high source
3361	4	3559	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Voltage below normal, or shorted to low source
3362	31	1682	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Input Lines	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Input Lines - Condition Exists
3363	3	1683	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Heater	Aftertreatment 1 Diesel Exhaust Fluid Tank Heater Voltage above normal, or shorted to high source
3363	4	1684	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Heater	Aftertreatment 1 Diesel Exhaust Fluid Tank Heater Voltage below normal, or shorted to low source
3363	18	1712	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Heater	Aftertreatment 1 Diesel Exhaust Fluid Tank Heater Data Valid But Below Normal Operating Range - Moderately Severe Level
3363	16	1713	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Heater	Aftertreatment 1 Diesel Exhaust Fluid Tank Heater Data Valid But Above Normal Operating Range - Moderately Severe Level
3363	7	3242	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Heater	Aftertreatment 1 Diesel Exhaust Fluid Tank Heater Mechanical system not responding or out of adjustment
3364	4	1685	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality Sensor Circuit Voltage below normal, or shorted to low source
3364	3	1686	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality Sensor Circuit Voltage above normal, or shorted to high source
3364	13	1714	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality - Out of Calibration
3364	11	1715	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality - Root Cause Not Known
3364	1	3866	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality - Data valid but below normal operational range - Most Severe Level
3364	18	3867	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality - Data Valid But Below Normal Operating Range - Moderate Severe Level
3364	9	3868	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality - Abnormal update rate
3364	7	3876	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality Sensor Mechanical system not responding or out of adjustment
3364	12	3877	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality Sensor - Bad intelligent device or component
3364	2	3878	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality - Data erratic, intermittent or incorrect
3364	19	4241	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality - Received Network Data In Error
3364	10	4277	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality - Abnormal Rate of Change
3364	5	4741	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality Sensor Circuit Current below normal or open circuit
3364	6	4742	Aftertreatment 1 Diesel Exhaust Fluid Tank 1 Quality	Aftertreatment Diesel Exhaust Fluid Quality Sensor Circuit Current above normal or grounded circuit
3364	15	4842	Aftertreatment Diesel Exhaust Fluid Quality	Aftertreatment Diesel Exhaust Fluid Quality - Data Valid But Above Normal Operating Range - Least Severe Level
3480	2	1926	Aftertreatment Fuel Pressure	Aftertreatment Fuel Pressure Sensor - Data erratic, intermittent or incorrect
3480	3	1927	Aftertreatment Fuel Pressure	Aftertreatment Fuel Pressure Sensor Circuit - Voltage above normal, or shorted to high source

ENGINE DIAGNOSTIC CODES - CONTINUED				
J1939 SPN	**J1939 FMI**	**Cummins Code**	**J1939 SPN Description**	**Cummins Description**
3480	4	1928	Aftertreatment Fuel Pressure	Aftertreatment Fuel Pressure Sensor Circuit - Voltage below normal, or shorted to low source
3480	17	2881	Aftertreatment Fuel Pressure	Aftertreatment Fuel Pressure Sensor - Data Valid But Below Normal Operating Range Least Severe Level
3481	16	2778	Aftertreatment 1 Fuel Rate	Aftertreatment Fuel Rate Data Valid But Above Normal Operating Range - Moderately Severe Level
3482	3	1923	Aftertreatment 1 Fuel Enable Actuator	Aftertreatment Fuel Shutoff Valve Circuit - Voltage above normal, or shorted to high source
3482	4	1924	Aftertreatment 1 Fuel Enable Actuator	Aftertreatment Fuel Shutoff Valve Circuit - Voltage below normal, or shorted to low source
3482	2	1925	Aftertreatment 1 Fuel Enable Actuator	Aftertreatment Fuel Shutoff Valve - Data erratic, intermittent or incorrect
3482	7	1963	Aftertreatment 1 Fuel Enable Actuator	Aftertreatment Fuel Shutoff Valve - Mechanical system not responding or out of adjustment
3482	13	2741	Aftertreatment 1 Fuel Enable Actuator	Aftertreatment Fuel Shutoff Valve Swapped - Out of Calibration
3482	16	4568	Aftertreatment 1 Fuel Enable Actuator	Aftertreatment Fuel Shutoff Valve - Data Valid But Above Normal Operating Range -Moderately Severe
3490	4	3223	Aftertreatment 1 Purge Air Actuator	Aftertreatment Purge Air Actuator Circuit - Voltage below normal, or shorted to low source
3490	3	3224	Aftertreatment 1 Purge Air Actuator	Aftertreatment Purge Air Actuator Circuit - Voltage above normal, or shorted to high source
3490	7	3225	Aftertreatment 1 Purge Air Actuator	Aftertreatment Purge Air Actuator - Mechanical system not responding or out of adjustment
3509	4	352	Sensor supply voltage 1	Sensor Supply 1 Circuit Voltage below normal, or shorted to low source
3509	3	386	Sensor supply voltage 1	Sensor Supply 1 Circuit Voltage above normal, or shorted to high source
3510	4	187	Sensor supply voltage 2	Sensor Supply 2 Circuit Voltage below normal, or shorted to low source
3510	3	227	Sensor supply voltage 2	Sensor Supply 2 Circuit Voltage above normal, or shorted to high source
3511	4	238	Sensor supply voltage 3	Sensor Supply 3 Circuit Voltage below normal, or shorted to low source
3511	3	239	Sensor supply voltage 3	Sensor Supply 3 Circuit Voltage above normal, or shorted to high source
3512	3	2185	Sensor supply voltage 4	Sensor Supply 4 Circuit - Voltage above normal, or shorted to high source
3512	4	2186	Sensor supply voltage 4	Sensor Supply 4 Circuit Voltage below normal, or shorted to low source
3513	3	1695	Sensor supply voltage 5	Sensor Supply 5 - Voltage above normal, or shorted to high source
3513	4	1696	Sensor supply voltage 5	Sensor Supply 5 - Voltage below normal, or shorted to low source
3514	3	515	Sensor supply voltage 6	Sensor Supply 6 Circuit Voltage above normal, or shorted to high source
3514	4	516	Sensor supply voltage 6	Sensor Supply 6 Circuit Voltage below normal, or shorted to low source
3515	3	4233	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2 Sensor Circuit - Voltage above normal, or shorted to high source
3515	4	4234	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2 Sensor Circuit - Voltage below normal, or shorted to low source
3515	2	4242	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2 Data erratic, intermittent or incorrect
3515	10	4243	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2 Abnormal Rate of Change
3515	5	4743	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2 Sensor Circuit - Current below normal or open circuit

ENGINE DIAGNOSTIC CODES - CONTINUED				
J1939 SPN	**J1939 FMI**	**Cummins Code**	**J1939 SPN Description**	**Cummins Description**
3515	6	4744	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2 Sensor Circuit - Current above normal or grounded
3515	11	4745	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2	Aftertreatment 1 Diesel Exhaust Fluid Temperature 2 Root Cause Not Known
3521	31	4235	Aftertreatment 1 Diesel Exhaust Fluid Property	Aftertreatment 1 Diesel Exhaust Fluid Property -Condition Exists
3521	11	4768	Aftertreatment 1 Diesel Exhaust Fluid Property	Aftertreatment 1 Diesel Exhaust Fluid Property - Root Cause Not Known
3555	17	1943	Ambient Air Density	Ambient Air Density - Data Valid But Below Normal Operating Range - Least Severe Level
3556	2	1932	Aftertreatment Hydrocarbon Doser	Aftertreatment Doser - Data erratic, intermittent or incorrect
3556	7	1964	Aftertreatment Hydrocarbon Doser	Aftertreatment Doser Mechanical system not responding or out of adjustment
3556	5	1977	Aftertreatment Hydrocarbon Doser	Aftertreatment Doser Circuit Current below normal or open circuit.
3556	18	3167	Aftertreatment Hydrocarbon Doser	Aftertreatment Doser - Data Valid But Below Normal Operating Range - Moderately Severe Level
3597	12	351	ECU Power Output Supply Voltage #1	Injector Power Supply - Bad intelligent device or component
3597	2	1117	ECU Power Output Supply Voltage #1	Power Supply Lost With Ignition On - Data erratic, intermittent or incorrect
3597	18	1938	ECU Power Output Supply Voltage #1	ECU Power Output Supply Voltage 1 - Data Valid But Below Normal Operating Range - Moderately Severe Level
3597	3	1939	ECU Power Output Supply Voltage #1	ECU Power Output Supply Voltage 1 - Voltage above normal, or shorted to high source
3597	4	1941	ECU Power Output Supply Voltage #1	ECU Power Output Supply Voltage 1 - Voltage below normal, or shorted to low source
3610	3	3133	Aftertreatment Diesel Particulate Filter Outlet Pressure	Aftertreatment 1 Diesel Particulate Filter Outlet Pressure Sensor Circuit Voltage above normal, or shorted to high source
3610	4	3134	Aftertreatment Diesel Particulate Filter Outlet Pressure	Aftertreatment 1 Diesel Particulate Filter Outlet Pressure Sensor Circuit Voltage below normal, or shorted to low source
3610	2	3135	Aftertreatment Diesel Particulate Filter Outlet Pressure	Aftertreatment 1 Diesel Particulate Filter Outlet Pressure - Data erratic, intermittent or incorrect
3667	3	3139	Engine Air Shutoff Status	Engine Air Shutoff Circuit Voltage above normal, or shorted to high source
3667	4	3141	Engine Air Shutoff Status	Engine Air Shutoff Circuit Voltage below normal, or shorted to low source
3667	7	4484	Engine Air Shutoff	Engine Air Shutoff -Mechanical System Not Responding or Out of Adjustment
3667	2	5221	Engine Air Shutoff Status	Engine Air Shutoff Status Data erratic, intermittent or incorrect
3695	2	4213	Aftertreatment Regeneration Inhibit Switch	Aftertreatment Regeneration Inhibit Switch - Data erratic, intermittent or incorrect
3703	31	2777	Diesel Particulate	Particulate Trap Active
3713	31	3753	Diesel Particulate Filter Active Regeneration Inhibited Due to System Timeout	Diesel Particulate Filter Active Regeneration Inhibited Due to System Timeout - Condition Exists
3750	31	3396	Diesel Particulate Filter 1 Conditions Not Met for Active Regeneration	Diesel Particulate Filter 1 Conditions Not Met for Active Regeneration - Condition Exists
3826	18	4573	Aftertreatment 1 Diesel Exhaust Fluid Average Consumption	Aftertreatment 1 Diesel Exhaust Fluid Average Consumption - Data Valid But Below Normal Operating Range
3936	15	1981	Aftertreatment Diesel Particulate Filter System	Aftertreatment 1 Diesel Particulate Filter System - Data Valid But Above Normal Operating Range - Level
3936	7	3245	Aftertreatment 1 Diesel Particulate Filter System	Aftertreatment 1 Diesel Particulate Filter System Mechanical system not responding or out of adjustment
3936	14	4584	Aftertreatment Diesel Particulate Filter System	Aftertreatment Diesel Particulate Filter System -Special Instructions

ENGINE DIAGNOSTIC CODES - CONTINUED				
J1939 SPN	**J1939 FMI**	**Cummins Code**	**J1939 SPN Description**	**Cummins Description**
4094	31	3543	NOx limits exceeded due to Insufficient Diesel Exhaust Fluid Quality	NOx limits exceeded due to Insufficient Reagent Quality Condition Exists
4096	31	3547	NOx limits exceeded due to Empty Diesel Exhaust Fluid Tank	Aftertreatment Diesel Exhaust Fluid Tank Empty - Condition Exists
4097	3	2732	Aftertreatment 1 Fuel Drain Actuator	Aftertreatment Fuel Drain Valve Circuit - Voltage above normal, or shorted to high source
4097	4	2733	Aftertreatment 1 Fuel Drain Actuator	Aftertreatment Fuel Drain Valve Circuit - Voltage below normal, or shorted to low source
4097	7	2878	Aftertreatment 1 Fuel Drain Actuator	Aftertreatment Fuel Drain Valve - Mechanical system not responding or out of adjustment
4182	4	3695	Generator Output Frequency Adjust Potentiometer Circuit	Generator Output Frequency Adjust Potentiometer Circuit Voltage below normal, or shorted to low source
4183	4	3696	Droop Adjust Potentiometer Circuit	Droop Adjust Potentiometer Circuit - Voltage below normal, or shorted to low source
4184	4	3694	Gain Adjust Potentiometer Circuit	Gain Adjust Potentiometer Circuit - Voltage below normal, or shorted to low source
4185	31	1427	Overspeed Shutdown Relay Driver	Overspeed Shutdown Relay Driver Diagnostic has detected an error - Condition Exists
4186	31	1428	Low Oil Pressure Shutdown Relay Driver	Low Oil Pressure (LOP) Shutdown Relay Driver Diagnostic has detected an error - Condition Exists
4187	31	1429	High Engine Temperature Shutdown Relay Driver	High Engine Temperature (HET) Shutdown Relay Driver Diagnostic has detected an error - Condition Exists
4188	31	1431	Pre-Low Oil Pressure Indicator Relay Driver	Pre-Low Oil Pressure Warning Relay Driver Diagnostic has detected an error - Condition Exists
4223	31	1432	Pre-High Engine Temperature Warning Relay Driver	Pre-High Engine Temperature Warning Relay Driver Diagnostic has detected an error - Condition Exists
4331	18	4658	Aftertreatment 1 Diesel Exhaust Fluid Actual Dosing Quantity	Aftertreatment SCR Actual Dosing Reagent Quantity Data Valid But Below Normal Operating Range - Mo
4334	3	3571	Aftertreatment 1 Diesel Exhaust Fluid Doser Absolute Pressure	Aftertreatment 1 Diesel Exhaust Fluid Pressure Sensor - Voltage above normal, or shorted to high source
4334	4	3572	Aftertreatment 1 Diesel Exhaust Fluid Doser Absolute Pressure	Aftertreatment 1 Diesel Exhaust Fluid Pressure Sensor - Voltage below normal, or shorted to low source
4334	18	3574	Aftertreatment 1 Diesel Exhaust Fluid Doser Absolute Pressure	Aftertreatment 1 Diesel Exhaust Fluid Pressure Sensor - Data Valid But Below Normal Operating Range
4334	16	3575	Aftertreatment 1 Diesel Exhaust Fluid Doser Absolute Pressure	Aftertreatment 1 Diesel Exhaust Fluid Pressure Sensor - Data Valid But Above Normal Operating Range
4334	2	3596	Aftertreatment 1 Diesel Exhaust Fluid Doser Absolute Pressure	Aftertreatment 1 Diesel Exhaust Fluid Pressure Sensor - Data erratic, intermittent or incorrect
4337	3	4174	Aftertreatment 1 Diesel Exhaust Fluid Dosing Temperature Sensor	Aftertreatment 1 Diesel Exhaust Fluid Dosing Temperature Sensor - Voltage Above Normal, or Shorted to High Source
4337	4	4175	Aftertreatment 1 Diesel Exhaust Fluid Dosing Temperature Sensor	Aftertreatment 1 Diesel Exhaust Fluid Dosing Temperature Sensor - Voltage below normal, or shorted to low source
4337	2	4244	Aftertreatment 1 Diesel Exhaust Fluid Dosing Temperature	Aftertreatment 1 Diesel Exhaust Fluid Dosing Temperature - Data erratic, intermittent or incorrect
4337	10	4249	Aftertreatment 1 Diesel Exhaust Fluid Dosing Temperature	Aftertreatment 1 Diesel Exhaust Fluid Dosing Temperature - Abnormal Rate of Change
4339	31	4586	Aftertreatment 1 SCR Feedback Control Status	Aftertreatment 1 SCR Feedback Control Status Condition Exists
4340	3	3237	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 Circuit - Voltage above normal, or shorted to high source
4340	4	3238	Aftertreatment 1Diesel Exhaust Fluid Line Heater 1 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 Circuit - Voltage below normal, or shorted to low source
4340	5	3258	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 1 Circuit - Current below normal or open circuit
4342	3	3239	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 Circuit - Voltage above normal, or shorted to high source

ENGINE DIAGNOSTIC CODES - CONTINUED				
J1939 SPN	**J1939 FMI**	**Cummins Code**	**J1939 SPN Description**	**Cummins Description**
4342	4	3241	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 Circuit - Voltage below normal, or shorted to low source
4342	5	3261	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 State	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 2 Circuit - Current below normal or open circuit
4344	3	3422	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 3 State	Aftertreatment Diesel Exhaust Fluid Line Heater 3 Circuit Voltage above normal, or shorted to high source
4344	4	3423	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 3 State	Aftertreatment Diesel Exhaust Fluid Line Heater 3 Circuit Voltage below normal, or shorted to low source
4344	5	3425	Aftertreatment 1 Diesel Exhaust Fluid Line Heater 3 State	Aftertreatment Diesel Exhaust Fluid Line Heater 3 Circuit Current below normal or open circuit
4360	3	3142	Aftertreatment 1 SCR Catalyst Intake Gas Temperature	Aftertreatment 1 SCR Intake Temperature Sensor Circuit Voltage above normal, or shorted to high source
4360	4	3143	Aftertreatment 1 SCR Catalyst Intake Gas Temperature	Aftertreatment 1 SCR Intake Temperature Sensor Circuit Voltage below normal, or shorted to low source
4360	2	3144	Aftertreatment 1 SCR Catalyst Intake Gas Temperature	Aftertreatment 1 SCR Intake Temperature Sensor - Data erratic, intermittent or incorrect
4360	15	3164	Aftertreatment 1 SCR Catalyst Intake Gas Temperature	Aftertreatment 1 SCR Intake Temperature - Data Valid But Above Normal Operating Range - Least Severe
4360	0	3229	Aftertreatment 1 SCR Catalyst Intake Gas Temperature	Aftertreatment 1 SCR Intake Temperature - Data valid but above normal operational range - Most Severe Level
4360	16	3231	Aftertreatment 1 SCR Catalyst Intake Gas Temperature	Aftertreatment 1 SCR Intake Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level
4360	16	5247	Aftertreatment 1 SCR Intake Temperature	Aftertreatment 1 SCR Intake Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level
4363	3	3146	Aftertreatment 1 SCR Catalyst Outlet Gas Temperature	Aftertreatment 1 SCR Outlet Temperature Sensor Circuit Voltage above normal, or shorted to high source
4363	4	3147	Aftertreatment 1 SCR Catalyst Outlet Gas Temperature	Aftertreatment 1 SCR Outlet Temperature Sensor Circuit Voltage below normal, or shorted to low source
4363	2	3148	Aftertreatment 1 SCR Catalyst Outlet Gas Temperature	Aftertreatment 1 SCR Outlet Temperature Sensor - Data erratic, intermittent or incorrect
4363	0	3165	Aftertreatment 1 SCR Catalyst Outlet Gas Temperature	Aftertreatment 1 SCR Outlet Temperature - Data valid but above normal operational range - Most Severe
4363	16	3235	Aftertreatment 1 SCR Catalyst Outlet Gas Temperature	Aftertreatment 1 SCR Outlet Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level
4364	18	3582	Aftertreatment 1 SCR Conversion Efficiency	Aftertreatment SCR Catalyst Conversion Efficiency - Data Valid But Below Normal Operating Range - Moderately Severe Level
4376	3	3577	Aftertreatment 1 Diesel Exhaust Fluid Return Valve	Aftertreatment Diesel Exhaust Fluid Return Valve - Voltage above normal, or shorted to high source
4376	4	3578	Aftertreatment 1 Diesel Exhaust Fluid Return Valve	Aftertreatment Diesel Exhaust Fluid Return Valve - Voltage below normal, or shorted to low source
4376	7	4157	Aftertreatment 1 Diesel Exhaust Fluid Return Valve	Aftertreatment Diesel Exhaust Fluid Return Valve Mechanical system not responding or out of adjust
4490	9	3367	Specific Humidity	Specific Humidity Sensor Abnormal update rate
4490	19	3368	Specific Humidity	Specific Humidity Sensor Received Network Data In Error
4765	16	3251	Aftertreatment Diesel Oxidation Catalyst Intake Temperature	Aftertreatment 1 Diesel Oxidation Catalyst Intake Temperature - Data Valid But Above Normal Operating Range
4765	4	3313	Aftertreatment Diesel Oxidation Catalyst Intake Temperature	Aftertreatment 1 Diesel Oxidation Catalyst Intake Temperature Sensor Circuit Voltage below normal, or shorted to low source
4765	3	3314	Aftertreatment Diesel Oxidation Catalyst Intake Temperature	Aftertreatment 1 Diesel Oxidation Catalyst Intake Temperature Sensor Circuit Voltage above normal, or shorted to high source
4765	2	3315	Aftertreatment Diesel Oxidation Catalyst Intake Temperature	Aftertreatment 1 Diesel Oxidation Catalyst Intake Temperature - Data erratic, intermittent or incorrect
4765	13	3325	Aftertreatment Diesel Oxidation Catalyst Intake Temperature	Aftertreatment 1 Diesel Oxidation Catalyst Intake Temperature Swapped - Out of Calibration
4766	3	4533	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature Sensor Circuit	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature Sensor Circuit Voltage above normal, or shorted to high source

ENGINE DIAGNOSTIC CODES - CONTINUED				
J1939 SPN	**J1939 FMI**	**Cummins Code**	**J1939 SPN Description**	**Cummins Description**
4766	4	4534	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature Sensor Circuit	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature Sensor Circuit Voltage below normal, or shorted to low source
4766	2	5386	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature - Data Erratic, Intermittent, or Incorrect
4766	0	5387	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature - Data Valid But Above Normal Operating Range - Most Severe Level
4766	16	5388	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature - Data Valid But Above Normal Operating Range - Moderately Severe Level
4766	15	5389	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature	Aftertreatment 1 Diesel Oxidation Catalyst Outlet Gas Temperature - Data Valid But Above Normal Operating Range - Least Severe Level
4792	7	3751	Aftertreatment SCR Catalyst System	Aftertreatment SCR Catalyst System - Mechanical system not responding or out of adjustment
4792	14	4585	Aftertreatment 1 SCR Catalyst System	Aftertreatment 1 SCR Catalyst System - Special Instructions
4793	31	3158	Aftertreatment Warm Up Diesel Oxidation Catalyst	Aftertreatment Warm Up Diesel Oxidation Catalyst Missing - Condition Exists
4794	31	3151	Aftertreatment 1 SCR Catalyst System	Aftertreatment 1 SCR Catalyst System Missing - Condition Exists
4795	31	1993	Aftertreatment 1 Diesel Particulate Filter Missing	Aftertreatment 1 Diesel Particulate Filter Missing Condition Exists
4796	31	1664	Aftertreatment 1 Diesel Oxidation Catalyst Missing	Aftertreatment 1 Diesel Oxidation Catalyst Missing -Condition Exists
4809	3	3152	Aftertreatment Warm Up Diesel Oxidation Catalyst Intake Temperature	Aftertreatment Warm Up Diesel Oxidation Catalyst Intake Temperature Sensor Circuit - Voltage above normal
4809	4	3153	Aftertreatment Warm Up Diesel Oxidation Catalyst Intake Temperature	Aftertreatment Warm Up Diesel Oxidation Catalyst Intake Temperature Sensor Circuit - Voltage below normal
4809	2	3154	Aftertreatment Warm Up Diesel Oxidation Catalyst Intake Temperature	Aftertreatment Warm Up Diesel Oxidation Catalyst Intake Temperature - Data erratic, intermittent or incorrect
4809	13	3166	Aftertreatment Warm Up Diesel Oxidation Catalyst Intake Temperature	Aftertreatment Warm Up Diesel Oxidation Catalyst Intake Temperature Sensor Swapped - Out of Calibration
4809	16	3247	Aftertreatment Warm Up Diesel Oxidation Catalyst Intake Temperature	Aftertreatment Warm Up Diesel Oxidation Catalyst Intake Temperature - Data Valid But Above Normal Operating Range
4810	3	3155	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature Sensor Circuit - Voltage above normal
4810	4	3156	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature Sensor Circuit - Voltage below normal
4810	2	3157	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature - Data erratic, intermittent or incorrect
4810	0	3162	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature - Data valid but above normal operating Range – Most Severe level
4810	16	3169	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature - Data Valid But Above Normal Operating Range
4810	15	3249	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature	Aftertreatment Warm Up Diesel Oxidation Catalyst Outlet Temperature - Data Valid But Above Normal Operating Range
5018	11	2637	Aftertreatment Diesel Oxidation Catalyst	Aftertreatment 1 Diesel Oxidation Catalyst Face Plugged - Root Cause Not Known
5018	14	5617		Aftertreatment 1 Diesel Oxidation Catalyst System Special Instructions
5019	3	3136	Engine Exhaust Gas Recirculation 1 Outlet Pressure	Engine Exhaust Gas Recirculation Outlet Pressure Sensor Circuit - Voltage above normal, or shorted to high source
5019	4	3137	Engine Exhaust Gas Recirculation 1 Outlet Pressure	Engine Exhaust Gas Recirculation Outlet Pressure Sensor Circuit - Voltage below normal, or shorted to low source
5019	2	3138	Engine Exhaust Gas Recirculation 1 Outlet Pressure	Engine Exhaust Gas Recirculation Outlet Pressure Data erratic, intermittent or incorrect

ENGINE DIAGNOSTIC CODES - CONTINUED				
J1939 SPN	**J1939 FMI**	**Cummins Code**	**J1939 SPN Description**	**Cummins Description**
5024	10	3649	Aftertreatment 1 Intake Gas NOx Sensor Heater Ratio	Aftertreatment 1 Intake NOx Sensor Heater - Abnormal rate of change
5031	10	3583	Aftertreatment 1 Outlet Gas NOx Sensor Heater Ratio	Aftertreatment 1 Outlet NOx Sensor Heater - Abnormal rate of change
5097	3	4293	Engine Brake Active Lamp Data	Engine Brake Active Lamp -Voltage Above Normal, or Shorted to High Source
5097	4	4294	Engine Brake Active Lamp Data	Engine Brake Active Lamp Voltage below normal, or shorted to low source
5125	3	3419	Sensor supply voltage 7	Sensor Supply 7 Circuit Voltage above normal, or shorted to high source
5125	4	3421	Sensor supply voltage 7	Sensor Supply 7 Circuit Voltage below normal, or shorted to low source
5245	31	4863	Aftertreatment Selective Catalytic Reduction Operator Inducement Active	Aftertreatment SCR Operator Inducement Active - Condition Exists
5246	0	3712	Aftertreatment SCR Operator Inducement Severity	Aftertreatment SCR Operator Inducement - Data valid but above normal operational range - Most Severe level
5298	18	1691	Aftertreatment 1 Diesel Oxidation Catalyst Conversion Efficiency	Aftertreatment 1 Diesel Oxidation Catalyst Conversion Efficiency - Data Valid But Below Normal Operating Range - Moderately Severe Level
5319	31	3376	Aftertreatment 1 Diesel Particulate Filter Incomplete Regeneration	Aftertreatment Diesel Particulate Filter Incomplete Regeneration - Condition Exists
5357	31	4713	Engine Fuel Injection Quantity Error for Multiple Cylinders	Engine Fuel Injection Quantity Error for Multiple Cylinders Condition Exists
5380	11	4936	Engine Fuel Valve 1	Engine Fuel Valve 1 - Root Cause Not Known
5380	13	4937	Engine Fuel Valve 1	Engine Fuel Valve 1 - Out of Calibration
5394	5	3567	Aftertreatment Diesel Exhaust Fluid Dosing Valve	Aftertreatment Diesel Exhaust Fluid Dosing Valve - Current below normal or open circuit
5394	7	3568	Aftertreatment Diesel Exhaust Fluid Dosing Valve	Aftertreatment Diesel Exhaust Fluid Dosing Valve Mechanical system not responding or out of adjustment
5394	2	3755	Aftertreatment Diesel Exhaust Fluid Dosing Valve	Aftertreatment Diesel Exhaust Fluid Dosing Valve - Data erratic, intermittent or incorrect
5395	16	3337	Engine Idle Fuel Quantity	Engine Idle Fuel Quantity Data Valid But Above Normal Operating Range - Moderately Severe Level
5395	18	3338	Engine Idle Fuel Quantity	Engine Idle Fuel Quantity Data Valid But Below Normal Operating Range - Moderately Severe Level
5396	31	3377	Engine Crankcase Ventilation Hose Disconnected	Engine Crankcase Ventilation Hose Disconnected - Condition Exists
5397	31	3375	Aftertreatment 1 Diesel Particulate Filter Regeneration too Frequent	Aftertreatment Diesel Particulate Filter Regeneration too Frequent - Condition Exists
5484	3	3633	Engine Fan Clutch 2 Output Device Driver	Engine Fan Clutch 2 Control Circuit - Voltage above normal, or shorted to high source
5484	4	3634	Engine Fan Clutch 2 Output Device Driver	Engine Fan Clutch 2 Control Circuit - Voltage below normal, or shorted to low source
5491	3	3562	Aftertreatment 1 Diesel Exhaust Fluid Line Heater Relay	Aftertreatment Diesel Exhaust Fluid Line Heater Relay Voltage above normal, or shorted to high source
5491	4	3563	Aftertreatment 1 Diesel Exhaust Fluid Line Heater Relay	Aftertreatment Diesel Exhaust Fluid Line Heater Relay Voltage below normal, or shorted to low source
5491	7	3713	Aftertreatment 1 Diesel Exhaust Fluid Line Heater Relay	Aftertreatment 1 Diesel Exhaust Fluid Line Heater Relay - Mechanical system not responding or out of adjustment
5571	7	3727	High Pressure Common Rail Fuel Pressure Relief Valve	High Pressure Common Rail Fuel Pressure Relief Valve Mechanical system not responding or out of adjustment
5571	0	3741	High Pressure Common Rail Fuel Pressure Relief Valve	High Pressure Common Rail Fuel Pressure Relief Valve Data valid but above normal operational range
5571	3	4262	High Pressure Common Rail Fuel Pressure Relief Valve	High Pressure Common Rail Fuel Pressure Relief Valve Voltage Above Normal, or Shorted to High Source

ENGINE DIAGNOSTIC CODES - CONTINUED				
J1939 SPN	**J1939 FMI**	**Cummins Code**	**J1939 SPN Description**	**Cummins Description**
5571	4	4263	High Pressure Common Rail Fuel Pressure Relief Valve	High Pressure Common Rail Fuel Pressure Relief Valve Voltage below normal, or shorted to low source
5571	11	4265	High Pressure Common Rail Fuel Pressure Relief Valve	High Pressure Common Rail Fuel Pressure Relief Valve Root Cause Not Known
5571	31	4867	High Pressure Common Rail Fuel Pressure Relief Valve	High Pressure Common Rail Fuel Pressure Relief Valve - Condition Exists
5571	15	5585	High Pressure Common Rail Fuel Pressure Relief Valve	High Pressure Common Rail Fuel Pressure Relief Valve Data Valid But Above Normal Operating Range - Least Severe Level
5585	18	4691	Engine Injector Metering Rail 1 Cranking Pressure	Engine Injector Metering Rail 1 Cranking Pressure - Data Valid But Below Normal Operating Range - Mo
5603	9	3843	Cruise Control Disable Command	Cruise Control Disable Command - Abnormal update rate
5603	31	3845	Cruise Control Disable Command	Cruise Control Disable Command - Condition Exists
5605	31	3844	Cruise Control Pause Command	Cruise Control Pause Command - Condition Exists
5625	2	5274	Engine Exhaust Back Pressure Regulator Position	Engine Exhaust Back Pressure Regulator Position - Data Erratic, Intermittent or Incorrect
5625	3	5275	Engine Exhaust Back Pressure Regulator Position Sensor Circuit	Engine Exhaust Back Pressure Regulator Position Sensor Circuit - Voltage Above Normal, or Shorted to High Source
5625	4	5276	Engine Exhaust Back Pressure Regulator Position Sensor Circuit	Engine Exhaust Back Pressure Regulator Position Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
5626	13	5277	Engine Exhaust Back Pressure Regulator	Engine Exhaust Back Pressure Regulator - Out of Calibration
5741	3	4143	Aftertreatment 1 Outlet Soot Sensor	Aftertreatment 1 Outlet Soot Sensor - Voltage Above Normal, or Shorted to High Source
5741	4	4144	Aftertreatment 1 Outlet Soot Sensor	Aftertreatment 1 Outlet Soot Sensor - Voltage below normal, or shorted to low source
5741	2	4451	Aftertreatment 1 Outlet Soot	Aftertreatment 1 Outlet Soot Data erratic, intermittent or incorrect
5742	9	4151	Aftertreatment Diesel Particulate Filter Temperature Sensor Module	Aftertreatment Diesel Particulate Filter Temperature Sensor Module - Abnormal update rate
5742	12	4158	Aftertreatment Diesel Particulate Filter Temperature Sensor Module	Aftertreatment Diesel Particulate Filter Temperature Sensor Module - Bad intelligent device or component
5742	3	4161	Aftertreatment Diesel Particulate Filter Temperature Sensor Module	Aftertreatment Diesel Particulate Filter Temperature Sensor Module - Voltage Above Normal, or Shorted to high source
5742	4	4162	Aftertreatment Diesel Particulate Filter Temperature Sensor Module	Aftertreatment Diesel Particulate Filter Temperature Sensor Module - Voltage below normal, or shorted to low source
5742	16	4163	Aftertreatment Diesel Particulate Filter Temperature Sensor Module	Aftertreatment Diesel Particulate Filter Temperature Sensor Module- Data Valid But Above Normal Operating Range
5742	11	4259	Aftertreatment Diesel Particulate Filter Temperature Sensor Module	Aftertreatment Diesel Particulate Filter Temperature Sensor Module - Root Cause Not Known
5743	9	4152	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module Abnormal update rate
5743	12	4159	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module Bad intelligent device or component
5743	3	4164	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module Voltage Above Normal, or Shorted to high source
5743	4	4165	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module Voltage below normal, or Shorted to low source
5743	16	4166	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module -Data Valid But Above Normal
5743	11	4261	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module	Aftertreatment Selective Catalytic Reduction Temperature Sensor Module Root Cause Not Known
5745	3	4168	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater - Voltage Above Normal, or Shorted to High

ENGINE DIAGNOSTIC CODES - CONTINUED				
J1939 SPN	**J1939 FMI**	**Cummins Code**	**J1939 SPN Description**	**Cummins Description**
5745	4	4169	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater - Voltage below normal, or shorted to low source
5745	18	4171	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater - Data Valid But Below Normal Operating Range
5746	3	4155	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater Relay	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater Relay - Voltage Above Normal, or Shorted to high source
5746	4	4156	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater Relay	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater Relay - Voltage below normal, or shorted to low source
5747	3	4153	Aftertreatment 1 Outlet Soot Sensor Heater	Aftertreatment 1 Outlet Soot Sensor Heater - Voltage Above Normal, or Shorted to High Source
5747	4	4154	Aftertreatment 1 Outlet Soot Sensor Heater	Aftertreatment 1 Outlet Soot Sensor Heater - Voltage below normal, or shorted to low source
5747	10	4449	Aftertreatment 1 Outlet Soot Sensor Heater	Aftertreatment 1 Outlet Soot Sensor Heater - Abnormal rate of change
5793	9	4284	Desired Engine Fueling State	Desired Engine Fueling State Abnormal Update Rate
5797	12	4253	Aftertreatment Warm Up Diesel Oxidation Catalyst Temperature Sensor Module	Aftertreatment Warm Up Diesel Oxidation Catalyst Temperature Sensor Module Bad intelligent device
5797	3	4254	Aftertreatment Warm Up Diesel Oxidation Catalyst Temperature Sensor Module	Aftertreatment Warm Up Diesel Oxidation Catalyst Temperature Sensor Module Voltage Above Normal, or shorted to high source
5797	4	4255	Aftertreatment Warm Up Diesel Oxidation Catalyst Temperature Sensor Module	Aftertreatment Warm Up Diesel Oxidation Catalyst Temperature Sensor Module Voltage below normal, or shorted to low source
5797	16	4256	Aftertreatment Warm Up Diesel Oxidation Catalyst Temperature Sensor Module	Aftertreatment Warm Up Diesel Oxidation Catalyst Temperature Sensor Module -Data Valid But Above Normal Operating Range – Moderately Severe Level
5797	11	4258	Aftertreatment Warm Up Diesel Oxidation Catalyst Temperature Sensor Module	Aftertreatment Warm Up Diesel Oxidation Catalyst Temperature Sensor Module -Root Cause Not Known
5798	2	4245	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater Temperature	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater Temperature - Data erratic, intermittent or incorrect
5798	10	4251	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater Temperature	Aftertreatment 1 Diesel Exhaust Fluid Dosing Unit Heater Temperature Abnormal Rate of Change
5838	31	4485	EGR Valve Malfunction	EGR Valve Malfunction Condition Exists
5839	31	4486	Diesel Exhaust Fluid Consumption Malfunction	Diesel Exhaust Fluid Consumption Malfunction Condition Exists
5840	31	4487	Diesel Exhaust Fluid Dosing Malfunction	Diesel Exhaust Fluid Dosing Malfunction - Condition Exists
5841	31	4488	Diesel Exhaust Fluid Quality Malfunction	Diesel Exhaust Fluid Quality Malfunction - Condition Exists
5842	31	4489	SCR Monitoring System Malfunction	SCR Monitoring System Malfunction - Condition Exists
6301	3	4688	Water in Fuel Indicator 2 Sensor Circuit	Water in Fuel Indicator 2 Sensor Circuit - Voltage above normal, or shorted to high source
6301	4	4689	Water in Fuel Indicator 2 Sensor Circuit	Water in Fuel Indicator 2 Sensor Circuit - Voltage below normal, or shorted to low source
6653	16	4841	Cold Start Injector Metering Rail 1 Pressure	Cold Start Injector Metering Rail 1 Pressure - Data Valid But Above Normal Operating Range - Moderate Severe Level
6655	3	4951	ECU Power Lamp	Maintain ECU Power Lamp Voltage Above Normal, or Shorted to High Source
6655	4	4952	ECU Power Lamp	Maintain ECU Power Lamp Voltage Below Normal, or Shorted to Low Source
6713	13	4956	Variable Geometry Turbocharger Actuator	Variable Geometry Turbocharger Actuator Software - Out of Calibration
6713	31	4957	Variable Geometry Turbocharger Actuator	Variable Geometry Turbocharger Actuator Software - Condition Exists
6713	9	5177	VGT Actuator Driver Circuit	VGT Actuator Driver Circuit Abnormal update rate

ENGINE DIAGNOSTIC CODES - CONTINUED				
J1939 SPN	**J1939 FMI**	**Cummins Code**	**J1939 SPN Description**	**Cummins Description**
6802	31	5278		Aftertreatment 1 Diesel Exhaust Fluid Dosing System Frozen - Condition Exists
6881	9	5653	SCR Operator Inducement Override Switch	SCR Operator Inducement Override Switch - Abnormal Update Rate
6881	13	5654	SCR Operator Inducement Override Switch	SCR Operator Inducement Override Switch - Out of Calibration
6882	9	5391	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module Abnormal Update Rate
6882	12	5392	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module Bad Intelligent Device or Component
6882	3	5393	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module Voltage Above Normal or Shorted to High Source
6882	4	5394	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module Voltage Below Normal or Shorted to Low Source
6882	11	5395	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module Root Cause Not Known
6882	16	5396	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module	Aftertreatment Diesel Oxidation Catalyst Temperature Sensor Module -Data Valid But Above Normal Operating Range - Moderately Severe Level
6918	31	5632	SCR System Cleaning Inhibited Due to Inhibit Switch	SCR System Cleaning Inhibited Due to Inhibit Switch Condition Exists
6928	31	5631	SCR System Cleaning Inhibited Due to System Timeout	SCR System Cleaning Inhibited Due to System Timeout - Condition Exists
520199	3	193	Cruise Control	Cruise Control (Resistive) Signal Circuit - Voltage above normal, or shorted to high source
520199	4	194	Cruise Control	Cruise Control (Resistive) Signal Circuit - Voltage below normal, or shorted to low source
520320	7	2699	Crankcase Depression Valve	Crankcase Depression Valve Mechanical system not responding or out of adjustment
520332	3	2755	Cruise Control	Cruise Control (Resistive) #2 Signal Circuit - Voltage above normal, or shorted to high source
520332	4	2756	Cruise Control	Cruise Control (Resistive) #2 Signal Circuit - Voltage below normal, or shorted to low source
520435	12	3222	Glow Plug Module	Glow Plug Module - Bad intelligent device or component
520595	3	4286	Closed Crankcase Ventilation System Pressure Sensor	Closed Crankcase Ventilation System Pressure Sensor Voltage Above Normal, or Shorted to High Source
520595	4	4287	Closed Crankcase Ventilation System Pressure Sensor	Closed Crankcase Ventilation System Pressure Sensor Voltage below normal, or shorted to low source
520595	2	4288	Closed Crankcase Ventilation System Pressure	Closed Crankcase Ventilation System Pressure - Data erratic, intermittent or incorrect
520668	31	4452	Aftertreatment 1 Outlet NOx Sensor Closed Loop Operation	Aftertreatment 1 Outlet NOx Sensor Closed Loop Operation - Condition Exists
520716	3	4752	Aftertreatment 1 Diesel Exhaust Fluid Dosing Valve 1 Heater	Aftertreatment 1 Diesel Exhaust Fluid Dosing Valve 1 Heater - Voltage Above Normal, or Shorted to High Source
520716	4	4753	Aftertreatment 1 Diesel Exhaust Fluid Dosing Valve 1 Heater	Aftertreatment 1 Diesel Exhaust Fluid Dosing Valve 1 Heater - Voltage Below Normal, or Shorted to Low Source
520784	3	5183	Fan Blade Pitch Position Sensor Circuit	Fan Blade Pitch Position Sensor Circuit - Voltage Above Normal, or Shorted to High Source
520784	4	5184	Fan Blade Pitch Position Sensor Circuit	Fan Blade Pitch Position Sensor Circuit - Voltage Below Normal, or Shorted to Low Source
520784	5	5185	Fan Blade Pitch	Fan Blade Pitch - Mechanical system not responding or out of adjustment
520791	2	5215	Engine Boost Curve Selection	Engine Boost Curve Selection - Data erratic, intermittent or incorrect
520808	31	5291	Engine Emergency Shutdown Switch Activated	Engine Emergency Shutdown Switch Activated - Condition Exists

ENGINE DIAGNOSTIC CODES - CONTINUED				
J1939 SPN	**J1939 FMI**	**Cummins Code**	**J1939 SPN Description**	**Cummins Description**
520809	31	5292	Excessive Time Since Last Engine Air Shutoff Maintenance Test	Excessive Time Since Last Engine Air Shutoff Maintenance Test - Condition Exists
524286	31	5617	Aftertreatment 1 Diesel Oxidation Catalyst System	Aftertreatment 1 Diesel Oxidation Catalyst System Special Instruction
524286	31	9491		Reserved for temporary use Condition Exists
524286	31	9999		Reserved for temporary use Condition Exists

AIR HOSE RESTRAINT INSTALLATION

Safety devices such as hose restraints (whipchecks) must be used to prevent hose whipping if a connection fails. Whipchecks are to be constructed of woven stainless steel, galvanised steel wire rope or chain with a minimum strength adequate for the supplied pressure and hose diameter. Whipchecks must be fastened to suitable mounting points or shackles.

The mounts and/or shackles are to be of the same or greater strength as the whipchecks. An engineer should be consulted about suitability of whipchecks, mounts, mounting points, shackles and fittings as well as strength rating of materials. Whipchecks must be used at the hose origination, termination and each hose to hose connection.

Hoses can fail in areas other than at connecting points and require daily inspection of the hoses for:

- *Cuts, cracks or kinks*
- *Weakened clamps due to rust and corrosion*
- *Damaged connections*
- *Deformity*
- *Incorrect or incompatible components or fittings*
- *Any visual damage*

Hoses must be selected that are rated for the application as to the maximum pressure and temperature to be encountered as well as compatible with the materials being conveyed inside the hose. Hoses must be compatible with the compressor oil.

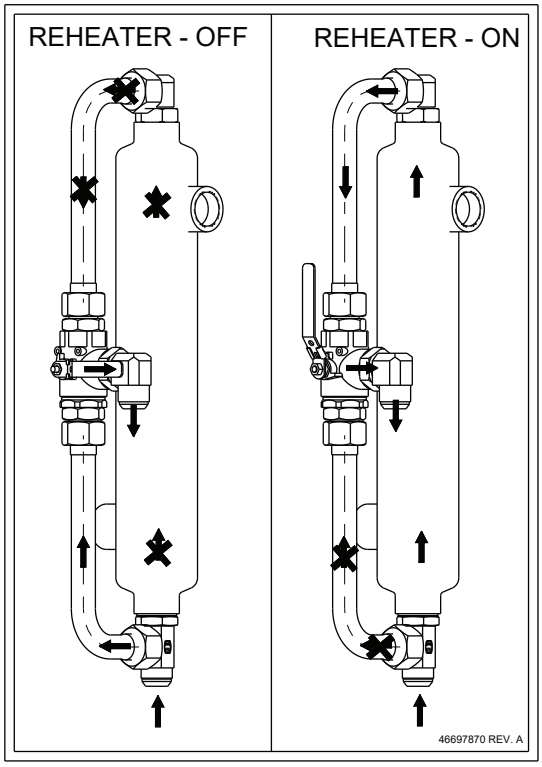
STARTING THE MACHINE

CAUTION: Do not use ether or any other starting fluid. Starting fluids can cause an explosion, fire, and severe engine damage. The engine is equipped with an electric heater starting aid.

NOTICE: This compressor is equipped with a battery disconnect switch which disconnects power for long term storage. The switch is located on the fuel tank side.

NOTICE: This switch must be in the ON position to provide power to the Control Panel for starting the compressor.

1. Press the Main Power Button. 
2. If machine is equipped with reheater option, always set the 3 way valve to the OFF position before starting. As soon as machine goes to load the valve can be set to required position (ON/OFF) for the reheater.



3. When the Wait To Start message on the MidPort changes to Total Engine Hours =, press and release Green Start Button  .
4. Engine will crank until engine starts or engine starting time limit is reached. The first Green light on the Start Button will illuminate.
5. If engine fails to start, press Main Power Button  to remove power from engine. Repeat steps 1-3.
6. When engine starts, the first two lights on the Start Button will illuminate.
7. Wait for Engine Temperature to reach 150°F (65°C). Press Service Air Button.  The third light on the Start Button will illuminate.
8. The compressor will start in the Low Pressure Mode and the Low Pressure Light will be illuminated on the Low Pressure Button.
9. To change to the High Pressure Mode, press the High Pressure Button. Three lights on the button will illuminate.

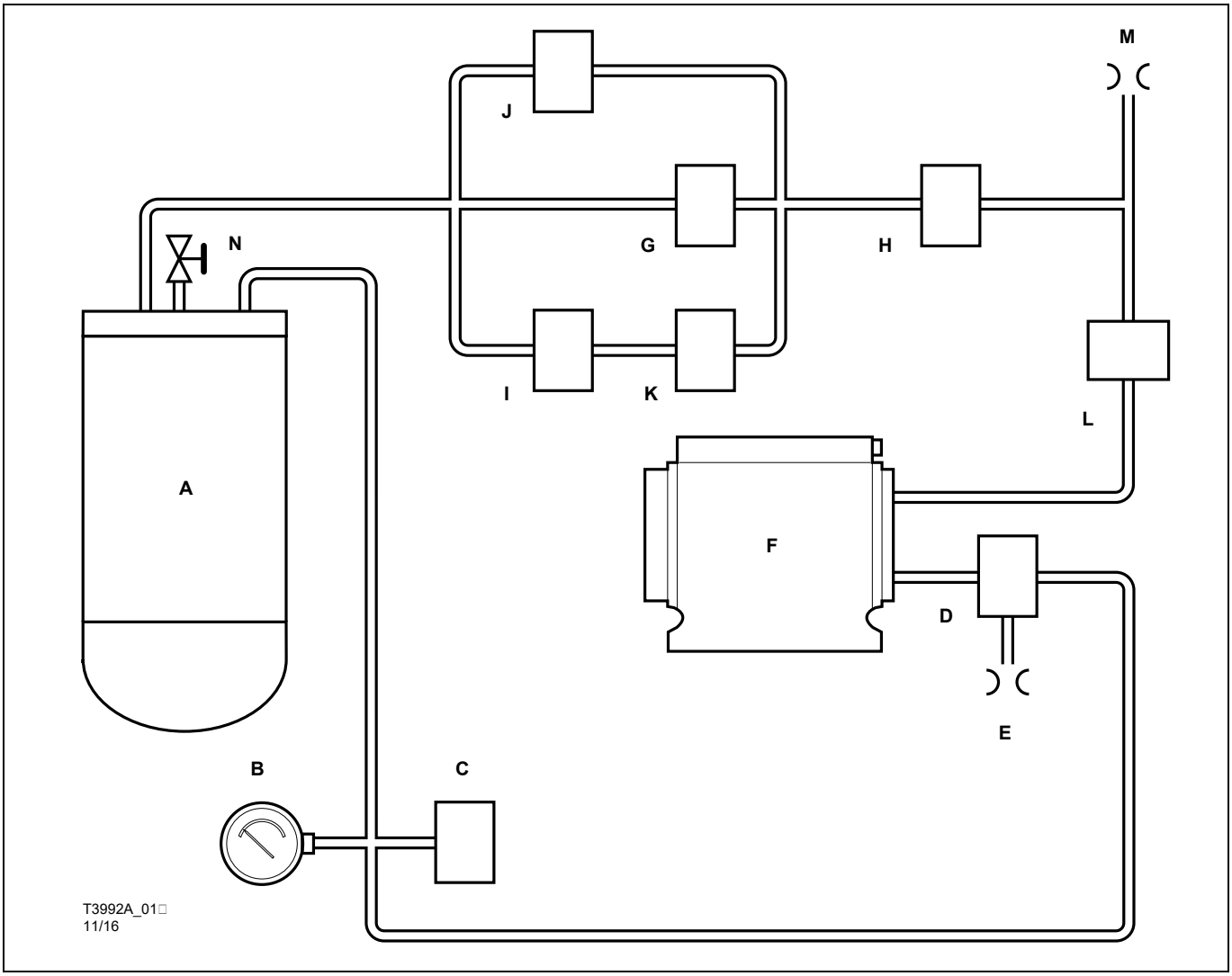
CAUTION: To ensure an adequate flow of oil to the airend, never allow the discharge pressure to fall below 3,4 bar.

NORMAL OPERATION

The operator may observe and monitor operating parameters using the MidPort and gauges. In the event the compressor controller detects a parameter outside normal operating limits, the compressor will alert and/or shutdown, and display a diagnostic code.

In the event the compressor controller detects a parameter at a dangerously high or low level, the compressor will be automatically shut down with the cause of the shutdown shown on the MidPort.

TWO PRESSURE MODES OF OPERATION (for 7/124 - 10/104 and 10/124 - 14/114 models only)



Key

A. Separator tank

B. Panel pressure gauge

C. Discharge pressure transducer

D. Automatic blowdown valve

E. Orifice

F. Unloader

G. Start / run solenoid valve

H. Regulator pressure transducer

I. Pressure regulator - Low pressure mode

J. Pressure regulator - High pressure mode (for dual mode models only)

K. Mode solenoid valve (for dual mode models only)

L. Captive pressure solenoid valve

M. Orifice

N. Manual blowdown valve

Dual mode models (7/124 - 10/104 and 10/124 - 14/114) are capable of operating at two pressure modes:

1. The Low Pressure Mode is activated by pressing the Low Pressure Button. 

In this mode, the compressor will regulate according to the air demand, between 0 and 12 m^3/min at 6,9 bar regulated set pressure for the 7/124 - 10/104 or between 0 and 12,7 m^3/min at 10,3 bar regulated set pressure for the 10/124 - 14/114. The regulated set pressure of this mode can be changed (see Pressure Regulating Adjusting Instructions) from 5,5-6,9 bar for the 7/124 - 10/104 or from 5,5-10,3 bar for the 10/124 - 14/114.

2. The High Pressure Mode is activated by pressing the High Pressure Button. 

In High Pressure Mode, the compressor will regulate according to air demand, between 0 and 10,6 m^3/min at 10,3 bar regulated set pressure for the 7/124 - 10/104 or between 0 and 11,3 m^3/min at 13,8 bar regulated set pressure for the 10/124 - 14/114. The regulated set pressure of this mode can be changed (see Pressure Regulating Adjusting Instructions) from 5,5-10,3 bar for the 7/124 - 10/104 or from 5,5-13,8 bar for the 10/124 - 14/114.

The mode of the compressor can be changed between the Low Pressure Mode and High Pressure Mode at any time when the Start-Run button is activated. Engine speed will be lower at the High Pressure Mode setting.

Operation - Loaded

Assume engine has been started and is running in the unload state at idle speed. If there is air demand (pressure falls below the load point pressure), compressor will load at idle speed by opening the inlet valve. As air demand rises and falls, engine speed is controlled between idle speed and full load speed to match the required flow while maintaining load point pressure.

Operation - Unloaded

If there is no air demand at idle speed (pressure rises above the unload point pressure), the compressor will unload by closing the inlet valve. The compressor then runs at idle speed unloaded with no air delivery. If air demand increases (pressure falls below the load point pressure), the compressor reloads to meet the required air demand.

SHUTDOWN

1. Close the Service Valve.
2. Allow the engine to idle for 3 minutes to cool down.
3. Press the Red Stop Button. 
4. Press the Main Power Button  when use of the compressor is not needed.

Note: Until Main Power Button is pressed, the gauges can be read and the MidPort can be navigated using the UP, DOWN, and ENTER Buttons.

5. If the Main Power Button is not pressed within 3 minutes (if ambient temperature is above 45°F (7°C)) or 15 minutes if ambient temperature is 45°F (7°C) or below of the keypad use the compressor will automatically shut off.

CAUTION: Failure to allow turbocharger cool down prior to stopping can cause component damage.

NOTE: This compressor is equipped with a battery disconnect switch which disconnects power for long term storage. The switch is located on the fuel tank side.

NOTE: Do not use the battery disconnect switch for normal stopping. Wait 1 minute after stopping engine before turning the battery disconnect switch to the OFF position.

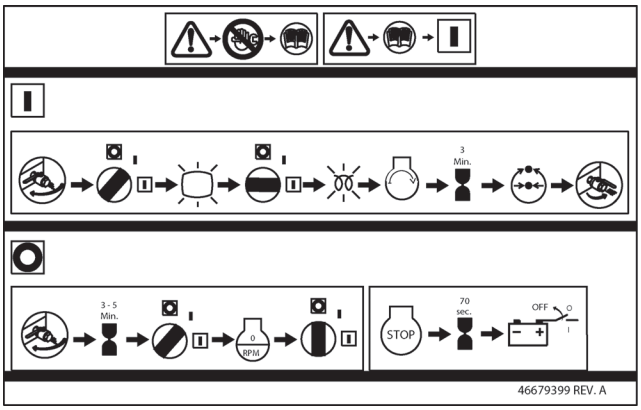
CAUTION: Use the Emergency Stop, if equipped, only for emergency conditions. Do not use for normal stopping. Emergency Stop must be reset before starting can be accomplished.

NOTE: Once the engine stops, the Automatic Blowdown Valve will relieve pressure from the separator tank. If the Automatic Blowdown Valve fails to operate, pressure must be relieved from the system by means of the Manual Blowdown Valve.

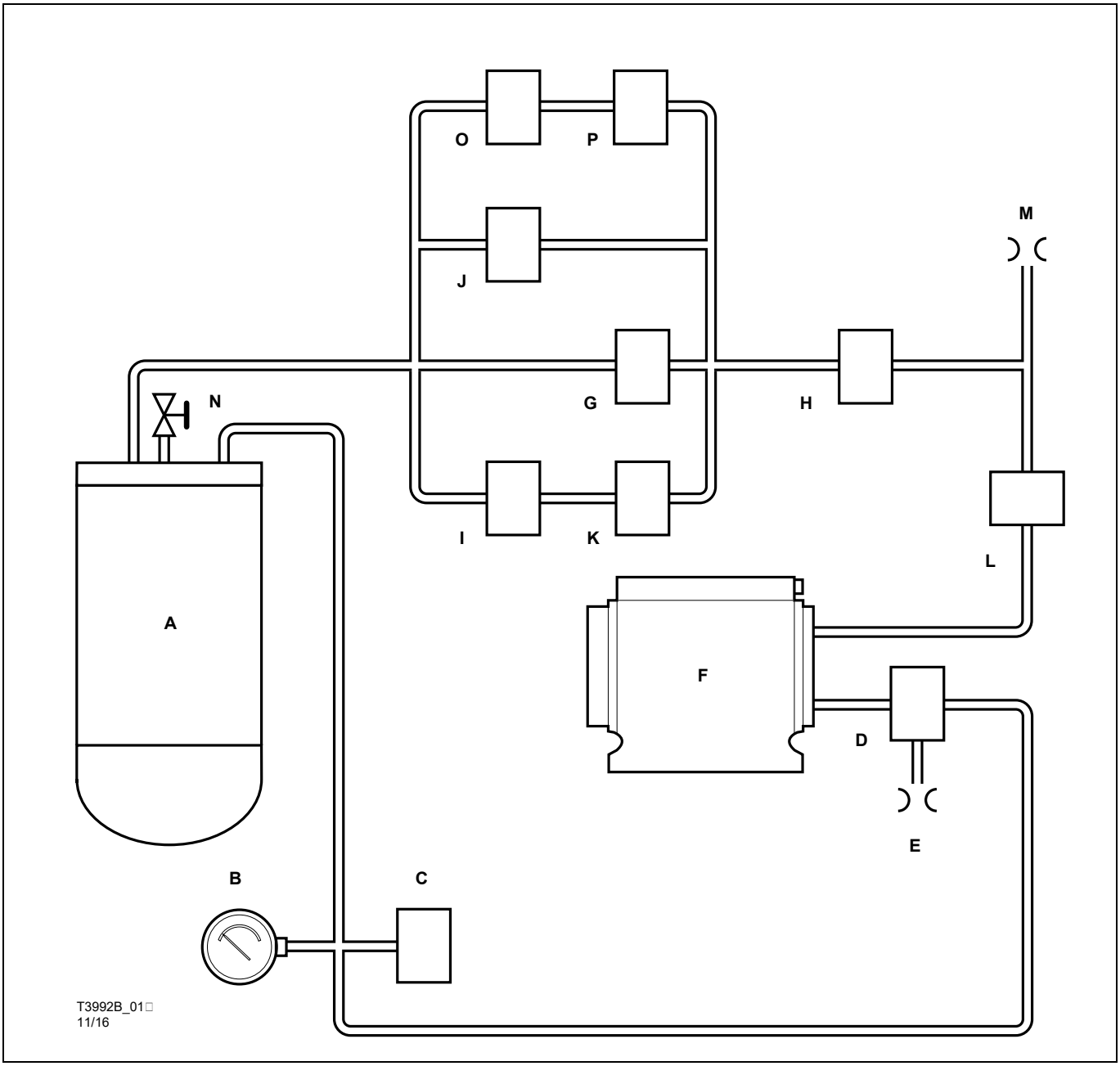
CAUTION: Never allow the compressor to sit stopped with pressure in the separator tank or piping. As a precaution, open the Service Valve.

If the battery needs to be disconnected, wait at least 70 seconds after stopping the engine.

CAUTION: Unswitched battery power must be available to the ECM for at least 70 seconds after the keyswitch is turned OFF. Failure to do this will cause damage to the DEF pump.



CUSTOM PRESSURE MODE OF OPERATION



Key

A. Separator tank
B. Panel pressure gauge
C. Discharge pressure transducer
D. Automatic blowdown valve
E. Orifice
F. Unloader
G. Start / run solenoid valve
H. Regulator pressure transducer
I. Pressure regulator - Low pressure mode
J. Pressure regulator - High pressure mode (for dual mode models only)
K. Mode solenoid valve (for dual mode models only)
L. Captive pressure solenoid valve
M. Orifice
N. Manual blowdown valve
O. Custom pressure regulator
P. Custom pressure solenoid valve

CUSTOM PRESSURE

This feature allows customer set required pressure independently on HI/LO mode. The main reason for implementation is to reduce fuel consumption as much as possible by setting the exact pressure value required.

The machine is equipped with an additional pressure regulator and solenoid valve.

Custom pressure activation controls outlet pressure and engine speed.

Settings (described for 7/124-10/110 unit):

Set Custom pressure value between HI/LO mode pressure, e.g 9 bar and activate function.

Machine operates in HI mode, pressure drops from 10 to 9 bar and engine speed remains the same.

Machine operates in LO mode, pressure drops to 7 bar (nominal pressure) and engine speed rises to 2200 rpm.

Switch to HI mode, pressure rises to 9 bar and engine speed drops to 1950 rpm.

Deactivate Custom pressure function, pressure rises to 10 bar (nominal pressure) and engine speed remains the same.

Set Custom pressure below LO mode pressure, e.g. 6 bar and activate function.

Machine operates in HI mode, pressure drops from 10 to 6 bar and engine speed remains the same.

Machine operates in LO mode, pressure remains at 6 bar and engine speed rises to 2200 rpm.

Switch to HI mode, pressure remains at 6 bar and engine speed drops to 1950 rpm.

Deactivate Custom pressure function, pressure rises to 10 bar (nominal pressure) and engine speed remains the same.

BUNDED BASE

Description

This machine is fitted with bund equipment to contain leakages and spillages, which occur within the machine enclosure.

The bund will contain all fluids normally installed in the machine, plus an additional 10%.

Drains for engine water & oil and compressor oil are located at the front corner of the machine The rear air intake is covered to prevent rainwater ingress. Ensure that the cover is not prevented from moving.

Draining of contaminated fluids

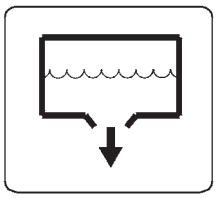
Contaminated fluid must be removed by authorized personnel only. Captured fluids can be drained from the bund by uncoupling the flexible pipe secured at the rear / side. This pipe must be re-secured after draining.

Drainage of machine fluids

During maintenance operations drain machine fluids using the drain ports indicated.

When cleaning of the fuel tank is needed, tank should be removed from compressor.

Captured fluids can be drained from the bund by uncoupling the flexible pipe secured at the rear / side. This pipe must be re-secured after draining.



WARNING: Major leakages or spillages must be drained before machine is towed.

AFTERTREATMENT DEVICES

The Aftertreatment Architecture for the QSB6.7 T4F engine used in this compressor is based on three key subsystems:

1. Diesel Oxidation Catalyst (DOC)
2. Selective Catalytic Reduction (SCR)
3. Diesel Exhaust Fluid (DEF) Dosing System

Diesel Oxidation Catalyst (DOC)

Modern catalytic converters consist of a monolith honeycomb substrate coated with platinum group metal catalyst, packaged in a stainless steel container. The honeycomb structure with many small parallel channels presents a high catalytic contact area to exhaust gasses. As the hot gases contact the catalyst, several exhaust pollutants are converted into harmless substances: carbon dioxide and water.

The diesel oxidation catalyst is designed to oxidize carbon monoxide, gas phase hydrocarbons, and the SOF fraction of diesel particulate matter to CO_2 and H_2O.

Selective Catalytic Reduction (SCR)

The purpose of the SCR system is to reduce levels of NOx (oxides of nitrogen emitted from engines) that are harmful to our health and the environment. SCR is the aftertreatment technology that treats exhaust gas downstream of the engine. Small quantities of diesel exhaust fluid (DEF) are injected into the exhaust upstream of a catalyst, where it vaporizes and decomposes to form ammonia and carbon dioxide. The ammonia (NH_3) is the desired product which in conjunction to the SCR catalyst, converts the NOx to harmless nitrogen (N_2) and water (H_2O).

Diesel Exhaust Fluid (DEF)

DEF is the reactant necessary for the functionality of the SCR system. It is a carefully blended aqueous urea solution of 32.5% high purity urea and 67.5% deionized water.

A 32.5% solution of DEF will begin to crystallize and freeze at 12 deg F (-11 deg C). At 32.5%, both the urea and water will freeze at the same rate, ensuring that as it thaws, the fluid does not become diluted, or over concentrated. The freezing and thawing of DEF will not cause degradation of the product.

During cold weather engine operation the engine coolant will be used to heat up and thaw the DEF fluid, there is a delay built in to the engine software to ensure engine operation even with frozen DEF fluid during warmup.

OPERATION OF THE AFTERTREATMENT DEVICES

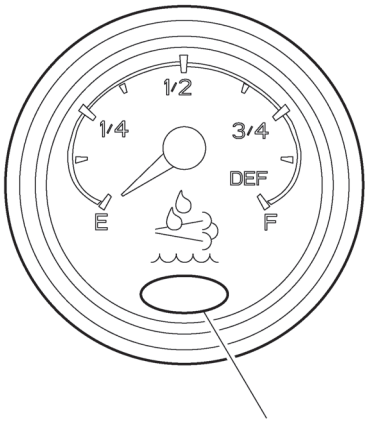
Diesel Aftertreatment Device specific lights

1. HEST Lamp

High Exhaust System Temperature

- Lights when the engine is in an active cleaning phase.
- Higher-than-normal exhaust temperatures may exist due to active aftertreatment system cleaning.
- Operator should make sure the exhaust pipe outlet is not directed at any surface or material that may become hazardous.

2. Diesel Exhaust Fluid (DEF) Lamp



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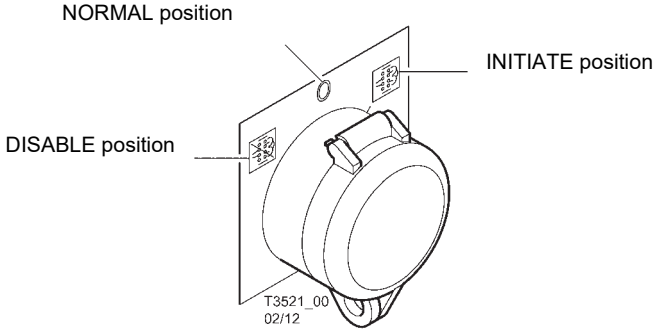
low level DEF lamp

- The Diesel Exhaust Fluid Lamp alerts the operator that the DEF is low and SHOULD be replenished.
- When DEF level drops below 10% the DEF lamp illuminates. The operator should now add DEF fluid.
- When DEF level drops below 5% the DEF lamp starts flashing. The engine power will de-rate to 25% which may cause the unit to shut off due to engine over load.
- When DEF level drops to 0% the DEF lamp continues flashing and the engine will stop repeatedly.
- When the machine is started again it is not possible to switch unit to full load and engine runs at idle speed.
- Refill at least 50% of DEF tank volume. After 3 minutes DEF tank gauge level will show actual tank volume and red DEF lamp goes OFF.

Exhaust System Cleaning Switch



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The exhaust system cleaning switch provides operator control of the exhaust cleaning system. When the switch is turned to the NORMAL position (0), the engine ECM will automatically perform the exhaust system cleaning when required. When the switch is turned to the INITIATE position (Right), a request is sent to the engine ECM for a manual cleaning of the exhaust system.

This manual cleaning will only happen when the engine ECM determines conditions for cleaning are met. When the switch is turned to the DISABLE position (Left), the engine ECM disallows any automatic or manual (non-mission) cleaning of the exhaust system.

NOTE: Switch returns from INITIATE position to NORMAL position automatically.

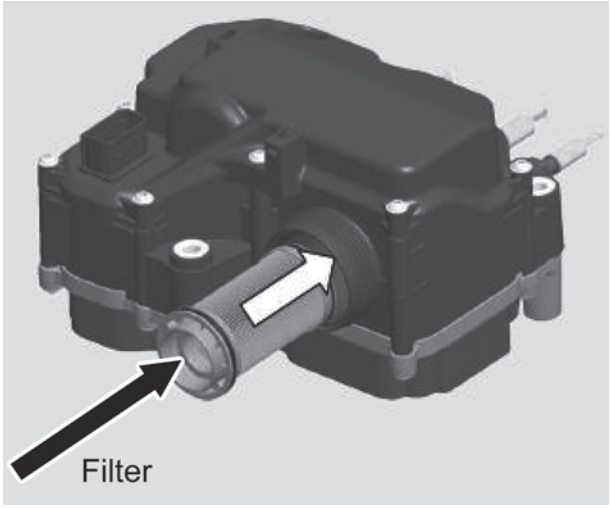
When the switch is turned to the DISABLE position (Left), the engine ECM disallows any automatic or manual (non-mission) cleaning of the exhaust system.

WARNING: Continued use of the Exhaust System Cleaning Inhibit position will at first lead to warning messages being displayed on the Midport. Failure to respond with a return to the Normal switch position will eventually create a severe engine power derate and shutdown, running in this condition until shutdown could also damage the SCR core requiring replacement instead of cleaning.

Important Notes:

The DOC is a maintenance free device and will under normal conditions remain operational for as long as the engine.

The DEF system requires maintenance of the filter situated in the Bosch dosing pump at the required intervals (see scheduled maintenance).



Using any fluid other then the proper DEF fluid will contaminate and render the dosing system inoperable causing the engine to stop.

Should any contamination occur, then the tank needs to be removed and cleaned before filling with the correct DEF fluid.

DEF fluid should only be used from clean receptacles or filtered pumping systems.

Never use additives to change the DEF fluid properties.

AFTERTREATMENT PROTECTION AFFECTING COMPRESSOR OPERATION

DEF Quality

Adequate DEF quality is essential to meet emission targets. If an issue with the DEF quality is detected the system will warn the operator of the issue by the use of warning lights. If the warnings are ignored the engine derate will apply, resulting in lower compressor flow output.

WARNING: The ultimate engine protection level will be activated after several restarts with the incorrect DEF quality in the DEF tank and requires a Cummins technician to reset protection parameters to allow engine restart.

DEF Equipment Tampering

When any hardware or performance issues cause the NOx emissions to exceed the legislated limits, the operator is warned with the respective engine fault codes. If the warnings are ignored, the inducements will start.

Tampering/Malfunction events include, but are not limited to:

- Disconnected tank level and/or quality sensor.
- Blocked DEF line or dosing unit.
- Disconnected DEF dosing unit.
- Disconnected DEF pump.
- Disconnected SCR Wiring Harness.
- Disconnected NOx Sensor.
- EGR Valve malfunction.
- Disconnected coolant level sensor.
- Any hardware or performance issues that will cause the NOx emission exceeding a legislated threshold.

WARNING: The ultimate engine protection level will be activated after several restarts with tampering uncorrected and may require a Cummins technician to reset protection parameters to allow engine restart.

Remote DEF Refilling (optional)

For units that have optional remote DEF filling, the feature is functional after connecting with an external DEF tank if the main power switch is in the “ON” position.

The DEF can be refilled either by gravity feed from an elevated external DEF tank, or by an external pump controlled by the on-board ECU. The pump must be connected via TB101 signal terminals (NO / NC / GND) and must meet the following specification:

- Power supply: Maximum 15 A or appropriate relay must be added.
- Flow rate: Maximum 34 l/min.
- Maximum static pressure at closed outlet: 2 bar.
- Pump must be equipped with a bypass valve.

If the DEF level drops below 20%, the solenoid valve behind the quick coupling opens and switches on the contacts for the external pump. The internal DEF tank is refilled from the external tank until the DEF level reaches 80%.

NOTE: For fully automatic refilling functionality, the machine has to run without any errors.

DECOMMISSIONING

When the machine is to be permanently decommissioned or dismantled, it is important to ensure that all hazard risks are either eliminated or notified to the recipient of the machine. In particular:-

- Do not destroy batteries or components containing asbestos without containing the materials safely.
- Do not dispose of any pressure vessel that is not clearly marked with its relevant data plate information or rendered unusable by drilling, cutting etc.
- Do not allow lubricants or coolants to be released into land surfaces or drains.
- Do not dispose of a complete machine without documentation relating to instructions for its use.

LONG TERM STORAGE RECOMMENDATIONS (6 months or more)

Spare Airends

- Long-term storage of airends should include filling the airend with the standard compressor fluid, PRO-TEC, XHP605 or XHP405. Upon installation of the airend, drain the storage oil from the airend and proceed with the installation, assuring fresh oil is poured into the intake prior to start up.

Portable Compressors

- Airend – Remove the intake connection and pour the airend intake full with Doosan compressor fluid PRO-TEC, XHP605 or XHP405. Reconnect the intake connection.
- Engine cooling system – Treat with rust inhibitor and drain. Check with engine dealer for further recommendations.
- Compressor Oil Filter/s- fill with Doosan compressor fluid PRO-TEC, XHP605 or XHP405.
- Seal all opening with waterproof tape
- Place a desiccant in the exhaust pipes, engine and compressor air intake pipes.
- Loosen tension on belts, fan, airend, etc.
- Block axles so tyres are off ground and do not support any weight.
- Disconnect battery cables.
- Drain fuel system.

SHORT TERM STORAGE

Machines that stand idle for extended periods of time greater than 30 days:

- Start and operate the machine every 30 days. Operate long enough to allow the engine and compressor to reach operating temperature.
- Open and close the service valve to exercise machine from full load to idle RPM.
- Drain fuel tank to remove any water.
- Drain water from fuel water separator.

COMPRESSOR MOUNTING

Portable compressors, which are modified to remove the running gear and mount the compressor directly to trailers, truck beds or frames, etc. may experience failure of the enclosure, frame, and/or other components.

It is necessary to isolate the compressor package from the carrier base with a flexible mounting system. Such a system must also prevent detachment of the package from the carrier base in the event the isolators fail.

Contact your Portable Power representative for flexible mounting kits.

Warranty does not cover failures attributable to mounting of the compressor package to the carrier base unless it is a Portable Power provided system.

NOTE: *The maintenance schedule in this manual describes the service intervals that should be followed for "normal" applications of this compressor. This page may be reproduced and used as a checklist by service personnel.*

In more severe applications such as but not limited to sandblasting, quarry drilling, well drilling, and oil and gas drilling, more frequent service intervals and/or the instalment of a heavy duty air filtration system will be required to ensure long component life.

Dust and dirt, high humidity, and high temperatures will affect lubricant life and service intervals for components such as inlet air filters, oil separation elements and oil filters.

Should you require assistance in determining the effect your application may have on compressor performance, we suggest you contact your Doosan dealer.

MAINTENANCE

	Daily	Weekly	Monthly	6 months or 500 hrs	1 year or 1000 hrs	2000 hrs	4500 hrs	5000 hrs
Compressor Oil Level	C							
Engine Oil Level	C							
Coolant Level	C							
Gauges / Lamps	C							
Air Cleaner Service Indicators	C							
Air Cleaner Dust Ejector Valve	C							
Aftertreatment Exhaust Piping	C							
Fuel Tank	C/Refill							
Fuel / Water Separator	D							
Fluid Leaks	C							
Radiator Filler Cap	C							
Diesel Exhaust Fluid (DEF) Level	C/Refill							
Air Cleaner Precleaner Dump		C						
Fan / Alternator Belts		C						
Battery Connections / Electrolyte		C						
Tire Pressure & Surface		C						
Wheel Lug Nuts			C					
Hoses (Oil, Air, Intake, etc.)			C					
Automatic Shutdown System			C					
Air Cleaner System			C					
Coolers & Radiator			C					
Fastener & Guards			C					
Primary Air Cleaner Elements					R/WI			
Secondary Air Cleaner Elements						R/WI		
Fuel/Water Separator Element				R				
Final Fuel Filter				R				
Engine Oil Filter				R				
Engine Oil				R				
Engine Breather Filter						R		
Engine Coolant Conditioner Filter				R				
Engine Valve Lash								C/A
Aftertreatment DEF Unit Filter							R	
Compressor Oil Filter				R				
Compressor Oil					R			
Oil Separator Element						R		
Engine Coolant				C		R		

* Disregard if not appropriate for this particular compressor

(1) or 3000 miles/5000km whichever is the sooner

C = Check and act if required

T = Test

D = Drain

R = Replace

R/WI = Replace or when indicated earlier

CBT = Check before towing

C/R = Check and replace if required

G/C = Grease and check

C/A = Check and adjust if required

NOTE: 500 and 1000 hour intervals are meant to be repeated at every 500 or 1000 hours. Other intervals only to be performed at hours indicated.

NOTE: All fluid and filter intervals are valid for near perfect conditions only. High ambient temperatures - high dust concentration - high humidity as well as using lower grade oils and fuels will require a decrease in maintenance intervals.

Contact your Doosan Infracore Portable Power dealer for more information or assistance in determining the optimum intervals for your application.

	Daily	Weekly	Monthly	6 months or 500 hrs	1 year or 1000 hrs	2000 hrs	4500 hrs	5000 hrs
Wheels (Bearings, Seals, etc.)				C				
Shutdown Switch Settings					T			
Scavenger Orifice & Related					C			
Lights (Brake, Running & Turn)	CBT							
Pintle Eye Bolts	CBT							
Brakes	C			C				
Brake Linkage	C							
Emergency Stop	T							
Fasteners	C							
Running Gear Linkage & Bolts			G/C					
Safety Valve				C				
Minimum Pressure Valve				C				
Pressure System					C			
Pressure Gauge					C			
Pressure Regulator					C			
Separator Tank Exterior					C			
Lubricator (Fill)	C							
Engine Air Inlet Shutdown Valve					C			
Engine Vibration Damper						C/R		

* Disregard if not appropriate for this particular compressor

(1) or 3000 miles/5000km whichever is the sooner

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G/C = Grease and check

C/A = Check and adjust if required

NOTE: 500 and 1000 hour intervals are meant to be repeated at every 500 or 1000 hours. Other intervals only to be performed at hours indicated.

NOTE: All fluid and filter intervals are valid for near perfect conditions only. High ambient temperatures - high dust concentration - high humidity as well as using lower grade oils and fuels will require a decrease in maintenance intervals.

Contact your Doosan Infracore Portable Power dealer for more information or assistance in determining the optimum intervals for your application.

MAINTENANCE

	Initial 500 miles /850 km	Daily	Weekly	Monthly	3 Months 500 hrs	6 Months 1000 hrs	12 Months 2000 hrs
*Brake linkage	C				C		
*Brakes	C				C		
*Lights (running, brake, & turn)		CBT					
*Pintle Eye Bolts		CBT					
*Tire Pressure and Condition			C				
*Wheel Lug Nuts				C			
*Running gear linkage				G/C			
*Running gear bolts(1)					C		
*Wheels (Bearings, Seals, etc.)						C	G/C

	2 Yrs	4 Yrs	6 Yrs
Safety valve	C		
Hoses		R	
Separator tank interior			C

* Disregard if not appropriate for this particular compressor

(1) or 3000 miles/5000km whichever is the sooner

C = Check and act if required

T = Test

D = Drain

R = Replace

R/WI = Replace or when indicated earlier

CBT = Check before towing

C/R = Check and replace if required

G/C = Grease and check

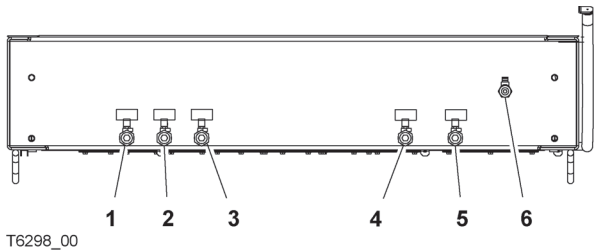
C/A = Check and adjust if required

NOTE: 500 and 1000 hour intervals are meant to be repeated at every 500 or 1000 hours. Other intervals only to be performed at hours indicated.

NOTE: All fluid and filter intervals are valid for near perfect conditions only. High ambient temperatures - high dust concentration - high humidity as well as using lower grade oils and fuels will require a decrease in maintenance intervals.

Contact your Doosan Infracore Portable Power dealer for more information or assistance in determining the optimum intervals for your application.

DRAIN LOCATIONS



1. Separator tank drain.
2. Oil cooler drain.
3. Engine oil sump drain.
4. Engine coolant drain (radiator).
5. Fuel tank drain.
6. DEF tank drain.

Ensure the compressor is stopped and all pressure is relieved before draining fluids. Check and close all drain valves, remove the plug from the drain outlet. Place the empty container underneath the drain outlet and open the valve using the tool provided. Do not leave unattended as some fluids will drain very rapidly and could spill.

WARNING: Use caution when draining fluids as these can be hot and could cause injury.

ROUTINE MAINTENANCE

This section refers to the various components which require periodic maintenance and replacement.

The *SERVICE/MAINTENANCE CHART* indicates the various components' descriptions and the intervals when maintenance is recommended. Oil capacities, etc., can be found in the *GENERAL INFORMATION* section of this manual.

For any specification or specific requirement on service or preventative maintenance for the engine, refer to the *Engine Manufacturer's Manual*.

Compressed air can be dangerous if incorrectly handled. Before doing any work on the unit, ensure that all pressure is vented from the system and that the machine cannot be started accidentally.

If the automatic blowdown fails to operate, then pressure must be gradually relieved by operating the manual blowdown valve. Suitable personal protective equipment should be worn.

Ensure that maintenance personnel are adequately trained, competent and have read the Maintenance Manuals.

Prior to attempting any maintenance work, ensure that:-

- all air pressure is fully discharged and isolated from the system. If the automatic blowdown valve is used for this purpose, then allow enough time for it to complete the operation.

NOTE: Pressure will always remain in the part of the system between the minimum pressure valve and the discharge valve after operation of the auto blowdown valve.

THIS PRESSURE MUST BE RELIEVED BY CAREFULLY:

(a) DISCONNECTING ANY DOWNSTREAM EQUIPMENT.

(b) OPENING THE DISCHARGE VALVE TO ATMOSPHERE.

(USE HEARING PROTECTION IF NECESSARY).

- the machine cannot be started accidentally or otherwise, by posting warning signs and/or fitting appropriate anti-start devices.
- all residual electrical power sources (mains and battery) are isolated.

Prior to opening or removing panels or covers to work inside a machine, ensure that:-

- anyone entering the machine is aware of the reduced level of protection and the additional hazards, including hot surfaces and intermittently moving parts.
- the machine cannot be started accidentally or otherwise, by posting warning signs and/or fitting appropriate anti-start devices.

Prior to attempting any maintenance work on a running machine, ensure that:-

- the work carried out is limited to only those tasks which require the machine to run.
- the work carried out with safety protection devices disabled or removed is limited to only those tasks which require the machine to be running with safety protection devices disabled or removed.
- all hazards present are known (e.g. pressurised components, electrically live components, removed panels, covers and guards, extreme temperatures, inflow and outflow of air, intermittently moving parts, safety valve discharge etc.).
- appropriate personal protective equipment is worn.
- loose clothing, jewellery, long hair etc. is made safe.
- warning signs indicating that Maintenance Work is in Progress are posted in a position that can be clearly seen.

Upon completion of maintenance tasks and prior to returning the machine into service, ensure that:-

- the machine is suitably tested.
- all guards and safety protection devices are refitted.
- all panels are replaced, canopy and doors closed.
- hazardous materials are effectively contained and disposed of.

PROTECTIVE SHUTDOWN SYSTEM

Refer to the MidPoint diagnostic display codes table for a listing of shutdown conditions.

SCAVENGE LINE

The scavenge line runs from the combined orifice/drop tube in the separator tank, to the orifice fitting located in the airend.

Examine the orifice, check valve and hoses at every service or in the event of oil carryover into the discharge air.

It is good preventative maintenance to check that the scavenge line and tube are clear of any obstruction each time the compressor lubricant is changed as any blockage will result in oil carryover into the discharge air.

COMPRESSOR OIL FILTER

Refer to the MAINTENANCE CHART in this section for the recommended servicing intervals.

Removal

WARNING: Do not remove the filter(s) without first making sure that the machine is stopped and the system has been completely relieved of all air pressure. (Refer to *STOPPING THE UNIT* in the *OPERATING INSTRUCTIONS* section of this manual).

Clean the exterior of the filter housing and remove the spin-on element by turning it in a anticlockwise direction.

Inspection

Examine the filter element.

CAUTION: *If there is any indication of the formation of varnishes, shellacs or lacquers on the filter element, it is a warning that the compressor lubricating and cooling oil has deteriorated and that it should be changed immediately. Refer to LUBRICATION later in this section.*

Reassembly

Clean the filter gasket contact area and install the new element by screwing in a clockwise direction until the gasket makes contact with the filter housing. Tighten a further $^{1}/_{2}$ to $^{3}/_{4}$ of a revolution.

CAUTION: *Start the machine (refer to PRIOR TO STARTING and STARTING THE UNIT in the OPERATING INSTRUCTIONS section of this manual) and check for leakage before the machine is put back into service.*

COMPRESSOR OIL SEPARATOR ELEMENT

Refer to the SERVICE / MAINTENANCE CHART in this section for service intervals.

Removal

WARNING: Do not remove the filter(s) without first making sure that the machine is stopped and the system has been completely relieved of all air pressure. (Refer to *STOPPING THE UNIT* in the *OPERATING INSTRUCTIONS* section of this manual).

Disconnect all hoses and tubes from the separator tank cover plate. Remove the drop-tube from the separator tank cover plate and then remove the cover plate. Remove the separator element.

Inspection

Examine the filter element. Examine all hoses and tubes, and replace if necessary.

Reassembly

Thoroughly clean the orifice/drop tube and install a new o-ring before reassembly. Install the new element.

Reposition the cover plate, taking care not to damage the o-ring, and replace the cover plate screws tightening in a criss-cross pattern to the recommended torque (refer to the TORQUE SETTING TABLE later in this section).

Replace the drop-tube and reconnect all hoses and tubes to the separator tank cover plate.

Replace the compressor oil (refer to LUBRICATION later in this section).

CAUTION: *Start the machine (refer to PRIOR TO STARTING and STARTING THE UNIT in the OPERATING INSTRUCTIONS section of this manual) and check for leakage before the machine is put back into service.*

COMPRESSOR OIL COOLER AND ENGINE RADIATOR AIR CHARGE COOLER

When grease, oil and dirt accumulate on the exterior surfaces of the oil cooler and radiator, the efficiency is impaired. It is recommended that each month the oil cooler and radiator be cleaned by directing a jet of compressed air, (carrying if possible a non-flammable cleaning solvent) over the exterior core of the cooler/radiator. This should remove any accumulation of oil, grease and dirt from the exterior core of the cooler so that the entire cooling area can radiate the heat of the lubricating and cooling oil/water into the air stream.

WARNING: Hot engine coolant and steam can cause injury. When adding coolant or antifreeze solution to the engine radiator, stop the engine at least one minute prior to releasing the radiator filler cap. Using a cloth to protect the hand, slowly release the filler cap, absorbing any released fluid with the cloth. Do not remove the filler cap until all excess fluid is released and the engine cooling system fully depressurised.

WARNING: Follow the instructions provided by the antifreeze supplier when adding or draining the antifreeze solution. It is advisable to wear personal protective equipment to prevent skin and eye contact with the antifreeze solution.

AIR FILTER ELEMENT

The air filter should be inspected regularly (refer to the SERVICE/ MAINTENANCE CHART) and the element replaced when the restriction indicator lamp illuminates. The dust collector box(es) should be cleaned daily (more frequently in dusty operating conditions) and not allowed to become more than half full.

The safety element should be renewed every 2000 hours or every other main filter element change, whichever comes first.

Removal

CAUTION: *Never remove and replace element(s) when the machine is running.*

Clean the exterior of the filter housing and remove the filter element by releasing the nut.

If the safety element is to be renewed, thoroughly clean the interior of the filter housing prior to removing the safety element.

Inspection

Check for cracks, holes or any other damage to the element by holding it up to a light source, or by passing a lamp inside.

CAUTION: *If inspection reveals damage to the main element, the safety element **must** be replaced.*

Check the seal at the end of the element and replace if any sign of damage is evident.

Reassembly

Assemble the new element into the filter housing ensuring that the seal seats properly.

Secure the element in the housing by hand tightening the nut.

Assemble the dust collector box parts, ensuring that they are correctly positioned.

Before restarting the machine, check that all clamps are tight.

CAUTION: *Safety elements must not be cleaned or re-used.*

VENTILATION

Always check that the air inlets and outlets are clear of debris etc.

CAUTION: *NEVER clean by blowing air inwards.*

COOLING FAN DRIVE

Periodically check that the fan mounting bolt in the fan hub has not loosened. If, for any reason, it becomes necessary to remove the fan or re-tighten the fan mounting bolt, apply a good grade of commercially available thread locking compound to the bolt threads and tighten to the torque value shown in the TORQUE SETTING TABLE later in this section.

This compressor is equipped with a variable speed fan clutch that requires no periodic maintenance.

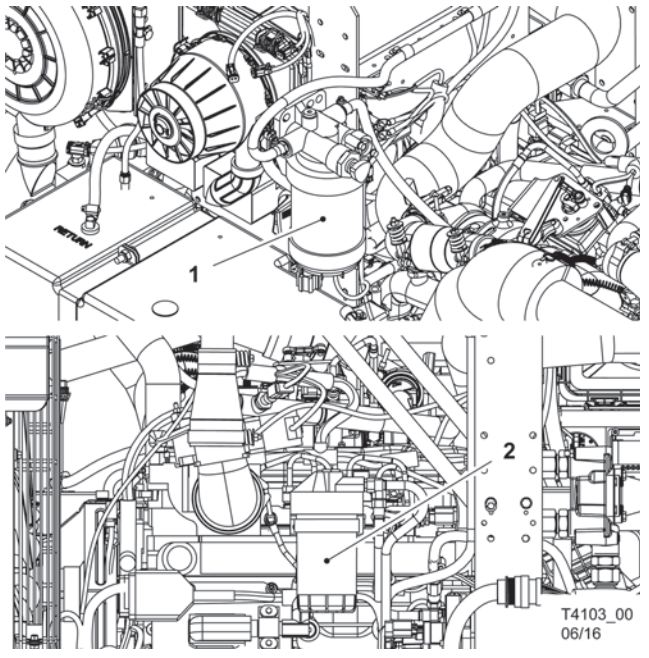
The fan belt(s) should be checked regularly for wear and correct tensioning.

FUEL SYSTEM

The fuel tank should be filled daily or every eight hours. To minimise condensation in the fuel tank(s), it is advisable to top up after the machine is shut down or at the end of each working day. At six month intervals drain any sediment or condensate that may have accumulated in the tank(s).

FUEL FILTER MAINTENANCE

This compressor is equipped with 2 fuel filters in series to be replaced at every 500 hour interval or sooner if required.



1. Fuel Filter / Water Separator (10 microns).
2. Final Fuel Filter / Water Separator (3 microns).

Fuel Filter / Water Separator

Mounted to the DEF module bracket, this filter is capable of separating water from fuel and will filter solid contaminants to 10 microns in size.

Replace: Remove the Water In Fuel sensor connector from the bottom of the filter element, remove and discard the filter. Install a new element taking care all seals are in place, install the sensor connector.

Final Fuel Filter / Water Separator

The final fuel filter (3 micron) is mounted on the engine. For maintenance details, refer to the engine manual.

WARNING: The Primary as well as Secondary filter elements may be filled with the appropriate quality of fuel from a clean source. NEVER fill the Final fuel filter before installing.

The correct procedure would be to fill Primary and Secondary filters with clean fuel, leave the Final filter empty and prime the system using the hand prime pump on the Primary filter head.

FUEL FILTER WATER SEPARATOR

The fuel filter water separator contains a filter element which should be replaced at regular intervals (see the SERVICE/MAINTENANCE CHART).

CHARGE COOLER PIPEWORK

Inspect all hoses and clips on the charge cooler pipe work.

Engine damage will occur if the charge cooling system leaks.

HOSES

All components of the engine cooling air intake system should be checked periodically to keep the engine at peak efficiency.

At the recommended intervals, (see the SERVICE/MAINTENANCE CHART), inspect all of the intake lines to the air filter, and all flexible hoses used for air lines, oil lines and fuel lines.

Periodically inspect all pipework for cracks, leaks, etc. and replace immediately if damaged.

ELECTRICAL SYSTEM

WARNING: Always disconnect the battery switch before performing any maintenance or service.

When removing connectors from electrical devices and sensors, inspect the terminals to ensure they have electrical grease on them. If electrical grease is not present or very minimal, then add a small amount of electrical grease (Doosan Part No. 22409114) to the terminals. Dirty and or corroded electrical terminals can be cleaned using electrical contact cleaner.

Inspect the safety shutdown system switches and the instrument panel relay contacts for evidence of arcing and pitting. Clean where necessary.

Check the mechanical action of the components.

Check the security of electrical terminals on the switches and relays i.e. nuts or screws loose, which may cause local hot spot oxidation.

Inspect the components and wiring for signs of overheating i.e. discolouration, charring of cables, deformation of parts, acrid smells and blistered paint.

BATTERY

Keep the battery terminals and cable clamps clean and lightly coated with petroleum jelly to prevent corrosion.

The retaining clamp should be kept tight enough to prevent the battery from moving.

CAUTION: *Exercise extreme caution when using booster battery. To jump battery, connect ends of one booster cable to the positive (+) terminal of each battery. Connect one end of other cable to the negative (-) terminal of the booster battery and other end to a ground connection away from dead battery (to avoid a spark occurring near any explosive gases that may be present). After starting the compressor, always disconnect cables in reverse order.*

PRESSURE SYSTEM

At 3 month intervals it is necessary to inspect the external surfaces of the system (from the airend through to the discharge valve(s)) including hoses, tubes, tube fittings and the separator tank, for visible signs of impact damage, excessive corrosion, abrasion, tightness and chafing. Any suspect parts should be replaced before the machine is put back into service.

LUBRICATION

The engine is initially supplied with engine oil sufficient for a nominal period of operation (for more information, consult The Engine Manufacturer's Manual).

CAUTION: *Always check the oil levels before a new machine is put into service.*

If, for any reason, the unit has been drained, it must be re-filled with new oil before it is put into operation.

ENGINE LUBRICATING OIL

The engine oil and oil filter element should be changed at the engine manufacturer's recommended intervals. Refer to the Engine Operator Manual. The Tier 4 engine in this compressor requires engine lubricating oil to ensure proper Aftertreatment System operation and engine durability. Doosan Tier 4 Premium Engine Oil is recommended. Refer to the Engine Operator Manual for engine oil specifications.

ENGINE LUBRICATING OIL SPECIFICATION

Refer to the Engine Manufacturer's Manual or Lubrication Specification list.

ENGINE OIL FILTER ELEMENT

The engine oil and oil filter element should be changed at the engine manufacturer’s recommended intervals. Refer to the Engine Operator Manual.

The Tier 4 engine in this compressor requires engine lubricating oil to ensure proper Aftertreatment System operation and engine durability. Doosan Tier 4 Premium Engine Oil is recommended. Refer to the Engine Operator Manual for engine oil specifications.

COMPRESSOR LUBRICATING OIL

Refer to the SERVICE/MAINTENANCE CHART in this section for service intervals.

NOTE: If the machine has been operating under adverse conditions, or has suffered long shutdown periods, then more frequent service intervals will be required.

WARNING: DO NOT, under any circumstances, remove any drain plugs or the oil filler plug from the compressor lubricating and cooling system without first making sure that the machine is stopped and the system has been completely relieved of all air pressure (refer to STOPPING THE UNIT in the OPERATING INSTRUCTIONS section of this manual).

Completely drain the receiver/separator system including the piping and oil cooler by removing the drain plug(s) and collecting the used oil in a suitable container.

Replace the drain plug(s) ensuring that each one is secure.

NOTE: If the oil is drained immediately after the machine has been running, then most of the sediment will be in suspension and will therefore drain more readily.

CAUTION: *Some oil mixtures are incompatible and result in the formation of varnishes, shellacs or lacquers which may be insoluble.*

RUNNING GEAR/WHEELS

Check the wheel nut torque 30 kilometres (20 miles) after refitting the wheels. Refer to the TORQUE SETTING TABLE later in this section.

The bolts securing the running gear to the frame should be checked periodically for tightness (refer to the SERVICE/MAINTENANCE CHART for frequency) and re-tightened where necessary. Refer to the TORQUE SETTING TABLE later in this section.

RUNNING GEAR WHEEL BEARINGS

Wheel bearings should be packed with heavy duty wheel bearing grease every 6 months.

Wheel bearings should be greased per the Maintenance Schedule in this manual. The type of grease used should conform to specifications below:

Grease

Thickener Type Lithium Complex

Dropping Point 215°C (419°F) Minimum

Consistency NLGI No.2

Additives EP, Corrosion & Oxidation Inhibitors

Viscosity Index 80 Minimum

TYRES/TYRE PRESSURE

See the GENERAL INFORMATION section of this manual.

BRAKES

Check and adjust the brake linkage at 500 miles (850km) then every 3000 miles (5000km) or 3 months (whichever is the sooner) to compensate for any stretch of the adjustable cables. Check and adjust the wheel brakes to compensate for wear.

CAUTION: *Check the wheel nut torque 20 miles (30 kilometres) after refitting the wheels (Refer to the TORQUE SETTING TABLE later in this section).*

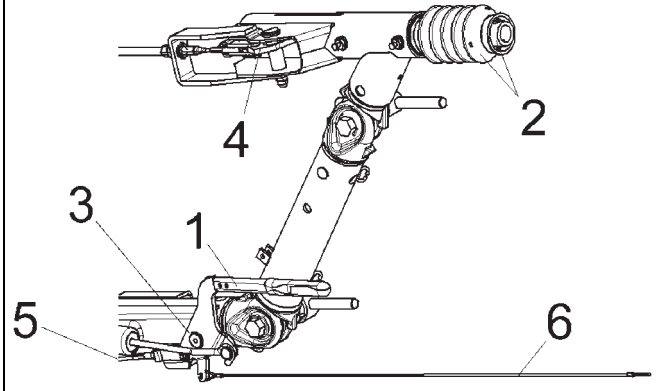
ADJUSTING THE OVERRUN BRAKING SYSTEM (KNOTT RUNNING GEAR)

1. Preparation

Jack up the machine

Disengage the handbrake lever [1].

Fully extend the draw bar [2] on the overrun braking system.



1. Handbrake lever
2. Draw bar and bellows
3. Handbrake lever pivot
4. Transmission lever
5. Brake cable
6. Breakaway Cable

Requirements:

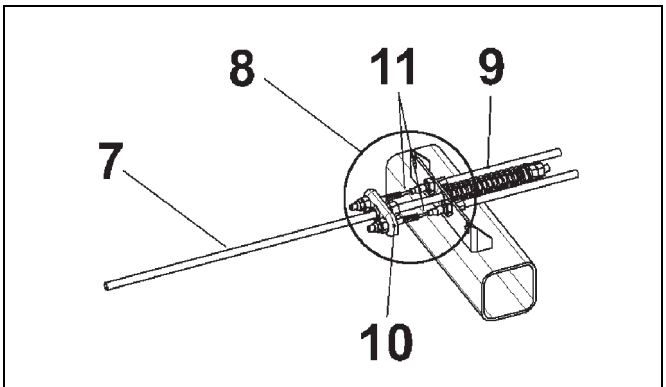
During the adjustment procedure always start with the wheel brakes.

Always rotate the wheel in the direction of forward movement.

Ensure that an M10 safety screw is fitted to the handbrake pivot.

The brake actuators must not be pre-tensioned - if necessary loosen the brake linkage [7] on the brake equalisation assembly [8].

Check that brake actuators and cables [11] operate smoothly.

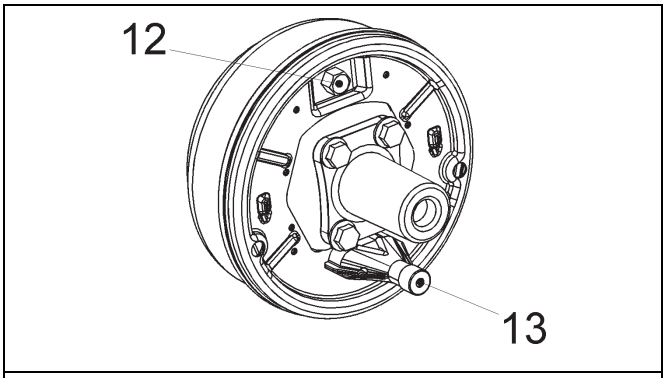


7. Brake linkage
8. Equalisation assembly
9. Compression spring
10. Equaliser plate
11. Cable

***CAUTION:** The compression spring [9] must only be lightly pre-tensioned and when operating must never touch the axle tube.*

Never adjust the brakes at the brake linkage [7].

2. Brake Shoe Adjustment



12. Adjusting screw
13. Cable entry

Width across flats of adjusting screw [12]

Brake size	Key width
160x35 / 200x50	SW 17
250x40	SW 19
300x60	SW 22

Tighten adjusting screw [12] clockwise until the wheel locks.

Loosen adjusting screw [12] anti-clockwise (approx. ½ turn) until the wheel can be moved freely.

Slight dragging noises that do not impede the free movement of the wheel are permissible.

This adjustment procedure must be carried out as described on both wheel brakes.

When the brake has been adjusted accurately the actuating distance is approximately 5-8mm on the cable [11]

3. Compensator assembly adjustment

Variable Height models

Fit an M10 safety screw to the handbrake pivot.

Disconnect the handbrake cable [5] at one end.

Pre-adjust brake linkage [7] lengthways (a little play is permissible) and re-insert the cable [5], adjusting it to give a small amount of play.

Remove the M10 safety screw from the handbrake pivot.

All Models

Engage the handbrake lever [1] and check that the position of the equaliser plate [10] is at right angles to the pulling direction. If necessary correct the position of the equaliser plate [10] on the cables [11].

The compression spring [9] must only be slightly pre-tensioned and when engaged must not touch the axle tube.

4. Brake linkage adjustment

Adjust the brake linkage [7] lengthways without pre-tension and without play in the transmission lever [4].

Readjustment

Engage the handbrake lever [1] forcefully a number of times to set the brake.

Check the alignment of the equalisation assembly [8], this should be at right angles to the pulling direction

Check the play in the brake linkage [7]

If necessary adjust the brake linkage [7] again without play and without pre-tensioning

There must still be a little play in cable [5] (Variable Height Only)

Check the position of the hand brake lever [1]. The start of resistance should be approximately 10-15mm above the horizontal position.

Check that the wheels move freely when the handbrake is disengaged.

Final test

Check the fasteners on the transmission system (cables, brake equalisation system and linkage).

Check the handbrake cable [5] for a small amount of play and adjust if necessary (Variable height only)

Check the compression spring [9] for pre-tensioning.

Test run

If necessary carry out 2-3 test brake actions.

Test brake action

Check the play in brake linkage [7] and if necessary adjust the length of brake linkage [7] until there is no play.

Apply the handbrake while rolling the machine forward, travel of the handbrake lever up to $^{2}/_{3}$ of maximum is allowed.

RE-ADJUSTING THE OVERRUN BRAKING SYSTEM (KNOTT RUNNING GEAR)

Re-adjustment of the wheel brakes will compensate for brake lining wear. Follow the procedure described in *2: Brake Shoe Adjustment.*

Check the play in the brake linkage [7] and re-adjust if necessary.

Important

Check the brake actuators and cables [11]. The brake actuators must not be pre-tensioned.

Excessive operation of the handbrake lever, which may have been caused by worn brake linings, must not be corrected by re-adjusting (shortening) the brake linkage [7]

Re-adjustment

The handbrake lever [1] should be engaged forcefully several times to set the braking system.

Check the setting of the brake equalisation assembly [8], which should be at right angles to the pulling direction.

Check the play in the brake linkage [7] again, ensuring that there is no play in the brake linkage and that it is adjusted without pre-tension

Check the position of the hand brake lever [1], cable [5] (with little play) and the compression spring [9] (only slight pre-tension). The start of resistance of the handbrake lever should be approximately 10-15mm above the horizontal position.

Final test

Check the fasteners on the transmission system (cables, brake equalisation system and linkage)

Apply the handbrake while rolling the machine forward, travel of the handbrake lever up to $^{2}/_{3}$ of maximum is allowed.

Check the handbrake cable [5] for a small amount of play and adjust if necessary (Variable height only)

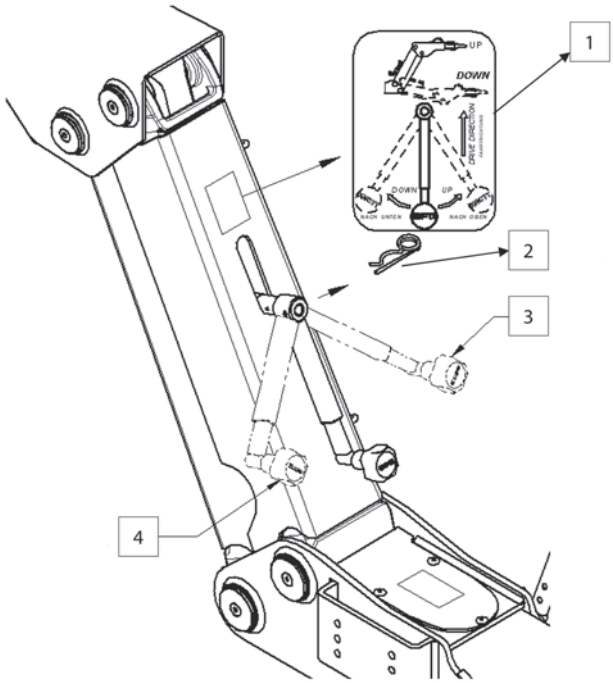
Check the compression spring [9] for slight pre-tensioning.

RUNNING GEAR HEIGHT ADJUSTMENT (KNOTT KHD)

Operating the height adjusting mechanism

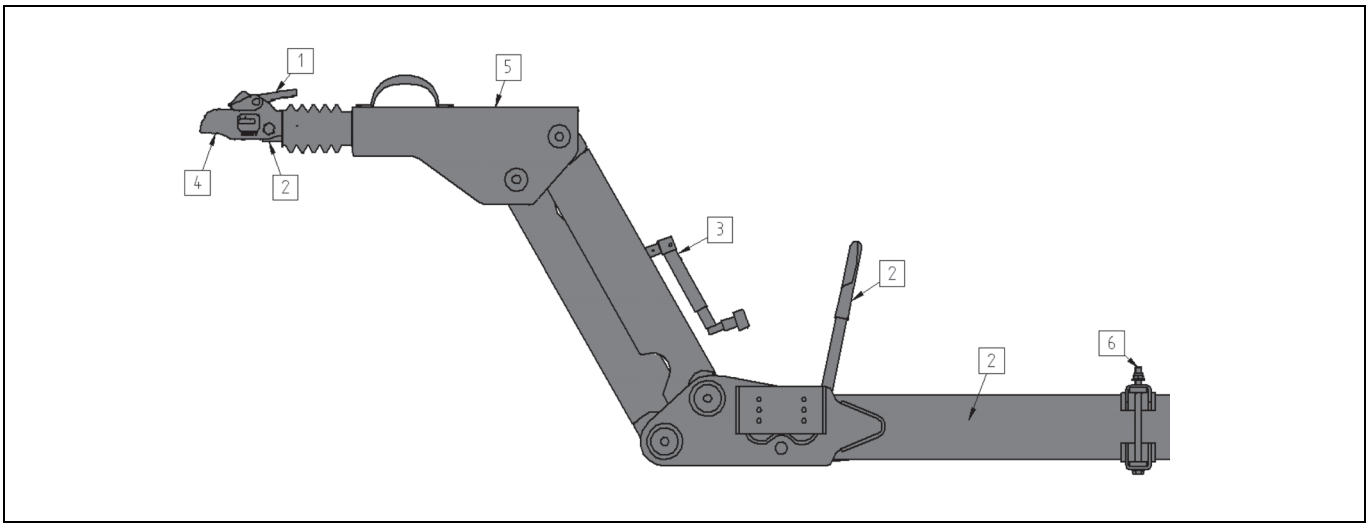
To adjust the coupling to the proper height, the lock spring must first be removed. Turning the handle clockwise will move the coupling down, turning it counter clockwise will move the coupling up. The direction of adjustment is visible on the warning label. After reaching the desired position, the coupling must be secured with the lock spring again.

WARNING:
During height adjustment, the drawbar may NOT be connected to the towing vehicle!
After connecting the coupling to the towing vehicle, turning the handle **IS FORBIDDEN!**
Lifting of the trailer by turning the handle **IS STRICTLY FORBIDDEN!**



1. Warning label
2. Lock spring
3. Upward adjustment
4. Downward adjustment

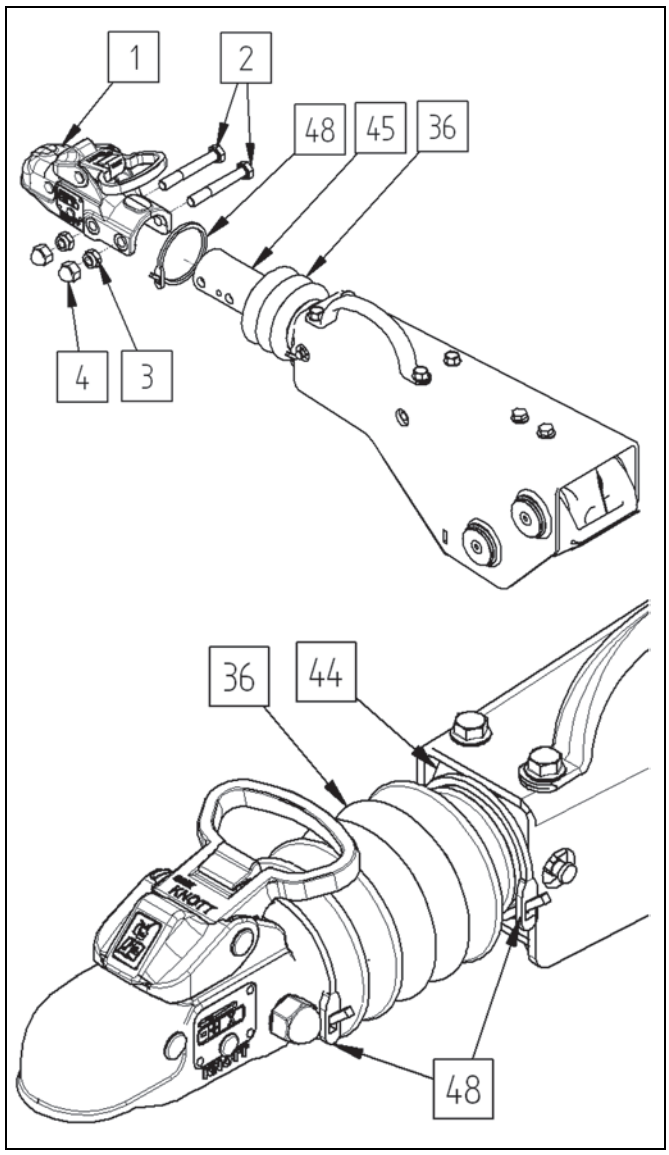
Maintenance: Lubrication and servicing



	Service interval Lubricate in accordance with regulation SK70003	Before the first journey	After the first loaded journey	After 500 km	Every 2000-3000 km
1	Function check of the coupling head or the towing eye	•			•
2	Mobility check of the drawtube, handbrake lever and rods	•		•	•
3	Mobility and ease of operation check of the height adjusting mechanism	•			•
4	Coupling head lubrication	•			•
5	Drawtube support lubrication – at the housing of the overrun coupling				•
6	Clamping jig bolts tightening		•		

Replacement of the coupling head or the towing eye

To be carried out ONLY by skilled service personnel.



Disassembly

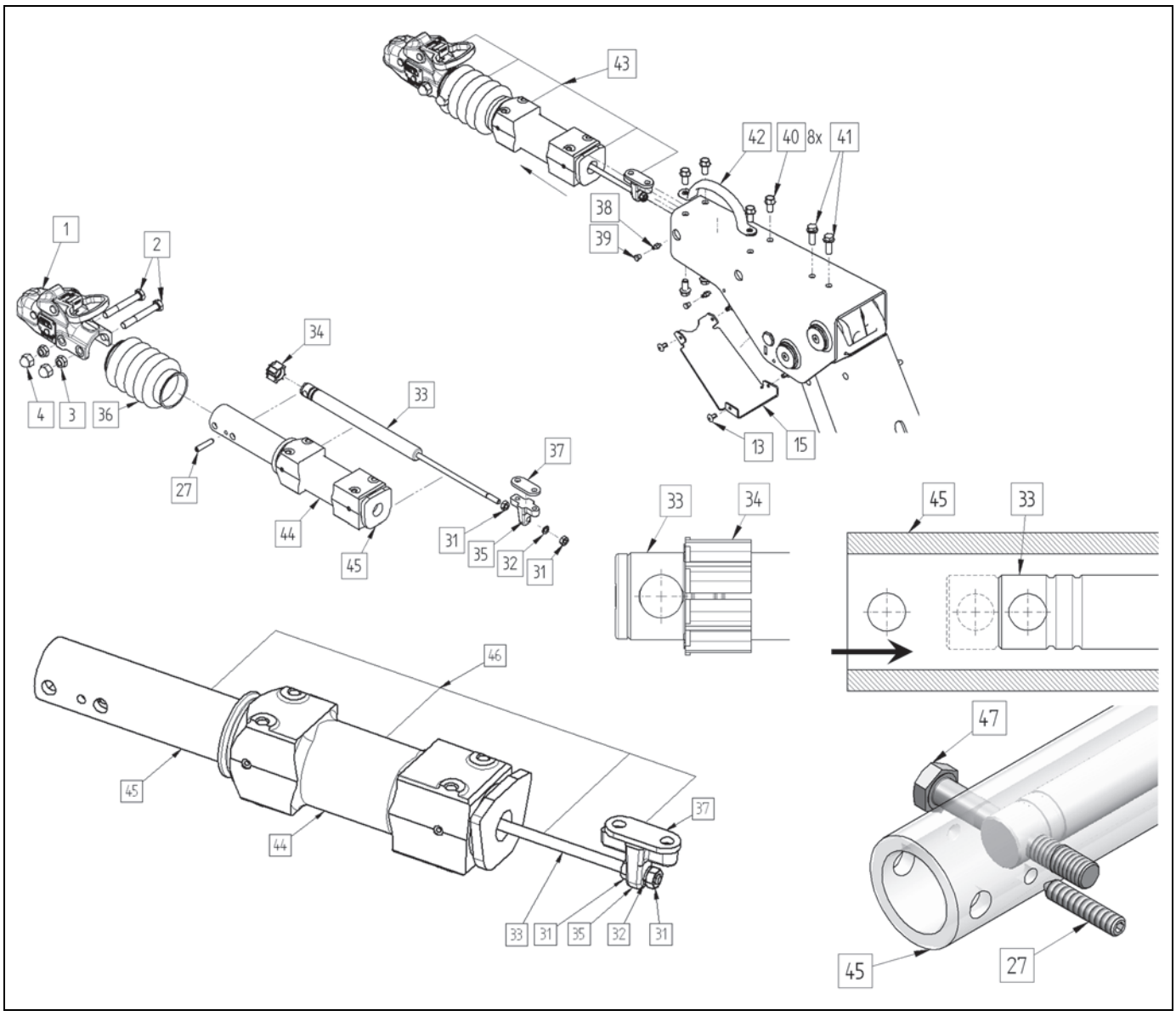
To remove the coupling (1), the cable tie (48) must be removed. Withdraw the bellows (36) from the coupling head (1) and remove the protection caps (4). Unscrew the fixing nuts (3) and remove the bolts (2). The coupling head (1) may now be removed. If the bellows (36) is damaged, it must be replaced.

Assembly

Before mounting, all the new and removed parts have to be lubricated in accordance with **regulation SK70003**. Attach the shaft of the coupling head (1) onto the drawtube (45) and adjust until the holes overlap. Insert both bolts (2). Screw on new fixing nuts (3) and fasten them with a torque wrench (Bolt M12 to 77 ± 5Nm, Bolt M14 to 125 ± 5Nm). Replace the protection caps (4). Slide the bellows (36) onto the coupling head (1). The rear bolt (2) must be covered by the bellows (36). Secure the bellows (36) with a new cable tie (48).

Replacement of the shock absorber

To be carried out ONLY by skilled service personnel.



Disassembly

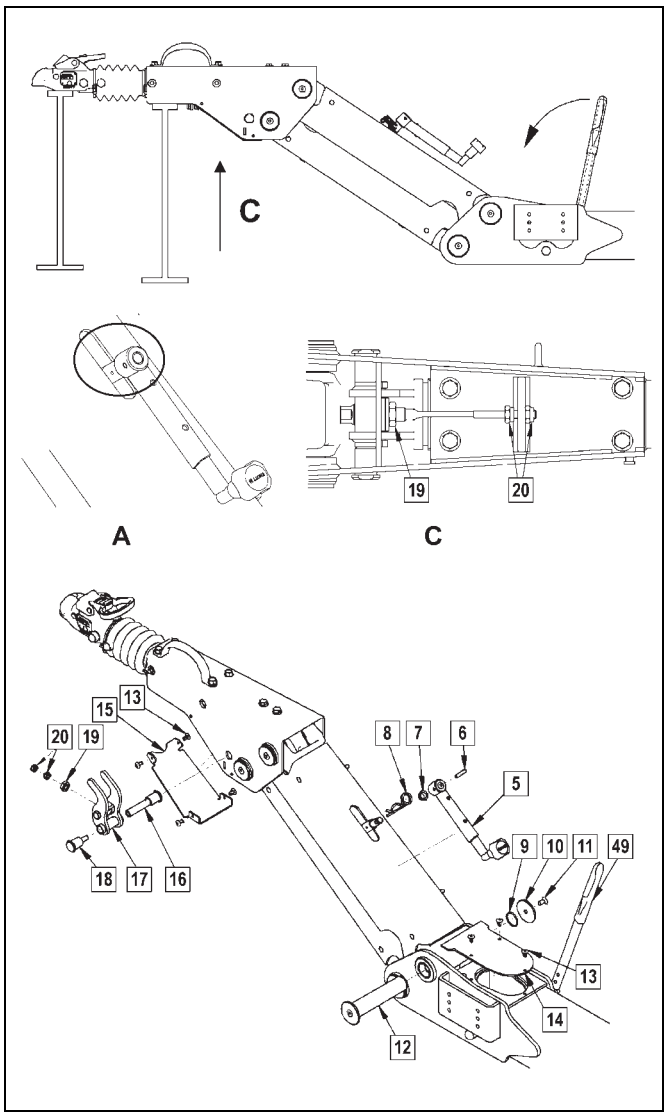
Drill out the blind rivets (13), remove the shield (15), grease the nipple caps (39) and the nipples (38) themselves. Unscrew all the bolts (41) and also all bolts (40) and then pull out the assembly (43). remover the coupling head (1), the bellows (36) and the pin (27) from the drawtube (45). Unscrew the hexagonal nut (31) from the shock absorber (33) and pull out the shock absorber (33) to the front. Dismount the centraliser tube (34) (if present) from the shock absorber (33) and replace the shock absorber (33).

Assembly

Before mounting, all the new and removed parts must be lubricated in accordance with regulation SK70003. Mount the centraliser tube (34) (if present) onto the shock absorber (33). Push the shock absorber (33) into the drawtube (45) from the front and bolt together with the shock absorber bracket (35). Fasten the hexagonal nut (31) with a tightening moment of 30±5Nm. Push the unit (46) from the front into the housing, place the disc (37) (if present) between the housing and the shock absorber bracket (35) and fasten with lock bolts (40), (41). At the same time mount the hand grip (42). Fasten the lock bolts with a tightening moment of 80+5Nm. Using a screw clamp, the shock absorber (33) has to be pressed together so far that the position of the hole in the shock absorber (33) coincides with the position of the rear hole in the drawtube (45). Secure in position using the bolt (47) and screw in (plug in) the pin (27) through the drawtube (45). Mount the bellows (36) and the coupling head (1) on the drawtube (45). Secure the bellows (36) on the coupling head (1) and the guide bearing (44) using cable ties (48). Replace the grease nipples (38), nipple caps (39) and the shield (15) for the overrun head.

Replacement of the cable

To be carried out ONLY by skilled service personnel.



Disassembly

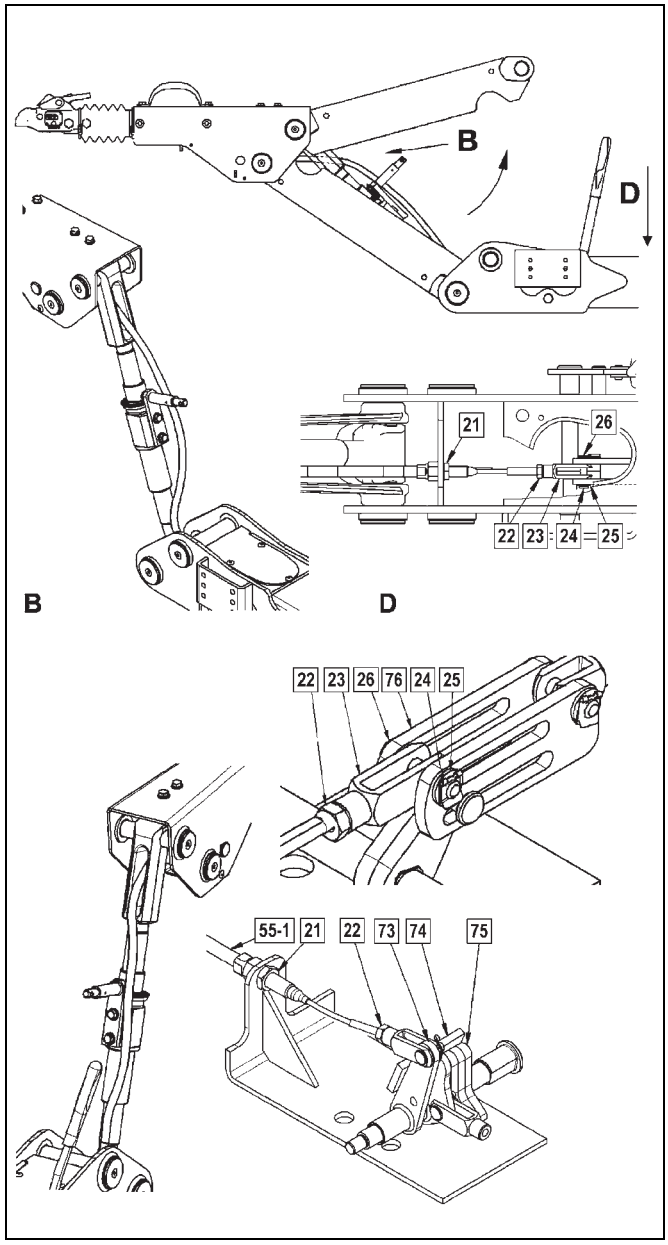
Remove the lock spring (8). Turn the handle (5) until halfway up the slot (See View A). Move the handbrake lever (49) to the front. Drill out the blind rivets (13) and shields (15) and (14). Unscrew the nut (20) from the cable (See View C), then pull the cable from the cable bracket. remove the hexagonal nut (19) and pins (16) and (18). Pull the cable out of the transmission lever (17). Knock out the pin (6) using a hammer and remove the winding handle (5). Pull out the adaptor (7). Unscrew the bolt (11) and remove the disc (10) with the seal ring (9).

Secure the overrun head against falling off – injury risk!!! Knock out the pin (12) with a hammer and bronze bar. Lift off the top middle part and **secure it against falling off – injury risk!!!**

Remove the SL-clip (24) and the disc (25) and pull out the pin (26). Unscrew the clevis (23) and hexagonal nuts (22) and (21). Pull out the cable and replace it.

Assembly

Before mounting, all the new and removed parts must be lubricated in accordance with regulation SK70003. Push the new cable through the cable bracket into the drawbar, screw in the hexagonal nut (21) and fasten it with a tightening moment of 30 ± 2Nm.

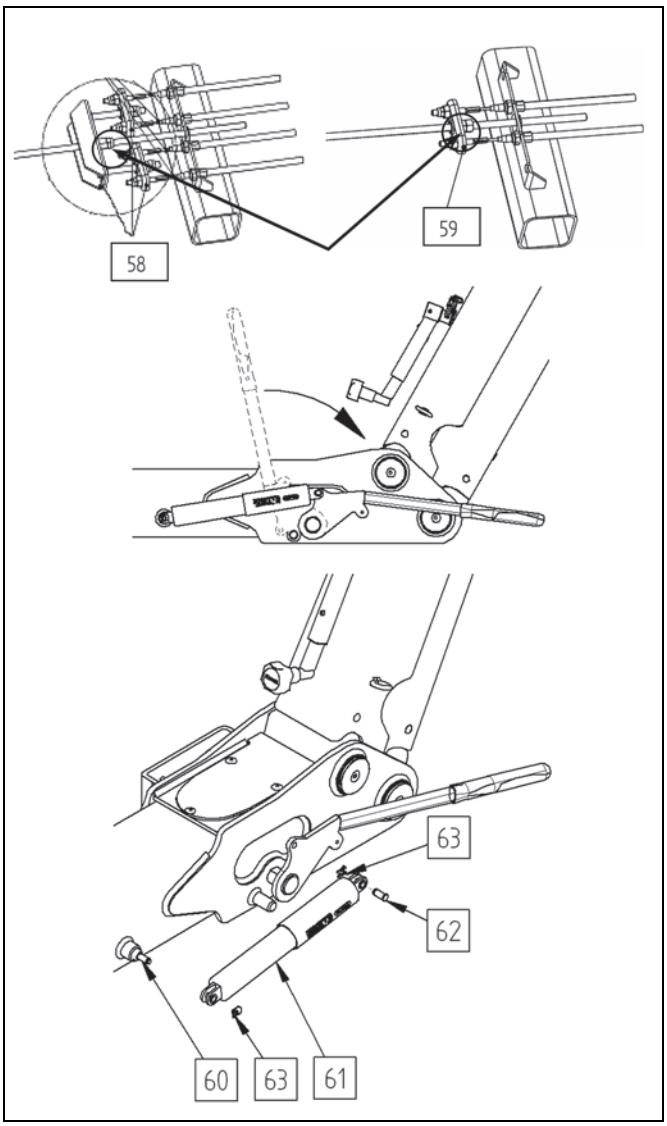


Screw the hexagonal nut (22) and the clevis (23) onto the cable and adjust it **in accordance with regulation SK70008**. Put the pin (26) through the balance lever (76) and the clevis (23) and lock it with the disc (25) and the SL-clip (24). Insert the cable into the slot in the spindle top part (See View B) and mount it with the transmission lever (17). Mount the transmission lever (17) into the overrun head and secure it with pins (16) and (18). Spread the pin (18) with liquid high strength thread locker and fasten it with a tightening moment of 30 ± 2Nm.

Screw in the hexagonal nuts (19) and (20) and adjust them **in accordance with regulation SK70008**. Mount on the top middle part. Using gentle hammer impacts, put the pin (12) through the drawbar and the top middle part. Secure the pin (12) with the seal ring (9), disc (10) and the bolt (11). Spread the bolt (11) with liquid high strength thread locker and fasten it with a tightening moment of 20 ± 2Nm. Set the handbrake lever into its non-braking position and check the adjustment of the KHD braking system **in accordance with regulation SK70008** once more. Do additional adjustments if necessary. Put on shields (15) and (14) and secure them with blind rivets (13). Plug in the adaptor (7) and the winding handle (5). Secure the winding handle (5) with the pin (6). Put the coupling unit into the highest position and adjust the whole braking system (KHD + axles).

Replacement of the coupling head or the spring pack

To be carried out ONLY by skilled service personnel.



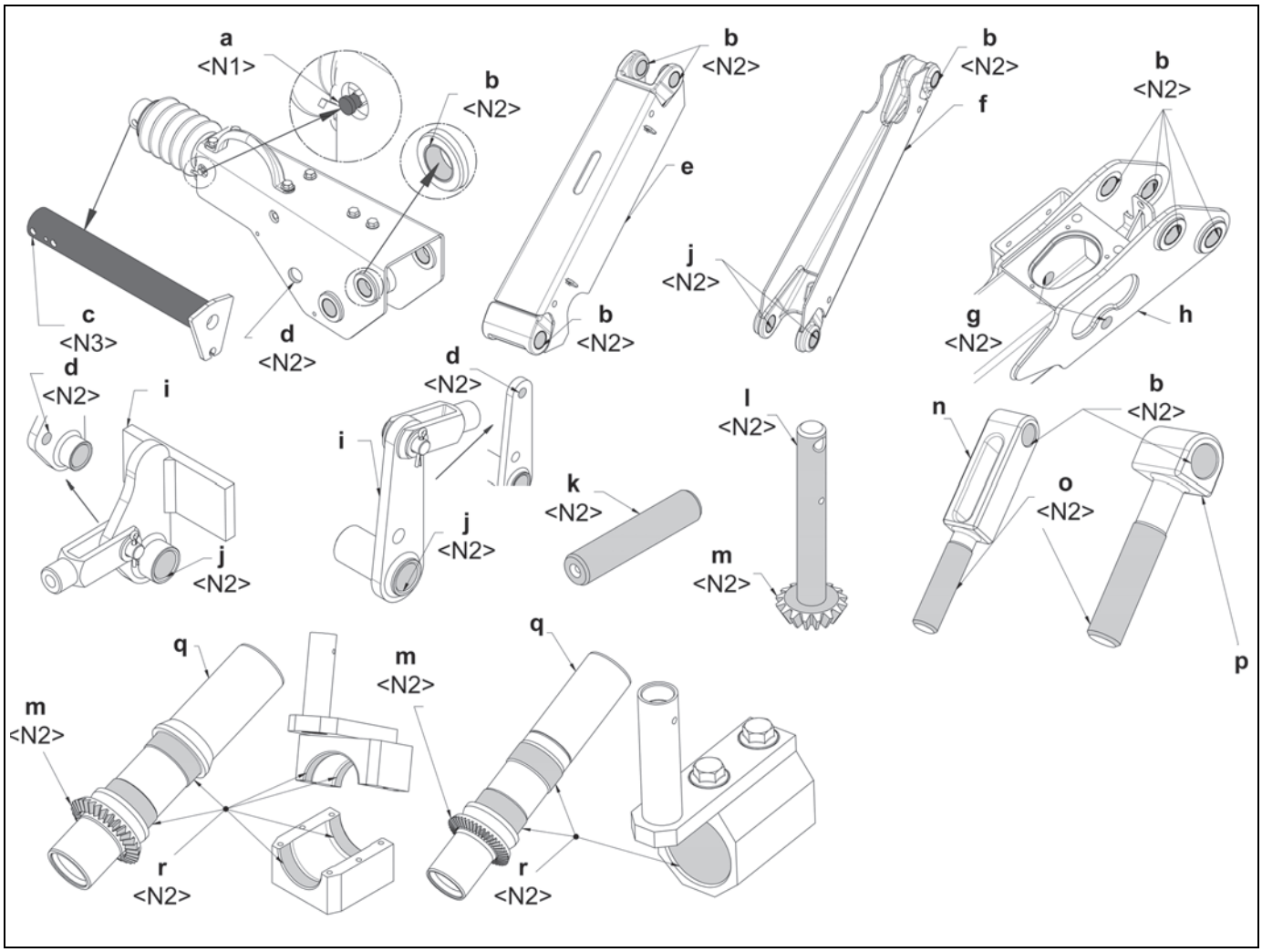
Disassembly

Loosen the balance bar (58, tandem) or (59, single axle) so that the handbrake lever can be moved down. Undo the SL-clips (63) and pull out the pin (62). Replace the damaged spring pack.

Assembly

Mount the new spring pack onto the spring pack bracket (60) and secure it with the SL-clip (63). Mount the spring pack (61) with the handbrake lever, insert the pin (62) and secure with the SL-clip (63). Set up the whole braking system according to general KNOTT regulation.

Lubrication points



	Part to be lubricated
a	Grease nipple
b	Bush
c	Piston rod
d	Hole
e	Top middle part
f	Bottom middle part
g	Holes for handbrake
h	Drawbar coupling
i	Conversion lever coupling
j	Tube
k	Pin
l	Adjustment bolt, welded
m	Gearing
n	Top spindle
o	Thread
p	Bottom spindle
q	Adjustment nut, welded
r	Area
s	Pin of handbrake
t	Seal ring
u	Contact area
v	Screw
w	Guiding slot

Lubricants

<N1> Lubricate with 5g SPHEEROL EPL2 lubricant or equivalent NLGI 2 Grade lubricant.

<N2> Using a brush, cloth or plastic sponge, apply a thin, even layer of OPTIMOL OLISTAMOLY 2 lubricant or equivalent MoS2 based high performance grease.

<N3> Using a brush, apply a thin, even layer of SPHEEROL EPL2 or equivalent NLGI 2 Grade lubricant.

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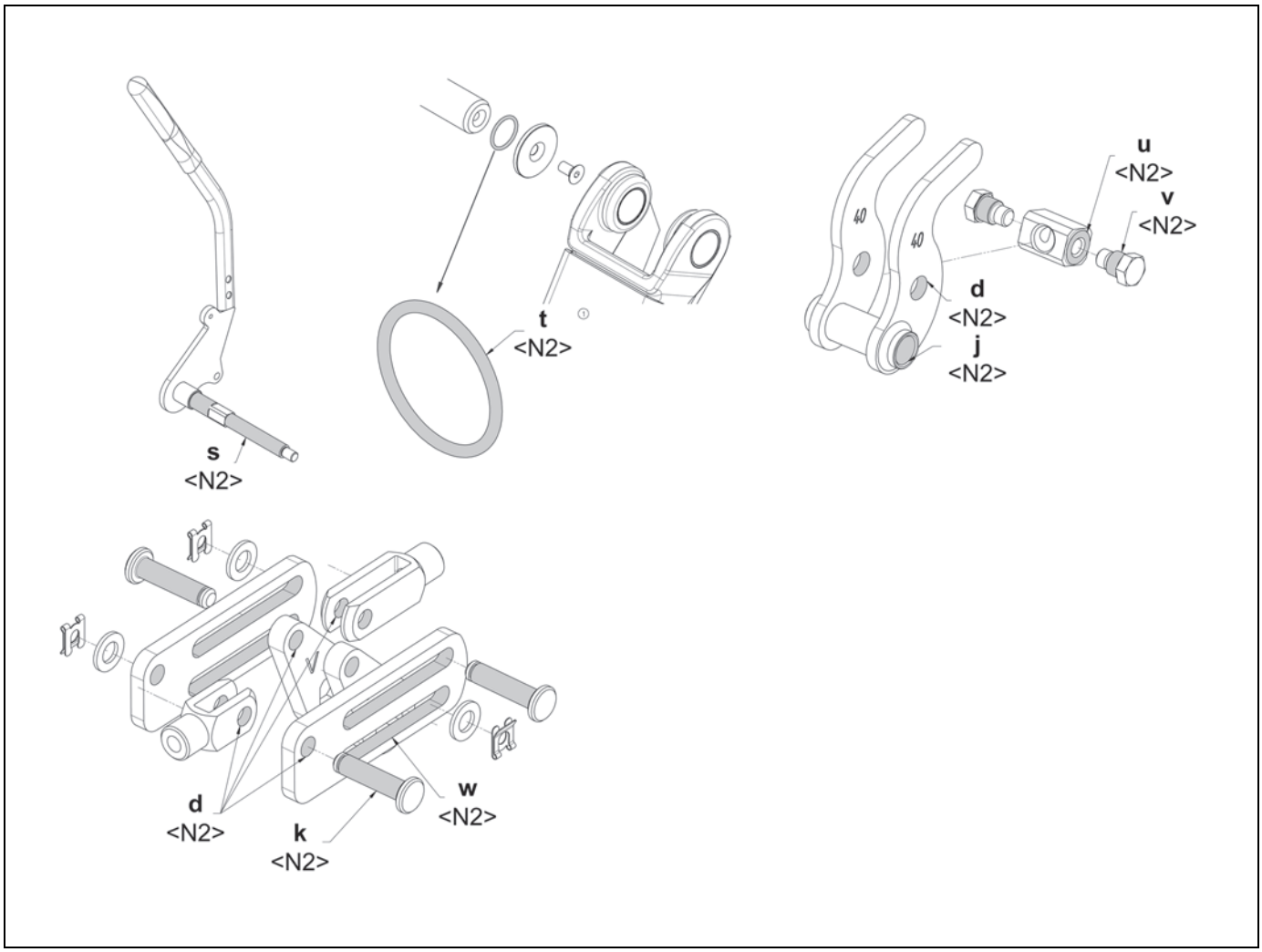
Lubrication points (continued)



	Part to be lubricated
a	Grease nipple
b	Bush
c	Piston rod
d	Hole
e	Top middle part
f	Bottom middle part
g	Holes for handbrake
h	Drawbar coupling
i	Conversion lever coupling
j	Tube
k	Pin
l	Adjustment bolt, welded
m	Gearing
n	Top spindle
o	Thread
p	Bottom spindle
q	Adjustment nut, welded
r	Area
s	Pin of handbrake
t	Seal ring
u	Contact area
v	Screw
w	Guiding slot

Lubricants

<N1> Lubricate with 5g SPHEEROL EPL2 lubricant or equivalent NLGI 2 Grade lubricant.

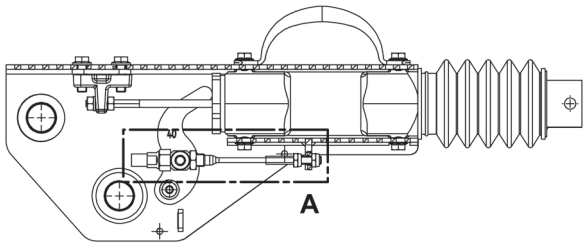
<N2> Using a brush, cloth or plastic sponge, apply a thin, even layer of OPTIMOL OLISTAMOLY 2 lubricant or equivalent MoS2 based high performance grease.

<N3> Using a brush, apply a thin, even layer of SPHEEROL EPL2 or equivalent NLGI 2 Grade lubricant.

Brake cable adjustment for KHD drawbar – SK70008

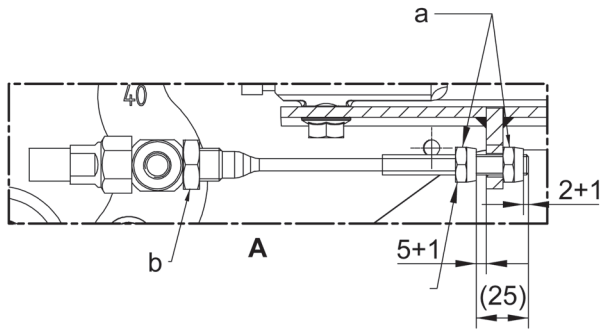
Instructions

1. Adjust drawbar in top position (60°).



Coupling cross-section showing position of detail 'A'

2. Adjust the brake system according to detail 'A'.

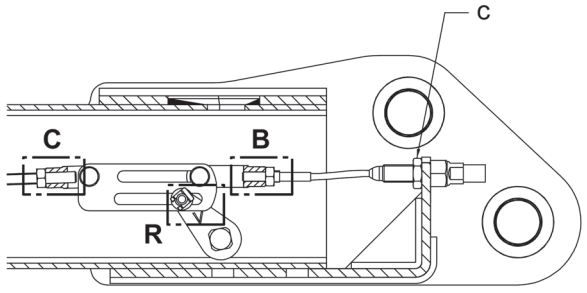


Detail 'A'

a. Fixing nut M10-8 DIN980
ATTENTION: Do NOT lock fixing nuts M10-8 DIN980!

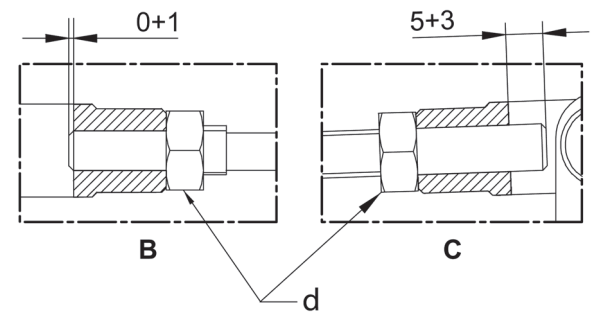
b. Hexagonal head nut M16x1,5 DIN936
Torque 30Nm ± 2Nm

3. Adjust the brake system according to details 'B' and 'C'.



Cross-section showing positions of details 'B', 'C' and 'R'

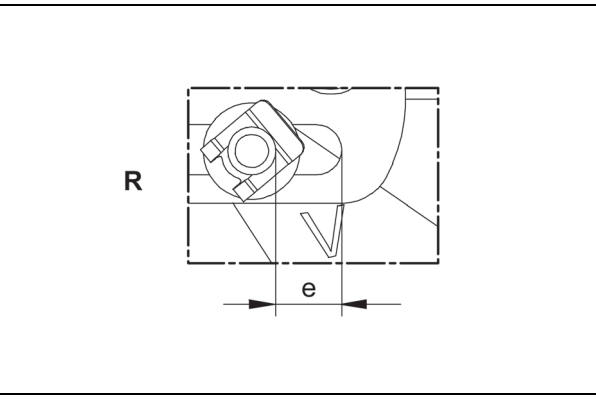
c. Hexagonal head nut M16x1,5 DIN936
Torque 30Nm ± 2Nm



Details 'B' and 'C'

d. Fixing nut M10-8 DIN980
ATTENTION: Do NOT lock fixing nuts M10-8 DIN980!

4. Check the gap in detail 'R'.

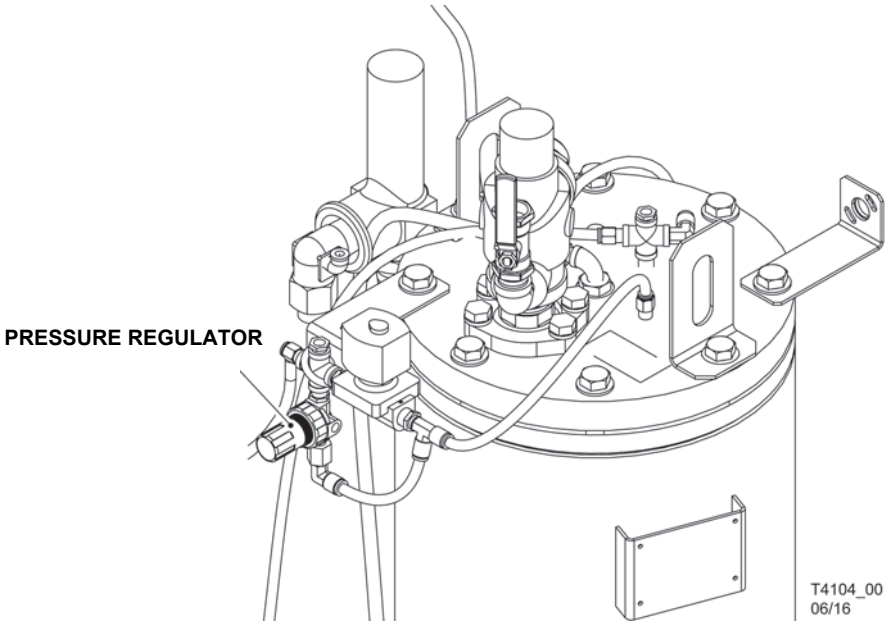


Detail 'R'

5. If gap 'e' is less than 10mm in detail 'R', then adjust the gap in detail 'B' to 0+5mm.

6. If gap 'e' is greater than 28mm in detail 'R', then adjust the gap in detail 'B' to 0-5mm.

Pressure Regulator Adjusting Instructions (for single pressure model 14/84 only)



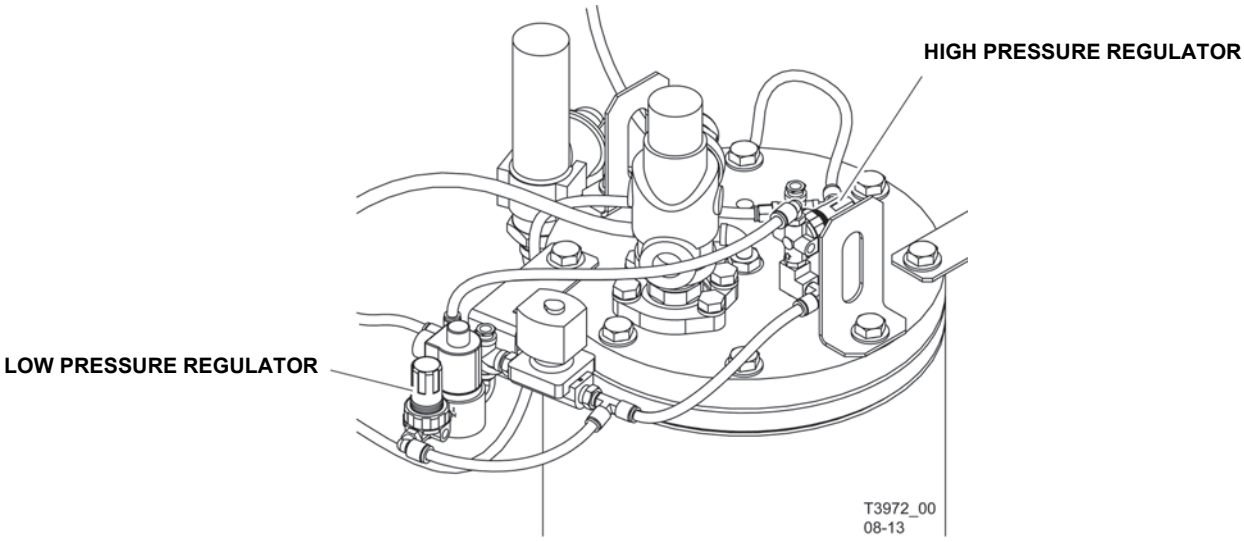
Before Starting

1. At the Pressure Regulator, pull the plastic cap upwards to unlock and turn counter clockwise until tension is relieved. Proceed to turn the cap clockwise one full turn.
2. Close Service Valves.

After Starting Unit

3. Push the Service Air Button on the Control Panel. The unit should speed up and then unload (and drop back to IDLE). With the unit unloaded, turn the adjusting cap on the Pressure Regulator clockwise until the discharge pressure gauge indicates 15,5-15,8 bar. Push the plastic cap downwards to lock.

Pressure Regulator Adjusting Instructions (for dual pressure models 7/124 - 10/104 and 10/124 - 14/114 only)



Before Starting

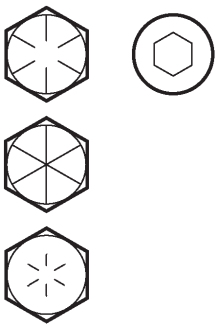
1. At the Low Pressure Regulator, pull the plastic cap upwards to unlock and turn counter clockwise until tension is relieved. Proceed to turn the cap clockwise one full turn.
2. If high pressure regulation needs adjustment, repeat Step 2 at High Pressure Regulator.
3. Close Service Valves.

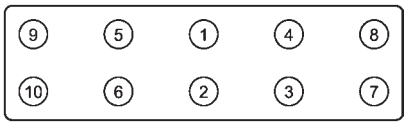
After Starting Unit

4. Push the Service Air Button on the Control Panel. The unit should speed up and then unload (and drop back to IDLE). With the unit unloaded, turn the adjusting cap on the Low Pressure Regulator clockwise until the discharge pressure gauge indicates 8,6-9,0 bar for the 7/124 - 10/104 or 12,1-12,4 bar for the 10/124 - 14/114. Push the plastic cap downwards to lock.
5. To adjust the high pressure regulation, repeat Step 5 on High Pressure Regulator except adjust pressure at idle to 12,1-12,4 bar for the 7/124 - 10/104 or 15,5-15,8 bar for the 10/124 - 14/114 while in High Pressure Mode.

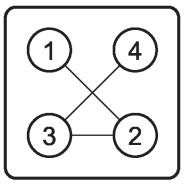
   Note: The High Pressure Regulator must be set at a higher pressure than the Low Pressure Regulator.

TORQUE VALUES

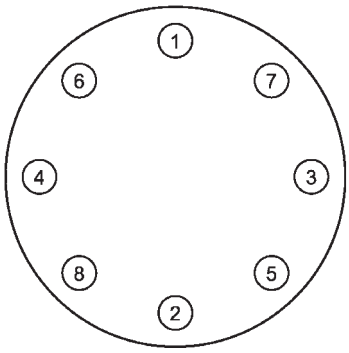
TABLE 1 INCH FASTENERS				
CAPSCREW OR NUT THREAD SIZE AND PITCH	NOMINAL DESIGN TORQUE			
	8AE J249 GRADE 5 (HEAD MARKING) 		8AE J249 GRADE 8 (HEAD MARKING) 	
	(Nm.)	(FT-LBF)	(Nm.)	(FT-LBF)
1/4 - 20	11	8	16	12
5/16 - 18	24	17	33	25
3/8 - 16	42	31	59	44
7/16 - 14	67	49	95	70
1/2 - 13	102	75	144	106
9/16 - 12	148	109	208	154
5/8 - 11	203	150	287	212
3/4 - 10	361	266	509	376



TYPICAL RECTANGULAR TORQUE PATTERN



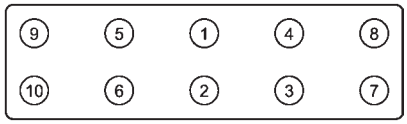
TYPICAL SQUARE TORQUE PATTERN



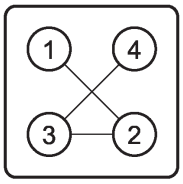
TYPICAL CIRCULAR TORQUE PATTERN

TABLE 2 METRIC FASTENERS

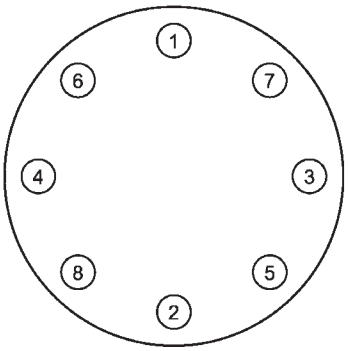
CAPSCREW OR NUT THREAD SIZE AND PITCH	NOMINAL DESIGN TORQUE					
	PROPERTY GRADE 8.8 (HEAD MARKING)		PROPERTY GRADE 10.9 (HEAD MARKING)		PROPERTY GRADE 12.9 (HEAD MARKING)	
	(Nm.)	(FT-LBF)	(Nm.)	(FT-LBF)	(Nm.)	(FT-LBF)
M6 X 1.0	11	8	15	11	18	13
M8 X 1.25	26	19	36	27	43	31
M10 X 1.5	52	38	72	53	84	62
M12 X 1.75	91	67	126	93	147	109
M14 X 2	145	107	200	148	234	173
M16 X 2	226	166	313	231	365	270
M20 X 2.5	441	325	610	450	713	526



TYPICAL RECTANGULAR TORQUE PATTERN



TYPICAL SQUARE TORQUE PATTERN



TYPICAL CIRCULAR TORQUE PATTERN

TABLE 3 WHEEL TORQUE CHART

Wheel Torque Chart - Inch			Wheel Torque Chart - Metric		
1/2” lug nuts	**Torque (Ft-Lbs)**			**Torque (N-m)**	**Torque (ft-Lbs)**
13” Wheel	80-90				
15” Wheel	105-115		M12 Bolts	85-95	62-70
16” Wheel	105-115		M14 Bolts	145-155	107-115
16.5” Wheel	105-115		M16 Bolts	175-185	129-137
5/8” Lug Nuts			M18 Bolts	205-215	151-159
16” Wheel	190-210				
17” Wheel	190-210				
9/16” Clamp nuts/Demountable Wheels					
14.5” Wheel	105-115				

LUBRICATION - GENERAL INFORMATION

Lubrication is an essential part of preventive maintenance, affecting to a great extent the useful life of the compressor. Different lubricants are needed and some components require more frequent lubrication than others. Therefore, it is important that the instructions regarding types of lubricants and the frequency of their application be explicitly followed. Periodic lubrication of the moving parts reduces to a minimum the possibility of mechanical failures.

The Maintenance Schedule shows those items requiring regular service and the interval in which they should be performed. A regular service program should be developed to include all items and fluids. These intervals are based on average operating conditions. In the event of extremely severe (hot, cold, dusty or wet) operating conditions, more frequent lubrication than specified may be necessary.

All filters and filter elements for air and compressor oil must be obtained through Portable Power to assure the proper size and filtration for the compressor.

Compressor Oil Change

These compressors are normally furnished with an initial supply of oil sufficient to allow operation until the first service interval indicated in the Maintenance Schedule. If a compressor has been completely drained of all oil, it must be refilled with new oil before it is placed in operation. Refer to specifications in the Portable Compressor Fluid Chart.

NOTE: Some oil types are incompatible when mixed and result in the formation of varnishes, shellacs, or lacquers which may be insoluble. Such deposits can cause serious troubles including clogging of the filters.

Where possible, do NOT mix oils of different types and avoid mixing different brands. A type or brand change is best made at the time of a complete oil drain and refill.

If the compressor has been operated for the time/hours indicated in the Maintenance Schedule, it should be completely drained of oil. If the compressor has been operated under adverse conditions, or after long periods in storage, an earlier change may be necessary as oil deteriorates with time as well as by operating conditions.

CAUTION: *In most severe applications such as sandblasting, quarry drilling, well drilling, and oil and gas drilling, more frequent service intervals will be required to ensure long component life.*

WARNING: High pressure air can cause severe injury or death from hot oil and flying parts. Always relieve pressure before removing caps, plugs, covers or other parts from pressurised air system. Ensure that the air pressure gauge reads zero (0) pressure and ensure there is no air discharge when opening the manual blowdown valve.

An oil change is good insurance against the accumulation of dirt, sludge, or oxidised oil products.

Completely drain the separator tank, piping, and cooler. If the oil is drained immediately after the compressor has been run for some time, most of the sediment will be in suspension and, therefore, will drain more readily. However, the oil will be hot and care must be taken to avoid contact with the skin or eyes.

After the compressor has been completely drained of all old oil, close the drain valves and/or plugs and install new oil filter elements. Add oil in the specified quantity at the filler plug. Tighten the filler plug and run the compressor to circulate the oil. Check the oil level. DO NOT OVERFILL.

NOTE: Portable Power provides compressor oil specifically formulated for Portable Compressors and requires the use of these fluids in order to obtain extended limited airend warranty.

COMPRESSOR LUBRICATION

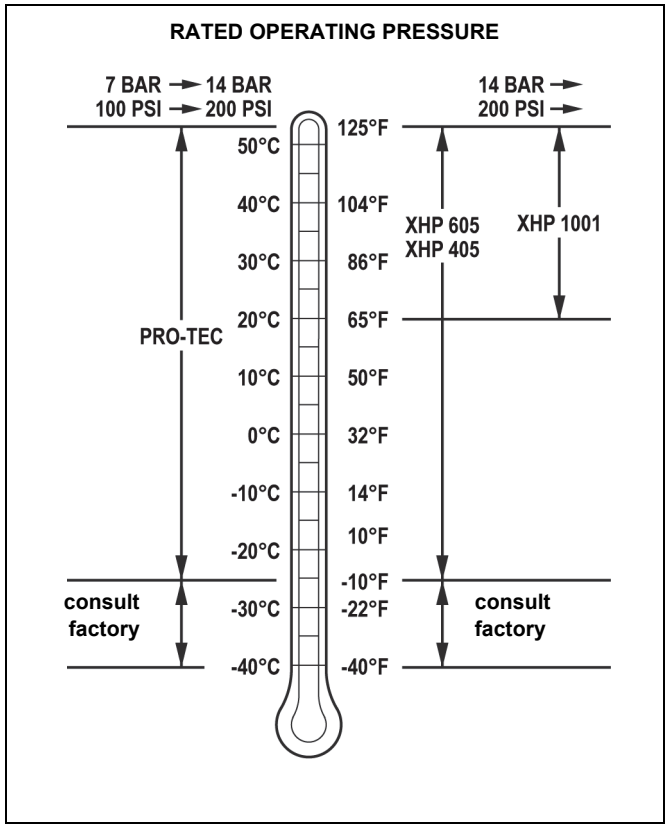
Portable Compressor Fluid Chart

Refer to these charts for correct compressor fluid required. Note that the selection of fluid is dependent on the design operating pressure of the machine and the ambient temperature expected to be encountered before the next oil change.

Note: Fluids listed as "preferred" are required for extended warranty.

Compressor oil carryover (oil consumption) may be greater with the use of alternative fluids.

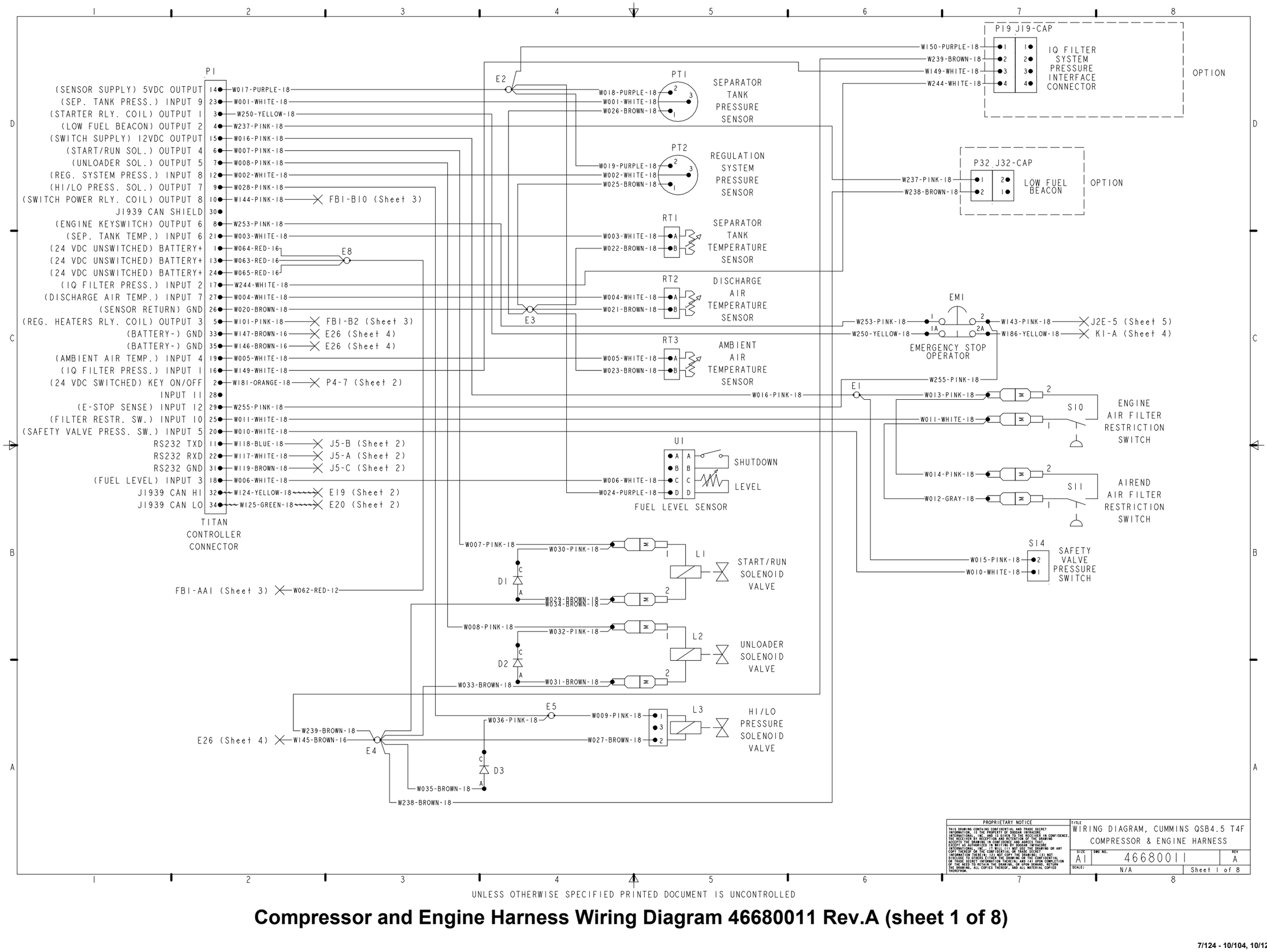
Design operating pressure	Ambient temperature	Compressor oil specification
7 bar to 14 bar (100 psi to 200 psi)	-23°C to 52°C (-10°F to 125°F)	Preferred: **PRO-TEC** Alternate: ISO Viscosity Grade 46 with rust and oxidisation inhibitors, designed for air compressor service.
14 bar and above (200 psi and above)	-23°C to 52°C (-10°F to 125°F)	Preferred: **XHP 605** Alternate: **XHP 405** ISO Viscosity Grade 68 Group 3 or 5 with rust and oxidisation inhibitors, designed for air compressor service.
	18°C to 52°C (65°F to 125°F)	Preferred: **XHP 605** **XHP 1001**



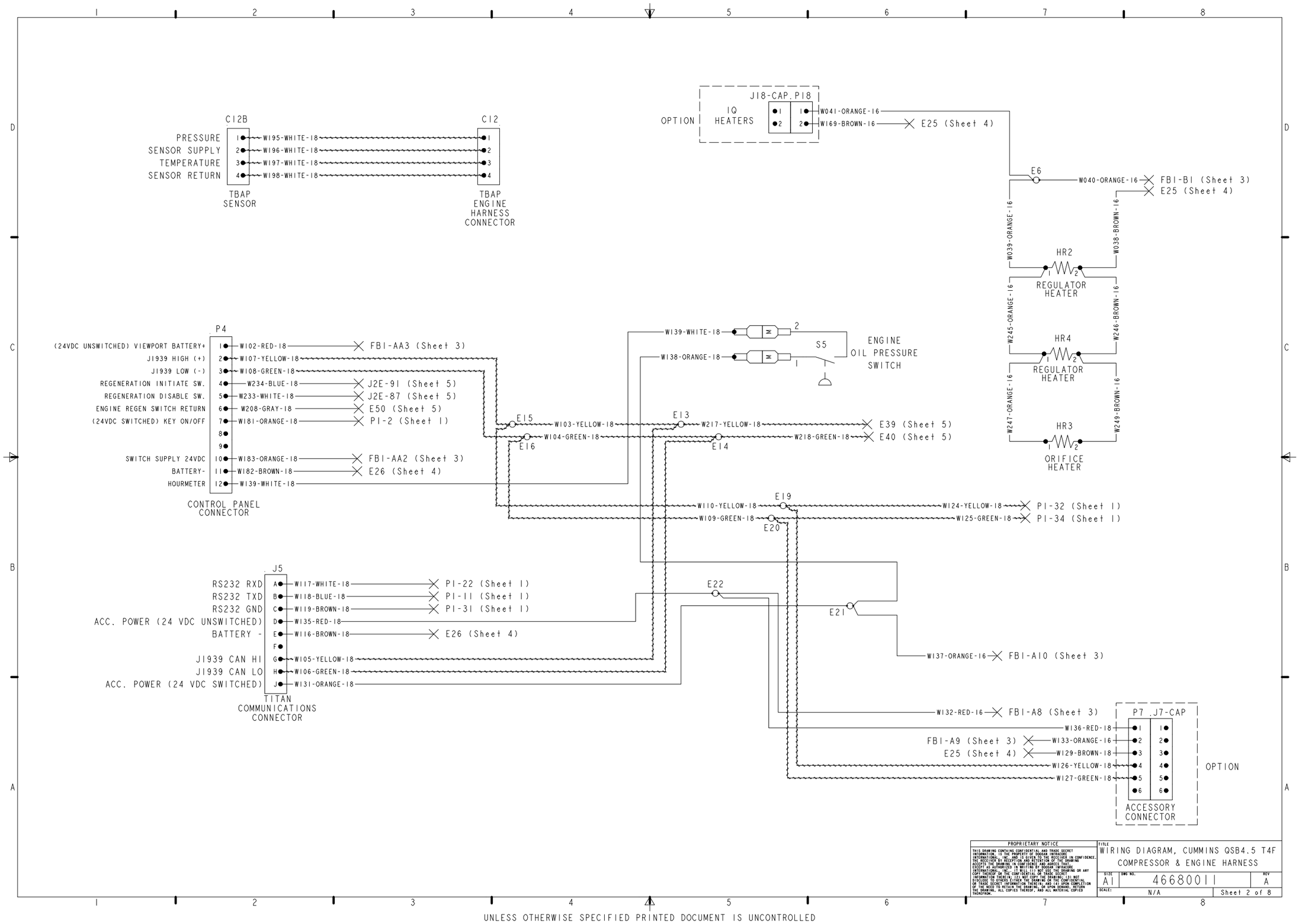
Doosan preferred fluids - the use of these fluids with original Doosan branded filters can extend airend warranty. Refer to operator's manual warranty section for details or contact your Portable Power representative.

Doosan preferred fluids		
PRO-TEC engine oil	46652105 (20.0 Litres)	46652106 (208.0 Litres)
Stage 3B and 4 engine oil	46551222 (20.0 Litres)	46551223 (208.0 Litres)
PRO-TEC compressor oil	89292973 (20.0 Litres)	89292981 (208.0 Litres)
XHP 605 compressor oil	22252076 (19.0 Litres)	22252050 (208.2 Litres)
XHP 1001 compressor oil	-	35300516 (208.2 Litres)
XHP 405 compressor oil	22252126 (19.0 Litres)	22252100 (208.2 Litres)

Note: Stage 3B & Stage 4 engines are required to use CJ-4/ACEA E9 engine oil only, failure to do so will result in engine after treatment damage. Please read the engine manual for more details.



Compressor and Engine Harness Wiring Diagram 46680011 Rev.A (sheet 1 of 8)



Compressor and Engine Harness Wiring Diagram 46680011 Rev.A (sheet 2 of 8)

FUSE/RELAY	DESCRIPTION
FB1-F1	TITAN CONTROLLER
FB1-F2	CONTROL PANEL
FB1-F3	POWER SWITCH SUPPLY
FB1-F4	NOT USED
FB1-F5	REG. / IQ HEATERS
FB1-F6	NOT USED
FB1-F7	NOT USED
FB1-F8	ACCESSORY POWER
FB1-F9	ACC. SWITCHED POWER
FB1-F10	ACC.
FB1-K11	REG. / IQ HEATERS
FB1-K12	NOT USED
FB1-K13	SWITCHED POWER

COMPRESSOR FUSE/RELAY CENTER

FB1

P1-5 (Sheet 1) — W101-PINK-18

E6 (Sheet 2) — W040-ORANGE-16

E26 (Sheet 4) — W057-BROWN-18

P1-10 (Sheet 1) — W144-PINK-18

E26 (Sheet 4) — W055-BROWN-18

W045-ORANGE-14 — E7 — W085-ORANGE-18

W049-RED-14 — BDSI-ON (Sheet 4)

F1 10A — W062-RED-12 — E8 (Sheet 1)

F2 10A — W052-RED-12 — BDSI-ON (Sheet 4)

F3 15A — W183-ORANGE-18 — P4-10 (Sheet 2)

W053-ORANGE-18

W102-RED-18 — P4-1 (Sheet 2)

W067-RED-18 — BDSI-ON (Sheet 4)

F5 10A — W042-RED-16 — BDSI-ON (Sheet 4)

W044-RED-16

F8 10A — W051-RED-16 — BDSI-ON (Sheet 4)

W132-RED-16 — E22 (Sheet 2)

F9 10A — W046-ORANGE-16

W133-ORANGE-16 — P7-2 (Sheet 2)

F10 15A — W047-ORANGE-16

W137-ORANGE-16 — E21 (Sheet 2)

ENGINE FUSE/RELAY CENTER

FB2

FUSE/RELAY	DESCRIPTION
FB2-F21	ENGINE ECM
FB2-F22	ENGINE COMMS
FB2-F23	DEF SYSTEM
FB2-F24	DEF SUPPLY MODULE
FB2-F25	DEF LINE HEATERS
FB2-F26	NOT USED
FB2-F27	NOT USED
FB2-F28	NOT USED
FB2-F29	NOT USED
FB2-F30	NOT USED
FB2-K21	DEF SUPPLY MODULE
FB2-K22	DEF LINE HEATERS
FB2-K23	ECM POWER-ON RELAY

W090-GRAY-18

W079-RED-18

W092-WHITE-18

W069-ORANGE-18

W089-WHITE-18

W080-RED-16

W093-DARK BLUE-16

W068-ORANGE-18

E26 (Sheet 4) — W091-BROWN-18

W091-BROWN-18

W081-RED-10

W082-RED-10

W069-ORANGE-18

F21 30A — W081-RED-10

W100-RED-10 — BDSI-BATT (Sheet 4)

F22 10A — W114-RED-18 — J5A-B (Sheet 5)

W084-RED-18 — BDSI-ON (Sheet 4)

F23 10A — W098-ORANGE-14 — E71 (Sheet 6)

W097-ORANGE-14 — E36 (Sheet 5)

F24 10A — W079-RED-18

W099-RED-18 — BDSI-ON (Sheet 4)

F25 10A — W080-RED-16

W187-RED-16 — BDSI-ON (Sheet 4)

W085-ORANGE-18 — D9

E12 — W087-GRAY-18 — W086-GRAY-18 — D8 — W083-GRAY-18 — J2E-83 (Sheet 5)

W088-GRAY-18

W089-WHITE-18 — J2E-3 (Sheet 5)

W090-GRAY-18 — J2E-7 (Sheet 5)

W092-WHITE-18 — J26E-5 (Sheet 5)

W093-DARK BLUE-16 — E41 (Sheet 6)

W082-RED-10 — E36 (Sheet 5)

W068-ORANGE-18 — E36 (Sheet 5)

W069-ORANGE-18 — E36 (Sheet 5)

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TITLE: WIRING DIAG., CUMMINS QSB4.5 T4F COMPRESSOR & ENGINE HARNESS

SIZE A1 | DWG NO. 46680011 | REV A

SCALE: N/A | Sheet 3 of 8

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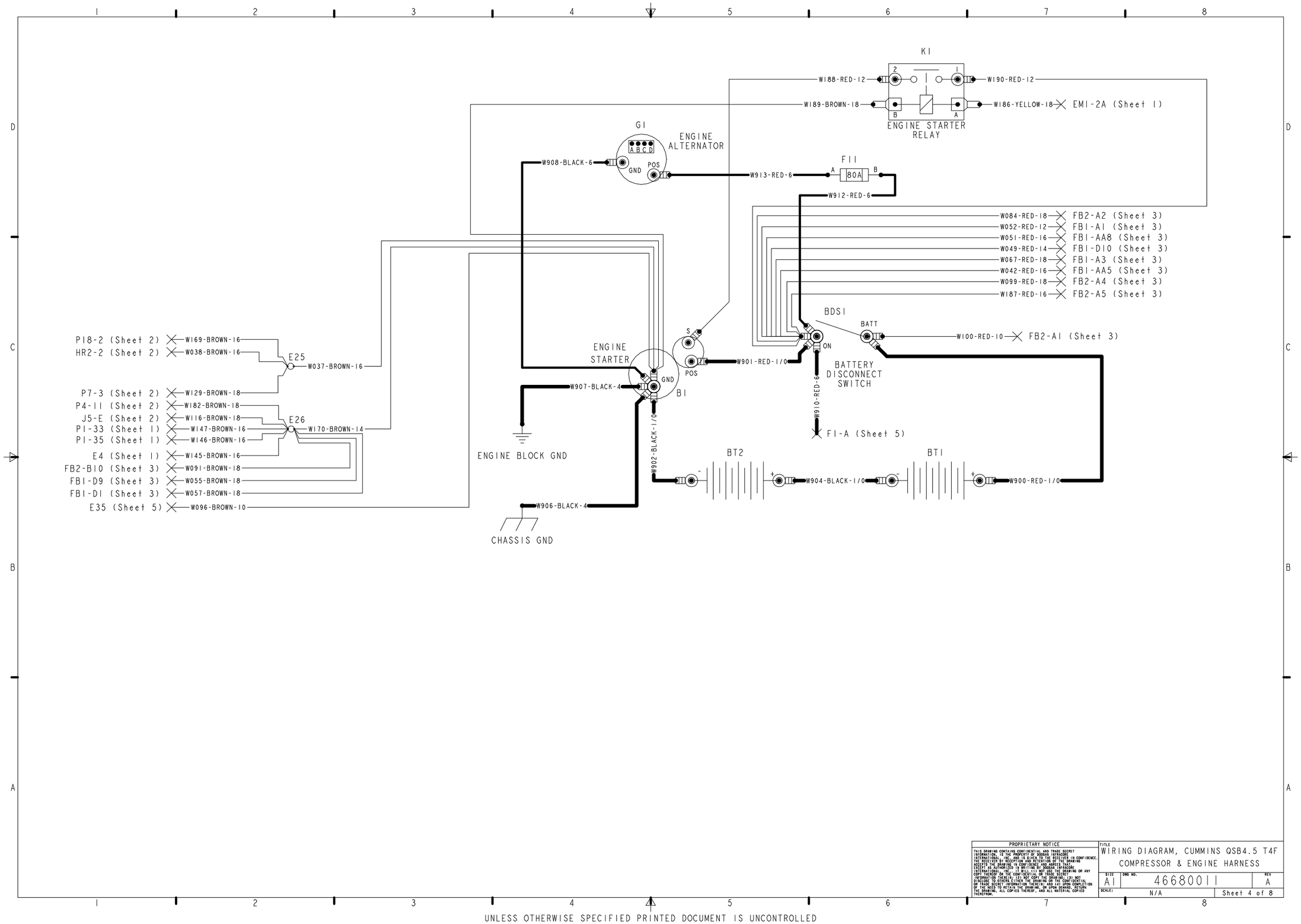
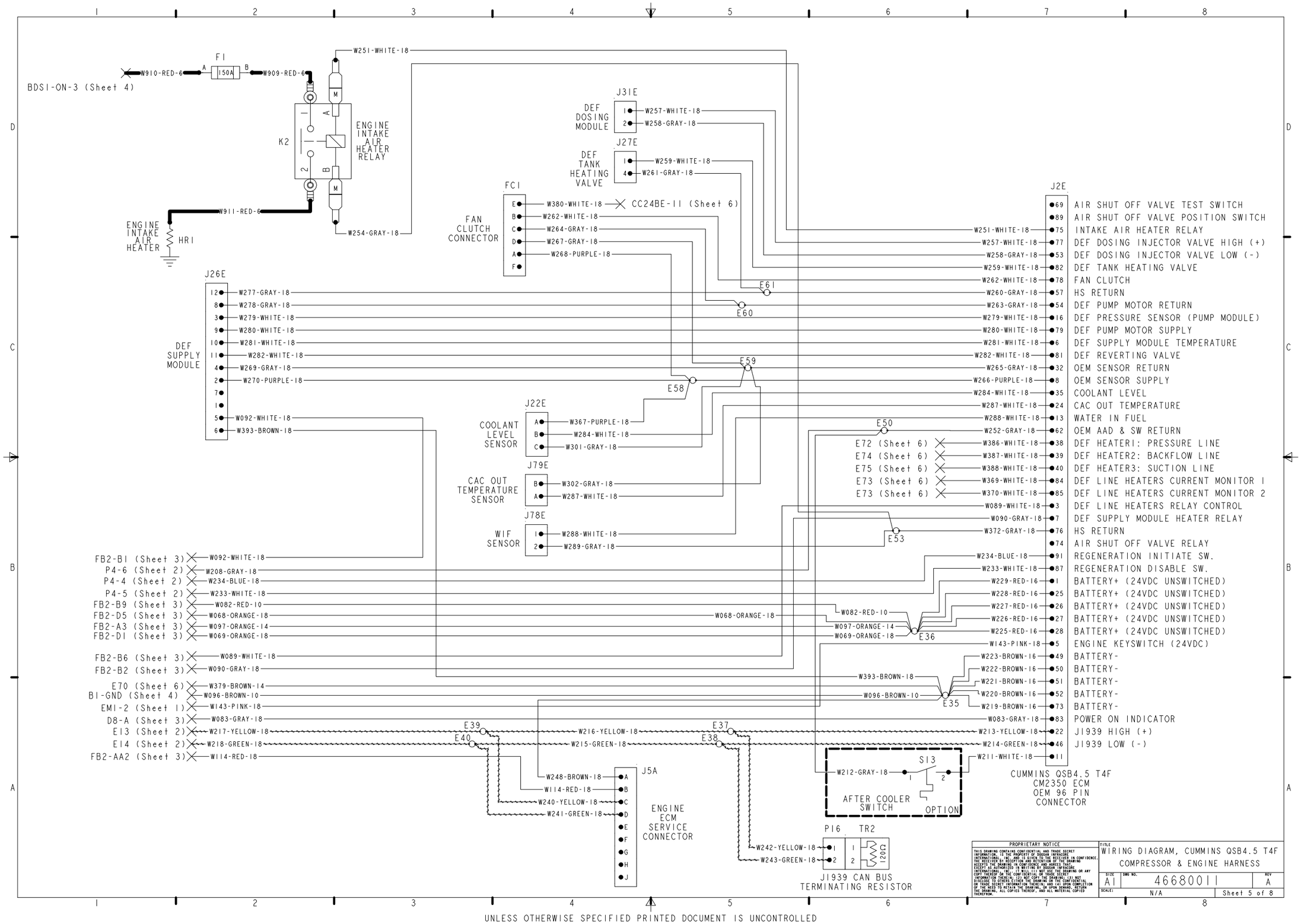
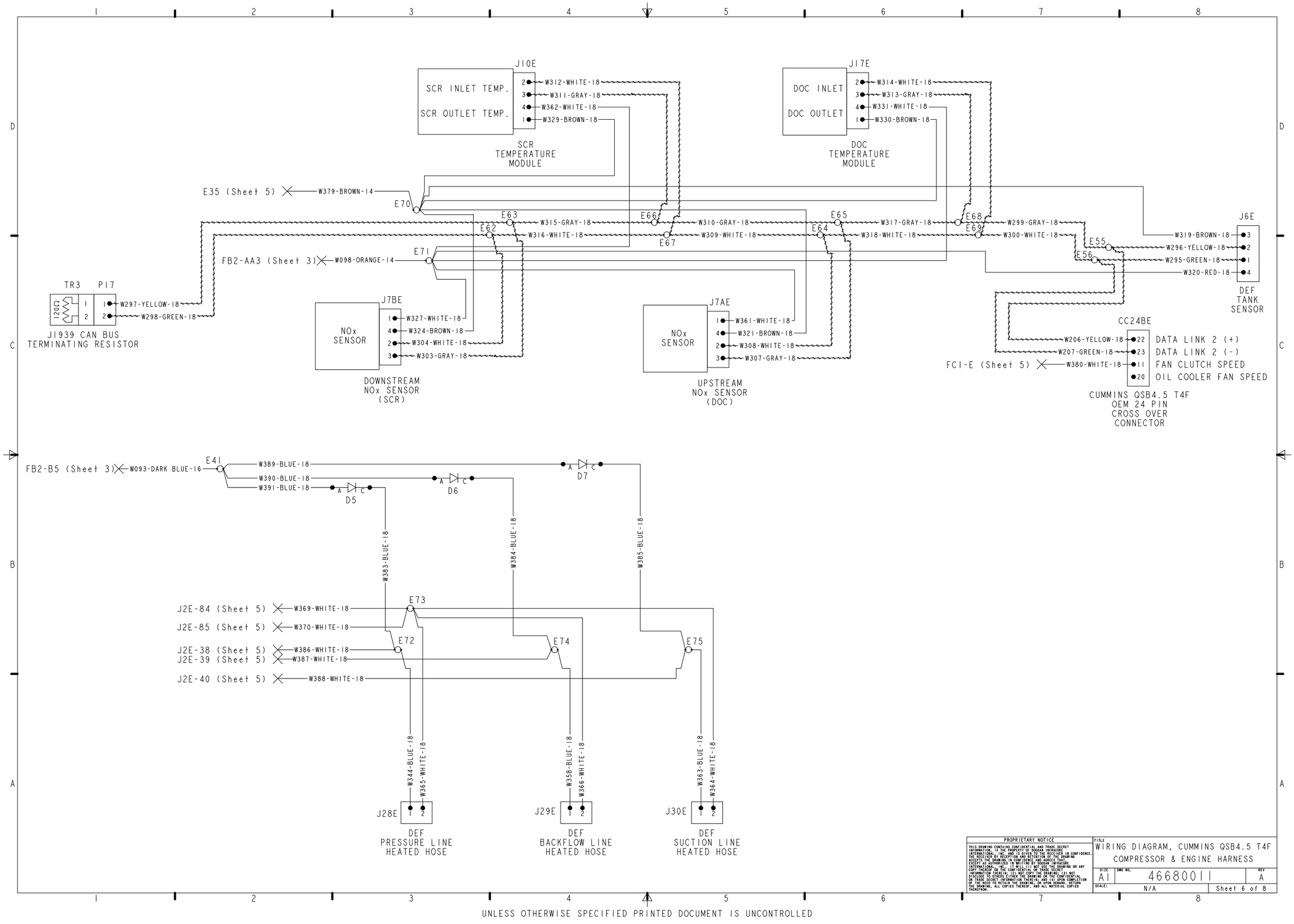
Compressor and Engine Harness Wiring Diagram 46680011 Rev.A (sheet 3 of 8)



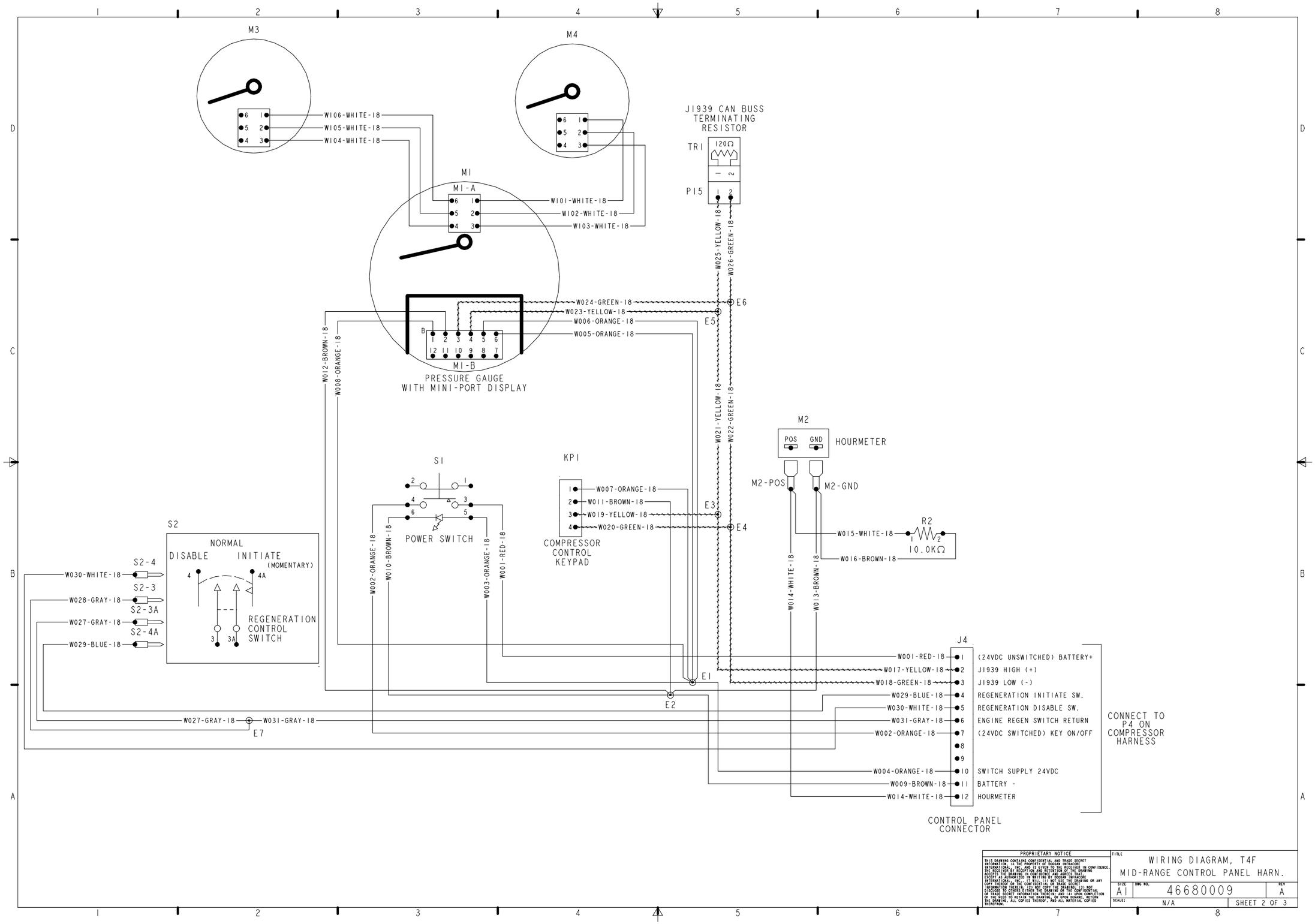
Compressor and Engine Harness Wiring Diagram 46680011 Rev.A (sheet 4 of 8)



Compressor and Engine Harness Wiring Diagram 46680011 Rev.A (sheet 5 of 8)



Compressor and Engine Harness Wiring Diagram 46680011 Rev.A (sheet 6 of 8)



Control Panel Harness Wiring Diagram 46680009 Rev.A (sheet 2 of 3)

DOOSAN

Portable Power

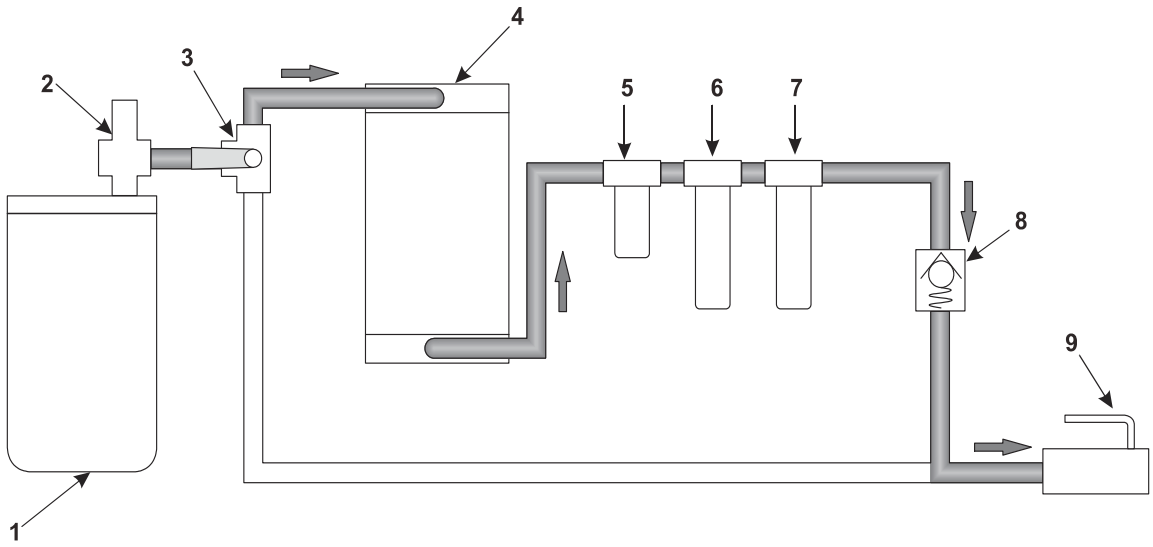
FAULT	CAUSE	REMEDY
1. Compressor has stopped unexpectedly	*Out of fuel.*	Add clean fuel.
	Compressor oil temperature too high.	See Fault #6.
	Engine coolant temperature too high.	Check coolant level. If low, add coolant. See Fault #3.
	Engine oil pressure too low.	See Fault #4.
	Loose or broken belts.	Tighten or replace belt set.
	Loose wire connection.	Check wires at switches and connectors to find loose connection. Make repairs. See Electronic Service Manual.
	Low fuel level fault.	If adequate fuel in the tank, check fuel level sender device. Replace if determined faulty. See Electronic Service Manual.
	Defective sensor.	Identify and check sensor. Replace if necessary. See Electronic Service Manual.
	Malfunctioning relay.	Identify and check relay. Replace if necessary. See Electronic Service Manual.
	Blown fuse.	Identify and replace fuse. See Electronic Service Manual.
	Engine malfunctioning.	See troubleshooting in Engine manual.
	Airend malfunctioning.	See Fault #6.
2. Compressor won't start or run	*Battery disconnect switch off.*	Check switch position and operation. Check switch position and operation.
	Emergency stop pushed.	Check emergency stop switch position and operation.
	Low battery voltage.	Check battery condition; recharge if necessary. Check electrolyte level; add if necessary. Check cable connections; clean and tighten as needed.
	Blown fuse.	Identify and replace fuse. See Electronic Service Manual.
	Malfunctioning main power switch.	Check switch. Replace if necessary. See Electronic Service Manual.
	Clogged fuel filters.	Service fuel filters. See Engine manual.
	Out of fuel.	Add clean fuel.
	Compressor oil temperature too high.	See Fault #6.
	Engine coolant temperature too high.	Check coolant level. If low, add coolant. See Fault #3.
	Engine oil pressure too low.	See Fault #4.
	Loose wire connection.	Check wires at switches and connectors to find loose connection. Make repairs. See Electronic Service Manual.
	Defective sensor.	Identify and check sensor. Replace if necessary. See Electronic Service Manual.
	Malfunctioning relay.	Identify and check relay. Replace if necessary. See Electronic Service Manual.
	Engine malfunctioning.	See troubleshooting in Engine manual.
	Airend malfunctioning.	See Fault #6.

FAULT	CAUSE	REMEDY
3. High engine Coolant Temperature	*Low coolant level.*	Check coolant level. If low, add coolant.
	Loose or broken belts.	Tighten or replace belt set.
	Ambient temperature above rated ambient temperature range.	Operate in cooler environment.
	Dirty operating conditions.	Move compressor to cleaner environment.
	Dirty cooler(s).	Clean exterior of cooler(s).
	Compressor tilted beyond out-of-level operating limit.	Reposition or relocate compressor to be more level.
	Operating pressure too high.	Reduce pressure to rated operating pressure.
	Recirculation of cooling air.	Close enclosure doors. Close and secure access panels. Check for loose or missing belly pans.
	Loose wire connection.	Check wires at switches and connectors to find loose connection. Make repairs. See Electronic Service Manual.
4. Low Engine Oil Pressure	*Low engine oil level.*	Check oil level. If low, add oil.
	Compressor tilted beyond out-of-level operating limit.	Reposition or relocate compressor to be more level.
	Wrong engine oil.	Change engine oil. Review engine oil specification.
	Clogged engine oil filter.	Replace engine oil filter.
	Engine malfunctioning.	See troubleshooting in Engine manual.
	Loose wire connection.	Check wires at switches and connectors to find loose connection. Make repairs. See Electronic Service Manual.
5. Low electrical system voltage	*Loose or broken belts.*	Tighten or replace belt set.
	Loose wire connection.	Check wires at switches and connectors to find loose connection. Make repairs. See Electronic Service Manual.
	Low battery voltage.	Check battery condition; recharge if necessary. Check electrolyte level; add if necessary. Check cable connections; clean and tighten as needed.
	Malfunctioning alternator.	Repair or replace alternator.
6. High compressor oil temperature	*Ambient temperature above rated ambient temperature range.*	Operate in cooler environment.
	Compressor tilted beyond out-of-level operating limit.	Reposition or relocate compressor to be more level.
	Low compressor oil level.	Add compressor oil. Look for and repair any leaks.
	Wrong compressor oil.	Change compressor oil. Review compressor oil specification.
	Dirty cooler(s).	Clean exterior of cooler(s).
	Dirty operating conditions.	Move compressor to cleaner environment.
	Clogged compressor oil filter(s).	Replace compressor oil filter(s) and change compressor oil.
	Loose or broken belts.	Tighten or replace belt set.
	Operating pressure too high.	Reduce pressure to rated operating pressure.
	Recirculation of cooling air.	Close enclosure doors. Close and secure access panels. Check for loose or missing belly pans.
	Malfunctioning compressor oil thermostat.	Replace thermostat element in conventional bypass valve, if equipped.
	Loose or broken belts.	Tighten or replace belt set.
	Malfunctioning oil cooler pressure relief valve.	Replace valve.
	Malfunctioning minimum pressure valve.	Repair or replace valve.
	Blocked or restricted oil lines.	Clean by flushing, or replace lines.
	Airend malfunctioning.	See Faults #11, #12.

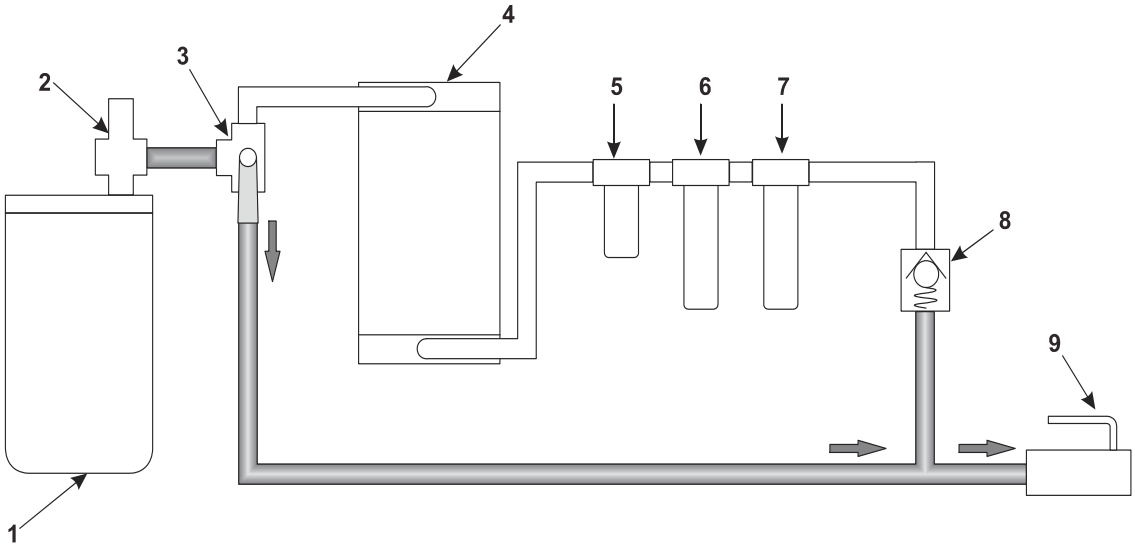
FAULT	CAUSE	REMEDY
7. Low engine speed	*Clogged fuel filters.*	Service fuel filters. See Engine manual. Drain and clean fuel tanks. Add clean fuel.
	Operating pressure too high.	Reduce pressure to rated operating pressure.
	Clogged air filter element(s).	Clean or replace air filter element(s).
	Wrong air filter element(s).	Install correct air filter element(s).
	Engine malfunctioning.	See troubleshooting in Engine manual.
	Airend malfunctioning.	See Faults #11, #12.
8. Excessive vibration	*Rubber mounting isolators loose or damaged.*	Tighten or replace.
	Defective or imbalanced fan.	Replace fan.
	Defective airend drive coupling.	Replace coupling.
	Engine malfunctioning.	See troubleshooting in Engine manual.
	Airend malfunctioning.	See Faults #7, #11, #12.
	Engine idle speed too low.	See Fault #7. See Engine manual.
9. Low air delivery / low cfm	*Clogged air filter element(s).*	Clean or replace air filter element(s).
	Incorrect pressure regulation adjustment.	Make adjustments per this manual.
	Malfunctioning inlet unloader / butterfly valve.	Inspect valve. Make adjustments per this manual.
	Wrong air filter element(s).	Install correct air filter element(s).
	Low engine speed.	See Fault #7. See Engine manual.
	Compressed air leaks.	Locate and repair leaks.
10. Short air filter life	*Dirty operating conditions.*	Move compressor to cleaner environment.
	Wrong air filter element(s).	Install correct air filter element(s).
	Inadequate air filter element cleaning.	Install new air filter element(s).
	Incorrect stopping procedure.	Comply with procedure in this manual.
11. Compressor will not unload	*Malfunctioning inlet unloader / butterfly valve.*	Inspect valve. Make adjustments per this manual.
	Malfunctioning pressure regulator.	Check pressure regulator. Check regulation lines for leaks.
	Ice in regulation lines and/or regulation orifice.	Apply heat to lines and/or orifice. Check operation of DC electric heaters, if equipped.
	Load solenoid leak or malfunction.	Replace load solenoid.
	Plugged vent leak.	Clean and/or replace.
12. Safety valve opens	*Operating pressure too high.*	Reduce pressure to rated operating pressure.
	Malfunctioning inlet unloader / butterfly valve.	Inspect valve. Make adjustments per this manual.
	Defective safety valve.	Replace safety valve.
	Compressor will not unload fast enough.	Check pressure regulator. Check regulation lines for leaks.
	Ice in regulation lines and/or regulation orifice.	Apply heat to lines and/or orifice. Check operation of DC electric heaters, if equipped.
13. Excessive carryover (compressor oil in the compressed air)	*Blocked separator scavenge line.*	Check scavenge line, drop tube, and orifice. Clean and replace as needed.
	Deteriorated separator element.	Replace separator element.
	Separator tank pressure too low.	Check the minimum pressure valve. Repair or replace as necessary.

OPTION - IQ SYSTEM

IQ System Active



Standard Operation (IQ System Bypassed)



KEY

1	Separator Tank	**6**	Primary IQ Filter
2	Minimum Pressure Valve	**7**	Secondary IQ FIlter
3	3 Way Selector Valve	**8**	Check Valve
4	Aftercooler	**9**	Service Valve
5	Water Separator		

IQ SYSTEM

The IQ System is a complete, self-contained system which provides cooler, cleaner air than from a standard portable compressor. The system utilises an integral aftercooler, high-efficiency filtration, and a patented condensate disposal system to provide the cool, clean air. The condensate disposal system injects all liquid condensed from the moisture separator and filters into the engine exhaust system where it is vaporised by heat. This eliminates the need for collecting the condensate, and the added cost of disposing of the condensate, which is often regulated by local regulations.

Ensure that the compressed air temperature always remains above freezing temperatures (typically 7°C (45°F)) at any ambient temperature down to -23°C (-20°F). This prevents the need for heat tracing systems, or any manual adjustment to prevent freezing of the compressed air system. All drain points for the condensate handling system are heated with 24VDC heaters, which are integral to the compressor heater system.

Standard Non-Louvred configuration not to be operated below freezing.

IQ SYSTEM OPERATING INSTRUCTIONS - 2

The compressed air exits the separator tank through the top cover piping, and can then travel along one of two paths, selectable via manual valving.

One path allows Standard Operation, which bypasses the IQ System, and delivers air quality equivalent to a standard oil-flooded portable compressor. If the IQ System is enabled by proper setting of the selector valve, the compressed air first enters the aftercooler.

The aftercooler is cooled by the incoming compressor package air. The compressed air and condensate (water with a small amount of compressor lubricant) exits the aftercooler and enters the moisture separator, where most of the condensate is removed. The aerosol oil is removed down to approximately 0.01 ppm and all particulates are removed down to 0.01 micron.

At the bottom of the moisture separator and both filters are strainers and constant-bleed orifices, which are sized to allow the maximum flow of condensate while minimising compressed air loss.

The condensate lines are then piped together, and the condensate is injected at a single point into the engine exhaust piping. The compressed air then travels through the minimum pressure valve, and out through the service air valve. The air pressure gauge on the instrument panel indicates the pressure inside the separator tank. A service air pressure gauge is located inside the front door of the compressor on the filter support.

If the IQ System is bypassed (Standard Operation selected), the delivered air pressure will be approximately equal to the separator tank pressure. If the IQ System operation is selected, the delivered air pressure will be slightly less, depending on the restriction of the filters.

MAINTENANCE

Daily Maintenance:

Verify, during full load (maximum compressed air delivery) operation, the IQ System filter restriction is not excessive. Filter restriction can be checked at the control panel. The compressor will shutdown if restriction exceeds recommended values.

Weekly Maintenance:

- Remove Y-strainer screens at the bottom of the moisture separator and both filters and clean out any residue.
- Verify that the orifices below the Y-strainers are not clogged.
- Verify that the piping from the orifice purge points to the exhaust system is not clogged.

Yearly Maintenance:

The normal maintenance interval on the primary and secondary IQ System filters is one year, or earlier if pressure drop becomes excessive. The compressor will shut down if restriction exceeds recommended values.

FILTER REPLACEMENT

- With engine stopped, ensure pressure is relieved from air system.
- Remove all wires and hoses connected to drains on bottom of each filter housing. Inspect fittings and hoses for any blockage. Clean if necessary.
- Using a chain wrench or similar tool, loosen the housing. The housing should be removed by hand after loosening, taking care to prevent the housing from falling to the floor panel.
- Lower the housing to floor panel and lean it against the airend. Remove and replace the filter element, being careful not to damage outer wrap.

Verify the part number of new element vs. old element, as the two IQ filters are of different media.

PRIMARY AND SECONDARY FILTER MAINTENANCE

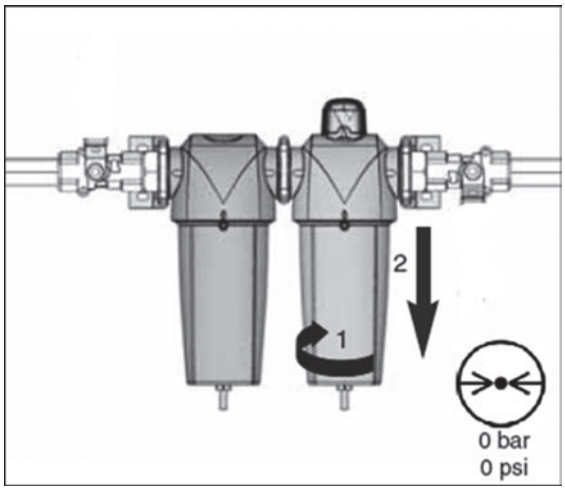
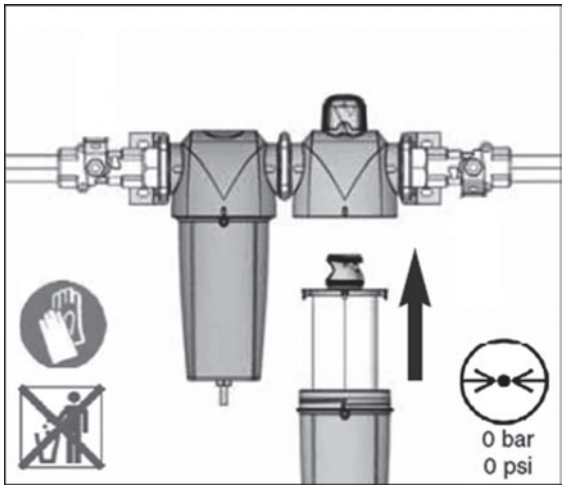


FIGURE 1.



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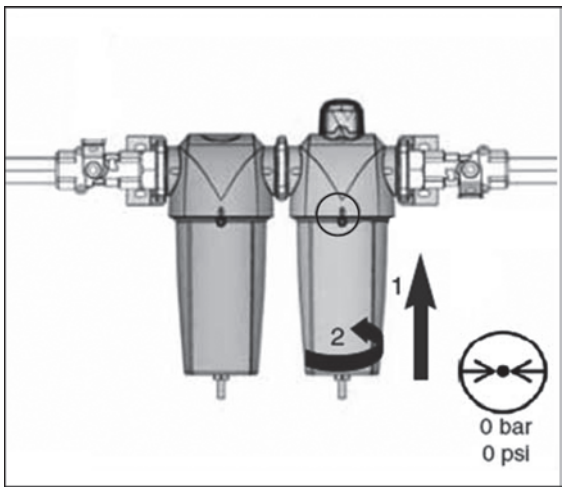
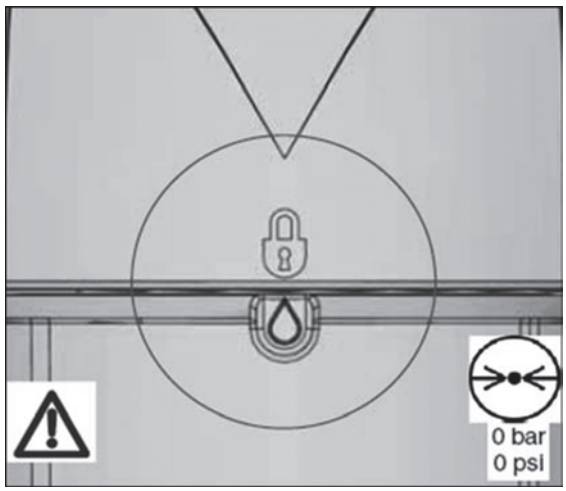


FIGURE 3.



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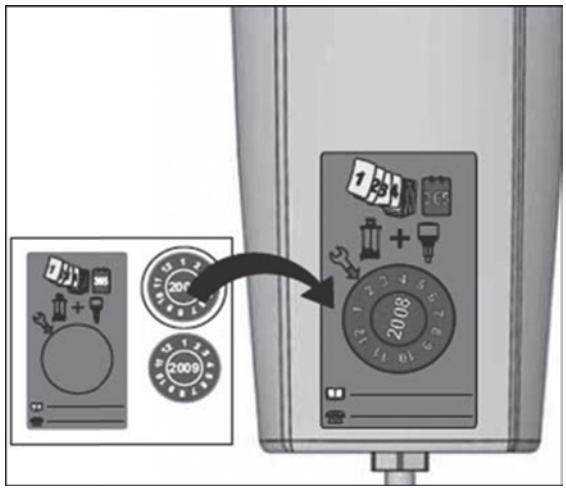
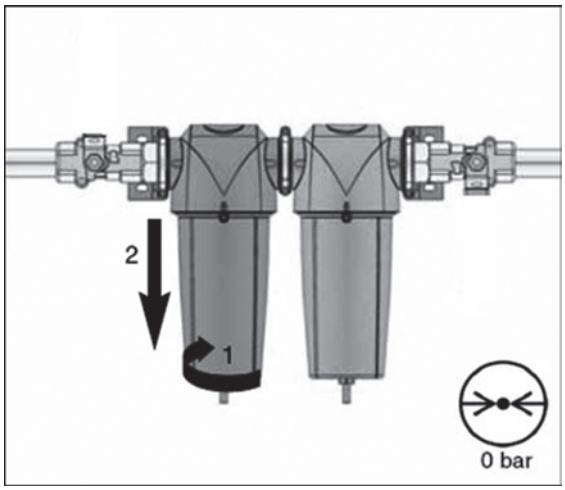


FIGURE 5.

WATER SEPARATOR MAINTENANCE



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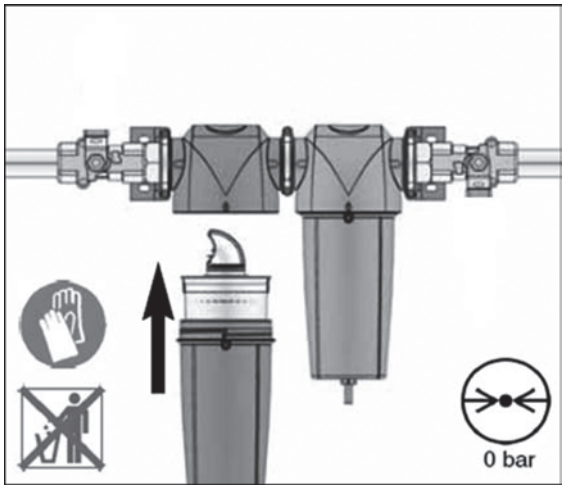


FIGURE 2.

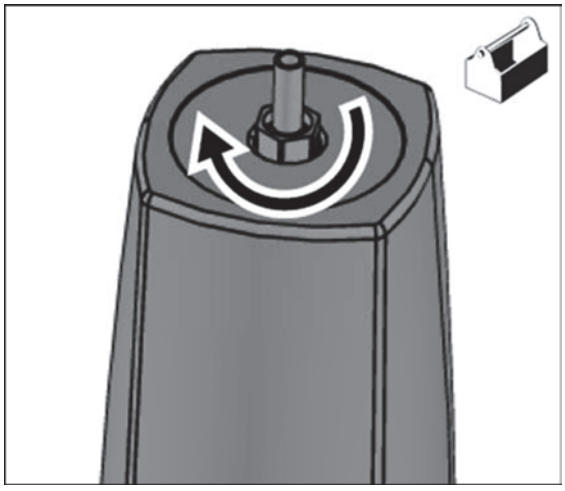
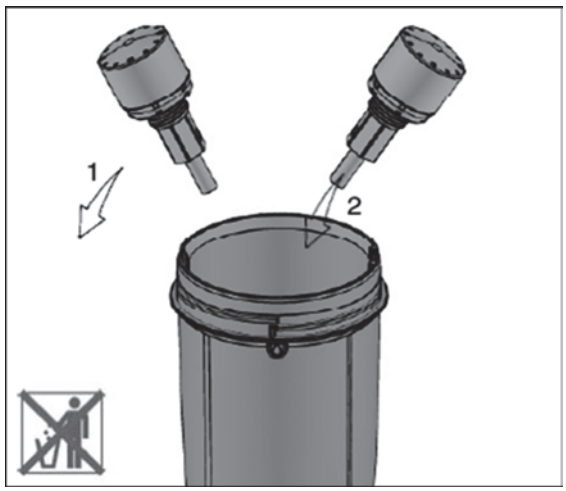


FIGURE 3.



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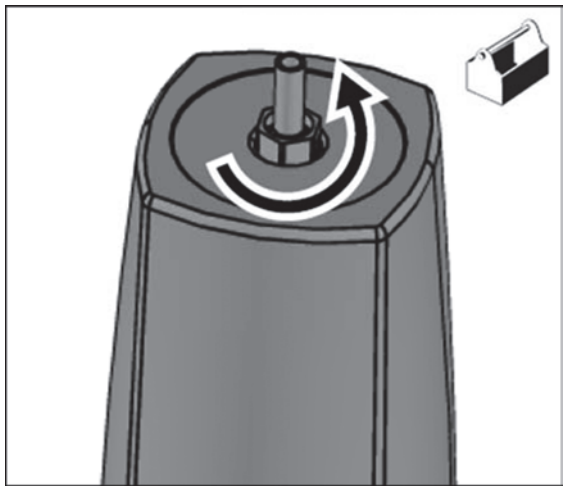
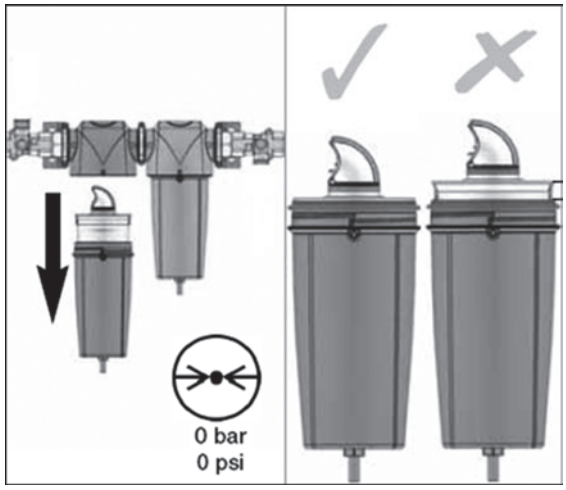


FIGURE 5.



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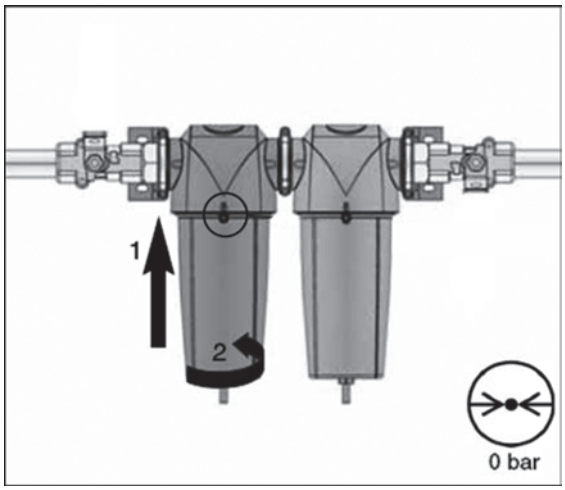


FIGURE 7.

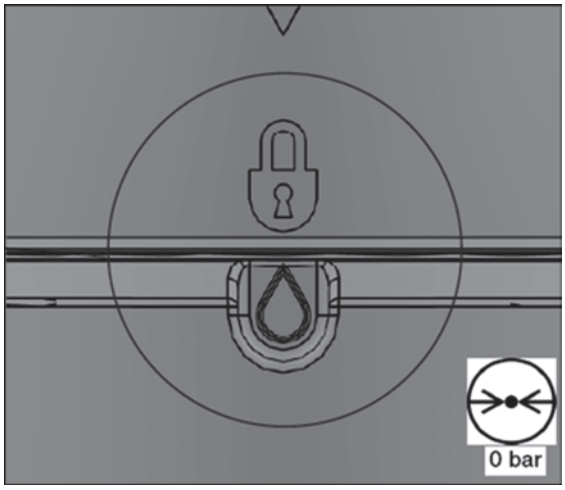
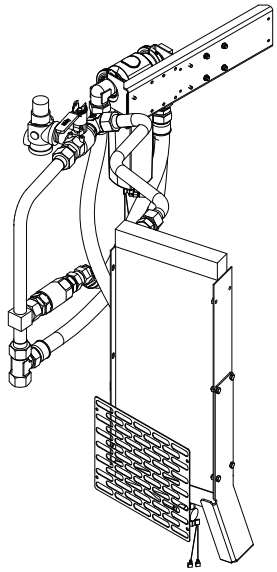


FIGURE 8.

SAFETY

CAUTION: *The compressor regulation system is adjusted to maintain regulated pressure at the separator tank. DO NOT adjust regulation to provide full regulation pressure at the service valve when the IQ System is enabled. This will result in operation at excessive horsepower levels, causing overheating, reduced engine life, and reduced airend life.*
CAUTION: *Excessively restricted filter elements may cause an increase in the amount of aerosol water and oil carryover, which could result in damage to downstream equipment. Normal service intervals should not be exceeded.*
CAUTION: *Blockage of the condensate will result in flooding of the vessels. If flooding occurs, excessive condensate may enter the air stream and could result in damage to downstream equipment.*
NOTE: Do not operate at temperatures less that 2°C (35°F).

OPTION - AFTERCOOLER AND WATER SEPARATOR



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DESCRIPTION

The compressed air exits the separator tank through the top cover piping, and will then travel into the aftercooler inlet side.

The aftercooler is cooled by the incoming compressor package air.

The compressed air and condensate (water with a small amount of compressor lubricant) exits the aftercooler and enters the moisture separator, where most of the condensate is removed.

At the bottom of the moisture separator a strainer and constant-bleed orifice is fitted, which are sized to allow the maximum flow of condensate while minimising compressed air loss.

A second condensate drain valve is mounted on the aftercooler body, this valve will open on machine shutdown thereby allowing any remaining condensate in the aftercooler to drain. This is to prevent cooler damage at freezing temperatures.

These drains are plugged through the compressor frame and will expel condensation to atmosphere. Should site contamination by this condensate be prohibited, the user can connect an additional section of drain hose and route into an allowed drain point.

MAINTENANCE

Daily Maintenance:

Verify, during full-load (maximum compressed air delivery) that condensate can be seen to drain from the water separator drain hose.

Weekly Maintenance:

- Verify that the piping from the orifice purge points are not clogged.
- Clean the inside of the water separator housing.

Water separator maintenance:

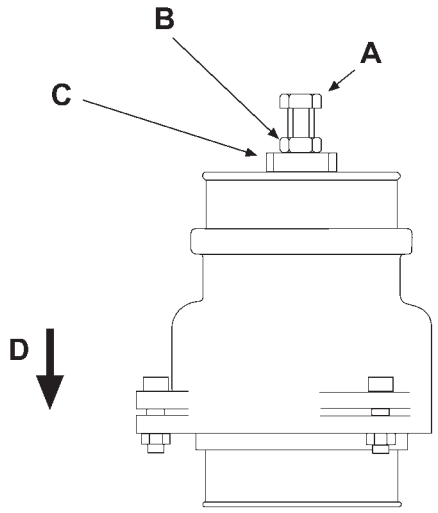
- With engine stopped, ensure pressure is relieved from air system.
- Remove any hose connected to the water separator housing. Inspect fittings and hoses for any blockage. Clean if necessary.
- Remove and clean the water separator float.

OPTION - CHALWYN VALVE (Air intake shutdown valve)

DESCRIPTION

Chalwyn valves provide emergency overspeed shutdown protection for diesel engines and are the most effective way of preventing a runaway situation. The valves completely block the engine air intake system, cutting off an uncontrolled external fuel source and the air required to keep the engine running.

OPERATING INSTRUCTIONS



A Adjuster

B Locknut

C Hold with spanner when adjusting

D Air flow

Once the Chalwyn valve is installed, adjustment of the overspeed trip setting is carried out using the adjuster and locknut (refer to diagram). Basically rotating the adjuster clockwise will increase the engine speed at which automatic shut down occurs.

1. Start engine. Slowly accelerate. Note speed at which shut down occurs.
2. Remove hose at air inlet to Chalwyn valve to expose the adjuster and locknut (see diagram).
3. Release locknut. Turn adjuster clockwise one turn. Tighten locknut.
4. Refit inlet hose to Chalwyn valve.
5. Start engine. Slowly accelerate. Note speed at which shut down occurs.
6. Repeat the above steps '2' to '5' until the first setting at which the engine does not shut down at high idle speed (i.e. maximum throttle, no load).

Then either:

a) Use the results of shut down speed versus adjuster setting as a calibration check to make a final adjustment to give the required setting (typically 10% to 15% over high idle).

or

b) If a very precise setting is not required, turn the adjuster a further one turn clockwise to take the shutdown above high idle speed by a suitable margin. When using this setting procedure it may be found that the engine occasionally shuts down during the normal operation. If so, turn the adjuster clockwise by a further one half turn.

7. Ensure the adjuster locknut is fully tightened.
   (Use a thread lock adhesive on the locknut threads).

NOTES:
Turbocharged Engines - When setting up a valve on a turbocharged engine using the preceding method, it may be found that at high power outputs, the engine will shut down at a lower speed than required. If this occurs, further small adjustments in steps of one half turn clockwise should be made until the problem is eliminated.

Jammed Valve - If in the course of adjusting the valve it jams on its seat, release by turning CLOCKWISE viewed from adjuster end of valve.

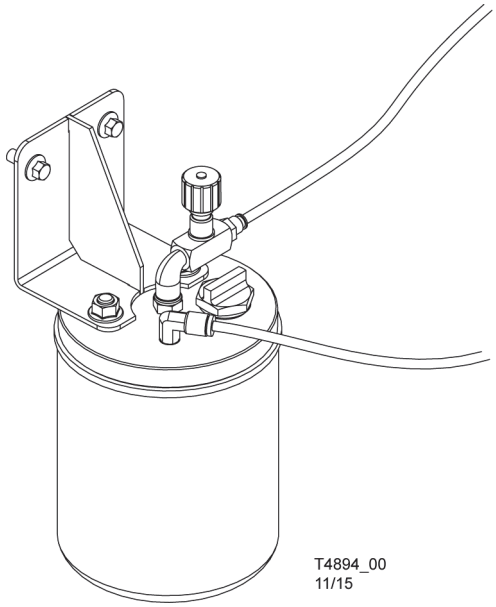
MAINTENANCE

Three monthly

1. Disconnect intake pipework and release the valve from any support brackets etc. to allow it to be removed.
2. Inspect the valve internally for cleanliness. If necessary, clean in paraffin or white spirit taking normal precautions. Dry the valve thoroughly.
3. Check there is no excessive wear and that the valve moves smoothly over its complete operating stroke. DO NOT LUBRICATE.
4. Refit valve. Check valve setting based on the 'Adjustment' instructions given herein.

NOTE: The three monthly routine maintenance period requirement is dependent on the operating conditions to which the equipment is exposed and, by experience, may need to be varied.

OPTION - LUBRICATOR



DESCRIPTION

The internal air line lubricator is used to release a lubricant into the internal compressed air piping before it exits the compressor, from there the air/oil mixture will flow to the compressed air operated appliance; one that requires an external source of pneumatic oil for proper operation.

SAFETY

WARNING: Ensure that the lubricator filler cap is re-tightened correctly after replenishing with oil.

WARNING: Do not replenish the lubricator oil, or service the lubricator without first making sure that the machine is stopped and the system has been completely relieved of all air pressure (Refer to STOPPING THE UNIT in the OPERATING INSTRUCTIONS section of this manual).

CAUTION: *If the nylon tubes to the lubricator are disconnected then ensure that each tube is re-connected in its original location.*

GENERAL INFORMATION

Oil capacity: 2 litres

Oil specification: *Refer to the Tool Manufacturer's Manual.*

OPERATING INSTRUCTIONS

COMMISSIONING

Check the lubricator oil level and fill as necessary.

PRIOR TO STARTING

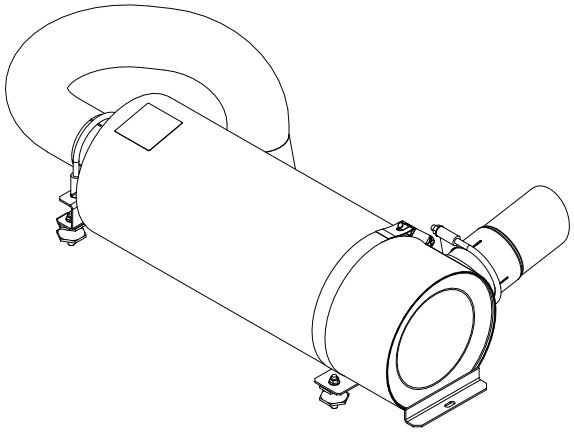
Check the lubricator oil level and replenish as necessary.

MAINTENANCE

Check the lubricator oil level and replenish as necessary.

FAULT FINDING

OPTION - SPARK ARRESTOR



T6361_00

DESCRIPTION

Diesel Engine exhaust spark arrestors are a key safety feature for both hazardous area and lower risk diesel engine applications where a stray spark may cause ignition of combustible material. Virtually all legislation regarding the operation of a diesel engine in a hazardous area includes a mandatory requirement to fit a tested and approved exhaust spark arrestor.

MAINTENANCE

Daily:

Examine the spark arrestor for any sign of gas leakage, cracks or significant areas of damage, i.e. dents of more than a few millimetres in depth.

Three Monthly:

Remove spark arrestor. Tap with a soft mallet to loosen any internal deposits and shake out. Also by shaking check for any loose internal baffles.

Six Monthly (or 1500 hours operation, whichever is sooner):

Examine the exhaust discharge in darkness whilst repeatedly loading and accelerating the engine. If any sparks are observed, the spark arrestor is not suitable for further use.

WARNING: Ensure adequate ventilation if this check is carried out in an enclosed area.

WARNING: The engine must not be put back into service until any problems identified by the above checks are rectified.

OPTION - ECO Mode

ECO Mode option reduces fuel consumption when the compressor is idling. Fuel savings are achieved by lowering the idling speed and simultaneously reducing the air pressure in the separator. The service air circuit is separated from the separator, so there is no reduction in service pressure during ECO Mode activation.

Activation of the ECO Modus occurs automatically after a short idle period. The air pressure in the separator starts gradually decreasing from the maximum value to the set relief pressure level, which ensures lubrication of the compressor and at the same time reduces the standard idling speed to the minimum possible level that the compressor permits.

If the air starts to be drawn and the service air pressure drops below 35% of the maximum pressure recorded during standard idling, the machine enters the normal operating mode. Engine speed increases to rated engine speed and the compressor starts supplying the maximum amount of air.

ECO Mode can independently evaluate when fuel economy is not occurring (repeated short-time transition between ECO Mode and standard operating mode) and ECO Mode is automatically deactivated. The machine automatically checks the fuel economy via ECO Mode.

ECO Mode is not activated if any of the following occurs:

- the coolant temperature is less than 50°C
- engine control unit reports any inducement

100 PARTS ORDERING

GENERAL

This publication, which contains an illustrated parts breakdown, has been prepared as an aid in locating those parts which may be required in the maintenance of the unit. All of the compressor parts, listed in the parts breakdown, are manufactured with the same precision as the original equipment. For the greatest protection always insist on genuine Doosan parts for your compressor.

NOTICE

Doosan can bear no responsibility for injury or damages resulting directly from the use of non-approved repair parts.

Doosan Infracore service facilities and parts are available worldwide.

There are Authorised Distributors or Company Sales offices in principal cities of many countries.

Special order parts may not be included in the manual. Contact Doosan Parts Department with the unit serial number for assistance with these special parts.

DESCRIPTION

The illustrated parts breakdown illustrates and lists the various assemblies, subassemblies and detailed parts which make up this particular machine. This covers the standard models and the more popular options that are available.

A series of illustrations show each part distinctly and in location relative to the other parts in the assembly. The part number, the description of the part and the quantity of parts required are shown on each illustration or on adjacent page. The quantities specified are the number of parts used per one assembly and are not necessarily the total number of parts used in the machine. Where no quantity is specified the quantity is assumed to be one.

Each description of a part is based upon the “noun first” method, i.e., the identifying noun or item name is always the first part of the description. The noun name is generally followed by a single descriptive modifier. The descriptive modifier may be followed by words or abbreviations such as upper, lower, inner, outer, front, rear, RH, LH, etc. when they are essential.

In referring to the rear, the front or to either side of the unit, always consider the **drawbar end** of the unit as the **front**. Standing at the rear of the unit facing the drawbar (front) will determine the right and left sides.

FASTENERS

Both SAE/inch, ISO/metric hardware have been used in the design and assembly of these units. In the disassembly and reassembly of parts, extreme care must be taken to avoid damaging threads by the use of wrong fasteners. In order to clarify the proper usage and for exact replacement parts, all standard fasteners have been identified by part number, size and description. This will enable a customer to obtain fasteners locally rather than ordering from the factory. These parts are identified in tables that will be found at the rear of the parts illustrations. Any fastener that has not been identified by both part number and size is a specially engineered part that must be ordered by part number to obtain the exact replacement part.

MARKINGS AND DECALS

NOTICE

Do not paint over safety warnings or instructional decals. If safety warning decals become illegible, immediately order replacements from the factory.

Part numbers for original individual decals and their mounting locations are shown within Parts List Section. These are available as long as a particular model is in production.

HOW TO USE PARTS LIST

a. Turn to Parts List.

b. Locate the area or system of the compressor in which the desired part is used and find illustration page number.

c. Locate the desired part on the illustration by visual identification and make note of part number and description.

HOW TO ORDER

The satisfactory ordering of parts by a purchaser is greatly dependent upon the proper use of all available information. By supplying your nearest sales office, autonomous company or authorised distributor, with complete information, you will enable them to fill your order correctly and to avoid any unnecessary delays.

In order that all avoidable errors may be eliminated, the following instructions are offered as a guide to the purchaser when ordering replacement parts:

a. Always specify the model number of the unit as shown on the general data decal attached to the unit.

b. Always specify the serial number of the unit. THIS IS IMPORTANT. The serial number of the unit will be found stamped on a plate attached to the unit. (The serial number on the unit is also permanently stamped in the metal of the frame side rail.)

c. Always specify the number of the parts list publication.

d. Always specify the quantity of parts required.

e. Always specify the part number, as well as the description of the part, or parts, exactly as it is given on the parts list illustration.

In the event parts are being returned to your nearest sales office, autonomous company or authorised distributor, for inspection or repair, it is important to include the serial number of the unit from which the parts were removed.

TERMS AND CONDITIONS ON PARTS ORDERS

Acceptance: Acceptance of an offer is expressly limited to the exact terms contained herein. If purchaser's order form is used for acceptance of an offer, it is expressly understood and agreed that the terms and conditions of such order form shall not apply unless expressly agreed to by Doosan Company (“Company”) in writing. No additional or contrary terms will be binding upon the Company unless expressly agreed to in writing.

Taxes: Any tax or other governmental charge now or hereafter levied upon the production, sale, use or shipment of material and equipment ordered or sold is not included in the Company's price and will be charged to and paid for by the Purchaser.

Shipping dates shall be extended for delays due to acts of God, acts of Purchaser, acts of Government, fires, floods, strikes, riot, war, embargo, transportation shortages, delay or default on the part of the Company's vendors, or any other cause beyond the Company's reasonable control.

Should Purchaser request special shipping instruction, such as exclusive use of shipping facilities, including air freight when common carrier has been quoted and before change order to purchase order can be received by the Company, the additional charges will be honoured by the Purchaser.

Warranty: The Company warrants that parts manufactured by it will be as specified and will be free from defects in materials and workmanship. The Company's liability under this warranty shall be limited to the repair or replacement of any part which was defective at the time of shipment provided Purchaser notifies the Company of any such defect promptly upon discovery, but in no event later than three (3) months from the date of shipment of such part by the Company. The only exception to the previous statement is the extended warranty as it applies to the special airend exchange program.

Repairs and replacements shall be made by the Company F.O.B. point of shipment. The Company shall not be responsible for costs of transportation, removal or installation.

Warranties applicable to material and equipment supplied by the Company but wholly manufactured by others shall be limited to the warranties extended to the Company by the manufacturer which are able to be conveyed to the Purchaser.

Delivery: Shipping dates are approximate. The Company will use best efforts to ship by the dates specified; however, the Company shall not be liable for any delay or failure in the estimated delivery or shipment of material and equipment or for any damages suffered by reason thereof.

The company makes no other warranty or representation of any kind whatsoever, expressed or implied, except that of title, and all implied warranties, including any warranty of merchantability and fitness for a particular purpose, are hereby disclaimed.

Limitation of Liability:

The remedies of the Purchaser set forth herein are exclusive, and the total liability of the Company with respect to this order whether based on contract, warranty, negligence, indemnity, strict liability or otherwise, shall not exceed the purchase price of the part upon which such liability is based.

The Company shall in no event be liable to the Purchaser, any successors in interest or any beneficiary of this order for any consequential, incidental, indirect, special or punitive damages arising out of this order or any breach thereof, or any defect in, or failure of, or malfunction of the parts hereunder, whether based upon loss of use, lost profits or revenue, interest, lost goodwill, work stoppage, impairment of other goods, loss by reason of shutdown or non-operation, increased expenses of operation or claims of customers of Purchaser for service interruption whether or not such loss or damage is based on contract, warranty, negligence, indemnity, strict liability or otherwise.

AIREND EXCHANGE PROGRAM

Doosan offers an airend exchange program to benefit portable compressor users.

Your nearest sales office, autonomous company or authorised distributor must first contact the Parts Service Department at the factory at which your portable air compressor was manufactured for further instructions.

For parts, service or information regarding your local distributor (Europe, Middle East, Africa) please contact:

Facility:

Doosan Bobcat EMEA s.r.o. (DBEM),

U Kodetky 1810, 263 12 Dobris,

Czech Republic

Website:

www.doosanportablepower.eu

Portable Power

Portable Power

Doosan Bobcat EMEA s.r.o
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263 12 Dobříš
Czech Republic