avro GSE

TITAN PT350 | *Tow Truck*

User Manual

Titan PT350 – User Manual

Published in Canada by Avro GSE ™ Limited.

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SECTION I: INTRODUCTION

Purpose

The purpose of this manual is to detail the effective operation and maintenance of the AVRO GSE PT350 Pushback Tractor. This is intended to ensure long service life of the vehicle.

Relevant technical and equipment information are included in this manual, as well as maintenance instructions.

This manual is not intended to serve as a textbook for teaching the basic skills required to drive the vehicle, or to carry out mechanical operations. It is assumed that the personnel employed in carrying out the various duties applicable to the vehicle have the necessary basic skills for their tasks.

Scope

This guide covers the following topics regarding the PT350 Pushback Tractor:

- General Information
- Operations and Controls
- Tractor Maintenance
- Hydraulic System
- Electrical System and Circuits

Audience

This manual is intended for authorized operator of the AVRO GSE PT350 Pushback Tractor responsible for driving and maintaining the vehicle.

SECTION II: GENERAL INFORMATION

General Description

The PT350 Pushback Tractor is an essential piece of ground support equipment (GSE) which connects to the nose landing gear of an aircraft via a specifically designed tow bar allowing the movement of aircraft to intended locations on the ground.

The manual is divided into 4 major parts. These are respectively:

GENERAL, OPERATION, MAINTENANCE and SPARE PARTS.

GENERAL INFORMATION – this part provides the basic information on the operation and maintenance of the tractor.

OPERATION – this part is divided into sections that explain the function and operation of the controls and instrumentation incorporated in the vehicle.

MAINTENANCE – this part of the manual is divided into sections, which apply to all parts and systems incorporated in the tractor with procedures laid down for the maintenance operations that must be carried out on the vehicle. This includes a Lubrication Schedule.

SPARE PARTS – this part of the manual provides the parts lists and details not related to any of the major components such as engine, transmission and axles as they have their own sections within this manual.

The major components of the vehicle, such as the Engine, Transmission, Axles and Brakes are not manufactured by AVRO GSE but are supplied by reputable manufacturers who are leaders in their respective fields.

For the Operation, Maintenance and Overhaul of these components, the manufacturers own publications are included in this manual. Where modifications have been made to these components for usage in this vehicle, the Procedure and Descriptions detailed by the manufacturers in their publications are not applicable. For these modifications the appropriate Descriptions and Procedures are included in the company's part of the manual. These procedures must be complied with in all cases.

Should any further requirements for information or procedures beyond which are described in this manual, please contact the AVRO GSE through the following:

Head Office:
Avro GSE
865 Prospect Ave.
Oxbow, Saskatchewan
Canada S0C 2B0

Main:
1 833 220 2810

General Inquiries:
info@avrogse.com

Parts Inquiries:
parts@avrogse.com

Service Inquiries:
service@avrogse.com

www.avrogse.com

Warranty

Warranty of this Pushback Tractor is 36 months from date of commissioning (unless otherwise stated in contract). The following clauses are excluded.

Failure to exchange or replace consumable parts during normal running of the vehicle could lead to major breakdown or failure. These are, but not limited to, brake pads, filters, lubricants, light bulbs, relays, fuses, wiper blades, and tires.

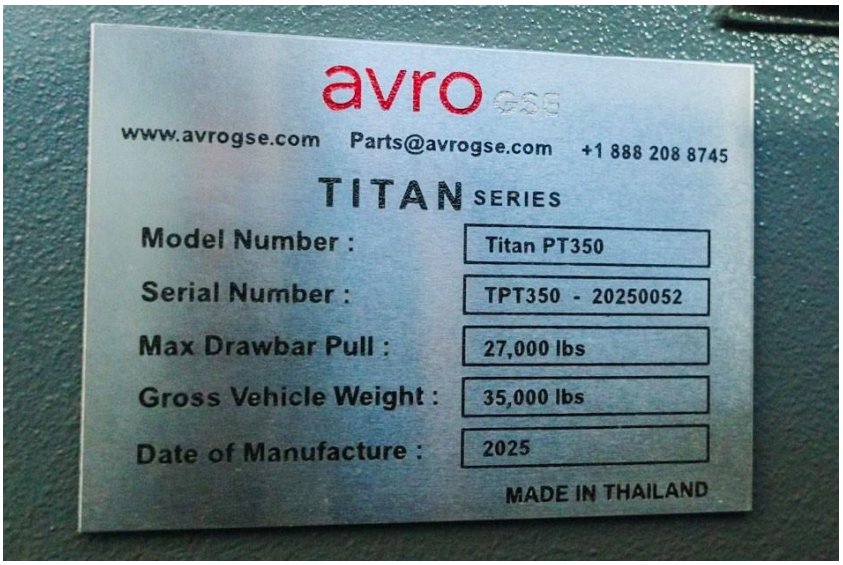
Failure to do Preventative maintenance at OEM recommended time or less such as oil changes, greasing, filter replacements, brake adjustment, fuel system and fuel condition etc.

Any modification to Pushback/ Tow Tractor without prior approval from AVRO GSE will with immediate effect make all warranties pertaining to this vehicle null and void.

If it is deemed that the part or tractor has been abused, warranty will be null and void.

Serial Plates

These allow major components to be easily identified for the order of parts and identification of the tractor make model and year of manufacture.



The tractor serial plate showing all relevant information is located on the right-hand side of the cabin, on the front of the electrical cabinet.

Safety Precaution Symbols

Read and understand this manual thoroughly before using the equipment to ensure safe and proper use. Failure to follow the instructions may result in damage or injury.

	WARNING Explains something that, if not obeyed, could cause death or injury to people.
	NOTICE Explains something that, if not obeyed, could cause damage to or a malfunction in the equipment.
	DO NOT Means “Do not”, “Do not do this” or “Do not let this happen”
	IMPORTANT NOTE Helpful information
	PART/S INVOLVED Contains information about the part/s.

Warning To Drivers and Maintenance Operators

	• This tractor can be hazardous in the hands of untrained or complacent Drivers/Operators. • Incorrect / Inappropriate operation of this PUSH OUT TRACTOR may cause injury to the Driver/Operator or other personnel. Including damage to the PUSH OUT TRACTOR OR OTHER EQUIPMENT INCLUDING AIRCRAFT IN ITS IMMEDIATE VACINITY. • The Driver/Operator must have other operating personnel and ground staff clearly within his field of view, with the Driver/Operator facing the direction of travel. • Never disconnect or remove any Safety Device or operate any tractor where Safety Devices have been disconnected or removed. • Prior to entering any wheel arch, ensure that the ignition is in the “OFF” position with the key removed and that the battery isolator is turned off and key is removed, the wheels may move without notice, thereby trapping person(s) between a wheel and chassis of the vehicle, causing severe injury or death.
	• A trained careful Driver or Operator is always the best insurance against accidents. Give complete and undivided attention to the job on hand. • Do not operate this tractor or any part thereof, which has loose, worn or broken parts. • Do not overload this tractor beyond its designed capabilities.

During Periods of Maintenance

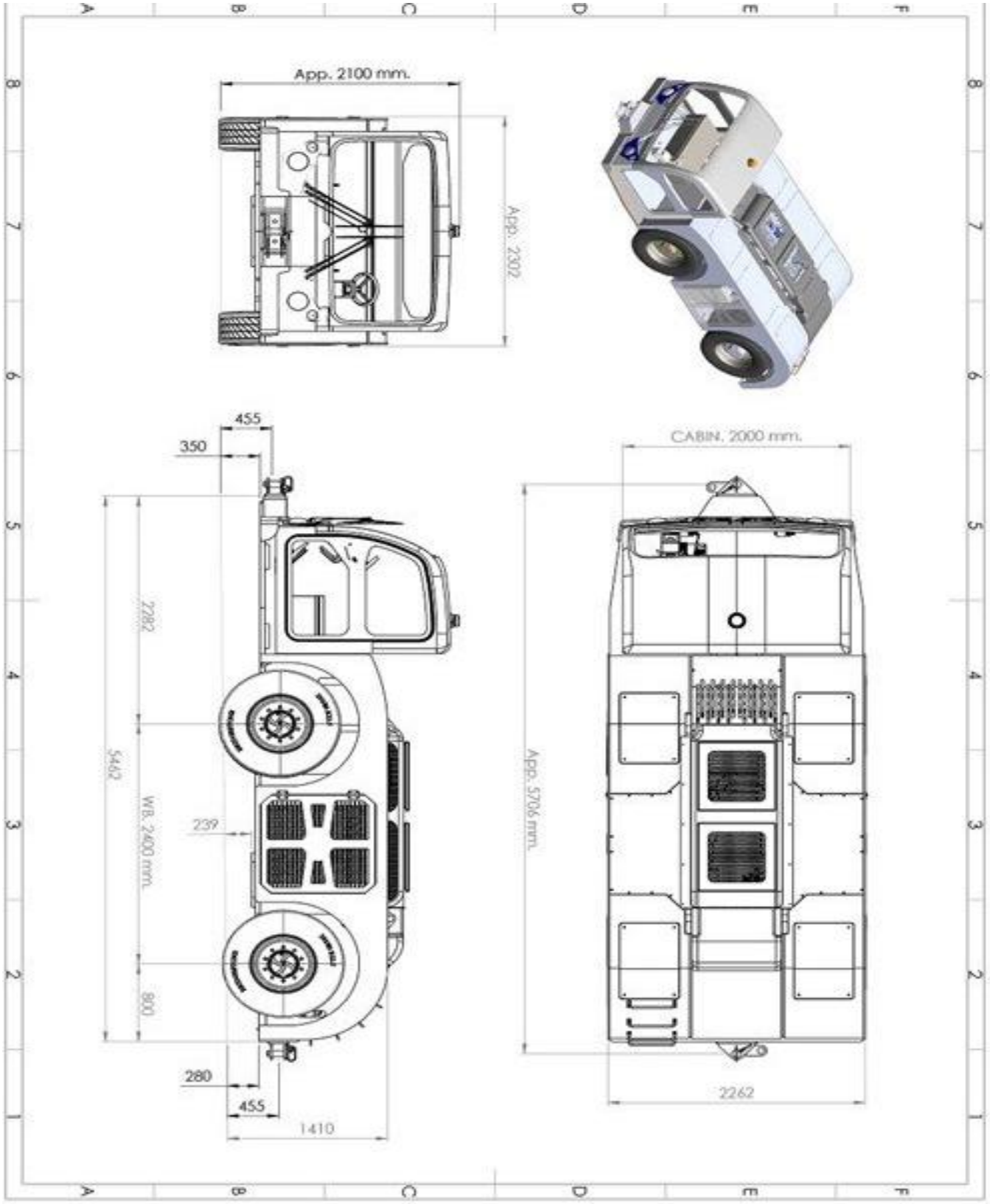
	• Disconnect and lock out the power supply from the battery before initiating any maintenance or repairs. • Discharge all hydraulic accumulators prior to working on any part of the hydraulic system. • Ensure only suitably qualified personal carry out maintenance at the required service intervals and during any breakdown or emergency. • During times of maintenance, safe working conditions are MANDATORY not only for maintenance Personnel but also to ensure the safety of others in the immediate area. • During times of removal and installation of heavy components, only use hoists and slings of sufficient capacity to lift the heaviest unit (engine module) and have an ample safety margin. • If a heavy item begins to fall, LET IT FALL! Do not try to stop or hold on to the item. • Do not work on the radiator or engine cooling system when it's hot to prevent burning and scalding.
	• During maintenance, ensure clean dry floors, the use of Work Platforms, Scaffolding, Ladders, DO NOT USE Stools, Boxes, Crates or similar items. • Ensure sufficient trained Service Personnel are always available when removing or installing heavy items to maintain control. • Ensure heavy items are correctly supported by hoist etc, before removing supporting members from towing tractor. • Before working on the engine and exhaust system ensure that it has cooled down to prevent burning to servicing personnel. • If any part of this machine should become over-lubricated during maintenance causing lubricant to spill or build-up, it

	should be cleaned immediately so as not to hinder maintenance or endanger maintenance personnel. • Keep the work area clean and dry and free of obstructions. • Keep inflammable liquids (solvents, lubricants etc.) away from electrical equipment and hot components.
	• Do not wear loose clothing, jewelry, or have unrestrained hair which may catch in moving parts during periods of maintenance or operation.

Warning To Drivers and Tractor Operators

	• Never place limbs or head through the driver's cabin doors or windows whilst the tractor is under way. • Disconnect the power supply from the battery before initiating any maintenance, or general repairs if any welding to be done disconnect all ecu's prior to commencing welding operation. • In the event of engine failure, bring the tractor to a complete stop with the service brakes, and then apply the park brake. • Prior to entering any wheel arch, ensure that the ignition is in the "OFF" position with the key removed and that the battery isolator is turned off and key is removed, the wheels may move without notice, thereby trapping person(s) between a wheel and chassis of the vehicle, causing severe injury or death.

Layout


App. 2100 mm.
App. 2302
455
350
2282
5462
WB. 2400 mm.
239
800
280
455
1410
CABIN. 2000 mm.
App. 5706 mm.
2262

General Description

The AVRO PT350 Pushback Tractor is a vehicle which has been designed especially for Pushback or towing operations of aircraft of up to 160,000 kg gross mass.

It is powered by a 4-cylinder Deutz TCD 3.6 EDG (79Kw) / TCD 3.6 T4 (79Kw) / diesel engine (See more details in DEUTZ engine section).

The engine is coupled to a DANA T12000 4-speed forward with 3-speed reverse powershift transmission via torque converter and flex plate to soften the gear changes.

The gear box is in turn coupled to the front and rear DANA 212 drive steer axle via 2-prop shafts coupled with either side of the output from the transmission.

Cabins are spacious and air conditioning / heating can be provided as an option.

The driver's seat is positioned on the left-hand side of the cabin. A pax seat is also provided for a passenger(s) which includes seat belts. The driving position provides excellent all-around vision.

Access for maintenance purposes to all compartments of the vehicle is easily obtained via hinged doors, hatches, and lightweight composite covers on the body.

This vehicle is fitted with hydraulic braking and steering circuits, both can be operated in an emergency such as engine failure.

Steering is hydraulic via steering orbital to front and rear steering cylinders. 3 steering modes are available namely 4WS (front and rear wheels steer in opposite directions), 2WS (only the front wheels steer), and CRAB steer (front and rear wheels steer in the same direction).

Braking is hydraulic via main hydraulic pump. Emergency braking is also available via DC emergency pump and accumulators in case of engine.

Overall Length:	5706 mm (CRS Tow Pins)
Overall Height:	2100 mm (Cabin)
Overall Width:	2300mm
Ground Clearance:	280mm
Wheelbase:	2400mm
Track:	1940mm
Outside Turning Radius	4300mm
Nominal Gross Mass	15-ton

Engine Specification

One Deutz TCD 3.6 EDG/T4 4 cylinder, 4-Stroke, liquid cooled diesel engine with EMR(electronics).

Capacity:	3.4 liters
Bore and Stroke:	101mm x 126mm
Rated Power:	76 kW @ 2400 rpm
Torque:	520 Nm @ 1600 rpm
Alternator:	24V DC
Fuel Injection System:	Electronic
Engine Lubrication System:	Crankshaft driven gear pump system incorporates an oil cooler and full flow replaceable element type filter.
Oil capacity:	10 liters
Oil type:	15w 40 or equivalent

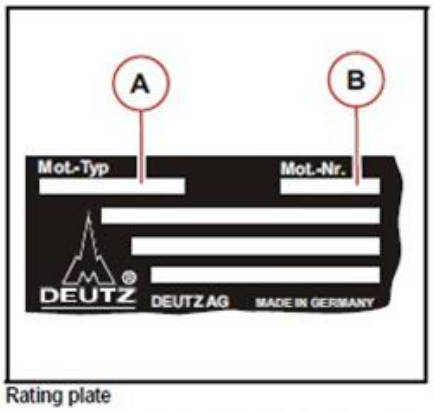
This manual covers the following engine types		
D 2011 L02 i	D 2011 L02 o	D 2011 L04 w
D 2011 L03 i	D 2011 L03 o	TD 2011 L04 w
D 2011 L04 i	D 2011 L04 o	TCD 2011 L04 w
TD 2011 L04 i	TD 2011 L04 o	

TCD	
T	Exhaust gas turbocharger
C	Charge air cooler
D	Diesel

2011	
2011	Series

L02/L03/L04	
L	in series
02	No. of cylinders
03	No. of cylinders
04	No. of cylinders

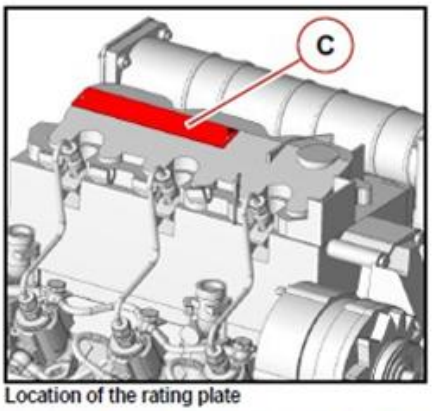
i/o/w	
i	oil-cooled (integrated cooler)
o	oil-cooled
w	water-cooled



Rating plate

The type (A), engine number (B) and performance data are stamped on the rating plate.

The engine type and number must be stated when purchasing spare parts.



Location of the rating plate

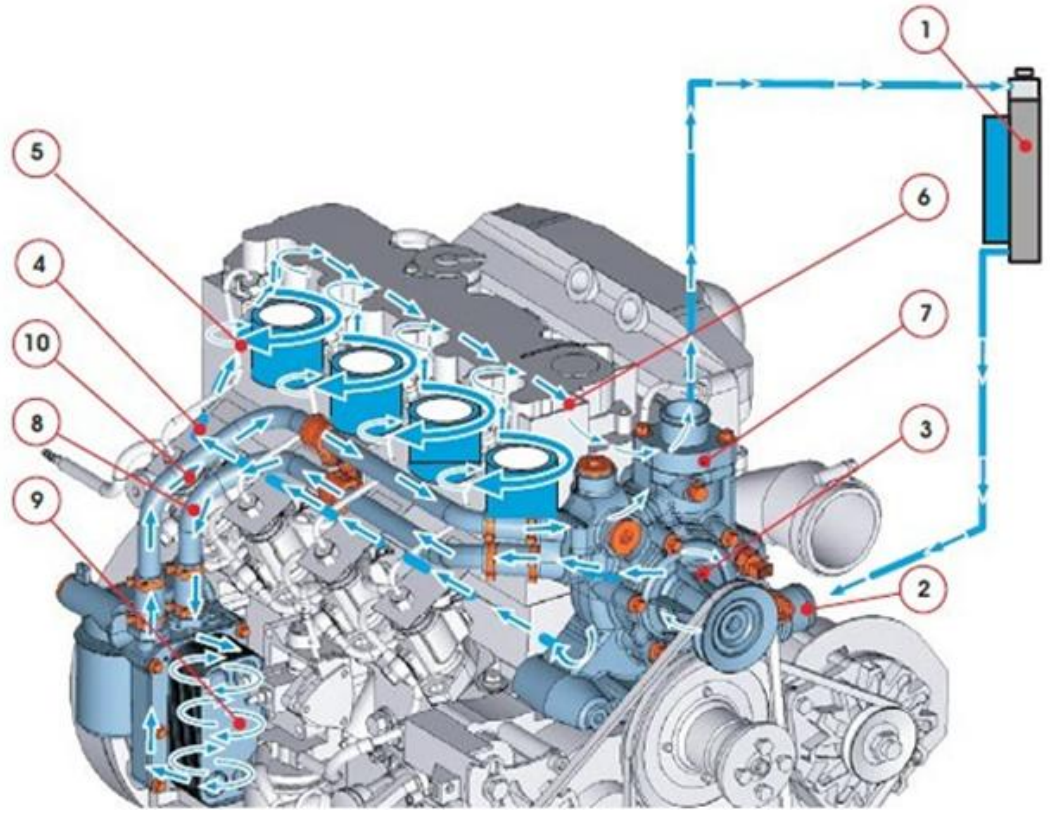
The rating plate (C) is fixed to the cylinder head cover or the crankcase.

Engine Cooling System and Engine Air Charge Cooler

Each tractor is provided with a radiator, charge air cooler and transmission. They are placed one in front of the other and have a common air flow. They are mounted in front of the engine in the engine bay. Air is drawn from above and below from the front of the tractor and pulled through the radiator and expelled via the engine bay.

An engine coolant is circulated through the system by an engine-mounted pump. The transmission oil is cooled via the transmission oil cooler mounted in front of the radiator.

The A/C condenser is positioned in front of the radiators at the front of the engine. The hydraulic oil cooler with temperature sensor controlled electric fan is placed on the left-hand side behind the left-hand doors.



Coolant Schematic

D/TD/TCD w

1. Cooler
2. Coolant inlet
3. Coolant pump
4. Coolant supply for engine cooling
5. Cylinder pipe/head cooling
6. Coolant returns to thermostat
7. Thermostat

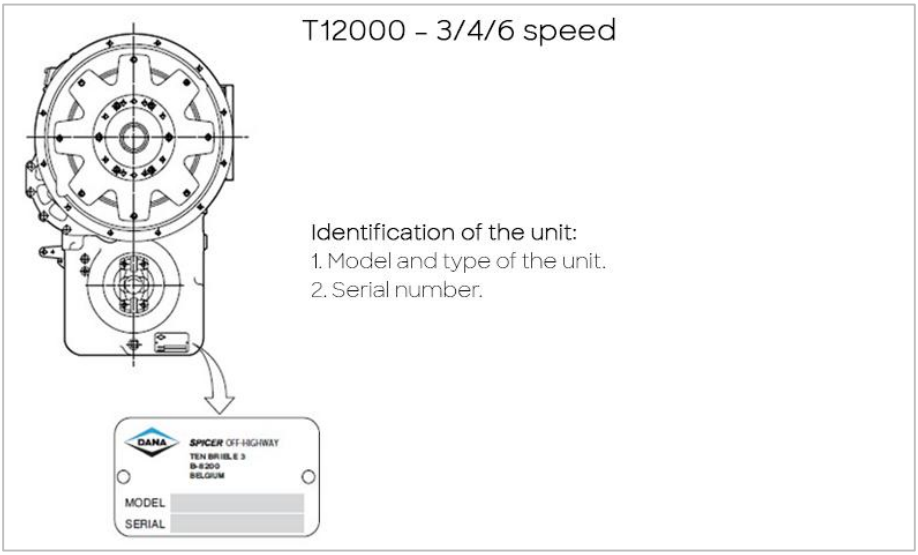
8. (Engine cold) coolant directly for engine cooling (Engine warm) coolant flow through the cooler
9. Coolant partial flow to the lubricating oil cooler
10. Lube oil cooler
11. Coolant return to thermostat

Transmission

Equipped with DANA T12000 series power shift transmission. Gear selection by floor mount electronic control type.

The Shift Selector is situated to the right of the driving position on a pedestal mounted to the floor.

Number of Forward Gears	4	
Number of Reverse Gears	3	
Ratio of Gears	First	5.2 : 1
	Second	3.3 : 1
	Third	2.2 : 1
	Fourth	1.4 : 1
	Reverse	4.9 : 1
		2.1 : 1
		0.8 : 1
Oil Capacity	15 liters	
Oil Type	Dextron 3	



Propeller Shaft

Manufacturer:	Drive Train Australia
Type:	Mechanics 5C axle side both drive shafts
Length mid slip:	See details in maintenance section

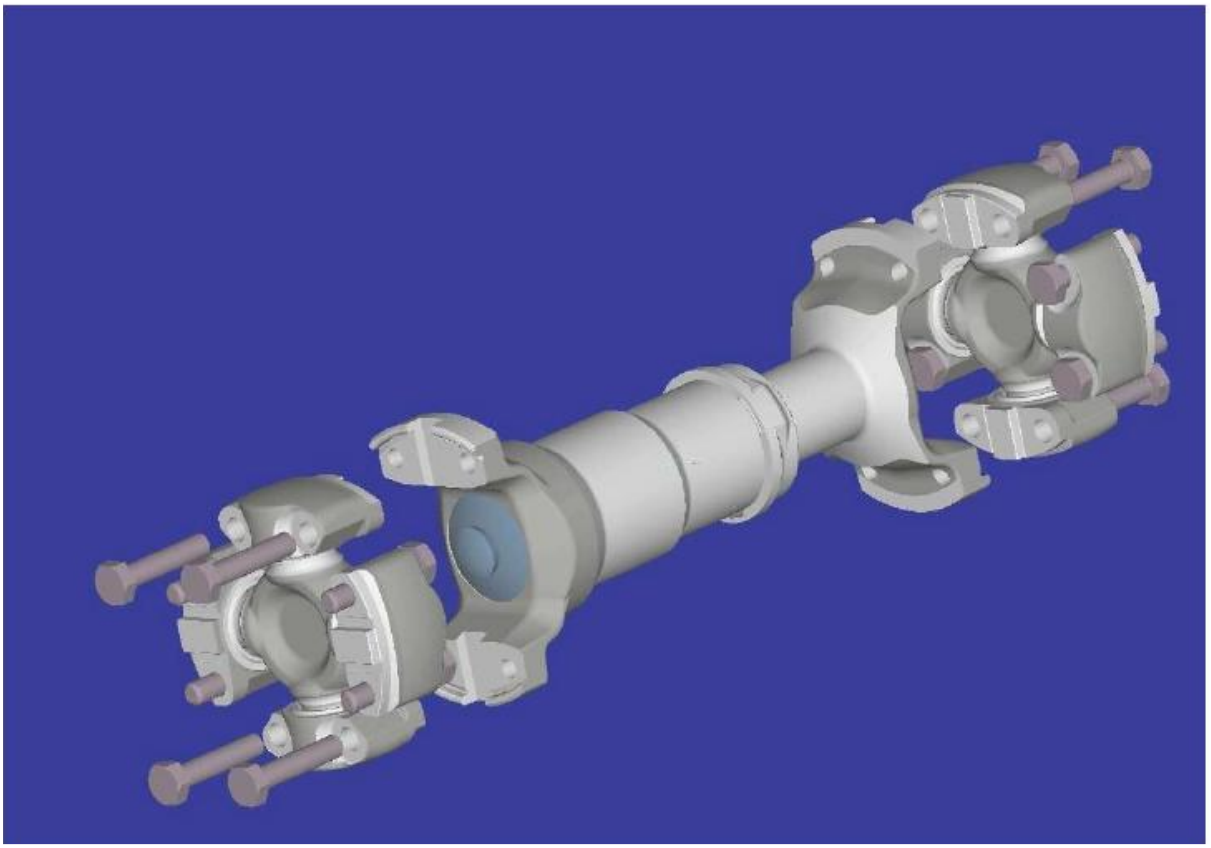
Wing Bearing / C-Positive

Spicer Italcardano driveshafts are designed for efficient torque transfer through a mechanical drive, using keys positioned on the bearing blocks. These keys fit precisely into corresponding slots machined on the connecting yokes.

This design offers significant advantages, especially in applications with continuous load variations or shock loads.

The direct connection of bearing blocks to output flanges provides several key benefits:

- High flexibility for various applications
- Ideal for short application lengths
- Reduced joint working angles for improved efficiency
- Quick disassembly with just four bolts per side
- Easy maintenance – U-joint kits can be replaced without removing the entire shaft.

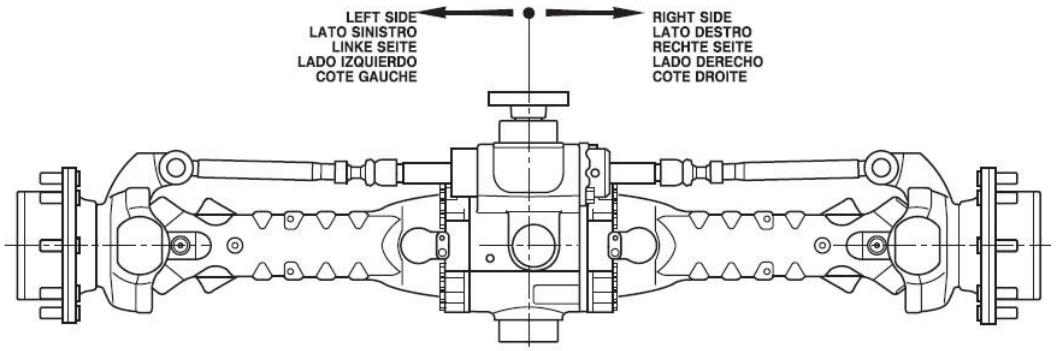


Drive Axle

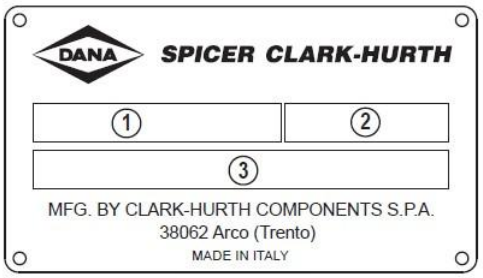
Model:	DANA 212 (Refer to Axles for maintenance and spare parts)
Manufacturer:	DANA CLARK HURTH components SPA Italy
Front Axle:	PN: 2749540 Drive Steer (fixed) axle with single reduction hypoid gear and differential.
Rear Axle:	PN: 2749541 Drive steer (pivot) axle with single reduction hypoid gear and differential.
Final Drive Reduction Ratio:	6.23 : 1
Oil capacity (approx.):	Hubs, 8 liters (all Four) Differential, 16.6 liters x (two)

Please refer to DANA service manual for more information on correct inspection and maintenance procedures.

DEFINITION OF VIEWPOINTS



DATA PLATE



1 - Type and model unit - modification index
2 - Serial number
3 - Lubricant

Wheels and Tires

Tire Size: 295/80
Wheels (rim): R22.5
Inflation pressure: 8.3 Bar (125 psi)
NOTE: Tire size/brand may vary.

Suspension (None)

The Front axle solid mounted to chassis.
The Rear axle pivot mounted to the chassis.

Steering

System Control	Fully managed by Eaton screen and ECU.
Steering Modes	- 2WS (Two-Wheel Steer): Front wheels only - 4WS (Four-Wheel Steer): All wheels turn for better maneuverability - Crab Steer: All wheels turn in the same direction
Power Source	Hydraulically powered by Eaton Vane pump, directly coupled to the rear of the DANA T12000 series transmission.
Steering Control	Three-spoke steering wheel connected to a hydraulic orbital unit that controls the steering cylinders on both front and rear axles.
Rear Steering	Hydraulically powered, mirroring front-wheel movements in 4WS and Crab Steer modes for precise control.

Brakes

Service Brakes	Under normal operating conditions, hydraulic oil powers the heavy-duty wet disc brakes (internal on each axle). Pressure is provided by the engine-driven hydraulic pump and controlled via the brake pedal.
	If the engine fails, pressure is supplied by accumulator-stored energy, allowing at least 15 brake pedal depressions for a safe stop. Alternatively, the DC pump can be switched on to restore hydraulic pressure for braking.
Parking Brake	Spring Applied Hydraulic Release (SAHR) system, controlled by a switch on the driver's console. The switch is self-centering: - Turn left → Park brake releases (indicator off on Eaton Display). - Turn right → Park brake applies (indicator on Eaton Display).

Hydraulic System

Power Source	2 Eaton vane pump directly connected to the rear of the T12000 series transmission.
Oil Circulation	Hydraulic oil is drawn from the main tank (located on the rear of the engine bay) and circulated through various valves and cylinders.
Hydraulic Circuits	Steering Braking Service Brakes Emergency Braking Emergency Park Brake Release
Pump System	Two close-coupled spline driven pumps

ⓘ Always chock the wheels when leaving the vehicle unattended.

Electrical System

System Voltage	24V DC powered by alternator
Battery	Two 12V DC Batteries in Series Connection

Electrical power is used for engine starting, vehicle lighting and accessories. (Refer to Electrical Layout and Diagram for more details s.)

Chassis and Body

The chassis and main frame are of all-steel, welded construction, with the covers bolted to the frame. The CAB is a split cabin. The top half and the engine bay covers are made of light weight composite material. The engine bay covers are hinged allowing access to the main engine bay and other critical equipment. They are fully removable to facilitate easy access to the engine bay for major work to be carried out. The cabin is mounted on rubber mountings to dampen excess noise. All windows, except the opening sliding glass on doors, in the cabin are laminated safety glass.

The driver's seat, steering wheel and instrument console are mounted on the left-hand side (LHS) of the cabin. A dual fixed passenger seat is located on the right-hand side (RHS) for passenger use. Seat belts are also provided for both seats.

Towing Facilities

Tow Hitch	Available in front and rear of the vehicle
Locking Catch	Available in front and rear hitch to hold the pin firmly.

SECTION III. OPERATION AND CONTROLS

It is not the intention of AVRO GSE to teach drivers how to drive a vehicle, this section is to provide an operator / maintenance technician with the ability to identify and familiarize themselves with the cabin layout so that they can perform their daily duties with confidence.

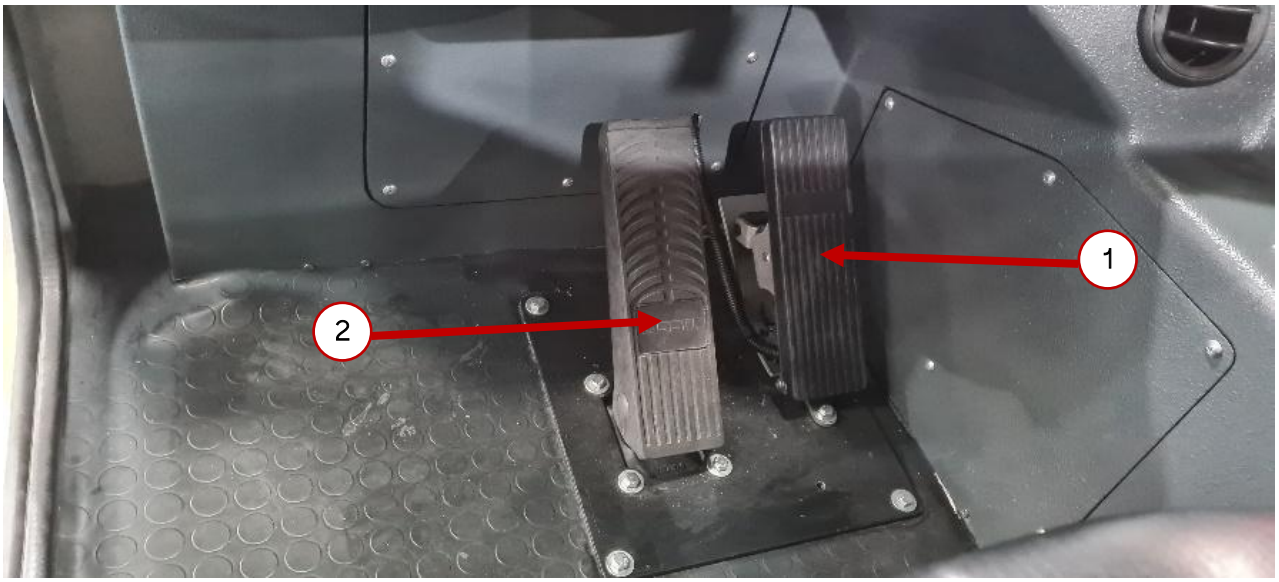
All people operating this vehicle require prior authorization and training from their company.

Pictures in this manual may be different to actual vehicle. They are used as a guide to identify specific components.

Operator's Controls

The controls are positioned for easy operation and can be divided into two groups: foot controls and hand controls.

Foot Controls



1. *Accelerator Pedal*

   This pedal is located on the floor of the driver's area, at the far-right hand side of the steering wheel. Depressing this pedal will accelerate the engine and releasing it will decelerate the engine. The throttle pedal is linked to the engine via an electrical CAN system. The pedal must be left in the idle position (with foot off the pedal) when starting the engine.

2. *Brake Pedal*

   This pedal operates a modulated hydraulic power valve and is located slightly to the left of the accelerator pedal. The pedal controls the operation of the service brakes (Dry disc type located externally with 2 calipers on each wheel of axle).

   The application of the service brakes is proportional to the amount of pressure applied to the brake pedal. Therefore, an increase in pressure on the brake pedal will produce a stronger application of the service brake and a higher deceleration rate of the tractor.

   Under normal operating conditions, hydraulic oil is supplied to the heavy-duty wet disc brakes (internal on each axle). The pressure is provided via the engine driven through the transmission PTO, hydraulic pump and is modulated by the brake pedal located in the driver's cabin as described above.

   Should the engine fail, pressure will be supplied to the service brake via stored energy in the accumulators. Gently depress the brake pedal until the vehicle is brought to safe stop. Approximately 15 (minimum) pedal depressions are available using the

accumulator stored energy to the service brake. Under normal circumstances this is enough to bring the vehicle to a safe stop.

The steering wheel becomes difficult to move at this point. It can however still be used to steer as the orbital acts as a pump under these conditions.

Alternately the DC pump can be switched on to provide hydraulic pressure, braking and steering are functional while the DC pump is operational.

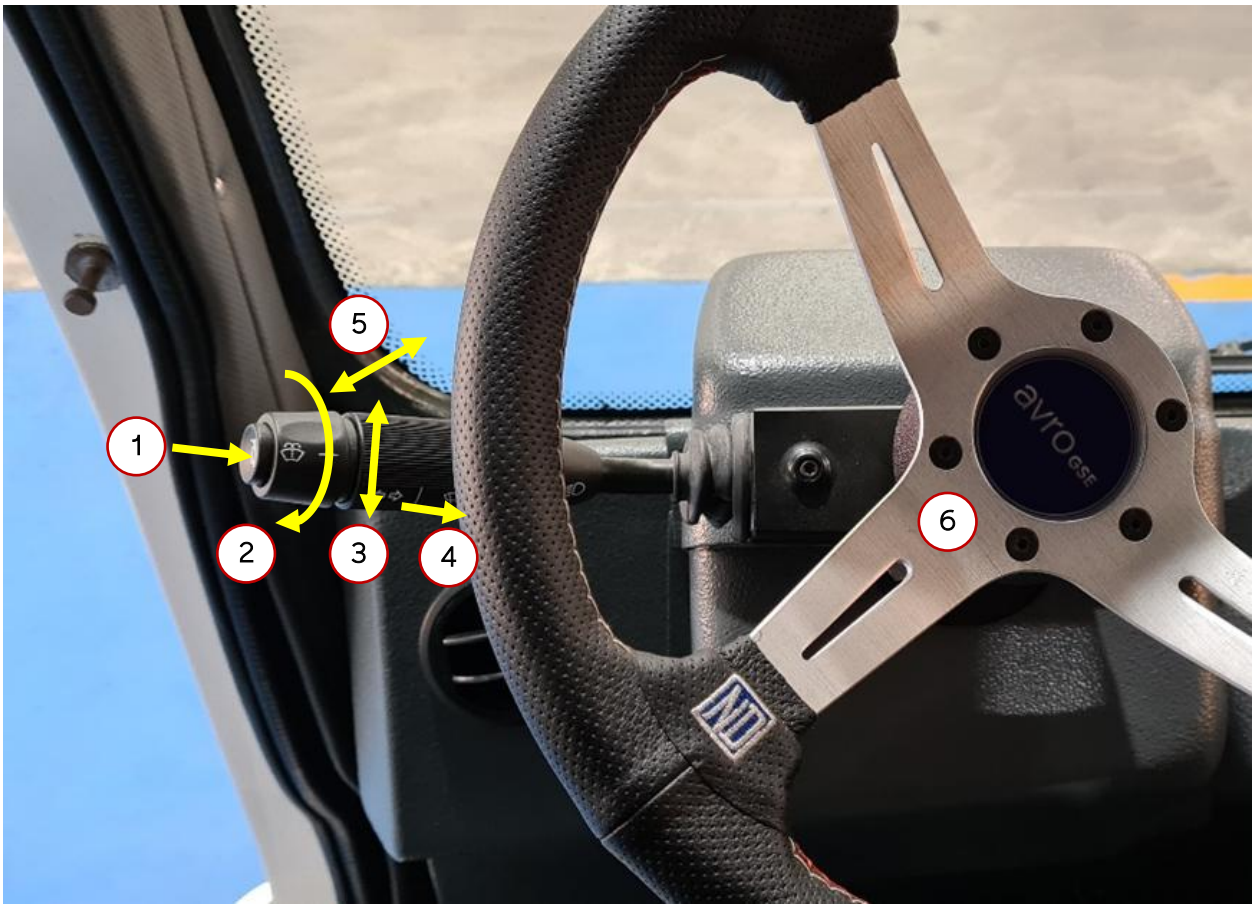
Hand Controls

All hand controls are located on the instrument panel and the steering column stalk switch. The switches or controls are all identified with symbols or name plates and their operation is as follows:

Steering Column Stalk Switch

Pictures may be generic and may not match the actual.

The steering column stalk switch is located under the steering wheel on the left side of the steering column. The stalk switch is used to control five functions:



1. **Horn Button** – Press the button at the end of the column stalk switch to activate the horn.
2. **Windscreen Washer** – Twist and hold the lever to spray washer fluid onto the windscreen.
3. **Turn Indicator Lights** – Push the lever up to signal a right turn and down for a left turn. Manually return the lever to neutral position after completing the turn.
4. **Windscreen Wiper** – Slide the lever to the right to activate the wipers.
5. **Headlight –** Push the stalk forward to turn on the headlights. Push it further to activate the high beam.

6. **Steering Wheel** - Used to control the direction of the tractor. It operates the hydraulic power assisted steering valve (steering Orbital).

Transmission Shift Control Lever

Tractor will not start if not in the Neutral position.

The shift lever is positioned to the right of the driver's seat and is used to select gears, offering four forward and three reverse options.

To change gears, the following conditions must be met:

- The engine must be running at normal idle speed.
- The vehicle must be at a complete stop, with the service brake engaged. (Note: The direction cannot be changed from forward to reverse while in motion.)
- The park brake must be released.

To select a gear, move the shift lever forward, then left or right, depending on the desired direction of travel. The selected gear (forward only) and direction will be displayed on both the Eaton screen and the Spicer screen on the dashboard. When reverse is engaged, the reversing camera will activate and display on the Eaton screen.

Park Brake

The park brake is SAHR (Spring Applied Hydraulic Release) and is operated via the switch on the driver's console, located to the right of the steering wheel assembly.

The Park Brake is controlled by a switch **(1)** mounted on the driver's console to the right of the steering wheel. The light on EATON screen **(2)** will be illuminated if the park brake is applied.

Park Brake Usage: Do not engage the park brake while the vehicle is in motion, except in extreme emergencies. Doing so can cause severe driveline damage, which is not covered under warranty. Always ensure the tractor is at a complete stop before applying the park brake.

Safety Reminder: Chock the Tractor when not in use.

When the engine is running, both park and service brake accumulators are being charged via the system vane pumps.

Under Normal operation, the hydraulic system pressure will operate both service and park brakes including the steering.

Upon shutting down the engine (either by turning the key to the off position or due to engine failure), the accumulators will retain pressure for the service brake as described above. However, the park brake accumulator will gradually bleed down its internal pressure, releasing pressure from the park brake caliper springs and allowing the park brake to apply pressure to the disc. This is a failsafe system, meaning that if all power is lost, the park brake will automatically apply. Additionally, if the operator forgets to apply the park brake via the switch on the driver's console, it will still be engaged. All operators should be aware of the park brake function.

This feature means that there is a limited time before the park brake is fully applied in the event of a hydraulic failure while the vehicle is at speed. It is essential that the service brake be applied immediately if a loss of hydraulic and electrical power occurs, to prevent the park brake from fully applying before the vehicle has come to a safe stop.

If the engine is inoperable but has electric (24 Volt) supply still operating, the park brake can only be applied with the switch on the driver's console. If the park brake needs to be released, use the following procedure:

1. Turn the ignition to the on position.
2. Press the DC pump switch and hold via the rocker switch in the cabin on the driver's console (symbol looks like a steering wheel).
3. Turn the park brake switch to the off position and wait for the indicator light to extinguish (on the Eaton Display).

The DC pump supplies hydraulic oil to the entire hydraulic system in an emergency if the engine fails or becomes unserviceable. The DC pump is set with a timer and will operate for only 1.5 to 2 minutes before it needs to be reset via the switch. Do not turn off the ignition until repositioning is completed.

Do not tow or move the vehicle more than 100 meters with drive shafts connected as severe damage will occur to the transmission. See transmission manual for details.

Driver's Seat Controls

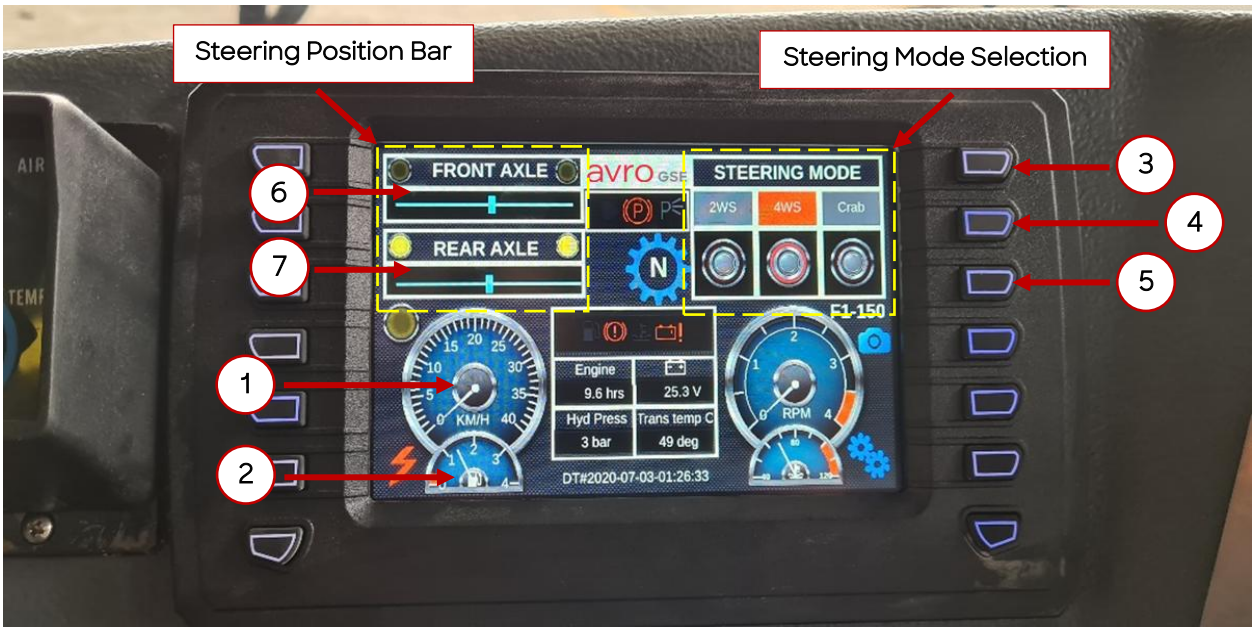
- Fore and aft movement - controlled by a grab bar at the base of the seat at the front.
- Seat tilt - controlled by a yellow lever on the right-hand side of the seat.
- Back rest angle - controlled by a knob on the left-hand side of the seat.

Passenger Seat

The passenger (Pax) seat is a bench type that can accommodate two passengers on the right-hand side of the cabin. The electrical panel is located under the Pax seat and can be accessed by removing the lock pin and flipping the Pax seat forward.

Digital Display

The tractor is equipped with an EATON digital display, and switches. This Electronic Display Module (EDM) serves as a digital dashboard which has several functions.



1. **Speedometer** – Indicates the road speed of the tractor in kilometers per hour (km/h).
2. **Fuel Gauge** – Indicates the volume of fuel available in tank.

Steering Mode Selection on Display

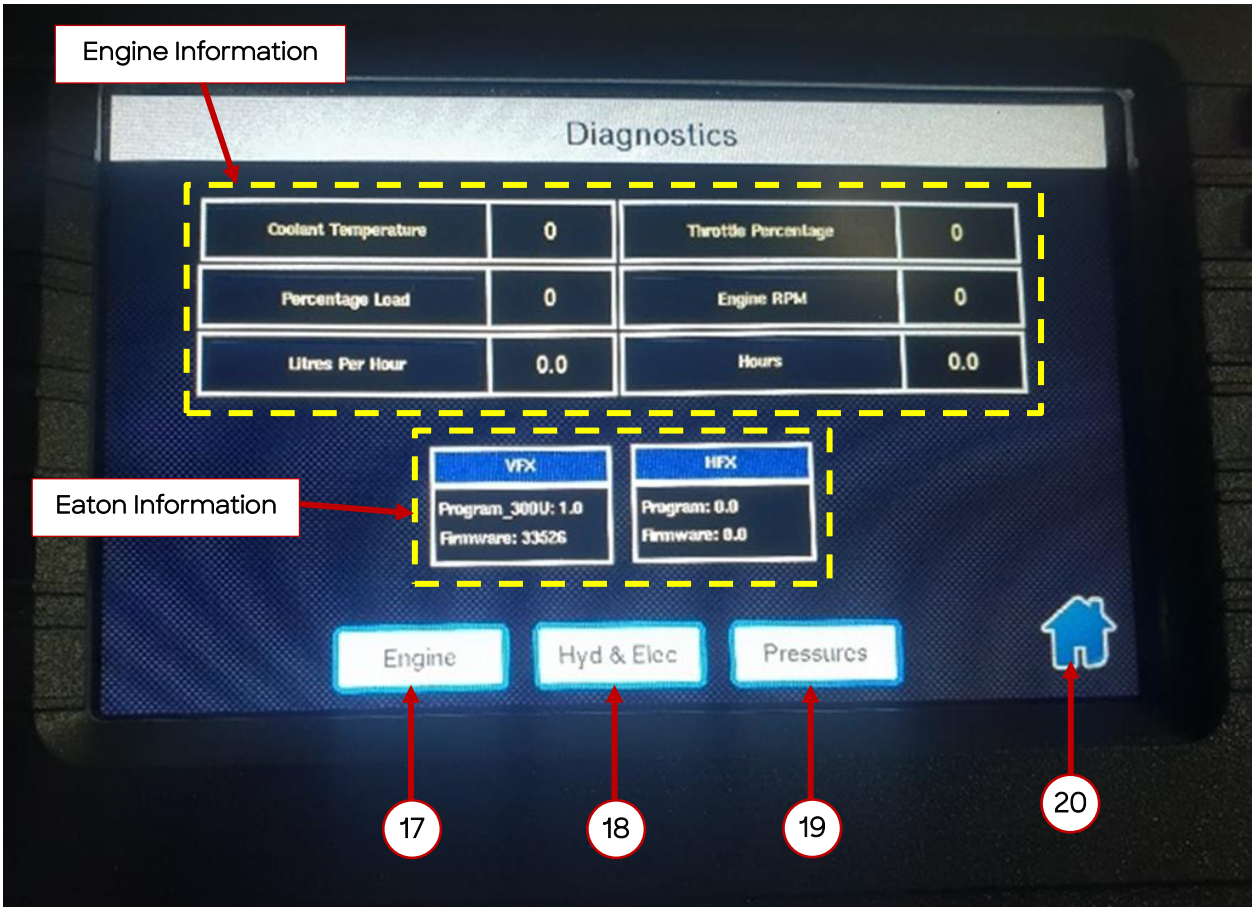
3. **2-Wheel Steering (2WS)** – Press to select 2-Wheel Steering mode.
4. **4-Wheel Steering (4WS)** – Press to select 4-Wheel Steering mode.
5. **Crab Steering** – Press to select Crab Steering mode.

Steering Position Bar

6. **Front Axle Position Bar** – Indicates the direction and position of the front wheels.
7. **Rear Axle Position Bar** – Indicates the direction and position of the rear wheels.

8. **Park Brake** – Park brake status indicator.
9. **Selected Gear** – Indicates the tractor direction and gear selected.
10. **Engine Hours** – Indicates the running hours of the tractor.
11. **Hydraulic Pressure** – Indicates the system hydraulic pressure.
12. **Battery Status** – Indicates real time battery voltage.
13. **System Failure** – Shows when a system failure is detected.
14. **Transmission Temperature** – Indicates real time transmission temperature in Celsius unit.

15. **Diagnostic and Faults Page** – Press the button or the icon on the screen to access the diagnostics page.
16. **Maintenance Page** – Press the button of the icon on the screen to access the maintenance log in page.

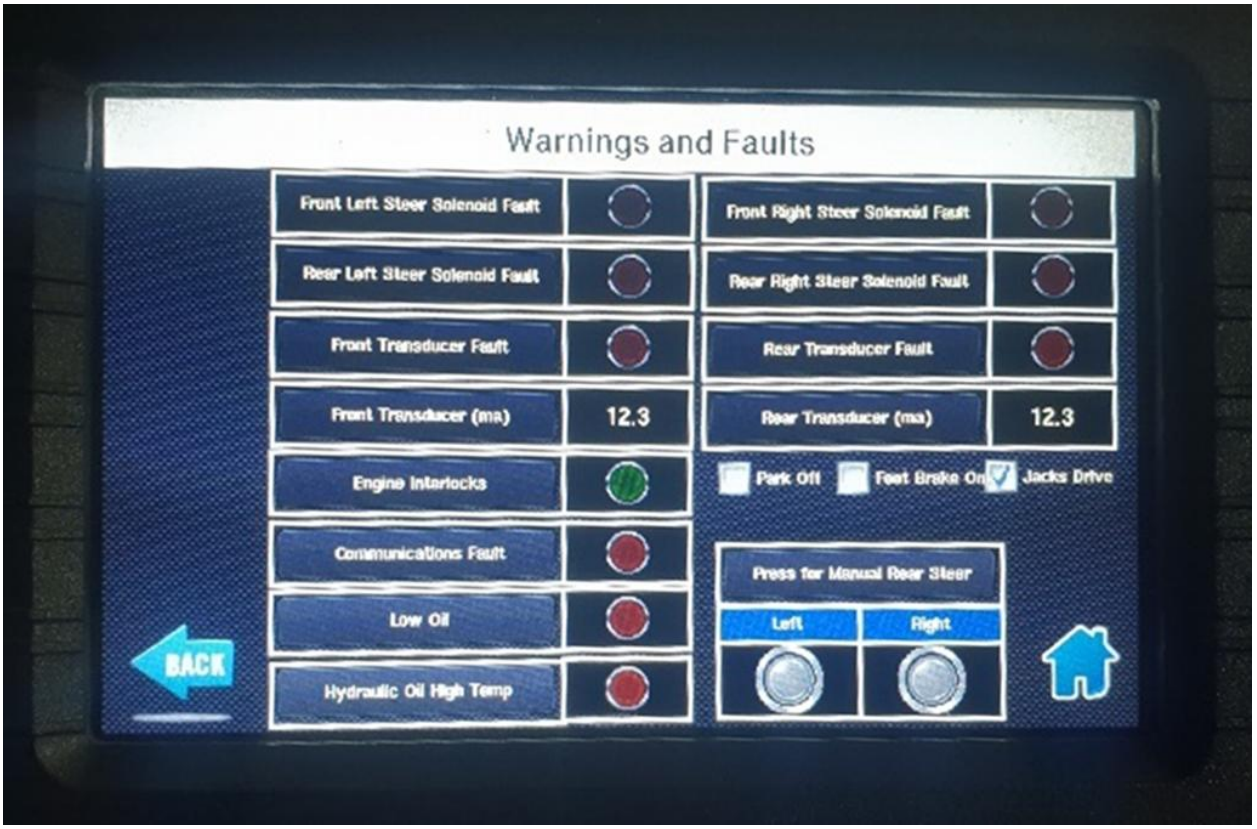


17. **Engine** – Press to enter the diagnostics page showing engine information.
18. **Hydraulic & Electrical** - Press to enter the diagnostics page showing hydraulic and electrical system information.
19. **Pressure** – Press to gather information about various system pressure.
20. **Home** – Press to go back to the EDM main page.

Diagnostics

Engine Information – this section contains information about the engine's Coolant Temperature, Engine Load, Fuel Consumption, Throttle Percentage, Engine RPM and Running Hours.

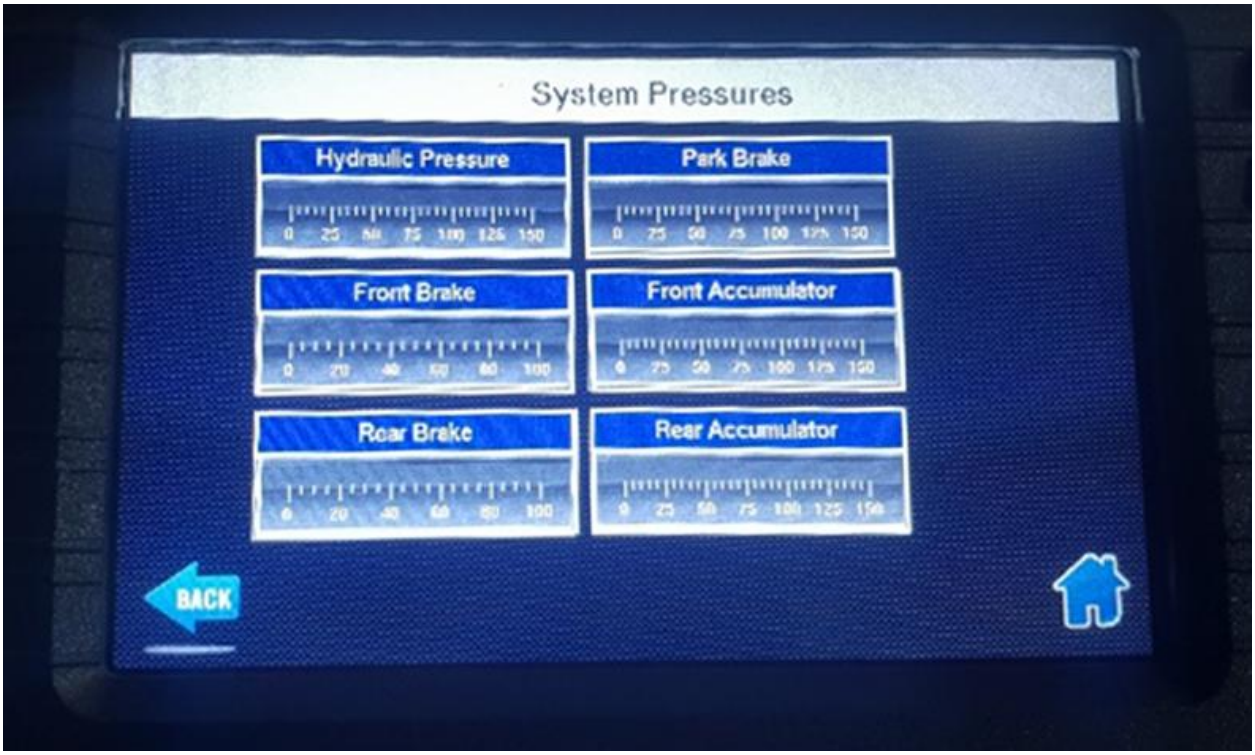
Eaton Information – this section contains details for the versions of VFX (Eaton Display) and HFX (Eaton ECU) which are useful when requesting replacement parts.



Warnings and Faults

This screen displays the status of:

- Hydraulic solenoid faults
- Steering transducer faults
- Engine/transmission interlock states
- Communication faults
- Low hydraulic oil level
- Hydraulic oil temperature
- Rear steering manual override



System Pressure

This screen hydraulic system pressures. The information displayed removes the requirement for connecting test equipment to the unit when diagnosing possible pressure related issues.

Maintenance Page

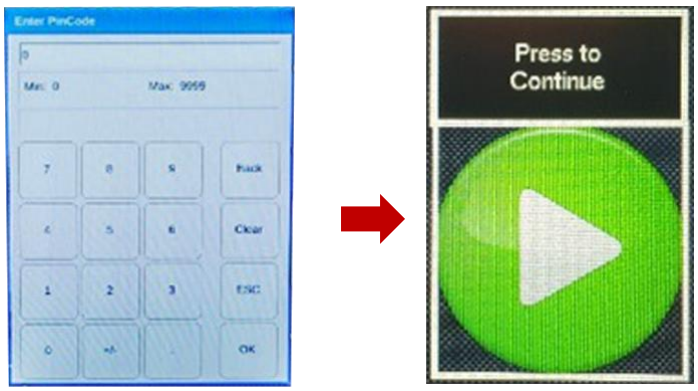
Maintenance Login

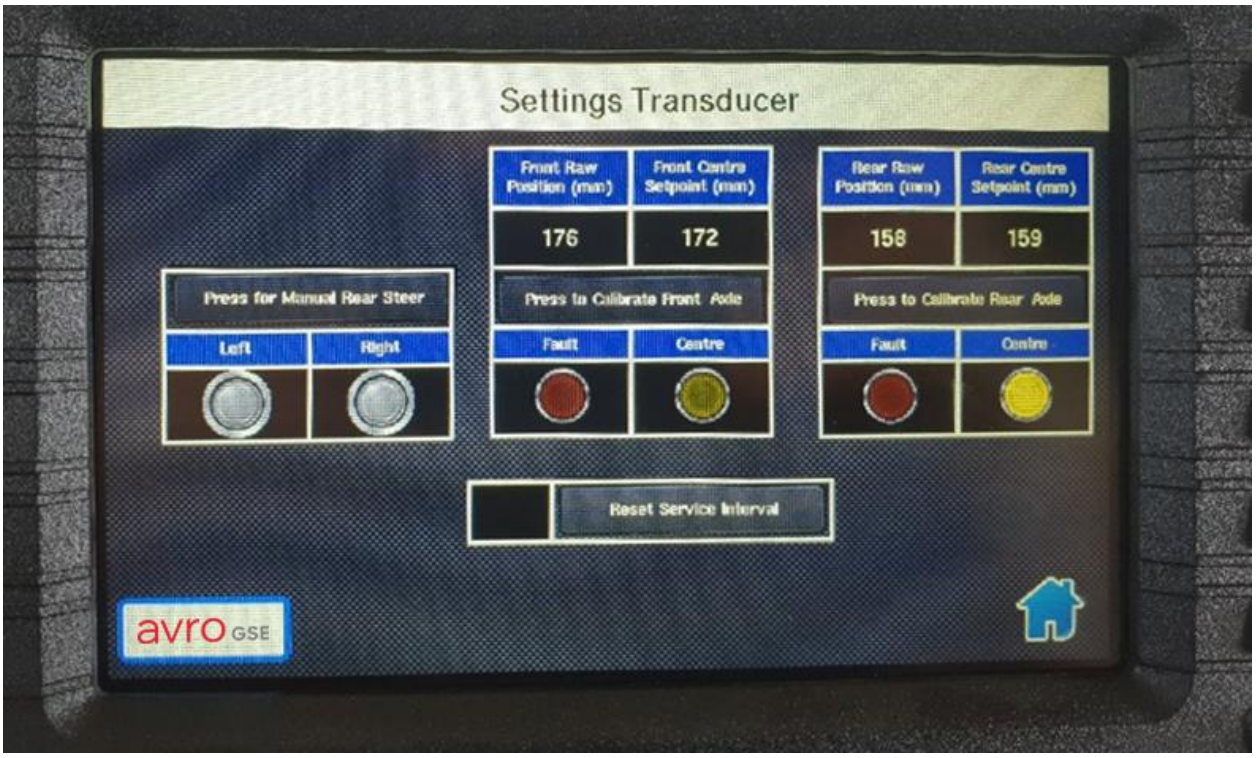
From this screen various functions can be accessed:

- General maintenance login
- Set screen brightness
- Set time and date
- Customer access login
- Avro login
- Home button returns to main screen

Maintenance Login Procedure

1. Select “Press to Login”, on the “Enter Pin Code” page select “Clear”, enter the code “1234” and select “OK”.
2. The next screen displays a green arrow icon, press to continue.





Settings Transducer

This screen allows a certified maintenance technician to recalibrate the steering sensors for correct tracking of the steering. “Reset Service Interval” is selected after maintenance has been performed to reset the service interval. Home button returns to main screen.

Deutz Screen

The Deutz digital display screen is located on the side wall just below the dash board. This screen provides the maintenance team with useful information regarding faults and general condition of the engine and its emissions related components.

Switches & Indicators

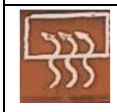
Spicer Transmission Display Module (TDM)

The TDM displays current gear selection and any current faults.

Press and hold “M” for three seconds to enter diagnostic mode where codes and data can be accessed.

	HEADLIGHT SWITCH This is a three-position rocker switch: 1. Off 2. Park Lights 3. Main Beam The green headlight symbol illuminates when the switch is in position two or three.
	HAZARD LIGHTS SWITCH This is an On-OFF rocker switch. In the ON position the amber side indicators intermittently flash, along with a lamp mounted within the switch which illuminates the orange symbol.

	BEACON SWITCH This is an On-OFF rocker switch. In the ON position it operates the beacon on the roof, along with the lamp mounted within the switch which illuminates the orange symbol.
	HIGH BEAM INDICATOR When the column mounted signal switch is in the forward position the high beam headlights are activated. The blue indicator illuminates when the headlights are on high beam.
	WORK LAMP SWITCH This is an On-OFF rocker switch, in the ON position the work lamp is activated. The green indicator illuminates when the work lamp is activated.
	TOW PIN LAMP SWITCH This is an On-Off rocker switch, in the ON position the tow pin lamps are activated front and rear. The green indicator illuminates when the work lamps are activated.
	IGNITION SWITCH This switch is key operated and has three positions, OFF, ON and START. Turning the key all the way counterclockwise to "OFF" will shut down the engine and power off all systems. Turning the key clockwise to "ON" will supply power to all systems. Turn the key clockwise past the "ON" position, spring resistance will be encountered, turning the key against the resistance activates the starter motor. Once the engine has started release the key and it will return to the "ON" position.
	LOW OIL PRESSURE INDICATOR LAMP This red indicator lamp will illuminate when the engine oil pressure is low and needs to be corrected before the machine can be put into service.
	TURN INDICATORS “ON” INDICATOR LAMP This green indicator lamp flashes when the turn indicators are functioning.
	CHECK TRANSMISSION INDICATOR LAMP This indicator lamp flashes when a fault occurs on the transmission. Diagnostics can be performed using the EDM

	ENGINE FAULT INDICATOR LAMP This indicator lamp will flash when a fault occurs on the engine. Diagnostics can be performed using the EDM
	ENGINE TEMP INDICATOR LAMP This indicator lamp will illuminate when OVER TEMP occurs. Diagnostics can be performed using the EDM.
	REAR WINDOW DEFOG SWITCH This is an On-Off rocker switch and must be switched off when not in use.
	REAR WINDSCREEN WIPER SWITCH This is an On-Off rocker switch and must be switched off when not in use.
	DC PUMP SWITCH This is an On-Off rocker switch and must be switched off when not in use. The switch and DC pump are protected by a timer that only allows the DC pump to operate for 1-1.5 minutes at a time. To reset the timer the switch must be switched off and then back on again. Do not operate the DC pump continuously as this will cause severe damage to the DC pump and will not be covered under warranty.
	INTERIOR LIGHT SWITCH This is an On-Off rocker switch and must be switched off when not in use.
	MIRROR ADJUSTMENT SWITCH This switch controls the adjustment of the rear-view mirrors. Position the arrow to the left or right selecting which mirror to adjust then move the button in the direction required.
	COOLANT BYPASS VALVE SWITCH This is an On-Off rocker switch and must be switched off when not in use. It opens the valve that allows heated engine coolant to flow through the heater core in the cabin.

Battery Isolation Switch

The control switch is located on the right-hand side of the vehicle.

To activate switch turn:

- Clockwise – On
- Anti-clockwise – Off

Only when the lever is in the OFF position can the lever be removed.

- The switch should be turned off when the vehicle is left in parked position for any extended periods or when any maintenance is going to be performed.
- Keep the Battery Isolation Switch on while the engine is running.
- Switch off Battery Isolation Switch when charging batteries.
- When welding on the tractor, switch off the Battery Isolation Switch and disconnect the batteries, engine and transmission ECU's and the Eaton Screen.
- Do not immediately turn off the Battery Isolation Switch after shutting down the engine. This is required for the ECUs to power down correctly.

Operator's Instructions

The AVRO PT350 Pushback Tractor is an easy vehicle to drive. It requires no specialized driver techniques as the vehicle and its controls are conventional automotive in their operation and response. However, it must always be remembered that it is a heavy and powerful vehicle, and any miss-judgment by the operator can lead to severe damage to aircraft, ground service equipment, buildings, or personnel.

Before operating the tractor ensure that the daily service/check procedures have been carried out. These procedures are listed in the Maintenance Intervals Section of this manual.

Pre-operational Check

Do operational safety check or check as per organization's local requirements and rules:

- Check for visible damage and leaks around the tractor and on the ground beneath the tractor.
- Check cabin for cleanliness.
- Check logbook for reported issues from previous operator if available.
- If there are any issues report immediately to maintenance supervisor.

Engine Start

1. Turn the battery isolator on.
2. Turn ignition to the On position.
3. Apply service brake.
4. Ensure gear shifter is in Neutral position.
5. Turn the ignition switch key for the engine to the ON position. (Eaton Display module will take approx. 1.5 minutes to boot up). Turn the key to the start position to crank the engine. The engine should fire within a couple of revolutions. Do not attempt to crank the engine over for more than a few seconds as the starter motor can be severely damaged by doing so.
6. As soon as the engine starts, release the key from the start position. Do not turn ignition key off and immediately back on. Wait a few seconds before attempting to start vehicle again. Failure to follow this procedure may cause severe damage to the starter motor.
7. Check that all gauges are operating in their normal operating ranges as per the OEM tech manuals in this manual.
8. After a cold start the engine should be allowed to idle for five minutes so that it can warm up to operating temperature and establish an oil film on all working surfaces.

Steering Controls

The tractor is equipped with power assisted steering and only minimal effort is required to turn the steering wheel from lock to lock while the vehicle is in motion.

Approximately 4.5 - 5 turns of the steering wheel are required to move the wheels from lock to lock.

To further assist the driver when maneuvering the vehicle while at stationary or low speed, there is no need to accelerate the engine. The system is designed to operate effectively at idle.

Moving Off

1. Start the engine in accordance with the Engine Start procedure above.
2. If the vehicle is to be operated at night, switch on the lights that are to be illuminated.
3. Check that the fuel gauge indicates sufficient fuel available for the duration of operation.
4. Apply the service brakes.
5. Release the Park Brake.
6. Select a suitable gear for the load condition and direction that applies for the vehicle to travel.
7. Release the service brakes and depress the accelerator pedal sufficiently to allow the vehicle to get under way smoothly.

Engine Shutdown

1. Ensure that the park brake is on.
2. Select Neutral Gear.
3. Allow the engine to idle for an additional thirty (30) seconds.
4. Turn the ignition switch to its OFF position.
5. Chock the wheels.
6. Turn battery isolator off after approx. 2 min allowing the ECU to power down correctly.

Towing the Tractor

Before pushing or towing, the tractor the driveline must be disconnected. The tractor cannot be started when pushing or towing it.

Maximum allowable push or tow is 20 meters.

Failure to disconnect the driveline before pushing or towing can cause serious transmission damage.

Braking the Vehicle

Always apply the service brakes progressively to ensure a smooth stop, especially when towing aircraft or cargo dollies.

Always allow plenty of distance when braking to a complete stop, especially when approaching or towing aircraft.

General Vehicle Shutdown

When the vehicle has completed an operation period, or if it is to be left unattended for any length of time, the following procedures should be complied with:

1. Select the NEUTRAL gear.
2. Apply the parking brakes
3. Chock the wheels.
4. Shut the engine down by turning the key to the off position.
5. Remove the ignition key from its switch.
6. Turn battery isolator to off position. (Remember to wait a few minutes before completing this function.)
7. At the end of an operational period, the driver is to inform the vehicle's maintenance crew of any malfunctions that may have occurred during that period and ensure that the vehicle's ignition keys, and battery isolation switch handle are left with the person in charge of the vehicle's operation.

Preparing for Aircraft Movement Operations

The vehicle can be used for Pushback operations on various narrow bodied sized aircraft connected to either the front or rear hitch points. For towing operations, it is recommended that the rear hitch point be used for both tractor performance and operator safety.

ⓘ Pushback operators are specially trained to do pushouts and tows.

Before proceeding with Pushback operations ensure that compliance is made with IATA AHM 631.

Basic lights and accessories:

- Two Headlight sets - 2 front
- Four Flashing Turn Indicator Lamps (Amber) - 2 front, 2 rear
- Two Taillights (Red) 2 rear
- Two Brake Lights (Red) 2 rear
- Two Reversing Lights 2 rear
- Two Emergency Stop Buttons one in the front cabin one on the rear of the tractor
- One Amber beacon Lamp
- 1 x Horn 1 front
- 1 x Reversing Siren 1 rear
- 2 x Floodlights (1 Front, 1 Rear)
- 2 x tow pin lights (1 front 1Rear)
- All gauges and warning lights are in the driver's cabin.

The Driver's Station is equipped with the following:

- One (1) - EATON Display, providing:
  - Tachometer
  - Km (distance travelled)
  - Transmission oil temperature
  - Voltage (24v)
  - Engine coolant temperature
  - Steering Mode selection (4WS, 2WS and Crab modes)
  - Steering position indicator
  - Engine Hrs
  - Gear selected and direction moved

  This screen is used for diagnostics and technical information
- One (1) Steering Column Stalk Switch - which contains:
  - Turn indicator lights lever
  - Headlight high beam on/off and flash
  - Wind screen wiper function 2 speed with intermittent

  - Wind screen washer
  - One (1) - Horn
- One (1) - Park brake on off switch
- One (1) - Park Brake ON Indicator (Eaton Screen)
- One (1) - High Beam Indicator (Eaton Screen)
- One (1) - Turning Indicators ON Indicator (Eaton Screen) and dashboard
- One (1) - Headlights Switch - OFF - PARK - ON
- One (1) - Floodlights Switch One (1) - Hazards Lights Switch
- One (1) – DANA Transmission Gearshift Selector (Right side of driver)
- One (1)- Ignition Switch
- Two (2) - Emergency Stop Push Button. **The Emergency Stop Push Button is to be used only in an emergency. Do not use it to shut down the tractor in lieu of the ignition key.**

SECTION IV: MAINTENANCE

Routine Maintenance Procedures And Information

Before Starting Service

Prepare lubricants and parts as per OEM requirements per service quick reference below:

Engine (TCD 3.6 EDG T3 and TCD 3.6 T4)

- Oil capacity: 10 liters – Confirm by checking the dip stick
- Oil type: Deutz Oil Rodon 10w40 or equivalent (Shell Rimula R5LE)

Transmission (DANA T12000)

- Oil capacity: 15 liters
- Oil type: Dextron III

Axles (DANA 212)

- Oil capacity: 8 liters (center differential section)
- Oil capacity: 2 liters (reduction hub each)
- Oil type: SAE 90

Check the hours on vehicle to ensure that correct service is carried out. Check with users / operators for any issues that they have encountered during the use of the vehicle. Check logbook if available for any comments or complaints from users.

Refer to appropriate OEM workshop manuals (engine, axles, and transmissions) for correct process or procedures all available in this manual.

All figures / numbers mentioned here are only for reference and actual manuals should be referred to for correct details.

The figures stated here for the maintenance intervals are the number of elapsed operational hours, which will be registered by the vehicle's engine hour-meter. It is emphasized that these procedures and intervals should always be adhered to, otherwise warranties covering the vehicle and its components will be void.

Should the operators of the vehicle wish to change any maintenance interval or procedures, AVRO GSE should be contacted for verification of the proposed change.

For the complete description of the lubricants and fluids, reference should be made to the specific texts of the various OEM manuals incorporated in this manual.

All maintenance operations serve only as a guide. For specific requirements, refer to the OEM manuals within this manual.

Only qualified personnel (mechanics and electricians) should be allowed to work on this equipment at the discretion of the vehicle owner with clear understanding that

incorrect procedures or processes are used by unqualified persons could result in warranty being revoked by AVRO GSE and or its suppliers.

Ensure all services are carried out on flat surfaces and that all local and workshop rules are strictly adhered to. The correct tool for the job at hand should always be used.

Ensure the cleanliness of the area where work is being performed.

Always take special care when working with hydraulic and electrical systems. Ensure that batteries are electrically disconnected and hydraulic accumulators are discharged.

Refer to relevant sections for workshop and parts manual of major components. (Engine, Transmission, Axles)

Special care should be taken when disconnecting electrical plugs to avoid pulling wires from their receptacles.

Use appropriate lifts, hoists and slings to avoid damage to equipment and to avoid injury or death when working with heavy components such as engines, transmissions, and axles.

Recommended Lubricants and Fluids

Refer to the Lubricants that are listed in the OEM's texts within this manual. OEMs of the major components (engine Deutz, transmission DANA and axles Dana) are used in the manufacture of this product.

AVRO GSE therefore recommends that customers use lubricants with the same specifications to maintain warranties and obtain the maximum service life for the tractor and its components.

To ensure trouble-free operation and long life of all components of the tractor; follow the service and lubrication schedule.

Any equivalent grade lubricant from another recognized supplier may be used, providing the manufacturer can guarantee it is an entirely suitable equivalent in every respect, and that the responsibility for satisfactory operation is accepted by them.

This tractor should be maintained and serviced mechanically, hydraulically and electrically, lubricated and adjusted only by experienced qualified tradespeople.

Service Intervals

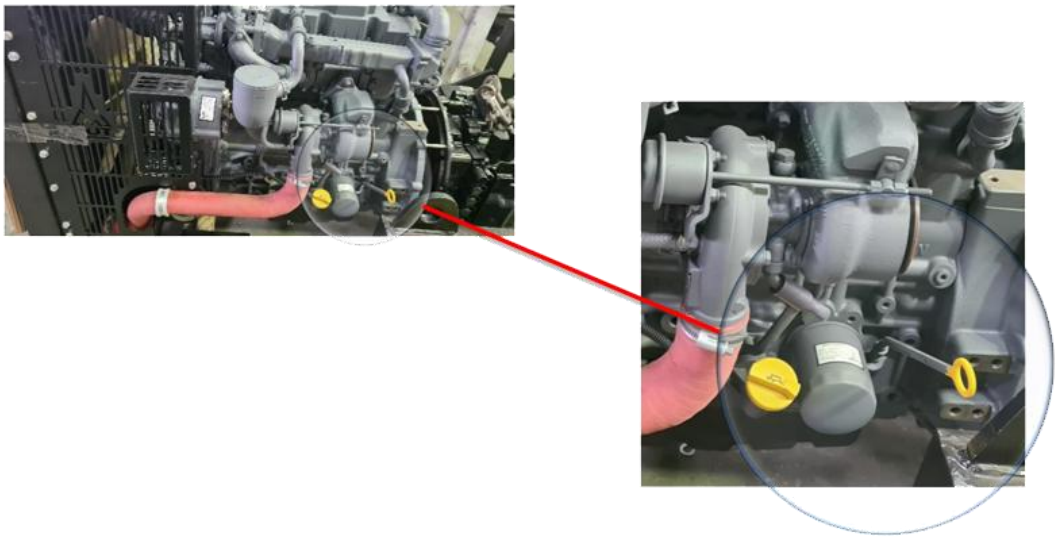
Engine Oil

- Specification: 15w40D or equivalent
- Capacity: 11.8 (with filter) see Deutz spec (tech Data 9-65)

The engine oil should be checked using a dip stick to confirm correct level after filling.

Oil Level

The dip stick is located on the RH side of the engine and accessed via the RH engine bay door.



Check the Lubricating Oil Level with the engine stopped. If the engine has just been in operation, wait approximately twenty (20) minutes to allow the oil to drain back to the oil pan (sump). Add the correct grade of oil, as required, to maintain the correct level on the Dipstick.

Do not overfill this can cause serious damage to the engine.

Oil Change Intervals

The engine oil filter is located on the Left-hand side of the engine below the turbo. Refer to service schedule for replacement.

During use, Engine Lubricating Oil undergoes deterioration from combustion by-products and contamination.

For this reason, and if the engine is subject to heavy loading, regular oil drain intervals are necessary. These intervals vary in length depending upon engine operation, fuel quality, sulfur content, and lubricant quality.

Under no circumstances should the engine OEM drain intervals be exceeded. Do not mix types, brands, or grades of engine oil.

Refer to the Deutz TCD 3.6 T4 Service manual, for more details on engine preventive maintenance

ⓘ Recommended oil change interval for PT350 pushback tractor is 500 service hours.

Using Lubricating Oil Analysis

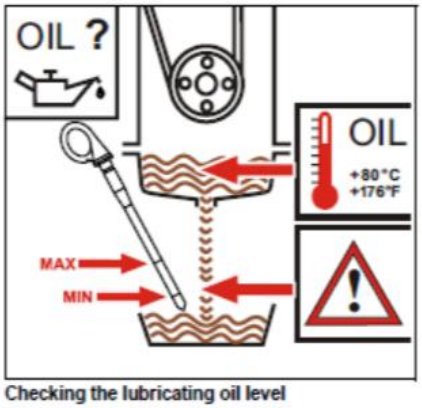
Using a lubricating oil analysis program is recommended for the monitoring of crankcase oil in all engines.

Oil analysis indicates the condition of the engine, not the lubricating oil. it should not be used to extend oil drain intervals.

Regulations for working on the lubricating oil system

Do not work when the engine is running! Smoking and naked lights prohibited! Be careful of hot lubricating oil. Danger of scalding!

Pay attention to utmost cleanliness when working on the lubricating oil system. Clean the area around the components concerned carefully. Blow damp parts dry with compressed air.
Observe the safety regulations and national specifications for handling lube oils.
Dispose of leaking lubricating oil and filter elements properly. Do not allow used oil to seep away into the ground.
Perform a trial run after all work. Pay attention to tightness and lubricating oil pressure and then check the engine oil level.
In case of fuels containing more than 1% sulphur, contact your corresponding DEUTZ partner.



Checking the lubricating oil level

Low lubricating oil level and overfilling lead to engine damage.
The lubricating oil level may only be checked with the engine in a horizontal position and switched off.
If the engine is warm, switch off the engine and check the lubricating oil level after 5 minutes. If the engine is cold you can check it immediately.

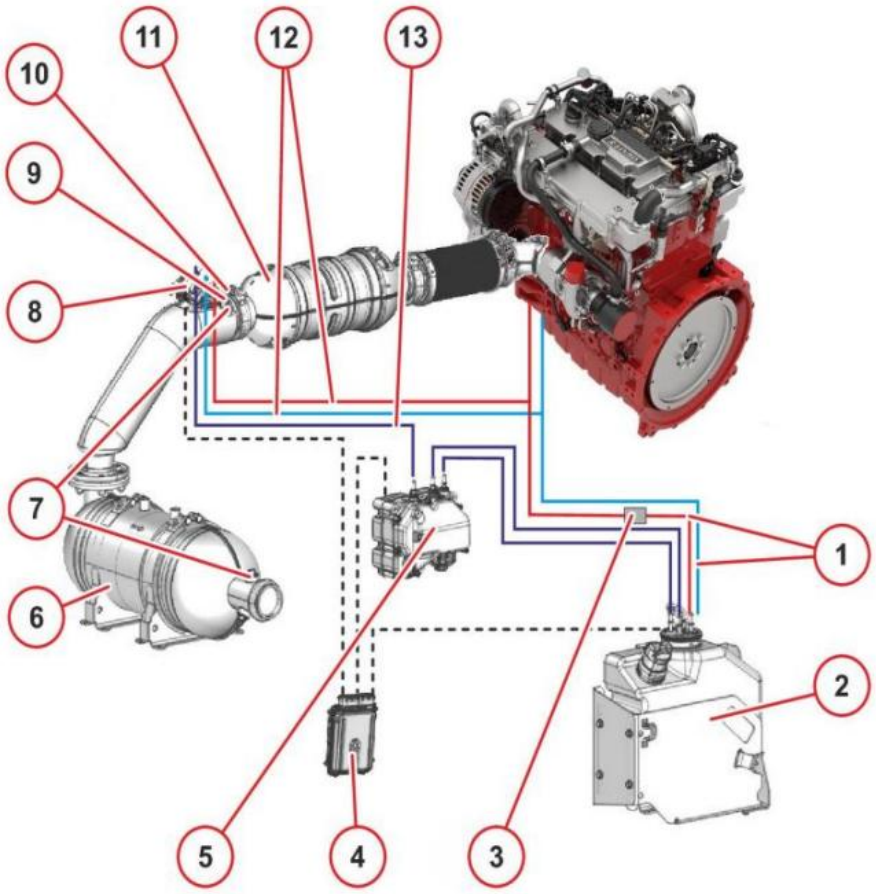
Be careful of hot lubricating oil. Danger of scalding!

- Pull out the lubricating oil dipstick and wipe off with a lint-free, clean cloth.
- Insert the lubricating oil dipstick as far as it will go.
- Extract the lubricating oil dipstick and read off the oil level.
- The oil level must always be between the MIN and MAX marks! Top up to the MAX mark if necessary.

Changing the lubricating oil

- Warm up the engine (lubricating oil temperature > 80 °C).
- Ensure that the engine or vehicle is in a level position.
- Switch off the engine.
- Place a collecting receptacle underneath the lube oil drain screw.
- Unscrew the lube oil drain screw, drain oil.
- Fit a new sealing ring to the lube oil drain screw, insert and tighten. (tightening torque 100 Nm).
- Pour in lube oil.
  - Quality/viscosity data.
  - Filling volume (65).
- Warm up the engine (lubricating oil temperature > 80 °C).
- Ensure that the engine or vehicle is in a level position.
- Check lubricating oil level, if necessary top up.

Exhaust Gas Aftertreatment SCR Catalytic Converters



Exhaust gas aftertreatment system

SCR catalytic converter

1 Coolant line for preheating the SCR tank
2 SCR tank
3 Solenoid valve
4 Engine control unit
5 SCR supply pump
6 SCR catalytic converter
7 NOx sensor
8 Metering unit
9 Pressure sensor
10 Temperature sensor
11 Diesel oxidation catalytic converter
12 Coolant line for cooling the metering unit
13 SCR line

SCR (selective catalytic reduction)

AdBlue is injected into the SCR converter. The NOx in the converter will be converted to N2 (nitrogen) and H2O (water)

NEVER ADD or USE ANY OTHER FLUID IN THE AdBlue Container SERIOUS DAMAGE WILL OCCUR TO THE SCR COVERTER

Faults relating to the SCR converter will be shown on the Deutz screen. It is highly recommended that the tractor Be used long enough to allow the engine to get to normal operating temperature. If the engine does not get to normal operating temperature the SCR will start building up urea crystals.

The system will request a stand still regeneration this will appear on the Deutz screen.

This must be taken care of immediately to avoid any unnecessary down time.

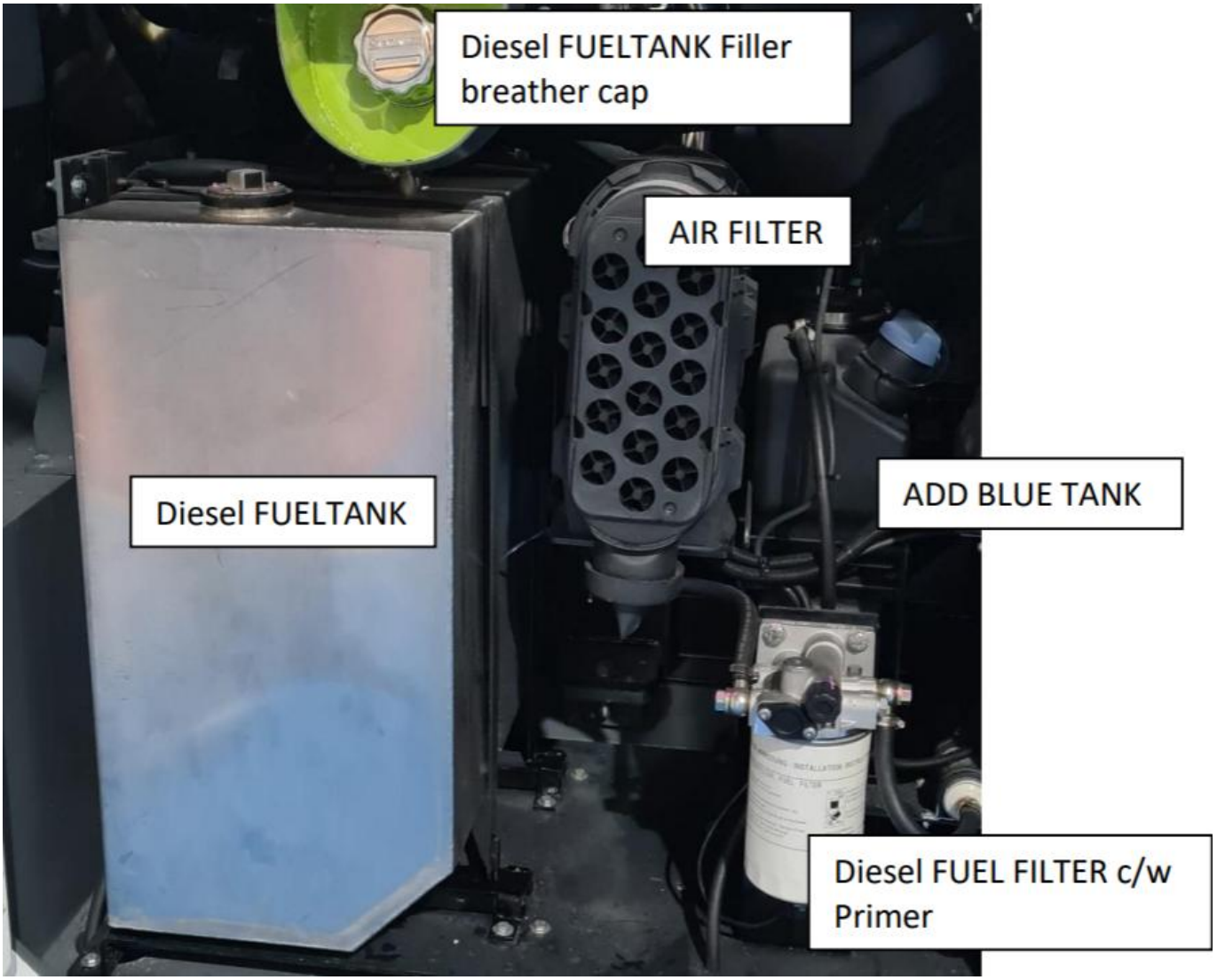
Stationary regenerations slightly dilute the engine oil each time they are performed. The Deutz system continuously monitors this, so it is recommended to complete the regeneration before the 500-hour oil change.

AdBlue

AdBlue is a NOx reduction agent for SCR exhaust after treatment in diesel engines.

For tech spec please ref to the Deutz ops manual and the manufacturers label. Usage must be checked daily or every 10 hrs. of continuous use and at periodic maintenance of 500 hrs. Deutz recommendation.

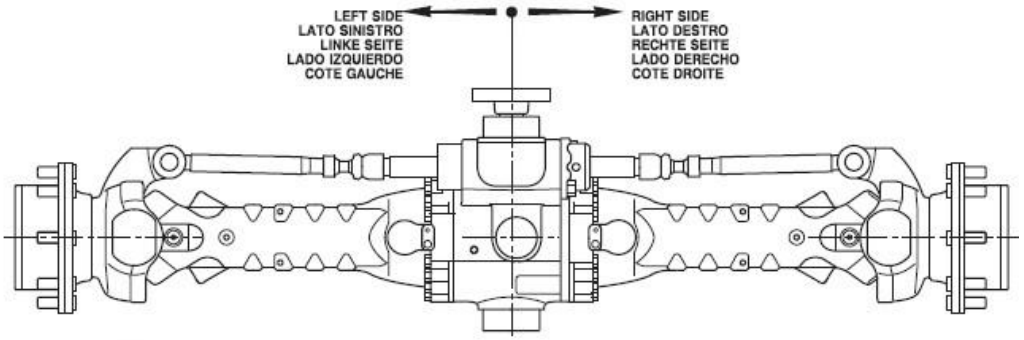
AdBlue tank Capacity 35 liters.



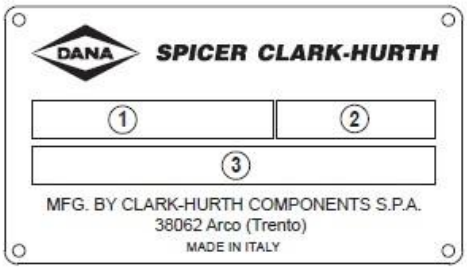
Service Intervals – Axle Components

SPECIFICATIONS

DEFINITION OF VIEWPOINTS



DATA PLATE



1 - Type and model unit - modification index
2 - Serial number
3 - Lubricant

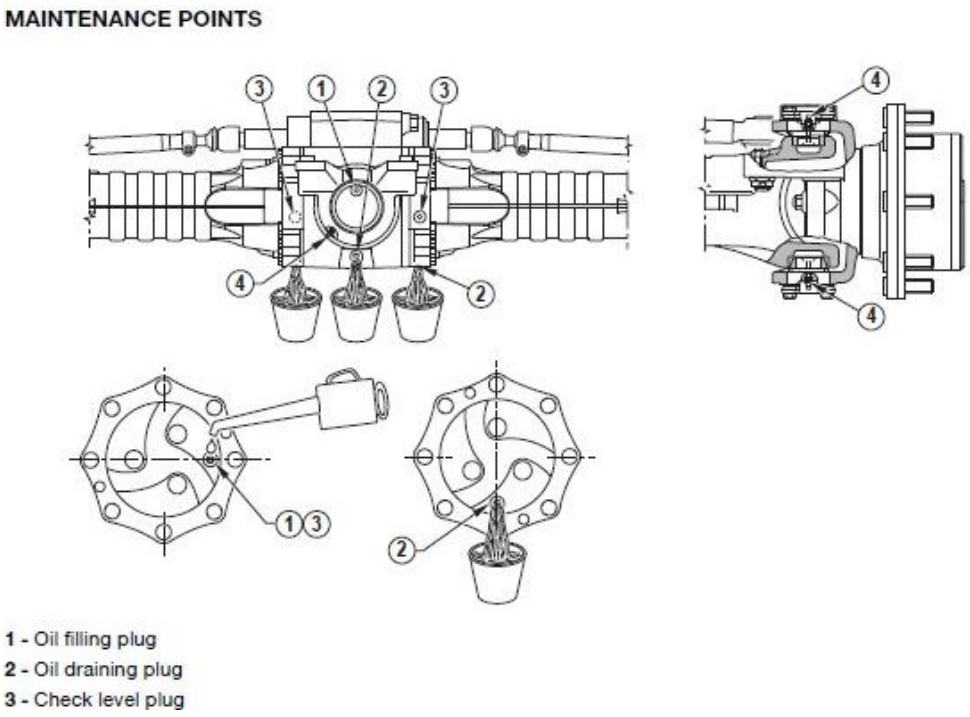
Refer to the DANA Service manual for all details on axle component preventative maintenance, including general lubrication instructions, lubrication points, specifications & intervals.

Brand recommendations are used by AVRO GSE and its suppliers as a guide to correct lubrication. Any equivalent grade lubrication from an alternate supplier the supplier must guarantee that it is an entirely suitable equivalent in every aspect and that the responsibility for satisfactory operation is accepted by them.

AVRO GSE will not be responsible for any mechanical failure if the incorrect grade of oil is used in any components requiring oil or lubrication.

Routine Maintenance, Procedures, Information Front and Rear Axles

General Details



The axles fitted to this vehicle are drive steer hypoid differential units where the drive from the transmission output flanges provides power through the propeller shafts that is applied to the axle input flanges and through to the planetary gear final drive hubs to the road wheels. (Refer to DANA). Both these components have their own separate lubrication. The front axle differential is provided with filler plugs which act as an oil level indicator also, refer to DANA manual for location. Ensure the tractor is stationary, the engine is turned off, the park brake is on, and the wheels are choked. batteries should be isolated prior to any checks being performed. The front axle is fixed mount to the chassis and the rear axle is pivot mount to the chassis.

Safety Recommendations

Prior to doing any maintenance on the axles (front and rear), the vehicle should be raised from its wheels and supported on suitable stands that will prevent it from falling or moving while axle maintenance is taking place. The wheels should be demounted from the hubs.

Maintenance can also be carried out over a suitable in ground pit if available. The following procedures must be always followed.

1. Pump the brake pedal or use the blow down valves to bleed all the oil pressure from the accumulator.
2. Check the hydraulic lines from the brake cylinders on the axles, including the input pinion park brake for wear and leaks.
3. Check the hydraulic lines from the steering cylinders for wear and leaks.
4. Check all grease points on the axle.
5. Drain the differential oil (rear). Refer to DANA manual for procedure.
6. Check the propeller shaft bolts on the differential input flange and the transmission output flange.
7. Check all the axle mounting bolts are secure and nuts are torqued (600 Nm).
8. Check axle housing for cracks and leaks.
9. Ensure that all hoses, pipes and grease lines are securely clamped and positioned out of the way so as not to obstruct the rotation of the wheels.
10. Replace oil with recommended oil type.
11. Check the operation and adjustments of the steering orbital and braking systems by starting the engine and operating the system. Adjust as necessary. Refer to the appropriate section of this manual for adjustment procedures.
12. Ensure that the axle's lubricating oil levels are correct.
13. Install wheels onto wheel hubs.

Overhaul

For overhaul of axle, refer to authorized DANA Dealer or to AVRO GSE.

Propeller Shafts – Bearing Cap Construction

General Information

There are two propeller shafts fitted to this unit. They are installed between the transmission and the front and rear differentials.

Ensure that the Tractor is stationary, the engine is turned off, and the wheels are choked on both sides before attempting to perform any maintenance on the propeller (drive) shafts.

Never use high pressure washer to remove grease from universal or slip joints.

Procedures

Lubricating the Propeller Shaft

Never use high pressure greasing equipment to grease the universal joints or slip joints as the bearing and shafts could be damaged.

1. Wipe the grease nipples which are located on the universal joint journals and slip joints, clean and ensure that the nipple sealing ball recess is free from old grease and dirt.
2. With a hand operated grease gun inject grease into the journal of the universals via the grease nipples until fresh grease appears around the bearing seals of every journal.
3. Wipe the purged grease from the universal.
4. With a hand operated grease gun inject grease into the slip joints via the grease nipples until fresh grease appears around the shaft at the edge of the dust cap on the slip joint.
5. Wipe the purged grease from around the slip dust cap and grease nipple.

Service Check for Propeller Shaft Component Wear

1. Hold the companion flange half of a universal joint stationary and attempt to rotate the other half about its axis in each direction. No movement should be felt.
2. Repeat this procedure for each universal joint.
3. Hold the yoke half of the slip stationery and attempt to rotate the slip joint stub shaft about its axis in each direction. A small amount of movement, only detectable movement is accepted.
4. Hold the slip joint yoke around the body of the joint and attempt to move it back and for the across the axis of the propeller shaft. No movement should be detectable.
5. Should movement be detected which is more than that which was described, the propeller shaft should be removed and overhauled.

Removing the Propeller Shaft

1. Take suitable precautions to prevent the vehicle from moving and take precautions to prevent the engine from being started.
2. Remove the fasteners that retain the propeller shaft flange yokes to their mating companion flanges.
3. Remove the propeller shaft from the vehicle.

Installing the Propeller Shaft

1. Ensure that the propeller shaft slip joint is restrained at the “fully closed” position so that it cannot accidentally slide out and damage the slip yoke dust cap while the propeller shaft is being installed.
2. Install the slip jointed half of the propeller shaft into position between the driver and driven companion flanges.
3. Ensure that all nuts and bolts fitted replaced with new ones and are of grade 10.9 minimum with spring washer torque to 81Nm.9 (Should be fine thread).

Overhaul Procedures

It is recommended that the propeller shafts are overhauled by a qualified tradesperson.

Disassembling the Propeller Shaft

1. Unscrew the dust cap fitted to the end of the slip yoke and slide the propeller shaft apart.
2. Bend the tabs on the locking strips down and remove the bearing cap fasteners on the universal joint which is to be disassembled.
3. Remove the locking strips and bearing caps from the journal bearings.
4. Bend up the tabs on the locking straps to lock the fasteners.
5. With the bearing caps removed, the journal can be displaced so that the journal bearings are pushed out of the yokes sufficiently to be removed. Remove the journal bearings.
6. Remove the journal and separate the joint.
7. Thoroughly wash the journal and yokes clean with a solvent, wipe the parts dry with a clean cloth.
8. Remove the seal, seal washer and dust cap from the slip joint stub shaft. Thoroughly wash the slip yoke and the slip stub and shaft splines clear with a solvent. Wipe the parts dry with a clean cloth.
9. Remove the split pin from the nut that retains the support bearing companion flange, then remove the nut and its washer and slide the flange of the splined end of the propeller shaft.
10. Remove the support bearing from the propeller shaft.

Assembling the Propeller Shaft

1. Position a universal joint journal in a flange yoke and lift a bearing assembly complete with seal, etc., into a bearing bore of the flange yoke and over a trunnion of the journal.
2. Support the journal and bearing assembly in position and fit the other bearing assembly.
3. Install the bearing caps, locking straps and fasteners, check that the bearing cap keys are engaged into the slots in the bearing assemblies and then tighten the fasteners securely.
4. Repeat this procedure to assemble the slip joint yoke to the journal.
5. Repeat this procedure to assemble the tubular shaft universal joint journal.
6. Apply a film of recommended grease to the spline surfaces on both halves of the slip joint.
7. Ensure that the drive shaft is phased correctly, if not done correctly it may cause severe vibration or even damage to the drive shaft.
8. Install the dust cap and steel washer onto the slip stub shaft and then install the slip yoke assembly onto the slip shaft with the arrows aligned. **This is important as it aligns the trunnions.**
9. Lubricate the universal joints and slip joint in accordance with procedures.

Inspecting the Propeller Shaft Component for Wear

1. Lightly clamp the tubular half of the propeller shaft horizontally in a vice, taking care not to deform the drive tube of shafts with this type of construction.
2. Check with a dial gauge, the radial end play of the universal joints. This must not exceed 0.010” (0.25mm).
3. Check with a dial gauge the circumferential play of the universal joints. This must not exceed 0.010” (0.25mm).
4. Checking for the axial run out of the propeller shaft must be carried out with specialized equipment. The maximum shaft run out between centers is 0.010” (0.25mm) and 0.005” (0.12mm) on the stub shaft neck.
5. Parts which are defective or at all suspects must be discarded and replacements obtained.

Transmission – DANA Series

For complete details on service repair, refer to the DANA Manuals.

General Information

The transmission assembly is mounted directly to the engine within the engine bay. It is fitted with a 'stick shift' upshift and downshift controller.

Ensure that the tractor is stationary, the engine is turned off, and the wheels are choked on both sides when performing any maintenance on this tractor.

Procedures

Removal and Installation

The transmission cannot be removed from the vehicle on its own. It must be removed with the engine as an assembly. The engine, transmission and hydraulic system can be removed as one as it is all mounted to a modular frame.

All safety recommendations must be observed and followed.

Disconnection of the Transmission from the Engine

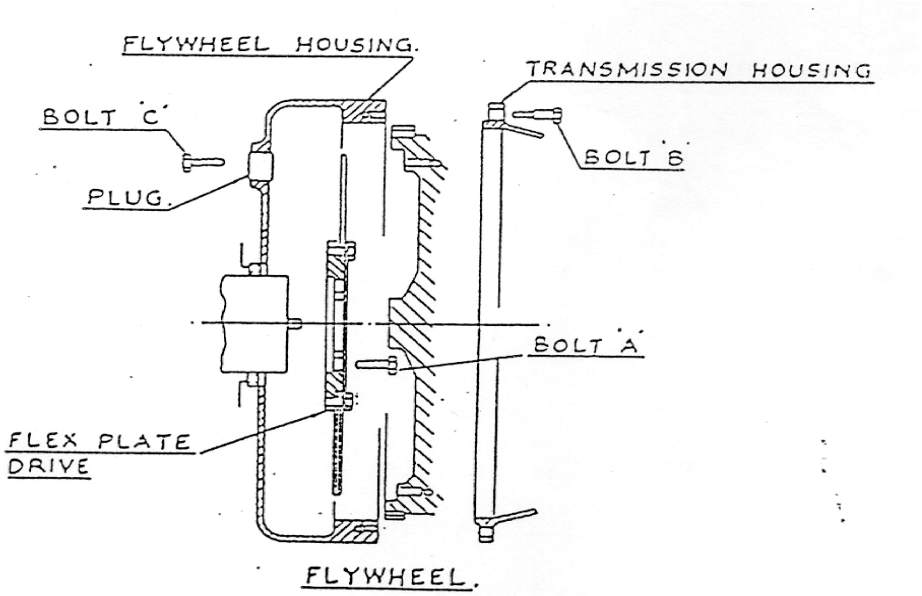
1. Support the engine and transmission assembly to facilitate the removal of the transmission.
2. Remove the large plug fitted to the engine flywheel housing.
3. Rotate the engine flywheel **clockwise only** until one of the bolts securing the flex disk drive plate to the flywheel is adjacent to the plug hole in the flywheel (bell) housing.

(!) Never rotate the engine anti clockwise during dis-assembly or assembly of transmission as this will result in major damage to engine components.

4. Remove the bolts and repeat this procedure until all bolts are removed.
5. Ensure that the engine is properly supported so that when the transmission is separated from the flywheel housing, the engine will not fall. Attach a chain hoist and suitable lifting sling to the transmission and then separate the transmission from the engine.

Removal of Flex Plate Assembly from Engine Crankshaft

1. Remove the fasteners which secure the flex plate hub to the engine crankshaft.
2. Remove flex plate assembly from engine crankshaft.



Installation of Flex Plate Assembly

1. Ensure engine crankshaft mounting diameters are free from burs and surface imperfections.
2. Install the flex plate assembly.
3. Install flex plate fasteners and tighten securely.

Installation of Transmission to Engine

Never use old fasteners, always replace such with new and the same spec (min grade 10 bolts).

The procedure for installing the transmission to the engine is in the reverse order to its removal with attention given to the following points:

1. Ensure that the fasteners securing the transmission to the engine flywheel housing are tightened to correct torque as per engine manufacture.
2. Ensure that the (BOLTS) fasteners used to secure the flex plate to the transmission converter housing are securely tightened to the correct torque as per engine manufacture.

Never rotate the engine anti clockwise during disassembly or assembly of transmission as this will result in major damage to engine components.

Overhaul

Refer all overhauls to authorized DANA Dealer or to AVRO GSE.

Air Inlet Equipment – Filter Assembly

The vehicle's engine is provided with 1 Air Filter that is housed in the filter housing on the Left-hand side behind the door next to the Diesel Tank.

Maintenance Checks

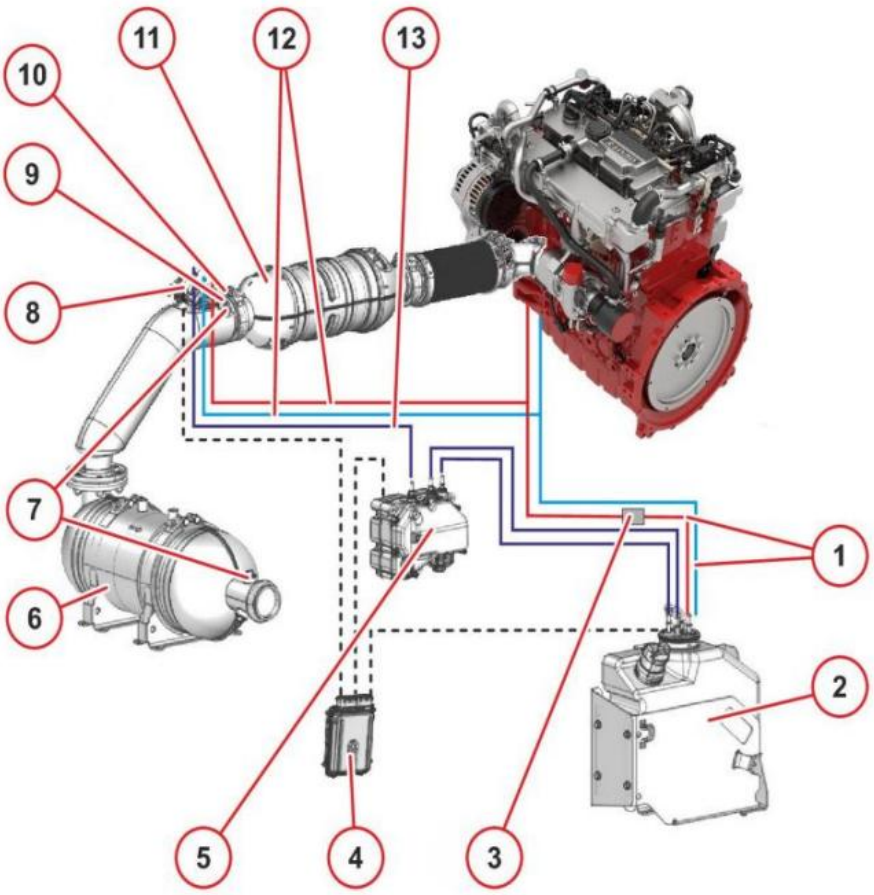
1. Check that all rubber hoses and boots are free from defects (holes and cracks).
2. Check all clamps are secure and undamaged.
3. Check for leaks and seal accordingly.

Replacing the Filter Element

1. Remove air filter end cover.
2. Remove filter elements and replace according to PM schedule. If conditions are extremely dusty, filters should be inspected and changed more regularly.
3. Wipe the inside of filter housing with clean rag, removing all dust and dirt prior to installing the new elements.
4. Inspect outside of housing, all clamps, rubber hoses to ensure no cracks or damage is visible and all joints are airtight.

Exhaust System

The exhaust system of the vehicle consists of 2 Catalytic convertors. The first being THE DIESEL catalytic convertor OR DPF(DIESEL PARTICAL FILTER) (11) located above the transmission to the rear of the engine, the second being the SRC catalytic convertor(6) on the RH side towards the rear of the engine bay behind the Left hand side door next to the batteries. The tail-pipe protrudes through the tractor floor.



Exhaust gas aftertreatment system

SCR catalytic converter

1 Coolant line for preheating the SCR tank
2 SCR tank
3 Solenoid valve
4 Engine control unit
5 SCR supply pump
6 SCR catalytic converter
7 NOx sensor
8 Metering unit
9 Pressure sensor
10 Temperature sensor
11 Diesel oxidation catalytic converter
12 Coolant line for cooling the metering unit
13 SCR line

Check Exhaust Assembly

1. Ensure all parts are cool NOT hot.
2. Check all clamps and joints on the exhaust system for leaks and damage.

Exhaust system can reach temperatures more than 500deg. C.

Cooling Systems

General Information

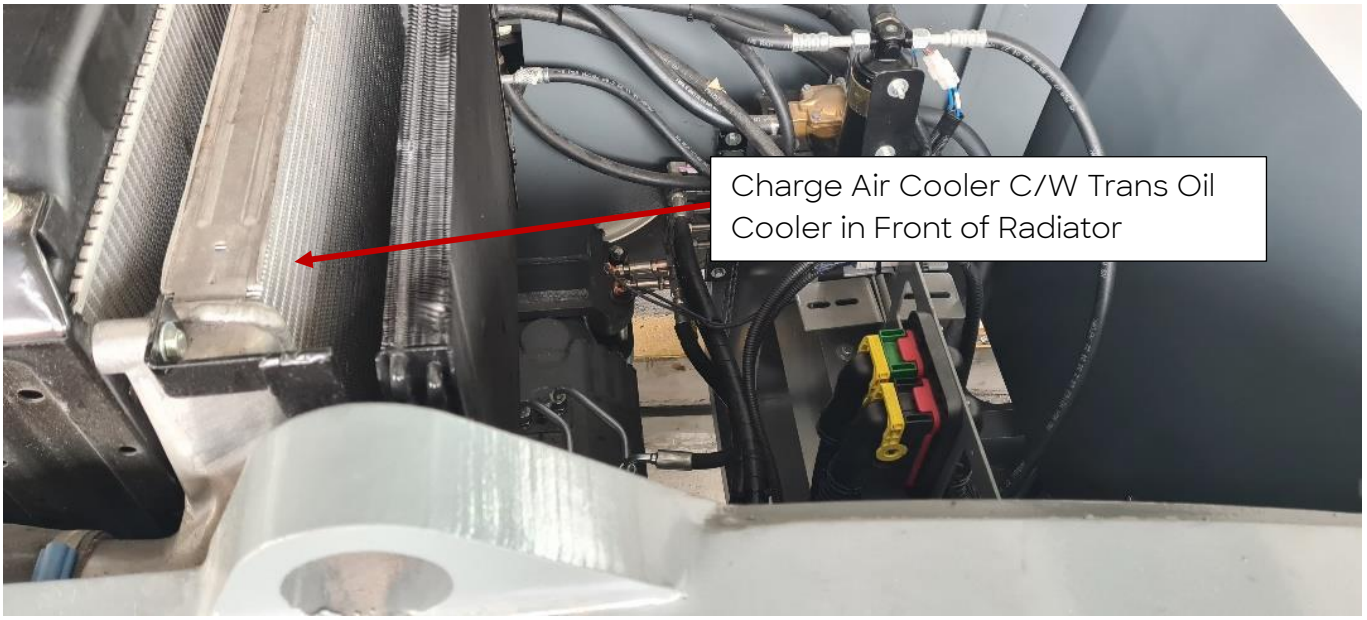
The engine cooling system incorporates a radiator in front of the engine assembly and is connected to the engine cooling system. There is also a “transmission oil” heat exchanger which is integral with the engine oil cooling system, a hydraulic oil cooler and where fitted an a/c condenser.

Procedures

Checking the Coolant Level

1. Maintain the coolant level within the degas bottle.
2. Use coolant specified in engine manual.

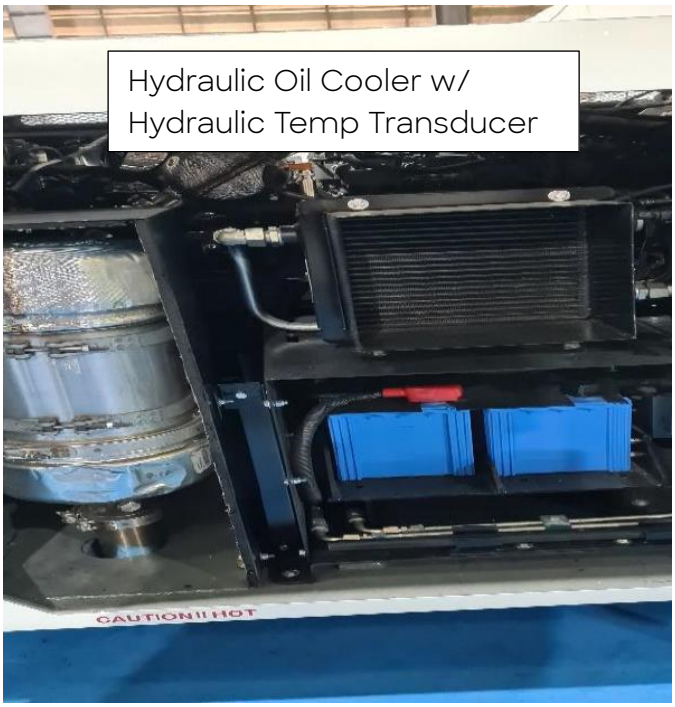
If the engine is still hot from operating, steam may be vented from under the filler cap and may cause severe injury. Eye protection should be worn when filling the radiator.



Radiator Fan Installation

General Information

The Fan Drive Assembly consists of a fan assembly and a hub directly installed to the Deutz engine. The fan will turn as soon as the engine is started and is of the suction type - meaning, it draws air from the front through the radiator, charge-air cooler, and auxiliary coolers. The hydraulic oil cooler is separate from this assembly and is located on the right-hand side behind the maintenance door.



Secure all loose clothing and hair when working around moving parts or machinery.

Procedures

Monthly Maintenance

1. Secure the fan tightly to the fan hub and the hub to the output shaft.
2. Ensure that the fan cowling does not show signs of fatigue or damage. If there is, repair or replace immediately to avoid costly repairs and downtime.
3. Check hydraulic oil cooler electric fan operation.
4. Clean radiator cores regularly with medium pressure washer.

Do not use high pressure washer as this may damage the aluminum radiator core.

Removal of Radiator Assembly

1. Remove the radiator filler cap and open all draincocks to drain the cooling system.
2. Check the fan for operation and damage.
3. Check all hose clamps and hoses for damage and leaks. Replace if required.
4. Check and clean radiator cooling fins.
5. Flush radiator.
6. Replace coolant with correct mixture of water and Deutz Inhibitor “anti-freeze”.
7. Run engine and recheck coolant level.

If the engine is still hot from operating, steam may be vented from under the filler cap and may cause severe injury.

Overhaul

For the procedures and information related to the overhaul of the cooling system, contact AVRO GSE.

Wheel Assemblies

General Information

The wheel assemblies used on the tractor are composed of conventional wheels and tires designed fit for purpose. However, tires may vary depending on brand.

Ensure that the tractor is stationary, the engine is turned off and the park brake is on.

Procedures

Tightening Wheel Nuts

The correct torque value is at 600 Nm. All wheel nuts should be tightened to identical value.

Pre-Cautionary:

When the tractor is new, the wheel nuts should be re-torqued after 8 hours of operation. Subsequently, it is recommended that all wheel nuts be re-torqued weekly for the first month. After this period, wheel nuts should be checked for the correct torque value monthly.

It is recommended to lift each end of the tractor sequentially, raising it to a point where most of the tractor's weight is off the wheels and tires, while ensuring the tires remain just in contact with ground.

Tire Wear

To help reduce unnecessary wear of the tires, it is recommended by AVRO GSE and the tire manufacturers to rotate the tires from SIDE to SIDE and from front to back every 500 to 600 hours. This will help reduce "HEEL and TOE" and possible "SCOLLOPING" wear and prolong tire life.

Checking Tire Pressure

The tire pressure should be checked prior to each operational period where practical, or whenever it is suspected that the tire pressures are incorrect. Check Tire Tread and Walls weekly. Report all tire concerns to the respective maintenance department immediately.

Tire pressure: 120 psi

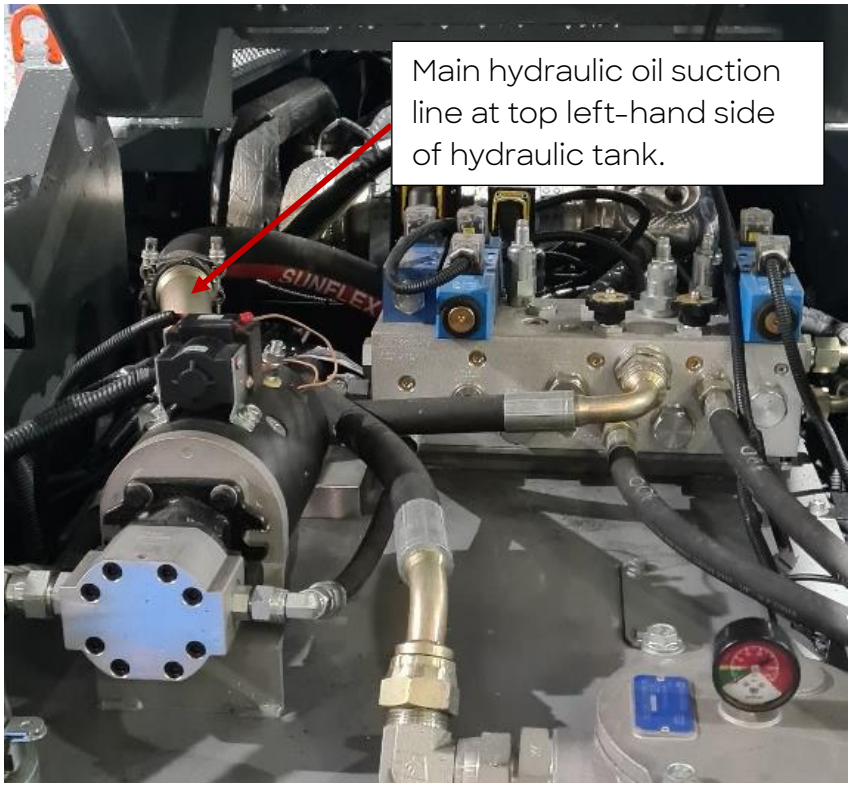
Hydraulic System

The vehicle's steering and braking systems are both hydraulically powered. They are divided into 2 major sections.

1. Steering
2. Braking

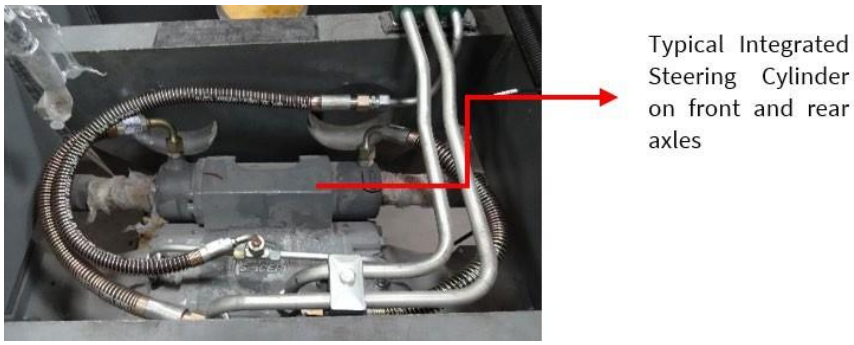
Fluid requirements for these systems are provided by two (2) Vane-pumps directly coupled to the Transmission's PTO drive. The pumps are fed from the oil reservoir by individual "flooded type" suction lines. The pumps provide maximum system pressure as required to ensure effortless operation. System relief provides safety from any hydraulic pressure overload.

Always ensure that the hydraulic tank supplying the suction hoses has sufficient oil to supply the hydraulic system after servicing. Severe damage will occur to the pump if pumps runs dry.

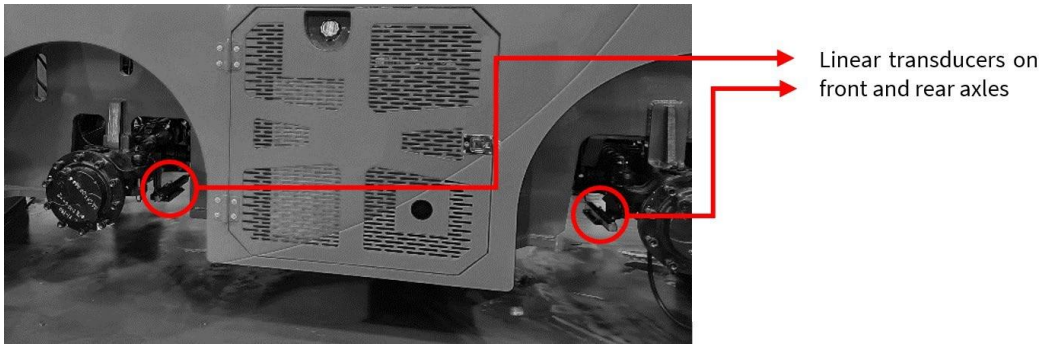


Steering

Vehicle steering is achieved by turning the steering wheel and passing oil through the steering orbital valve (located under the steering column beneath the covers front left inside the cabin) to the integrated hydraulic cylinders on the front and rear axles.



The steering is controlled via two linear transducers positioned on the left-hand side of each axle. The movement of the front axle is mimicked by the rear axle via the Eaton electronic control system and screen.



Steering Faults and Adjustment

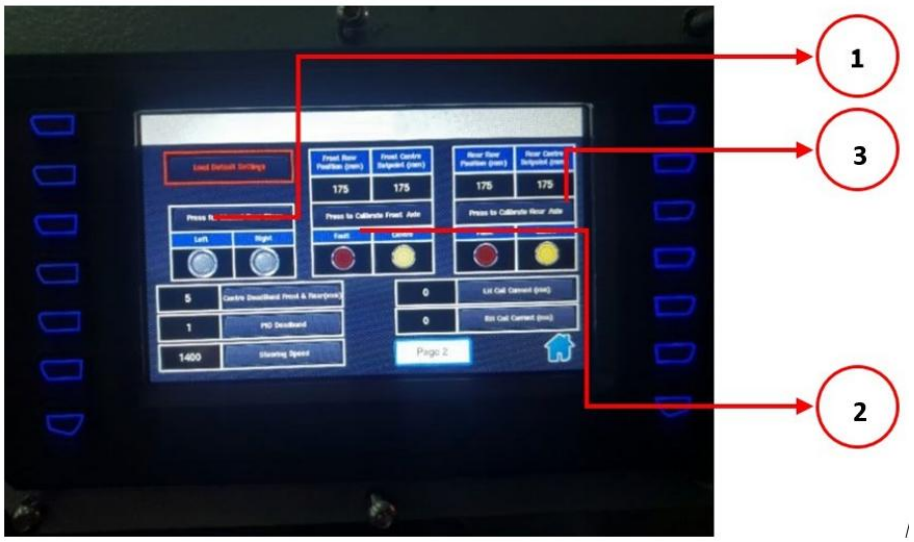
If at any time the steering is not tracking straight, or the rear has moved out of alignment for some reason, follow the following procedure to correct the wheel alignment.

	Select maintenance log in page. Maintenance log in page can be selected via either the button or touch screen.
	From this screen, various functions can be accessed. General maintenance log in. Set the time, date and screen brightness. Code Request: For this function AVRO provides access code. AVRO needs to be contacted. AVRO level login. Home button back to main screen.
 	From the maintenance log in page, Select press to login. Enter the code 1234 in the pin code screen. Press OK. The screen will show an icon with a green arrow, press to Continue.
	This screen allows the maintenance team to: Recalibrate the steering transducers if the wheels are not tracking in a straight line. Bring the rear wheels online if there is a fault with the 4 steering wheels. Press Home to return to main screen.

For more advanced functions, it is necessary to log on to the Code Request page. A code is provided by AVRO GSE upon request. These pages enable the maintenance team to perform additional tasks, such as program updates (special tools, including cables, are required and can be purchased separately).

	Select login request From the maintenance log in page, select 'CODE REQUEST' login. A pin code screen will appear. Press 'Clear', then enter the code provided by AVRO GSE. Once done, press 'OK'.
	This screen allows the maintenance team to perform the same functions as previous with additional functions provided for trouble shooting.
	Page 2 allows the maintenance team to: Update program if required via special tool cable. Set preferred start-up of steering 4 WS or 2 WS (Crab not recommended at start up). Camera on/off if installed. Allows to override interlock in cases of emergency.

Procedure to Correct Steering Track



This will take two personnel to do correctly. This can be done by one person with clear vision of both front and rear wheels.

1. Position the front wheels in the center via the steering wheel. Check using a straight edge or string line confirming that the wheels are in the straight ahead/parallel with the tractor chassis or body.
2. Once confirmed the wheels are straight or parallel, press the calibrate front axle button (2), on the right the yellow light will illuminate.
3. For positioning the rear wheels, use the manual steer buttons (1) to set the rear wheels straight. The left and right buttons will move the wheels in the direction of correction required. Check by using a straight edge or string line same as for the front to confirm wheels are straight/parallel to the chassis.
4. Once confirmed, it is straight/parallel press the calibrate rear axle button (3), on the right the yellow light will illuminate.
5. Press the home button, shut down and reboot, the tracking should be functioning correctly now.

Deutz Screen

There is an additional Deutz diagnostic screen located on the right wall of the driver compartment. This screen will show all faults that occur on the Deutz system.

The DPF/ Regen request will also be shown on this screen with an audible alarm.

Braking

It is a closed-circuit hydraulic system operated via the service brake pedal which in turn provides pressure to the 16 sets of internal wet disc brakes per axle.

Parking Brakes

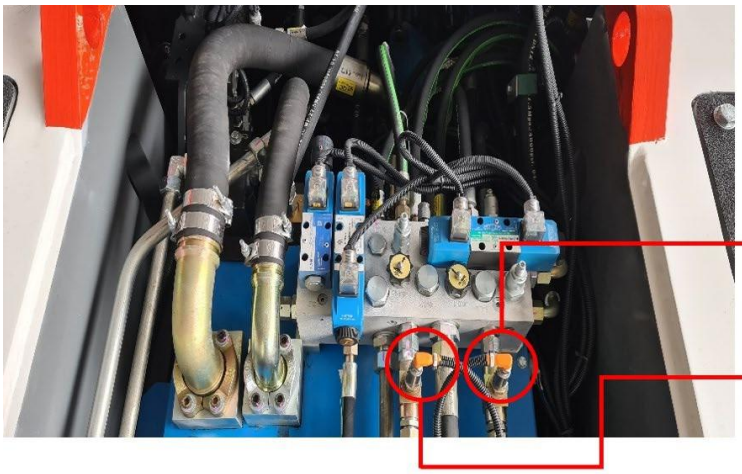
Park brake is activated via an on/off. Return to the center switch (1) on the dash mounted on the driver's console to the right of the steering wheel. It is a hydraulic release spring applied self-adjusting system incorporated on the front axle. The light on EATON screen (2) will illuminate if the park brake is applied. It also forms part of the transmission interlocking system. Gear cannot be selected if park brake is applied.

Do not apply park bake while tractor in motion. This will result in severe mechanical failure in the driveline and will not be covered by warranty.

Service Brakes

Wet Disc (DANA) internal type operated from the foot brake valve and pedal. The Pressure Switch is used to activate the vehicle's stop lights as well as the interlocking system for the transmission gear selector.

Service brake pedal shown, brake valve below plate.



Service brake pressure transducers located on hydraulic power pack.

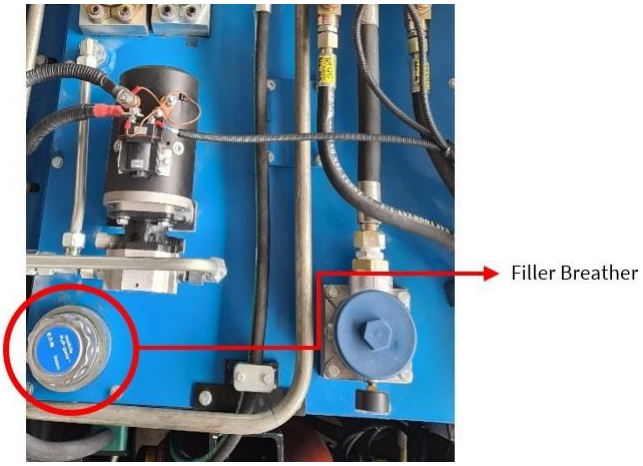
Park brake pressure transducers located on the hydraulic power pack.

Reservoir and Ancillary Equipment

The hydraulic reservoir is mounted in the rear section under the composite cover of the chassis and holds approximately 80 liters of oil. The reservoir is equipped with a sight level gauge and temperature sensor oil temp should not exceed 70 deg. C.

Access to the reservoir is via a large composite inspection cover which is located at the rear of the tractor between the rear wheels. Filling is done via the filler-breather located on the left side of the hydraulic reservoir.

If oil is not clear in the sight glass and it appears to look milky it will require immediate changing as in this condition it is contaminated with water or some other liquid substance and will cause serious damage to the hydraulic pump and valves.



A plugged outlet is provided for reservoir draining.

Components in Hydraulic System

Main System Relief Valve is provided to offer protection to the entire system and is set to be slightly higher than maximum system pressure.

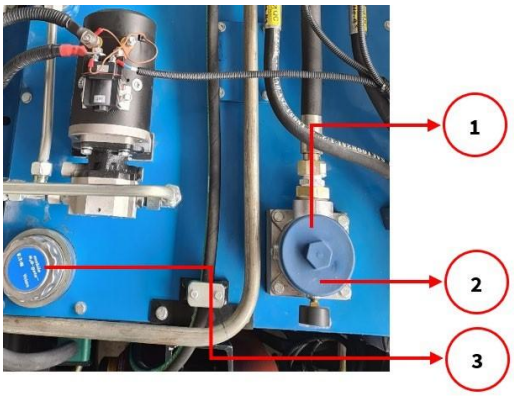
Main Manifold

The main manifold distributes the oil flow to the required areas of use as and when it is required by the different components in the system. The system pressures and pressures to the brake system are monitored and can be seen on the Eaton display. This is very useful when diagnosing basic hydraulic faults that normally require gauges to be connected to the system.

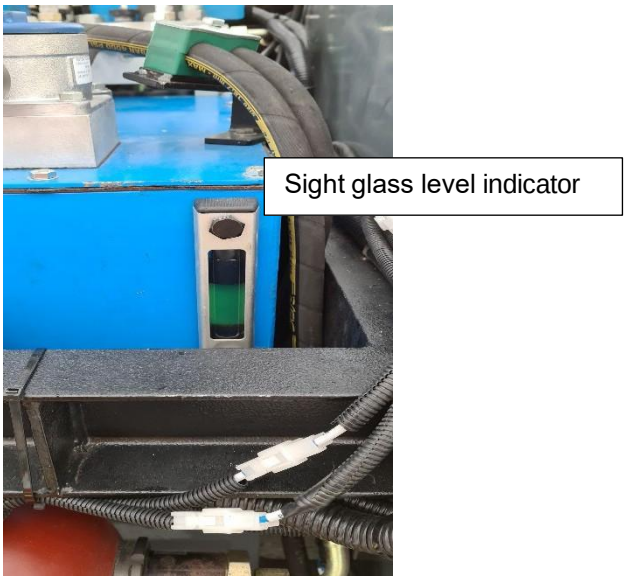
Return Line Filter (1) is positioned so that all valves return functions flow though the filter before returning to the reservoir. The only exception to this is that the brake circuit has its own dedicated return to ensure that part of the circuit is not subject to possible tank-line back pressure surges. The filter assembly also has a filter blocked indicator (2).

Hydraulic Oil Filler/Breather Cap (3)

The filler/breather cap is positioned on the top left side of the hydraulic reservoir. It has an integral strainer to remove any large foreign debris that may be accidentally introduced while filling / toping up oil. It also acts as a breather to prevent any pressure building up in the tank.



Oil Level sight glass level indicator located at the rear of the tractor fitted to the hydraulic tank indicates oil level. It contains a warning Symbol ⚠ on the Eaton screen in the cabin to the operator. The maintenance team can access the diagnostic page when the red warning shows low hydraulic oil.



- If oil is not clear in the sight glass and appears to look milky, immediate changing is required. The reason for this is that the oil is contaminated with water and will cause serious damage to the hydraulic pump and valves.
- The oil level must be in the sight level gauge.
- Oil level is not at the top of the filler breather. Topping up is done through the filler-breather

DC Pump

The DC pump is an electric powered hydraulic pump that is used in the event of an emergency e.g. failure of main hydraulic pumps (engine driven), Engine failure or any other scenario that may occur that requires hydraulic power.

Main Hydraulic Pumps

The two Variable displacement pumps (Vane type) provide all the fluid requirements under normal operating conditions to the hydraulic systems. They are directly coupled with the transmission's PTO drives. The pumps are fed from the oil reservoir by individual "flooded" suction lines. The pump is self-compensating, meaning, it automatically provides the flow required by the system.

System operating pressures need to be referred from the Hydraulic drawing in this manual.

Only qualified hydraulic technicians that understand hydraulic systems and drawings should be allowed to set system pressures. Ensure that mixture of oils is never used in this hydraulic system.

Under normal working conditions, the "life" expectancy of the hydraulic oil supplied by AVRO GSE in the Tractor is very high. However, it is recommended that the hydraulic oil be inspected for both quality and quantity at least once every calendar month.

Hydraulic Changes

The grade of Hydraulic Oil used in the Hydraulic System is a vital factor in influencing the hydraulic system performance and ensures freedom from frequent and unnecessary servicing.

Oil Change

Under normal operating conditions, it is automatically filtered and should be periodically tested to ensure suitability, the oil may be retained in service for up to two years, especially if the oil temperature remains below 70° C and is kept free of contaminants.

If the system operates under adverse conditions the oil must be changed more regularly.

When doing periodic maintenance, drain the hydraulic reservoir by using the drain plug. It is then advisable to flush the entire system pumps, cylinders, pressure lines etc. With a specified flushing oil, drain the system free of flushing oil, and replace the oil filters associated with the hydraulic system.

At this point, fill the Hydraulic Reservoir and the entire system with new, clean, filtered Hydraulic Oil. Fill to the correct level and bleed the system free of trapped air.

Eye protection should be worn when draining or filling hydraulic system.

Preventative Maintenance

- Oil level must be checked daily. Top up if necessary.
- Filler breather cap to be kept secured and clean.
- Ensure there are no leaks from the reservoir, pumps, cylinders or pressure lines.

Replacement of Return Line Filter Element

The return line filter is fitted with a filter condition indicator. Replace filter element if the indicator is in the Amber or Red section of the Condition Gauge or at the bi-annual hydraulic oil change. This indicator is located on the filter housing.

Cleanliness

Since most of the parts in this system have precision finished surfaces working together, it is a proven fact that contamination from acid, water, grit, metal particles etc. in the oil will inevitably cause damage that will require repairs. Use new clean oil only, handle all oil in clean containers and pour oil into the hydraulic system through a clean 10-micron filter. Even new oil should be filtered. Keep containers adequately capped or sealed when not in use, to prevent water contamination.

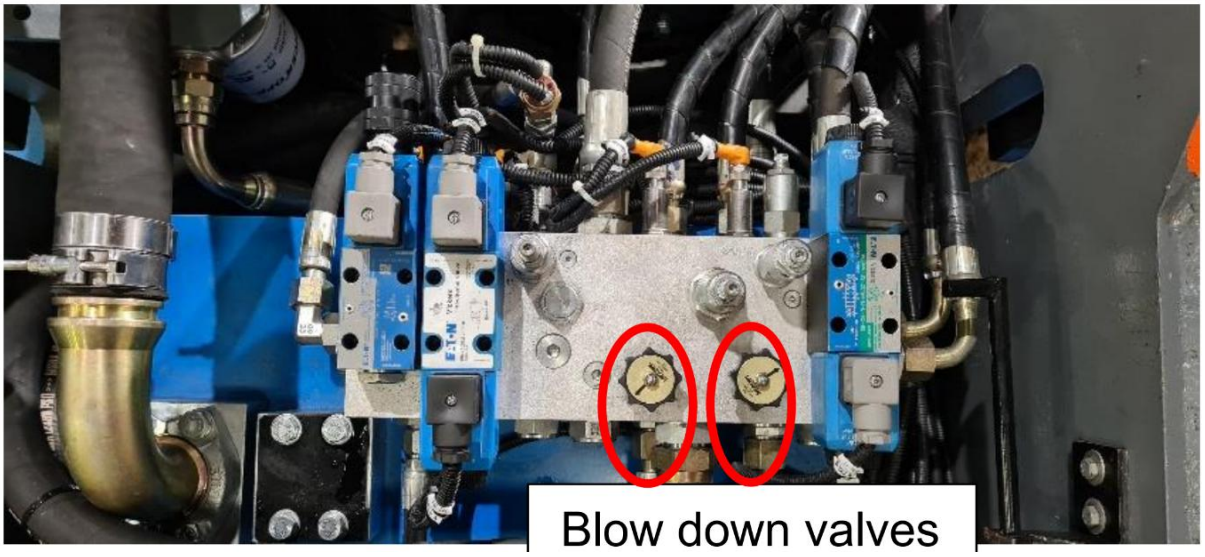
Hydraulics – Maintenance of Components

General Precautions

Any maintenance on the vehicle hydraulic components must be done with the engine shut down and the Park Brake is applied, and the vehicle chocked. Should the pumps need removing for servicing, the Suction Gate Valves (where installed) must be closed before removing any hoses. Remember to OPEN these valves upon re-assembly, as failure to do this, and running the pumps without oil supply, will damage them almost instantly.

Before removing any Solenoid Valve for servicing, it is a good practice to manually energize each solenoid a few times to ensure that any residual pressure is released to tank.

Any work on the braking circuit will require the main accumulator to be bled off via applying the brake pedal several times or by opening the blow down valves on the main manifold block.

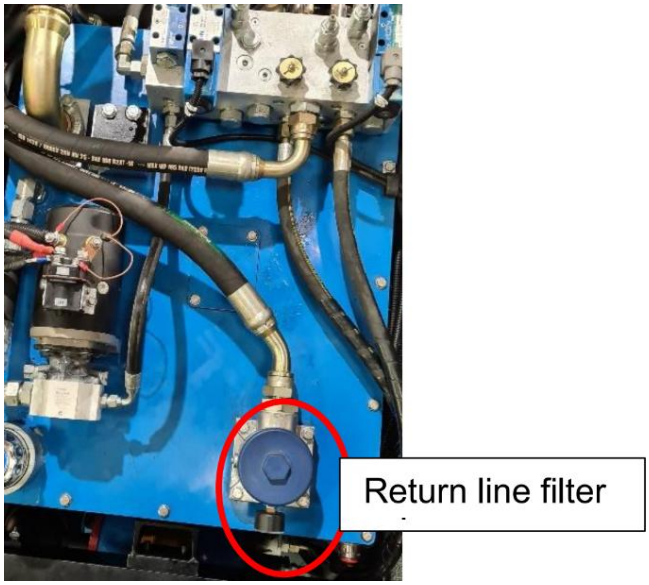


When performing maintenance, ensure the following:

- Clean hands
- Clean oil
- Clean container

General Hydraulic System Check

1. Check all hydraulic hoses for any signs of leakage or damage. Replace any hose that is faulty.
2. Check for oil leaks at all valves and fittings. Take note of the parking area for signs of leakage on the ground and report to maintenance staff immediately.
3. Check the Hydraulic cooler for damage and clogging. Clean regularly to avoid over temp of hydraulic system.
4. Confirm hydraulic temperature transducer not damaged.
5. Test manual park brake release regularly to ensure correct operation.



Replacement of Return Line Filter Element

The return line filter is fitted with a filter condition indicator. Replace the filter elements if the indicator is in the Amber or Red section of the Condition Gauge or at the bi-annual hydraulic oil change. This indicator is located on the filter housing above the filter element.

Fuel Reservoir

The fuel reservoir is mounted on the left side of the engine bay, behind the hydraulic tank, and has a capacity of approximately 140 liters. The reservoir is equipped with a fuel level sender, which provides readings on a fuel gauge located on the EDM on the right side of the driver's console. Fueling is done on the right side of the tractor, with the filler located on the exterior wall. Always replace the filler cap after refueling and avoid overfilling. Only filtered fuel should be added.

A suitable filler Breather Cap is fitted to the top of the Reservoir and must be always kept clean.

A plugged outlet is provided at the base of the Reservoir for draining fuel at the bottom of the tank when required.

Check the fuel gauge at the start of each shift to ensure that the fuel does not run out, preventing being stranded during the shift.

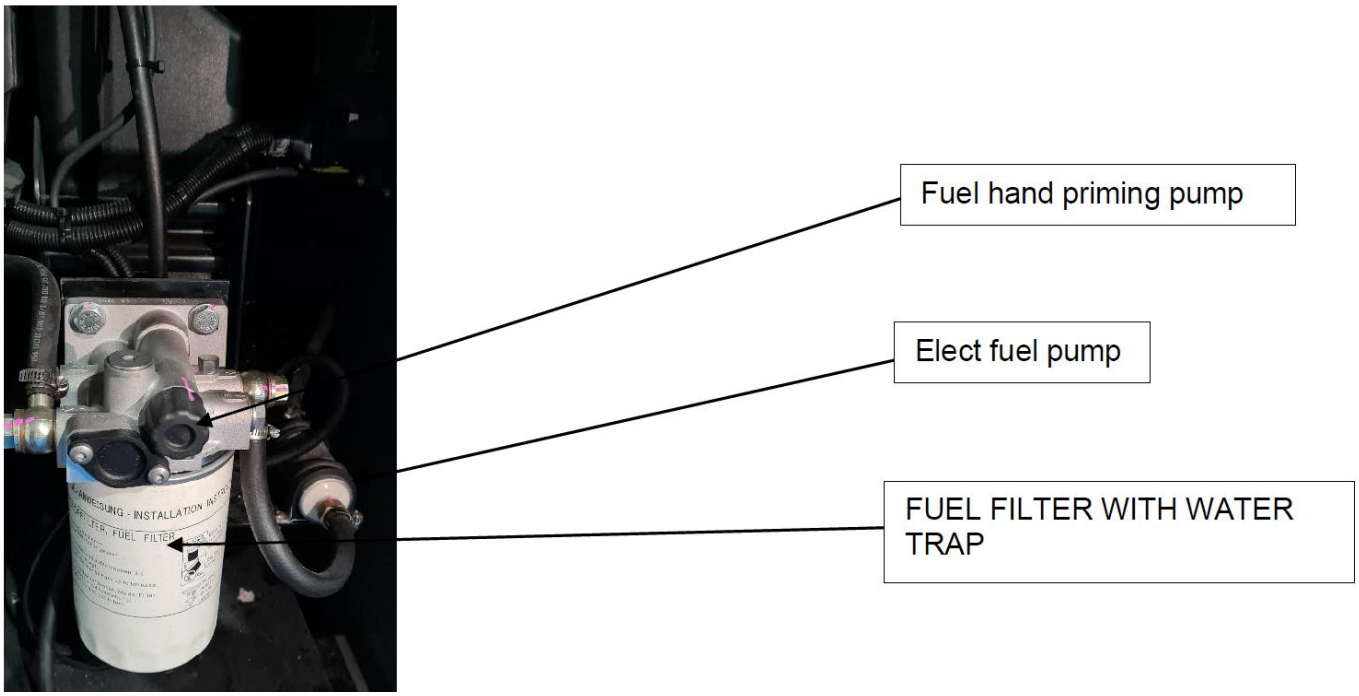
Always visually check the fuel gauge, as it is the only protection against running out of fuel. When in doubt, fill up the Fuel Reservoir/tank.

Fuel Reservoir Cleaning

Over time, if the interior of the Reservoir becomes fouled, or the fuel may be contaminated, it is necessary to drain the entire system, clean the interior of the reservoir and replace the filter/s located on the left side of engine.

After draining and cleaning check that the drain plug is securely replaced in the base of the Fuel Reservoir prior re- filling the entire fuel system.

Fuel Filters



⚠ Eye protection should be worn when draining or filling fuel lines or reservoir.

Preventative Maintenance

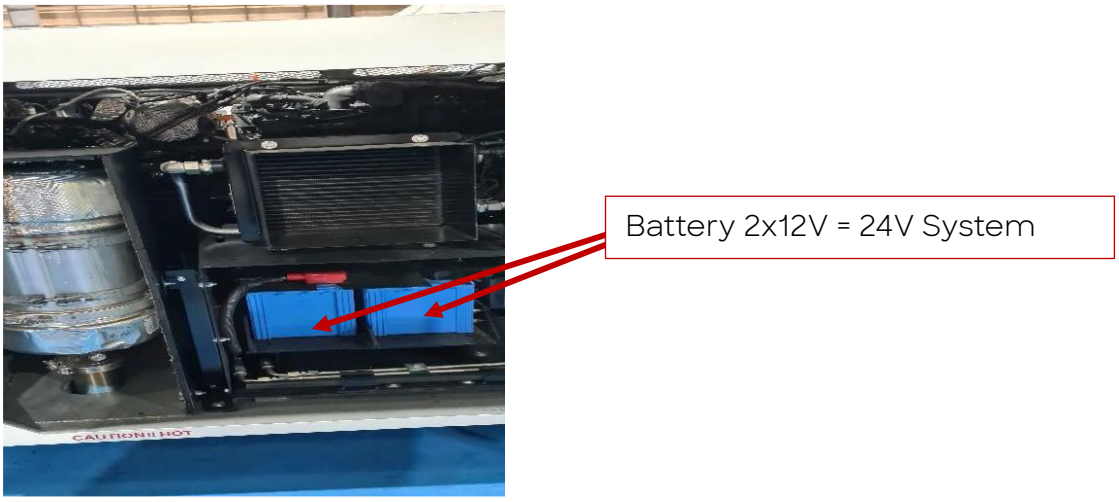
1. Fuel Level should be checked at the start of each shift. Top up if necessary.
2. Filler Cap to be kept secured.
3. Air Vent to be kept clean.
4. Ensure there are no leaks from the reservoir, fuel pump or feed lines.

Fuel lines are to be inspected annually and must be replaced immediately if:

- The cover appears to be abnormal (cracking)
- There is any fluid leakage
- The fittings are damaged
- The hoses are damaged
- The metal reinforcement is showing(visible)
- Use only compatible hoses and fittings

Battery and Battery Box

The batteries for this Tractor are accessible from right hand side by opening the door. The battery is secured with a Clamp Bar which is manually secured by use of Wing Nuts.



Battery Connection

Applicable Cables should be secured to the Battery Terminals ensuring correct connection and polarity.

Battery Fluid Level

Check the fluid level in all cells of all batteries where applicable.

Ensure the fluid level just covers the top of each vertical plate where applicable.

Only top up the batteries with distilled water where applicable.

⚠ Eye protection should be worn when filling or servicing batteries.

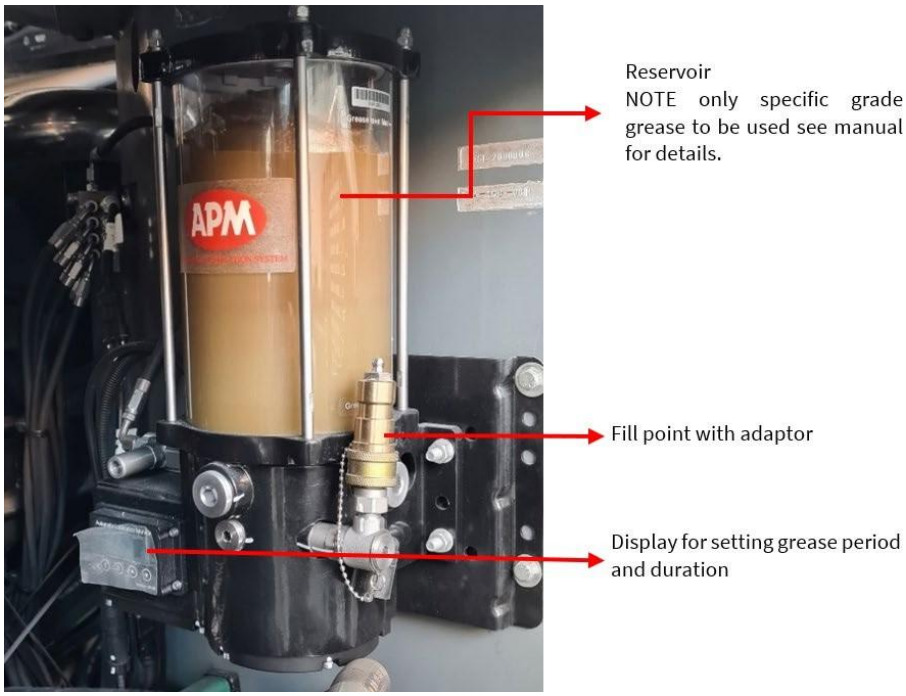
Preventative Maintenance

1. Ensure the battery is secured in its cradle.
2. Check the fluid level in each cell (If not maintenance free type).
3. Check for correct terminal connection.

Auto Greasing System (Optional)

The tractor is fitted with an Auto greasing system.

The reservoir is located on the rear platform allowing easy access for checking and refilling.



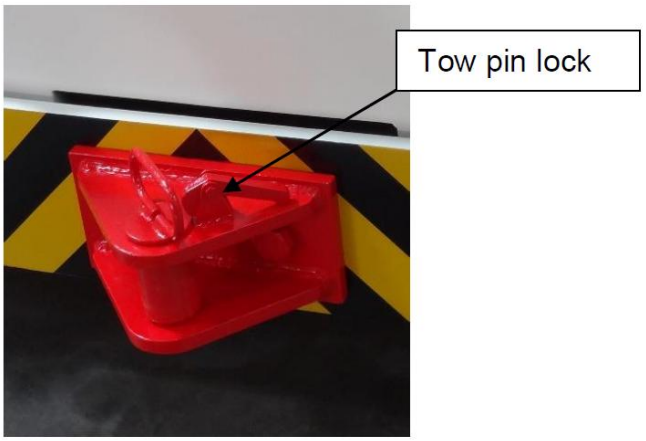
The auto greaser provides grease to 10 key areas on the tractor, including the top and bottom trunnion bearings on both axles and the pivot bearings on the front axle. The greaser is an industrial-grade system, and it is important to understand how the greasing cycle is configured.

For example, if the tractor operates for 20 hours per week, set the cycle to 20 hours. The amount of grease applied is controlled by the cycle duration in minutes. Therefore, to grease the tractor weekly, set the cycle to 20 hours and the duration to 1 minute.

Tow Hitches

The vehicle is fitted with bolted-on single or double (where requested by customer) level tow hitches with stepped diameter tow pins. It is recommended that they be checked every six months for any abnormal wear & tear and replaced whenever necessary.

With both tow pins in place, ensure that the safety latch locks the towing pins. To unlock them ensure that they are easily unlocked by just lifting the latch.



Diesel Fuel Oils

The quality of fuel used for high-speed engine operation is a very important factor in obtaining satisfactory engine performance, long engine life, and acceptable exhaust emission levels.

Refer to engine manufacture for the minimum fuel requirements.

Fuel Mixing Considerations

Very small amounts of Isopropyl Alcohol (Isopropanol) may be used to preclude fuel line freeze-up in winter months. No more than two (2) liters of Isopropyl Alcohol should be added to 570 liters of diesel fuel for adequate protection.

Gasohol and/or gasoline should **never** be added to diesel fuel due to the fire and explosive hazards of mixing and burning such blends. The use of turbine fuel JP4, JET A1, a gasoline/diesel fuel blend, is also **not** recommended.

Using fuel that contains drained lubricating oil can result in premature ring wear, valve burning and injector problems. Mixing drain oil with diesel fuel is **not** recommended.

ASTM Diesel Fuel Specifications

Specification or Classification Grade NATO CODE	VV-F-800 DF-2 CONUS	VV-F-800 DF-2 CONUS (F54)	VV-F -800 DF-1	ASTM D-975 1-D	ASTM D-975 2-D	VV-F -800 DF-A (F56)	MIL-T -5264 JP-5 (F44)	MIL-T -83133 JP-8 (F34)
Flash C Point Min F	52 125	56 133	38 100	38 100	52 125	60 140	38 100	38 100
Carbon Residue (10% residuum) mass % max.	0.35	0.20	0.15	0.15	0.35	0.10	NS	NS
Accelerated Stability Total Insolubles (mg/100mL)	1.5	1.5	1.5	NS	NS	1.5	NS	NS
Water & Sediment % by vol max.	--	--	--	0.05	0.05	0.01	--	--
Particulate mg/Lmax	10	10	10	--	10	1.0	1.0	1.0
Appearance, Visual	C&B	C&B	C&B	NS	--	C&B	C&B	C&B
Ash % by wt max.	0.01	0.02	0.01	0.01	0.01	0.01	--	--
Distillation Temp 10% Recovered C Min. F 90% Recovered C Min F Max C F End Point Max C F	 NS -- 338 640 370 698	 NS -- 357 675 370 698	 NS -- 288 550 330 626	 NS -- 288 550 --	 NS 282 540 338 640 --	 NS -- 288 554 300 572	 400 205 -- 243 470 300 572	 400 205 -- -- 300 572
Viscosity Kinematic cSt @40 C Min. Max.	 20 C 1.9 4.1	 1.8 9.5	 1.3 2.9	 1.3 2.4	 1.9 4.1	 -20 C 1.1 2.4	 -20 C -- 8.5	 -- 8.0
Sulphur mass % Max	0.50	0.70	0.50	0.50	0.50	0.25	0.40	0.30
Cetane No. Min.	45.0	45.0	40.0	40.0	40.0	40.0	Report	Report
Specific Gravity Kg/L @ 15 C	REPORT	REPORT	REPORT	NS	NS	NS	0.788 0.845	0.775 0.840
Cloud Point Max C	--	--	--	--	--	-51	-46 Fz	-47 Fz

NS = Not Specified C&B = Clear & Bright Fz = Freeze Temperature -- Specified property ref to specification for details.

Service Intervals

OPERATION	FREQUENCY (HOURS)										
	DAILY	50	100	250	500	750	1000			Min. 1 yr	Min. 1 in 2 yr
Check Engine Oil	ϕ				ϕ						
Check AdBlue	ϕ				ϕ						
Check Coolant Mixture Level	ϕ				ϕ						
Check Radiators for Blockages & Debris	ϕ										
Check Fuel Level	ϕ										
Check Tyre Inflation Pressure	ϕ										
Check Hydraulic Oil Level	ϕ										
Check Battery Electrolyte Level	ϕ										
Check Operation of Lights	ϕ										
Check Tyre Condition, Tread & Walls	ϕ										
Check Towing Attachments	ϕ										
Vee-Belt Check	ϕ	ϕ			ϕ					ϕ	
Check Differential Level		ϕ			ϕ						
Check Planetary Hub Level		ϕ			ϕ						
Check Wheel nuts for Tightness	ϕ	ϕ									
Bolt Tightening - Axle					ϕ						
Check Tightness of Fuel Lines					ϕ						
Greasing – Under Normal Use					ϕ						
Check Radiator Hoses					ϕ						
Change Fuel Filter /water trap	ϕ				ϕ		ϕ				
Change Engine Oil					ϕ		ϕ				
Change Oil Filter					ϕ		ϕ				
DO SRC REGEN BEFORE PM					ϕ						
Change Air Cleaner Cartridge					ϕ		ϕ				

OPERATION	FREQUENCY (HOURS)										
	DAILY	50	100	150	200	500	1000	2000	5000	Min. 1 yr	Min. 1 in 2 yr
Change Differential Oil							ϕ			ϕ	
Change Planetary Oil							ϕ			ϕ	
Adjustment of Park (Safety) Brake (Check every service)						ϕ	ϕ				
Change External Transmission Oil Filter						ϕ	ϕ				ϕ
Change Hydraulic Return Filter							ϕ			ϕ	
Change Coolant Mixture							ϕ			ϕ	ϕ
Clean Fuel Tank							ϕ				ϕ
Change Fan Belt							ϕ			ϕ	
Check Turbo Unit							ϕ				ϕ

- Transmission: DANA T12000
- Engine: Deutz TCD 3.6 T4
- Axles: DANA 212

To avoid unnecessary and costly damage to the SCR Supply pump and SCR system, please ensure that the AdBlue tank is maintained at least 50% of full capacity.

Daily Maintenance Inspection

The following items must be checked before the operation of the PT350 Tow Vehicle daily. Refer to the AVRO Daily Maintenance Manual for a more detailed explanation of the following items.

Tick the following items once completed.

☐	**Engine Oil Quantity.** Inspect the engine oil quantity level via the engine oil dipstick by placing the vehicle on a flat, level surface. Pull the dipstick out and wipe clean then re-insert the dipstick into its housing. Remove the dipstick, hold it horizontal and check to see if the oil level is between the minimum and maximum levels on the dipstick.
☐	**Fuel Lines and Fuel Tank.** Perform a visual inspection of the fuel lines and the fuel tank to ensure there are no fuel leaks evident
	AdBlue Tank – Check AdBlue tank daily. When topping up tank use extreme caution as the liquid is highly corrosive. (T4 ONLY)
☐	**Cooling System.** Check to see if the cooling system has sufficient coolant. Ensure the engine is not hot and gently touch the top of the radiator cap to ensure the radiator and its coolant is not too hot to open the cap. Remove the radiator cap and check to see if the fluid level is within 50mm from the top of the filler neck.
☐	**Turbocharger.** Inspect the turbocharger mounting, intake and exhaust ducting for leaks.
☐	**Transmission Oil Level.** Check the transmission oil quantity level using the following procedure. Inspect the transmission oil quantity level via the transmission oil dipstick by placing the vehicle on a flat, level surface with engine and transmission oil at normal operating temperature and park brake applied. Pull the dipstick out and wipe it clean then re-insert the dipstick into its housing. Remove the dipstick, hold it horizontally and check to see if the oil level is between the minimum and maximum levels on the dipstick.
☐	**Visual Inspection and Walkaround.** Carry out a visual inspection of the entire vehicle checking for the following items: Body – look for damage, severe rust and metal cracking Windscreens, windows and mirrors - look for cracks, breaks and damaged rubber Lights – Ensure all lights are not broken and are functioning correctly Fluid leakage - oil, fuel, coolant and hydraulic fluid. Ensure there are no fluid leaks evident on the ground Wheels – ensure all wheel mounting bolts and tie rod ends are installed and do not show signs of loosening Tires – inspect the tires for bulging, blistering, large cuts and wear. Visually check the tire for sufficient inflation if in doubt check with pressure gauge

Inspector Name:	
Date and Time of Inspection:	
Any additional remarks:	
Signature	

Spare Parts List

DESCRIPTION	PART NUMBER
CABIN	
Door Latch L/H (Right Hand Door)	GA172304067
Door Latch R/H (Left Hand Door)	GA172304070
Door Handle External C/W Keys	GA403004097
Door Strap	GA323004136
Ignition Switch	GA403004002-S
Work Light	GA152304543
Tow Pin Light	GA152304543
Interior Cabin Light	GA273004108
Switch 3 POS	GA152304488
Light Switch 2 POS	GA152304486
Column Stalk Switch Front	GA152304472-S
FILTERS	
Air Filter	PRPW03398
Air Filter Safety	PRPW03397
Oil Filter (Engine)	PRPW03394
Fuel Filter with Water Separator	PRPW03395

Contact Avro GSE for spare parts ordering and inquiries:

Main:
1 833 220 2810

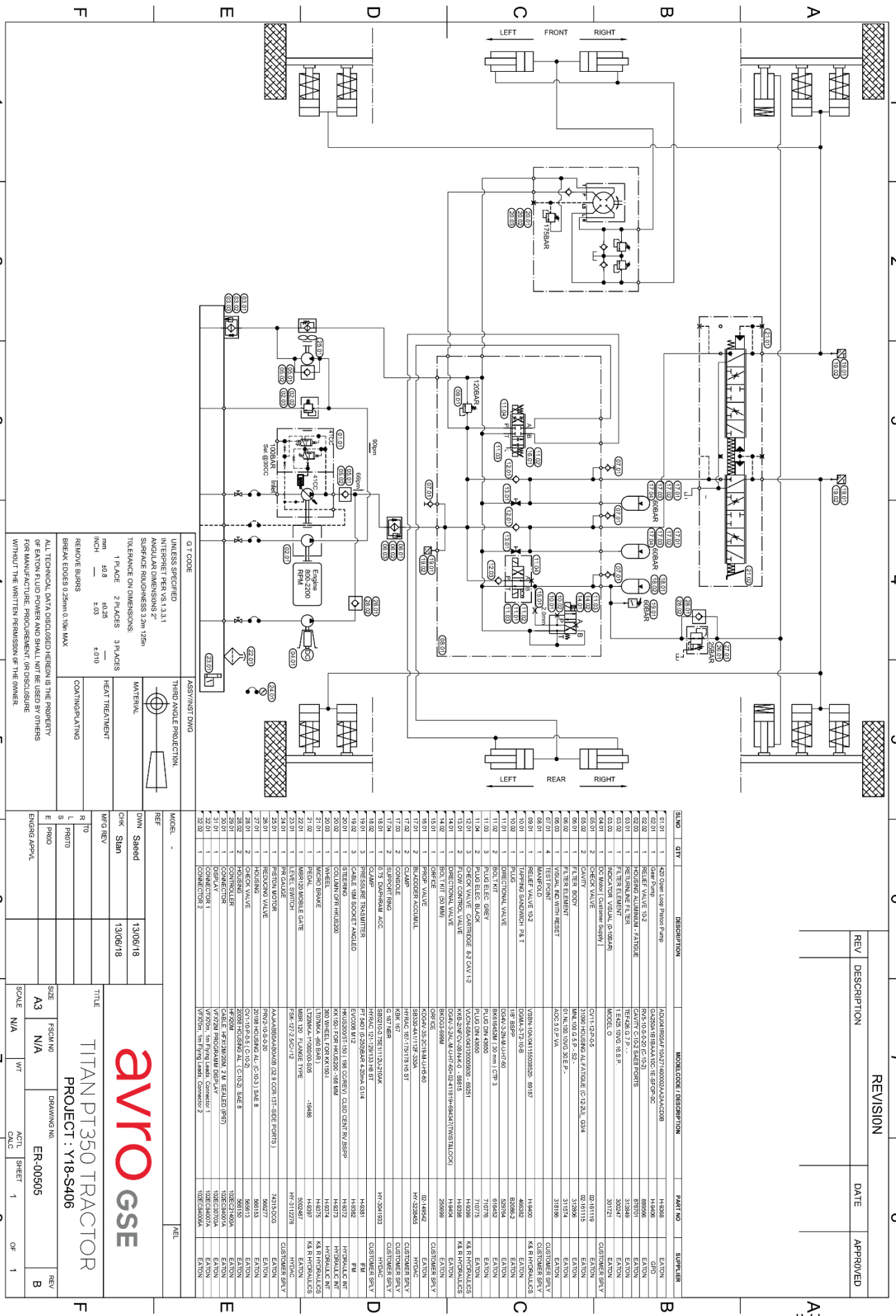
General Inquiries:
info@avrogse.com

Parts Inquiries:
parts@avrogse.com

SECTION V: HYDRAULIC SYSTEM DIAGRAMS

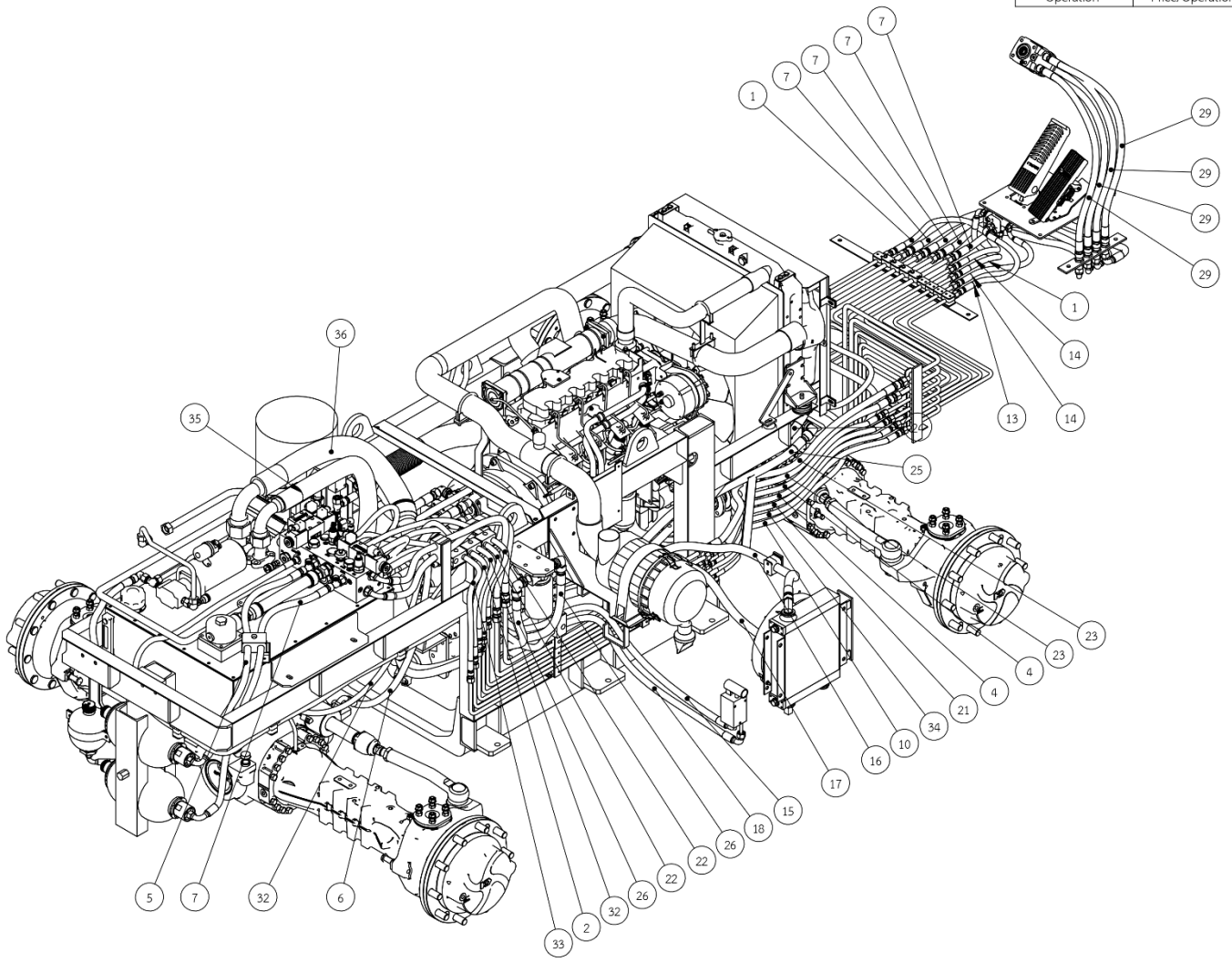
Hydraulic System Diagrams

This section contains detailed hydraulic system diagrams, illustrating component layout, and connections for reference during operation, maintenance, and troubleshooting.


LEFT
FRONT
RIGHT
LEFT
REAR
RIGHT
175BAR
120BAR
100BAR
60BAR
22BAR
Engine 800-2200 RPM
REVISION
REV
DESCRIPTION
DATE
APPROVED
SLNO
QTY
DESCRIPTION
MOBILCODE / DESCRIPTION
PART NO
SUPPLIER
TITAN PT350 TRACTOR
PROJECT : Y18-S406
avro GSE
DRAWING NO.
ER-00505
REV B
SIZE A3
SCALE N/A
SHEET 1 OF 1
TITLE

Part Process	
Operation	Price/Operation

NO.	ITEM	DESCRIPTION	Q'TY	REV.
36	GA212904186	สาย T605 2" หน้าแปลน 2" งอ 45 100 cm + ประกับ	1	00
35	GA212904216	สาย T605 1 1/2" หน้าแปลน 1 1/2" งอ 90 80 cm + ประกับ	1	00
34	GA212904215	Assembly สาย R2 12L ตรง x12L ตรง 100 cm กลับถัง	1	00
33	GA212904214	Assembly สาย R2 12L ตรง X 12L ตรง 95 cm ABR	1	00
32	GA212904213	Assembly สาย R2 12L ตรง X 12L งอ 90 160 cm เบรคเพลาหลัง	1	00
31	GA212904212	Assembly สาย R2 15L ตรง X 15L งอ 90 70 cm T	1	00
30	GA212904211	Assembly สาย R2 หน้าแปลน 1"90 x 22L ตรง 80 cm	1	00
29	GA212904210	Assembly สายR2 15L ตรง x 15L ตรง 75 cm	4	00
28	GA212904209	Assembly สาย R2 12L ตรง x 10L งอ 90 45 cm	1	00
27	GA212904208	Assembly สาย R2 1/2 JS งอ90 x 12L ตรง 85 cm	1	00
26	GA212904207	Assembly สาย R2 3/4 JS ตรง x 3/4 JS ตรง 140 cm	2	00
25	GA212904206	Assembly สาย R2 3/4 JS ตรง x 3/4 JS ตรง 260 cm	1	00
24	GA212904205	Assembly สาย R2 3/4 JS ตรง x 3/4 JS ตรง 180 cm	1	00
23	GA212904204	Assembly สาย R2 15L ตรง x 15L ตรง 110 cm T กระปุก/P	2	00
22	GA212904203	Assembly สาย R2 12L ตรง x 12L ตรง 105 cm BR1/BR2	2	00
21	GA212904202	Assembly สาย R2 12L ตรง x 12L ตรง 110 cm T เบรค/เบรคหลัง	2	00
20	GA212904201	Assembly สาย R2 3/4 JS งอ 90 x 22L ตรง 40 cm	1	00
19	GA212904200	Assembly สาย R2 15L ตรง x 15L งอ90 50 cm	1	00
18	GA212904199	Assembly สาย R2 15L ตรง x12L งอ90 375 cm T	1	00
17	GA212904198	Assembly สาย R2 22L ตรง x 22L ตรง 230 cm	1	00
16	GA212904197	Assembly สาย R2 3/4 JS งอ 90 x 22L ตรง 215 cm	1	00
15	GA212904196	Assembly สาย R2 15L ตรง x12L งอ90 280 cm P	1	00
14	GA212904193	Assembly สาย R2 12L ตรง x 12L งอ 90 50 cm	2	00
13	GA212904192	Assembly สาย R2 12L ตรง x 12L งอ 90 40 cm	1	00
12	GA212904182	Assembly สาย R2 12L ตรง x 12L งอ 90 160 cm	1	00
11	GA212904179	Assembly สาย R2 12L ตรง x 12L งอ 90 55 cm	1	00
10	GA212904185	Assembly สาย R2 12L ตรง x 12L งอ90 120 cm	1	00
9	GA212904130	Assembly สาย R2 15L ตรง x 15L งอ90 115 cm B	1	00
8	GA212904129	Assembly สาย R2 15L ตรง X 15L งอ 90 80 cm P	1	00
7	GA212904127	Assembly สาย R2 15L ตรง x 15L งอ 90 120cm	5	00
6	GA212904126	Assembly สาย R2 15L ตรง x 15L งอ90 100 cm A	2	00
5	GA212904125	Assembly สาย R2 15L ตรง x 15L งอ 90 130 cm	1	00
4	GA212904122	Assembly สาย R2 12L ตรง x 12L ตรง 85 cm SP1,SP2	2	00
3	GA212904115	Assembly สาย R2 12L ตรง x 12L งอ90 75 cm	1	00
2	GA212904103	Assembly สาย R2 12L ตรง x 12L ตรง 80 cm	1	00
1	GA212904065	Assembly สาย R2 12L ตรง x 12L งอ 90 45 cm	2	00



Hydraulic system Hose

LC

SC

00

ORIGINAL SIZE

03/08/2020

avro GSE

Dimension in millimetres (mm)

Rev. No.

Revision note

Rev. date

PROJECTION

Unspecified tolelances
Linear ±2 Angular ±2°
Hole position

Drawn by : T.SUPHACHAI

Checked by :

Approved by :

Material : -

Scale : Non scale

Model : TITAN PT350

Drawing Date : 06/08/2020

File name : D:\Job Suphachai\GSE\F150D_2020\F1-150_13-03-2020_02\F1-150D_Hydraulic system

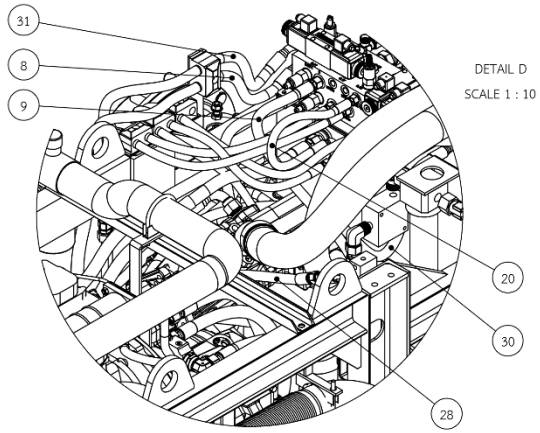
Drawing name : Assembly F1-150D Hydraulic system

Part No. -

REV. 00

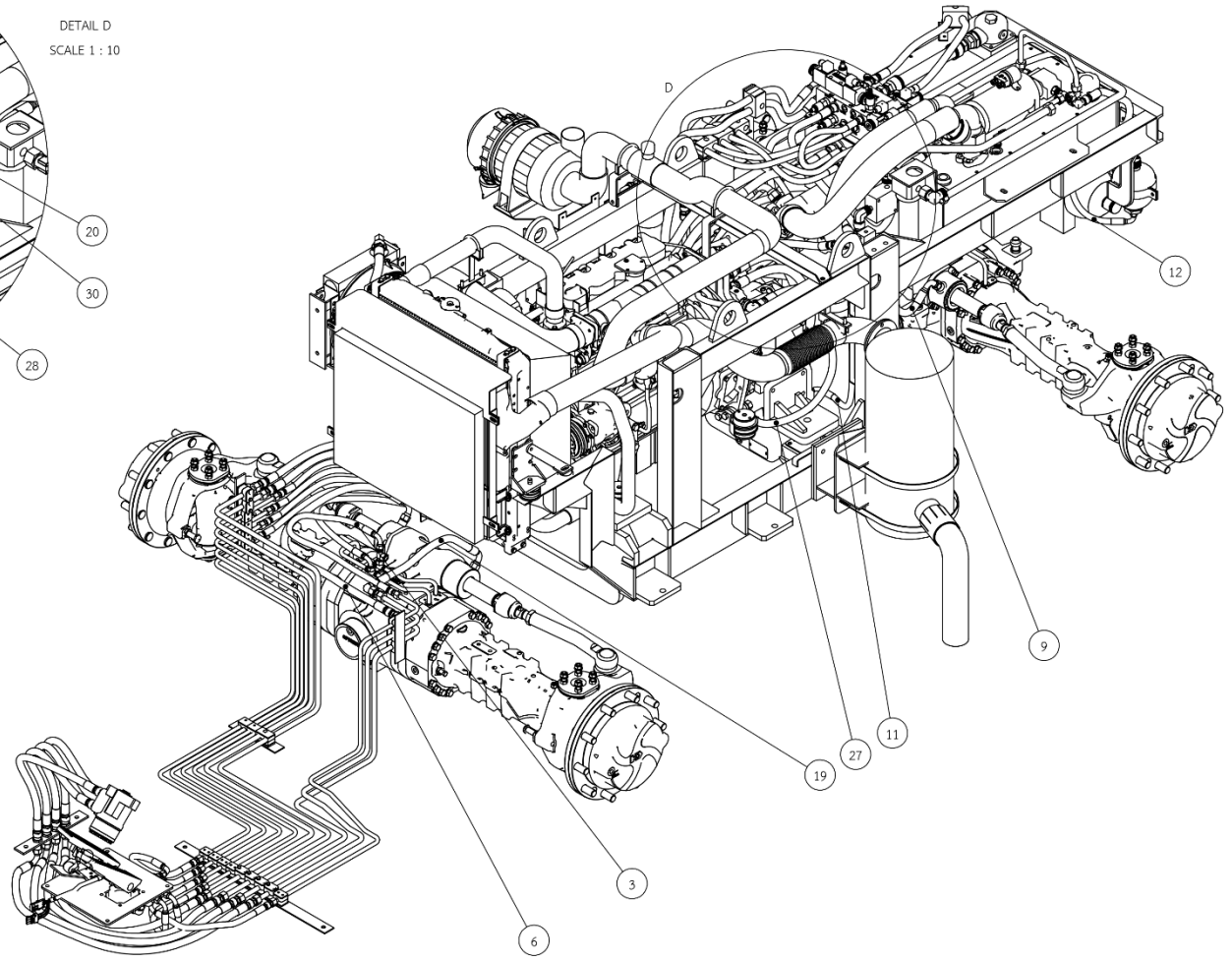
Sheet: 1/1

Part Process	
Operation	Price/Operation



DETAIL D

SCALE 1 : 10

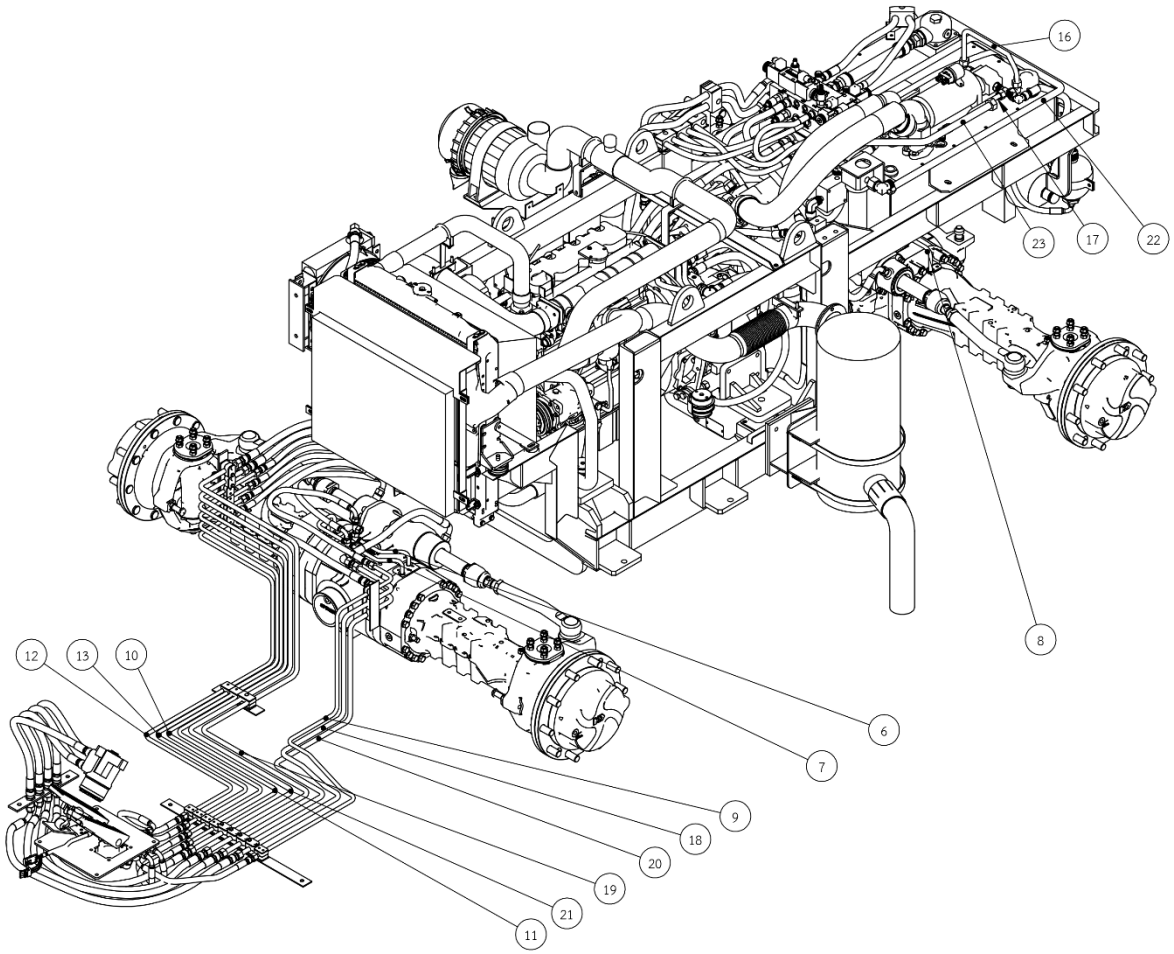


NO.	ITEM	DESCRIPTION	Q'TY	REV.
36	GA212904186	สาย T605 2" หน้าแปลน 2" งอ 45 100 cm + ประกับ	1	00
35	GA212904216	สาย T605 1 1/2" หน้าแปลน 1 1/2" งอ 90 80 cm + ประกับ	1	00
34	GA212904215	Assembly สาย R2 12L ตรง x12L ตรง 100 cm กลับถัง	1	00
33	GA212904214	Assembly สาย R2 12L ตรง X 12L ตรง 95 cm ABR	1	00
32	GA212904213	Assembly สาย R2 12L ตรง X 12L งอ 90 160 cm เบรคเพลาหลัง	1	00
31	GA212904212	Assembly สาย R2 15L ตรง X 15L งอ 90 70 cm T	1	00
30	GA212904211	Assembly สาย R2 หน้าแปลน 1"90 x 22L ตรง 80 cm	1	00
29	GA212904210	Assembly สายR2 15L ตรง x 15L ตรง 75 cm	4	00
28	GA212904209	Assembly สาย R2 12L ตรง x 10L งอ 90 45 cm	1	00
27	GA212904208	Assembly สาย R2 1/2 JS งอ90 x 12L ตรง 85 cm	1	00
26	GA212904207	Assembly สาย R2 3/4 JS ตรง x 3/4 JS ตรง 140 cm	2	00
25	GA212904206	Assembly สาย R2 3/4 JS ตรง x 3/4 JS ตรง 260 cm	1	00
24	GA212904205	Assembly สาย R2 3/4 JS ตรง x 3/4 JS ตรง 180 cm	1	00
23	GA212904204	Assembly สาย R2 15L ตรง x 15L ตรง 110 cm T กระปุก/P	2	00
22	GA212904203	Assembly สาย R2 12L ตรง x 12L ตรง 105 cm BR1/BR2	2	00
21	GA212904202	Assembly สาย R2 12L ตรง x 12L ตรง 110 cm T เบรค/เบรคหลัง	2	00
20	GA212904201	Assembly สาย R2 3/4 JS งอ 90 x 22L ตรง 40 cm	1	00
19	GA212904200	Assembly สาย R2 15L ตรง x 15L งอ90 50 cm	1	00
18	GA212904199	Assembly สาย R2 15L ตรง x12L งอ90 375 cm T	1	00
17	GA212904198	Assembly สาย R2 22L ตรง x 22L ตรง 230 cm	1	00
16	GA212904197	Assembly สาย R2 3/4 JS งอ 90 x 22L ตรง 215 cm	1	00
15	GA212904196	Assembly สาย R2 15L ตรง x12L งอ90 280 cm P	1	00
14	GA212904193	Assembly สาย R2 12L ตรง x 12L งอ 90 50 cm	2	00
13	GA212904192	Assembly สาย R2 12L ตรง x 12L งอ 90 40 cm	1	00
12	GA212904182	Assembly สาย R2 12L ตรง x 12L งอ 90 160 cm	1	00
11	GA212904179	Assembly สาย R2 12L ตรง x 12L งอ 90 55 cm	1	00
10	GA212904185	Assembly สาย R2 12L ตรง x 12L งอ90 120 cm	1	00
9	GA212904130	Assembly สาย R2 15L ตรง x 15L งอ90 115 cm B	1	00
8	GA212904129	Assembly สาย R2 15L ตรง X 15L งอ 90 80 cm P	1	00
7	GA212904127	Assembly สาย R2 15L ตรง x 15L งอ 90 120cm	5	00
6	GA212904126	Assembly สาย R2 15L ตรง x 15L งอ90 100 cm A	2	00
5	GA212904125	Assembly สาย R2 15L ตรง x 15L งอ 90 130 cm	1	00
4	GA212904122	Assembly สาย R2 12L ตรง x 12L ตรง 85 cm SP1,SP2	2	00
3	GA212904115	Assembly สาย R2 12L ตรง x 12L งอ90 75 cm	1	00
2	GA212904103	Assembly สาย R2 12L ตรง x 12L ตรง 80 cm	1	00
1	GA212904065	Assembly สาย R2 12L ตรง x 12L งอ 90 45 cm	2	00

Hydraulic system Hose

LC	SC	00	ORIGINAL SIZE	03/08/2020
avro GSE	Dimension in millimetres (mm)	Rev. No. △	Revision note	Rev. date
PROPRIETARY AND CONFIDENTIAL THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF PANUS ASSEMBLY CO.,LTD. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF PANUS ASSEMBLY CO.,LTD. IS PROHIBITED.	Unspecified tolelances Linear ±2 Angular ±2° Hole position	Drawn by : T.SUPHACHAI	Model : TITAN PT350	Drawing name : Assembly F1-150D Hydraulic system	REV. 00
PROJECTION	Material : -	Checked by :			
	Scale : Non scale	Approved by :	Drawing Date : 06/08/2020	Part No. -	Sheet: 1/1
		File name : D:\Job Suphachai\GSE\F150D 2020\F1-150 13-03-2020 02\F1-150D Hydraulic system			

Part Process	
Operation	Price/Operation



NO.	ITEM	DESCRIPTION	Q'TY	REV.
23		ท่อเหล็ก OD22 Power pack มอเตอร์ DC ไป กรองดิดถังไฮดรอลิค	1	00
22		ท่อเหล็ก OD22 Power pack #8.7-3 ไปกรองดิดถังไฮดรอลิค	1	00
21		ท่อเหล็ก OD15 หน้ารถ T	1	00
20		ท่อเหล็ก OD15 หน้ารถ R	1	00
19		ท่อเหล็ก OD15 หน้ารถ P	1	00
18		ท่อเหล็ก OD15 หน้ารถ L	1	00
17		ท่อเหล็ก OD15 ถังไฮดรอลิค ไป มอเตอร์ DC	1	00
16		ท่อเหล็ก OD15 Power pack มอเตอร์ DC ไป กรองดิดถังไฮดรอลิค	1	00
15		ท่อเหล็ก OD15 Power pack #T	1	00
14		ท่อเหล็ก OD15 Power pack #P	1	00
13		ท่อเหล็ก OD12 หน้ารถ เพลาหลัง	1	00
12		ท่อเหล็ก OD12 หน้ารถ N	1	00
11		ท่อเหล็ก OD12 หน้ารถ BR2	1	00
10		ท่อเหล็ก OD12 หน้ารถ BR1	1	00
9		ท่อเหล็ก OD12 หน้ารถ BR1 in เพลาหน้า	1	00
8		ท่อเหล็ก OD12 เพลาหลัง	1	00
7		ท่อเหล็ก OD12 เพลาหน้ารถ #P2-#P2	1	00
6		ท่อเหล็ก OD12 เพลาหน้ารถ #P1-#P1	1	00
5		ท่อเหล็ก OD12 Power pack #เพลาหลัง	1	00
4		ท่อเหล็ก OD12 Power pack #PBR	1	00
3		ท่อเหล็ก OD12 Power pack #N	1	00
2		ท่อเหล็ก OD12 Power pack #BR2	1	00
1		ท่อเหล็ก OD12 Power pack #BR1	1	00

Hydraulic system Pipe

LC

avro GSE

PROJECTION

SC

Dimension in millimetres (mm)

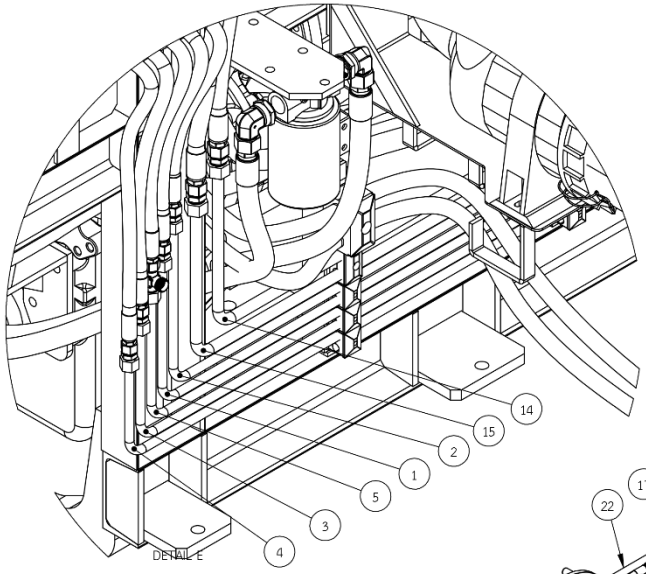
Unspecified tolelances
Linear ±2 Angular ±2°
Hole position

Material : -

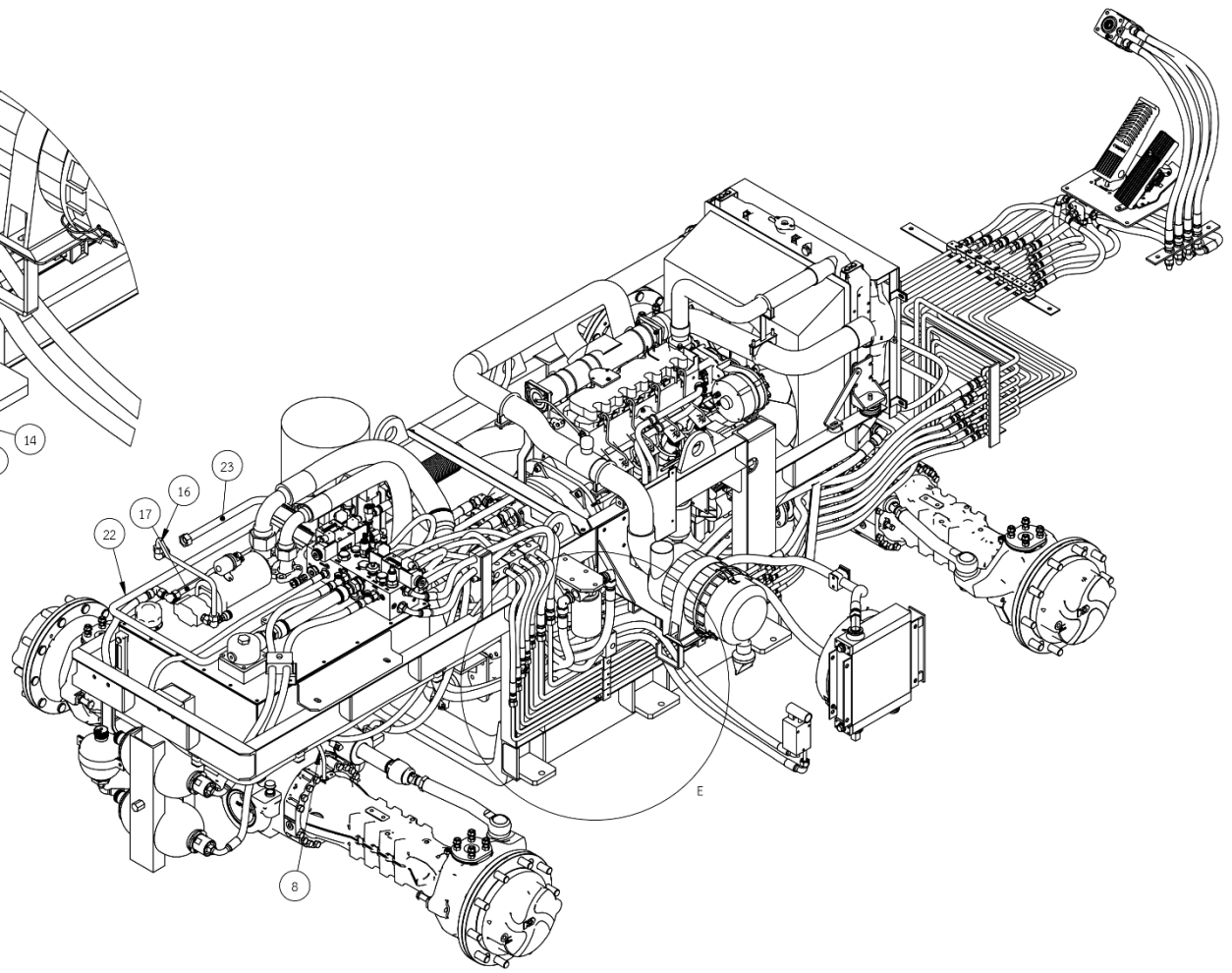
Scale : Non scale

00	ORIGINAL SIZE		03/08/2020
Rev. No. △	Revision note		Rev. date
Drawn by : T.SUPHACHAI	Model : TITAN PT350	Drawing name : Assembly F1-150D Hydraulic system	REV. 00
Checked by :			
Approved by :	Drawing Date : 06/08/2020	Part No. -	Sheet: 1/1
File name : D:\Job Suphachai\GSE\T150D_2020\T 150_13 03 2020_02\T 150D_Hydraulic system		FM-EN-XX-02-3 Eff.Date 30/11/19	

Part Process	
Operation	Price/Operation



SCALE 1 : 6



NO.	ITEM	DESCRIPTION	Q'TY	REV.
23		ท่อเหล็ก OD22 Power pack มอเตอร์ DC ไป กรองดิดถังไฮดรอลิค	1	00
22		ท่อเหล็ก OD22 Power pack #8.7-3 ไปกรองดิดถังไฮดรอลิค	1	00
21		ท่อเหล็ก OD15 หน้ารถ T	1	00
20		ท่อเหล็ก OD15 หน้ารถ R	1	00
19		ท่อเหล็ก OD15 หน้ารถ P	1	00
18		ท่อเหล็ก OD15 หน้ารถ L	1	00
17		ท่อเหล็ก OD15 ถังไฮดรอลิค ไป มอเตอร์ DC	1	00
16		ท่อเหล็ก OD15 Power pack มอเตอร์ DC ไป กรองดิดถังไฮดรอลิค	1	00
15		ท่อเหล็ก OD15 Power pack #T	1	00
14		ท่อเหล็ก OD15 Power pack #P	1	00
13		ท่อเหล็ก OD12 หน้ารถ เพลาหลัง	1	00
12		ท่อเหล็ก OD12 หน้ารถ N	1	00
11		ท่อเหล็ก OD12 หน้ารถ BR2	1	00
10		ท่อเหล็ก OD12 หน้ารถ BR1	1	00
9		ท่อเหล็ก OD12 หน้ารถ BR1 in เพลาหน้า	1	00
8		ท่อเหล็ก OD12 เพลาหลัง	1	00
7		ท่อเหล็ก OD12 เพลาหน้ารถ #P2-#P2	1	00
6		ท่อเหล็ก OD12 เพลาหน้ารถ #P1-#P1	1	00
5		ท่อเหล็ก OD12 Power pack #เพลาหลัง	1	00
4		ท่อเหล็ก OD12 Power pack #PBR	1	00
3		ท่อเหล็ก OD12 Power pack #N	1	00
2		ท่อเหล็ก OD12 Power pack #BR2	1	00
1		ท่อเหล็ก OD12 Power pack #BR1	1	00

Hydraulic system Pipe

LC | SC | 00 | ORIGINAL SIZE | 03/08/2020

avro GSE

Dimension in millimetres (mm) | Rev. No. | Revision note | Rev. date

PROJECTION

Unspecified tolelances Linear ±2 Angular ±2° Hole position	Drawn by : T.SUPHACHAI	Model : TITAN PT350	Drawing name : Assembly F1-150D Hydraulic system
	Checked by :		REV. 00
Material : -	Approved by :	Drawing Date : 06/08/2020	Part No. -
Scale : Non scale	File name : D:\Job Suphachai\GSE\T150D_2020\T 150_13 03 2020_02\T 150D_Hydraulic system		Sheet: 1/1

Emergency Operation Procedure

If the engine is unserviceable but electrical (battery) power is still available, limited steering, limited service brake & park brake operation can be achieved by use of the Emergency Pump switch is Located on the Right hand side of steering column on the control panel above the ignition key.

Procedure

1. Turn Ignition 'ON'
2. Switch on Emergency Pump, via rocker switch (press and hold, if it is released the pump will stop) in Cabin, as shown above.

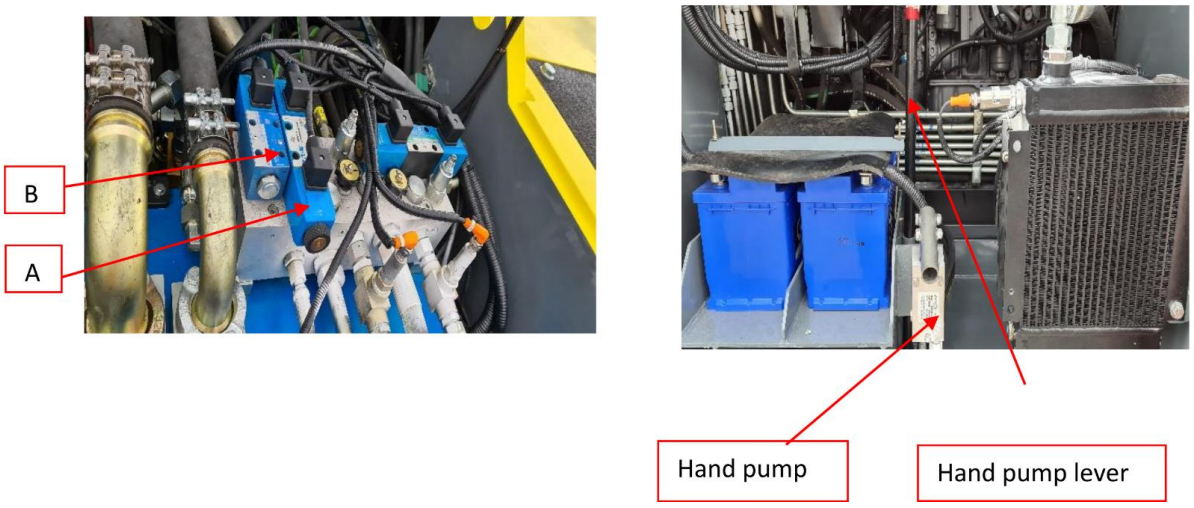
To release the park brake, operate the park brake switch as per normal procedure.

Note: The emergency pump will only run if the switch is held. One-minute intervals are recommended to maximize battery life and prevent damage to the electric motor. Note the DC motor has a thermal overload protection built in. If the motor overheats it will not operate until it cools down.

Hand Pump

The hand pump is used to release the park brake only.

Emergency Hand Pump



The park brake is spring-applied and requires hydraulic pressure to release it.

To release the park brake when the engine and emergency pump is unserviceable, follow the below procedures:

1. On Solenoid 'B' (Blow Down Solenoid) push in the black knob and turn to the right to lock in position, refer Photo B.
2. On Solenoid 'A' (ON/OFF Solenoid) using a small screwdriver or similar tool, push in the solenoid spool (center part of solenoid) blue arrow until park brake spool is in the off position (as far as it can move usually only moves a couple of millimeters).
3. Ensure that the valve on the side of the hand pump is closed, where fitted. Using the pump handle located behind the pump, pump the handle until the vehicle moves freely.

Note that if the vehicle does not move, return to Step 2 and push the solenoid spool from the opposite side. See red arrow in Photo C.

Photo B

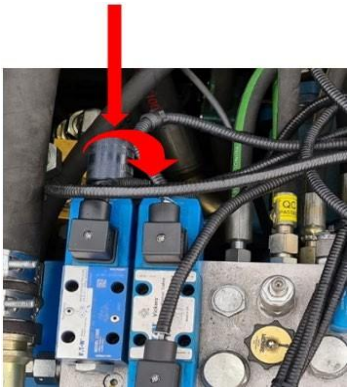
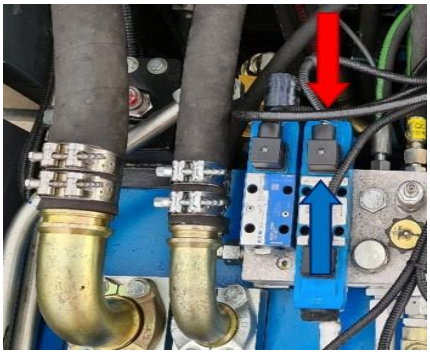


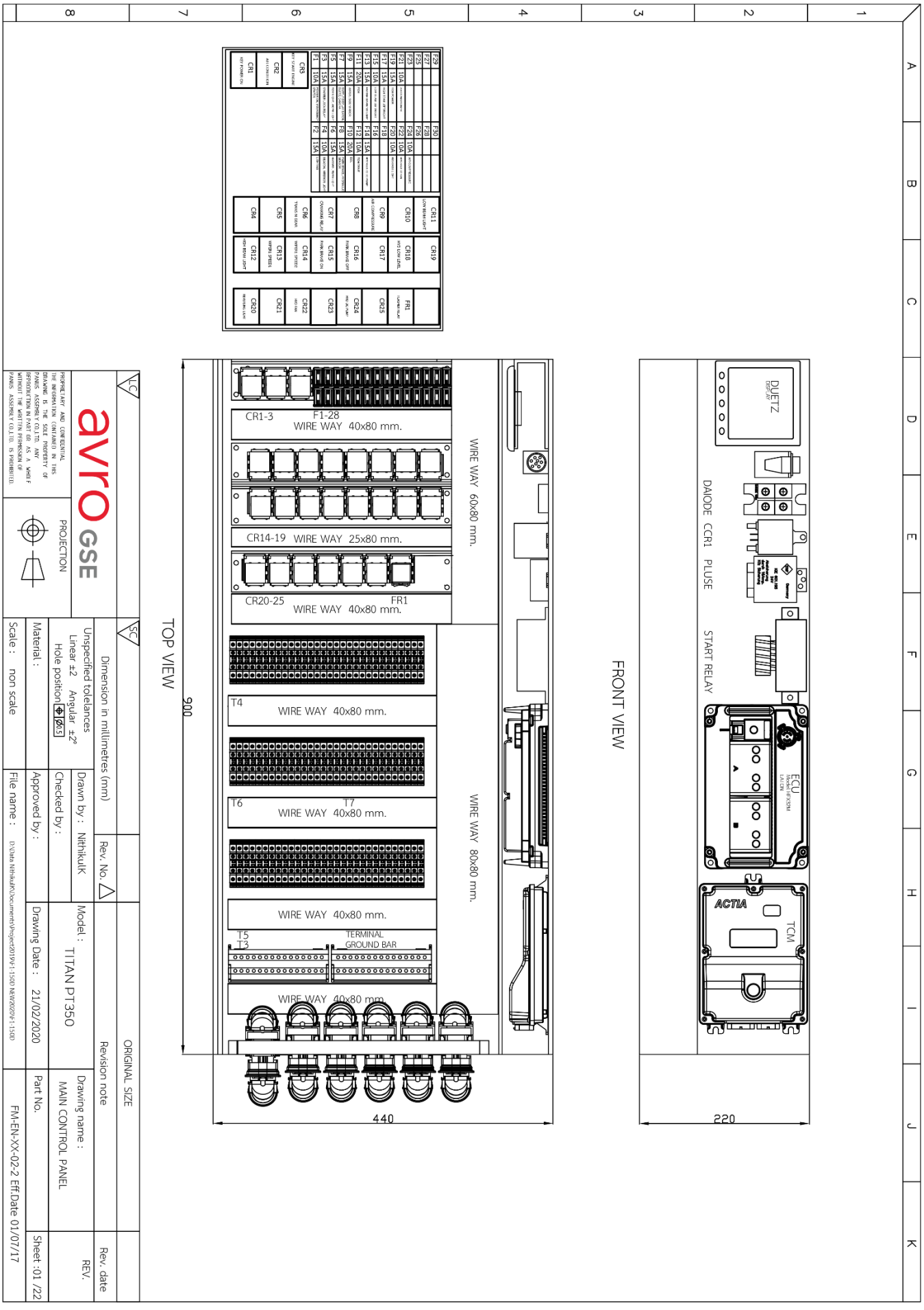
Photo C

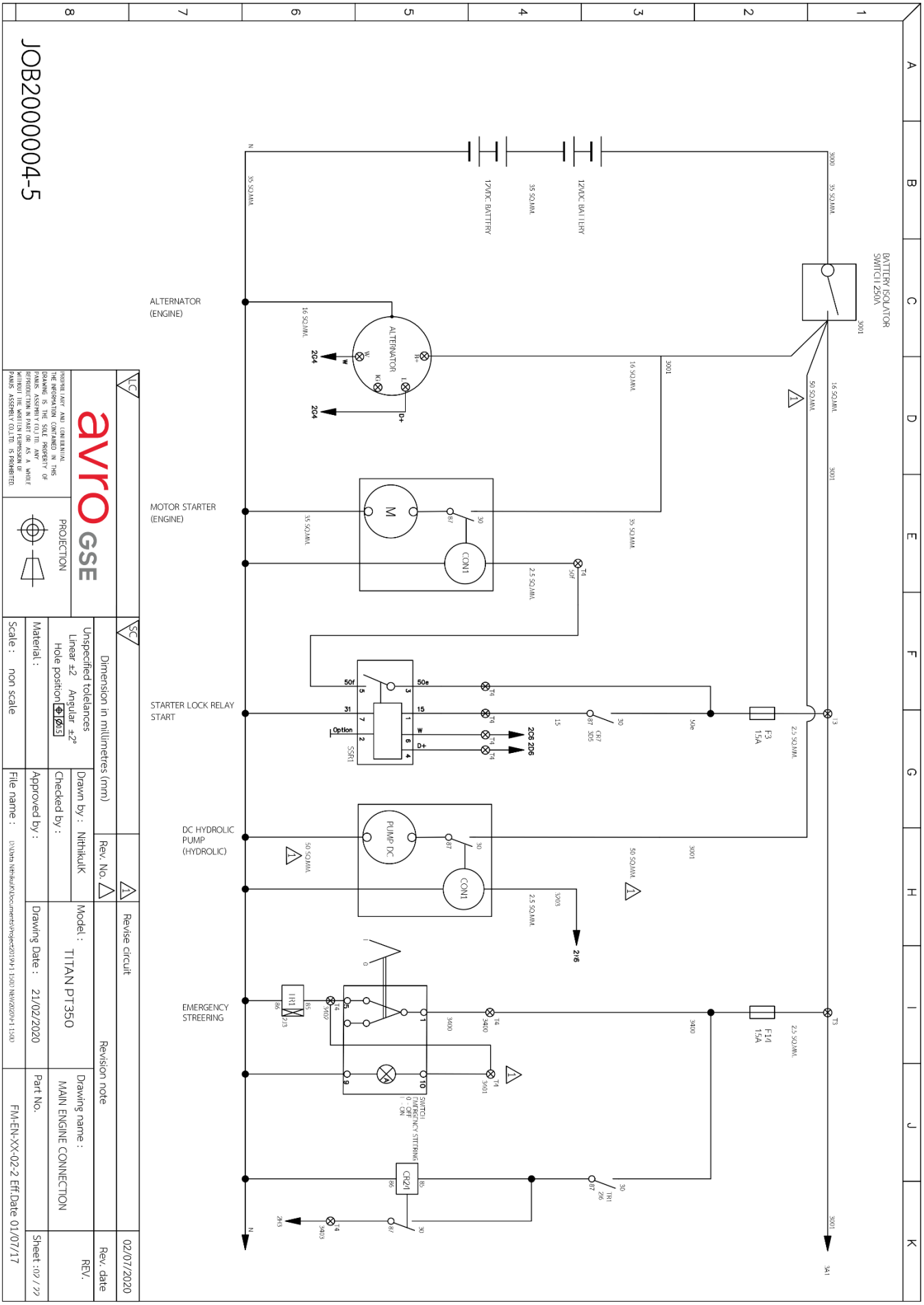


SECTION VI: ELECTRICAL SYSTEM AND CIRCUITS

Electrical System and Circuits Diagrams

This section includes detailed diagrams of the electrical system and circuits, showing component connections, wiring paths, and power distribution for troubleshooting and maintenance.




JOB2000004-5
ALTERNATOR (ENGINE)
MOTOR STARTER (ENGINE)
STARTER LOCK RELAY START
DC HYDROLIC PUMP (HYDROLIC)
EMERGENCY STREERING
BATTERY ISOLATOR SWITCH 250A
12VDC BATTERY
12VDC BATTERY
ALTERNATOR
PUMP DC
CON1
SSR1
F3 15A
F14 15A
CR7 305
CR2/1
IR1
IR3
SWITCH EMERGENCY STEERING
0 : OFF
1 : ON
Option
Revise circuit
Revision note
Rev. date
02/07/2020
Drawing name : MAIN ENGINE CONNECTION
Model : TITAN PT350
Drawing Date : 21/02/2020
Part No.
FM-EN-XX-02-2 Eff.Date 01/07/17
Material :
Scale : non scale
Drawn by : NithikuK
Checked by :
Approved by :
File name :
Dimension in millimetres (mm)
Unspecified tolelances
Linear ±2 Angular ±2°
Hole position ⌖ Ø0.5
PROJECTION
avro GSE
PROPRIETARY AND CONFIDENTIAL
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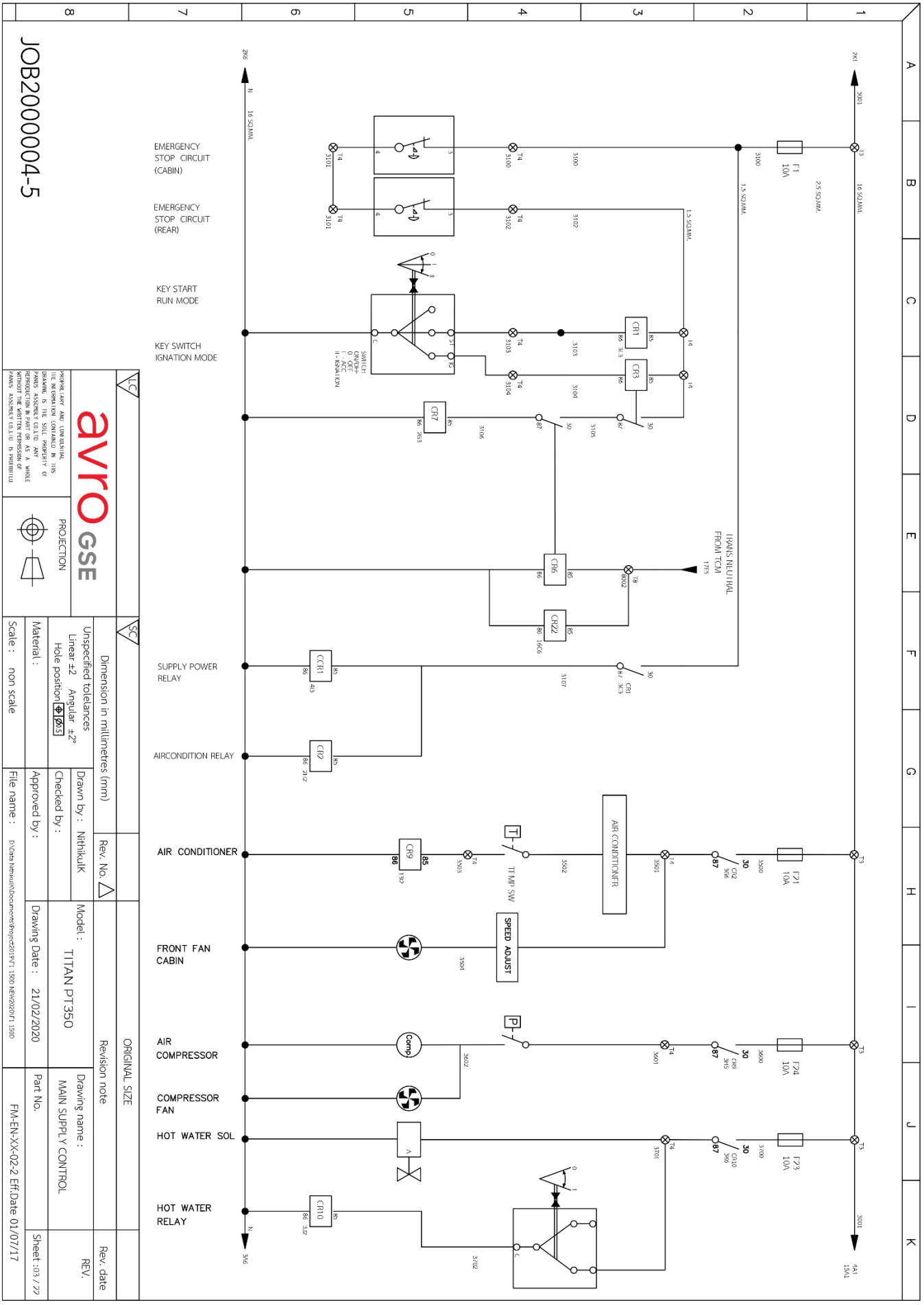
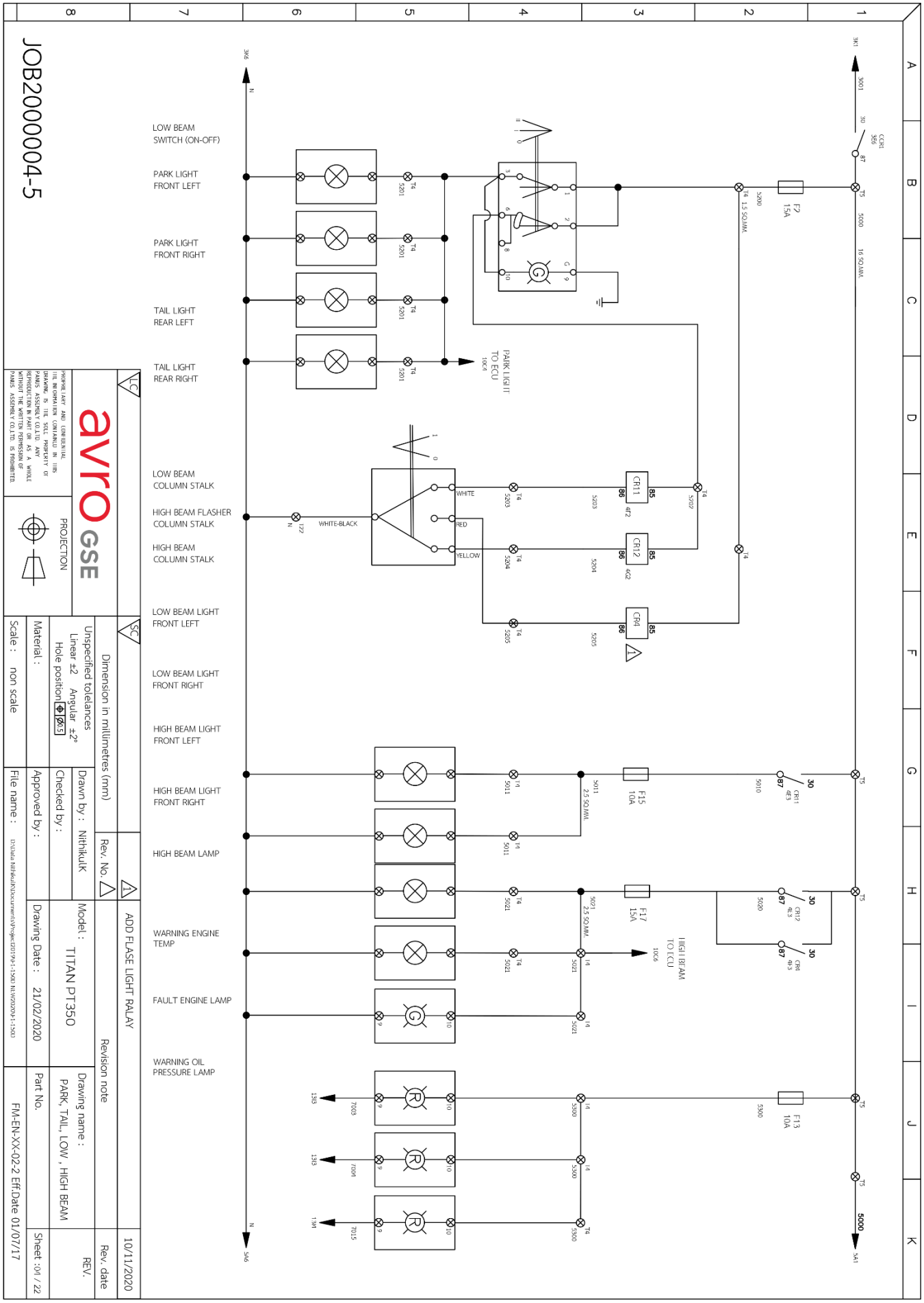
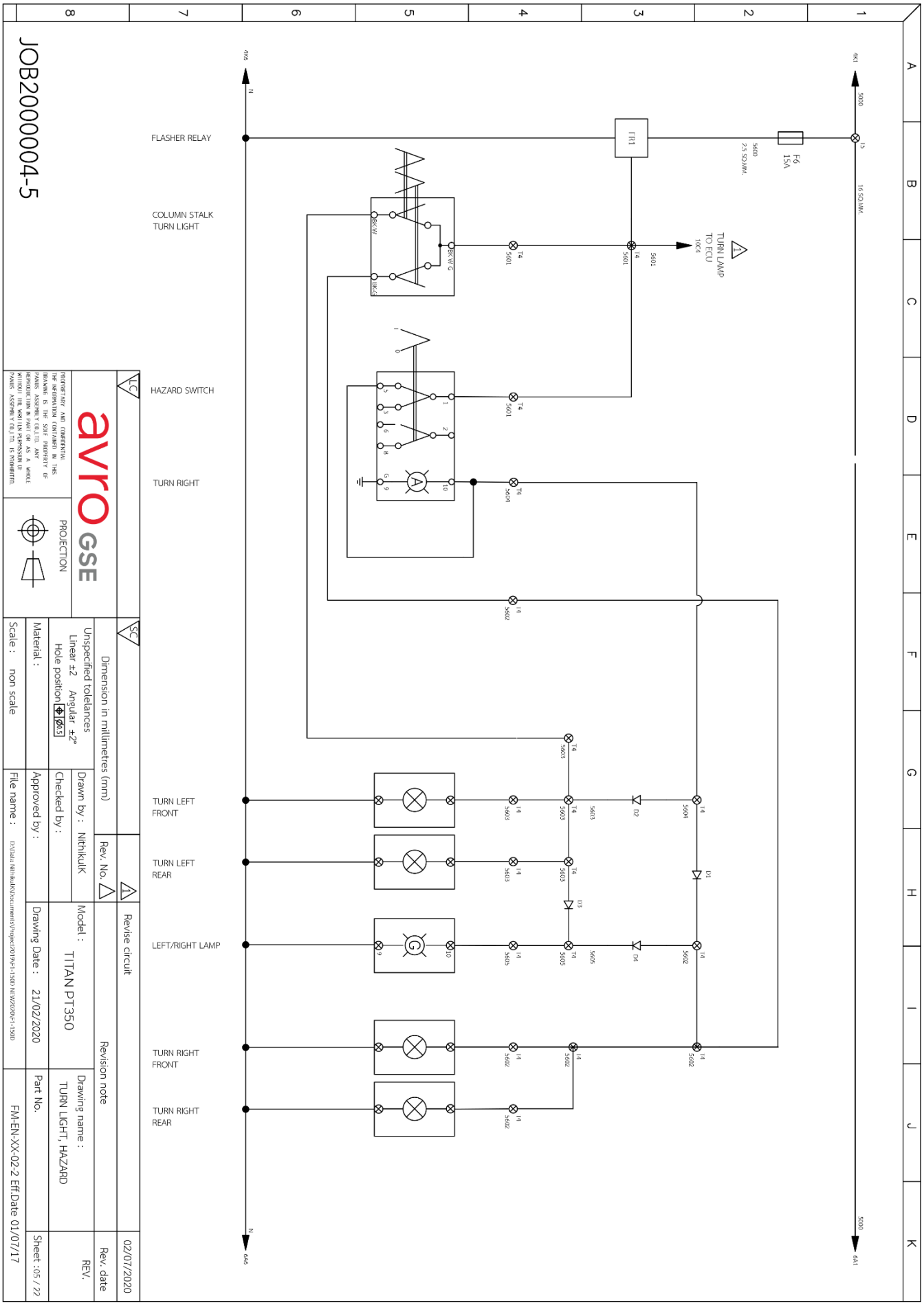
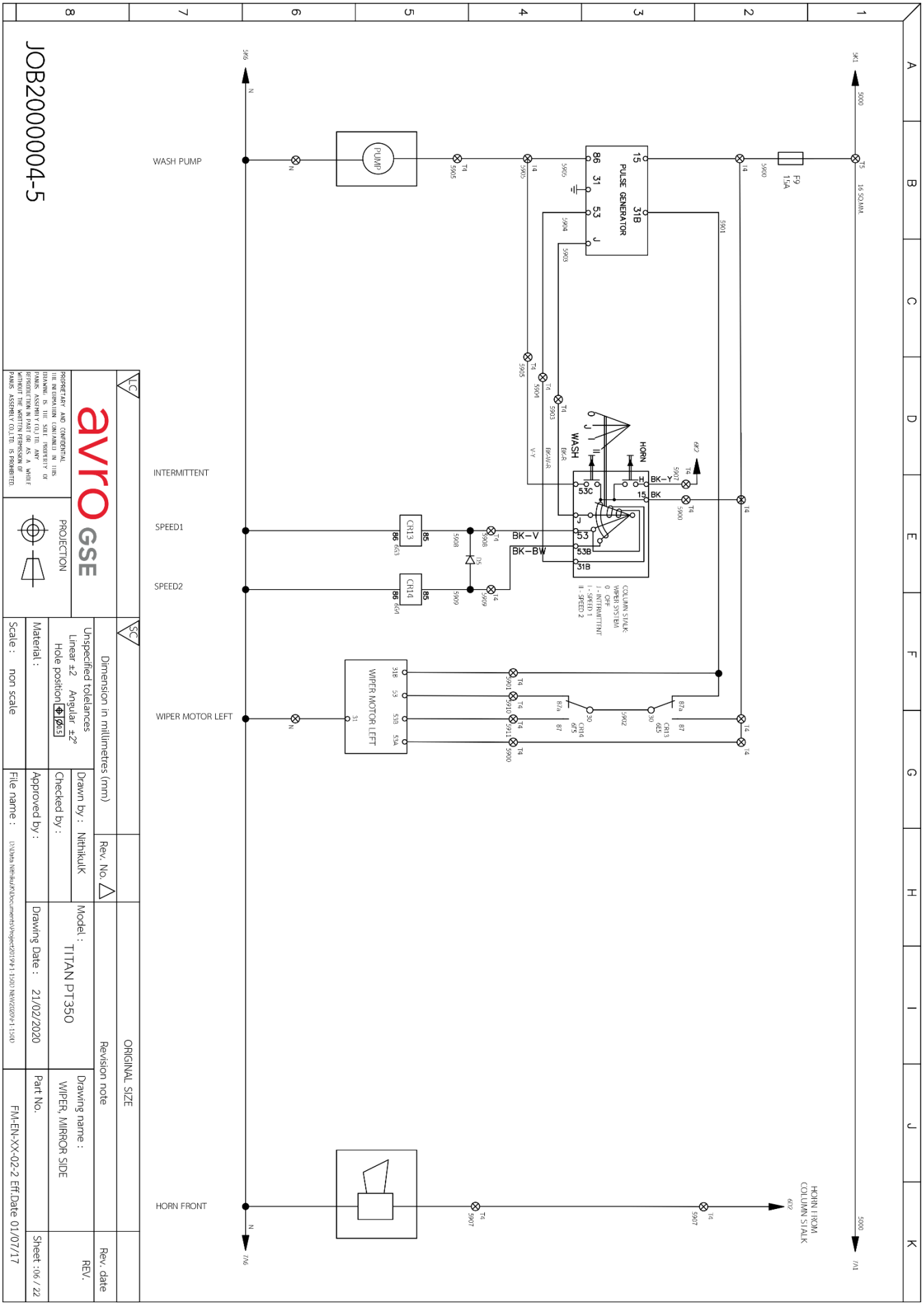
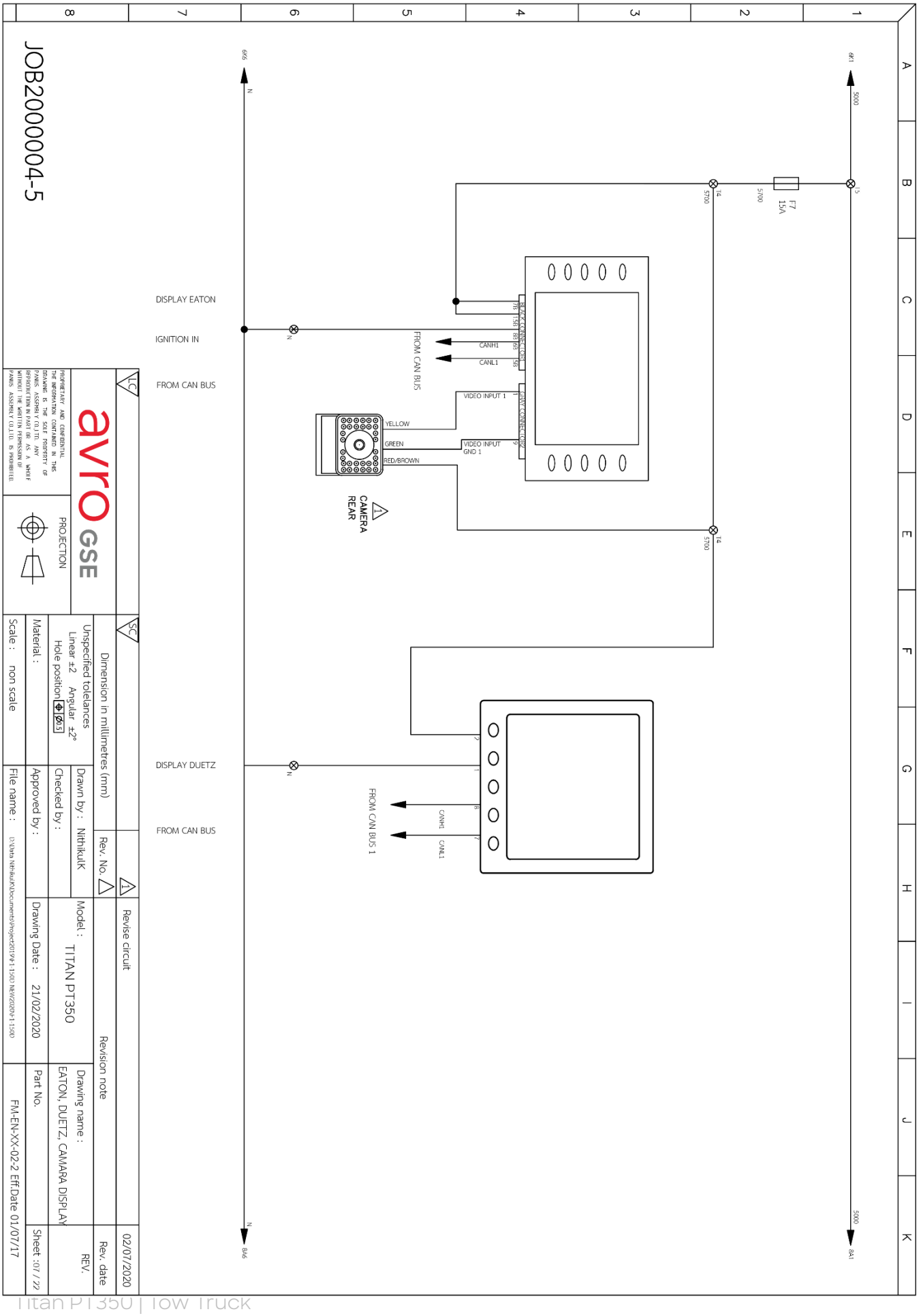
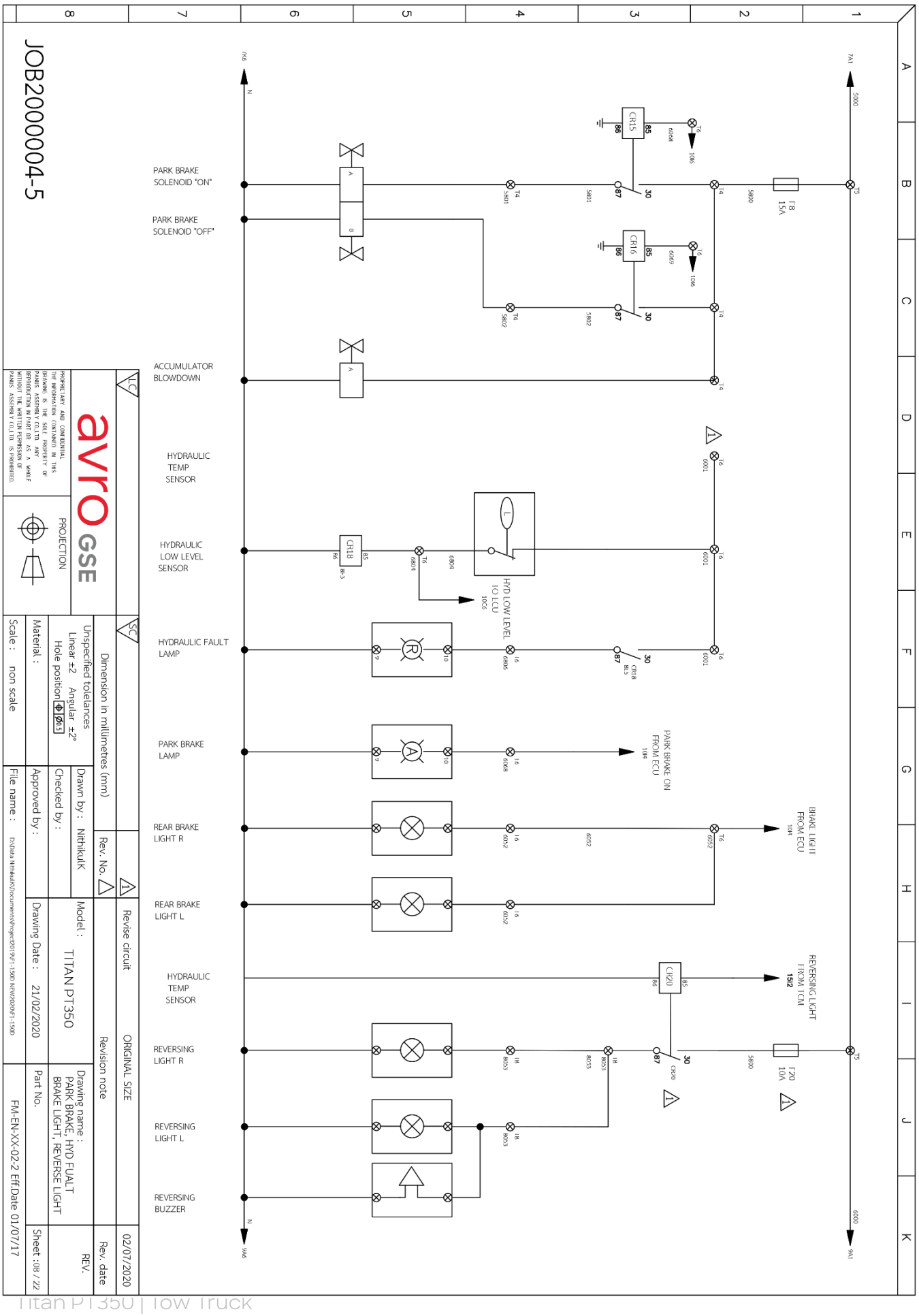

EMERGENCY STOP CIRCUIT (CABIN)
EMERGENCY STOP CIRCUIT (REAR)
KEY START RUN MODE
KEY SWITCH IGNATION MODE
SUPPLY POWER RELAY
AIRCONDITION RELAY
AIR CONDITIONER
FRONT FAN CABIN
AIR COMPRESSOR
COMPRESSOR FAN
HOT WATER SOL
HOT WATER RELAY
HANS NEUTRAL FROM TCM
AIR CONDITIONER
TITMP SW
SPEED ADJUST
JOB2000004-5
avro GSE
PROJECTION
Dimension in millimetres (mm)
Unspecified tolerances
Linear ±2 Angular ±2°
Hole position Ø0.5
Drawn by : NithikuIK
Checked by :
Material :
Approved by :
Scale : non scale
File name :
Model : TITAN PT350
Drawing Date : 21/02/2020
Drawing name : MAIN SUPPLY CONTROL
Part No.
Revision note
Rev. date
REV.
Sheet :03 / 22
ORIGINAL SIZE
FM-EN-XX-02-2 Eff.Date 01/07/17


JOB2000004-5
LOW BEAM SWITCH (ON-OFF)
PARK LIGHT FRONT LEFT
PARK LIGHT FRONT RIGHT
TAIL LIGHT REAR LEFT
TAIL LIGHT REAR RIGHT
LOW BEAM COLUMN STALK
HIGH BEAM FLASHER COLUMN STALK
HIGH BEAM COLUMN STALK
LOW BEAM LIGHT FRONT LEFT
LOW BEAM LIGHT FRONT RIGHT
HIGH BEAM LIGHT FRONT LEFT
HIGH BEAM LIGHT FRONT RIGHT
HIGH BEAM LAMP
WARNING ENGINE TEMP
FAULT ENGINE LAMP
WARNING OIL PRESSURE LAMP
PARK LIGHT TO ECU 10C4
HIGH BEAM TO ECU 10C6
WHITE
RED
YELLOW
WHITE-BLACK
F2 15A
F13 10A
F15 10A
F17 15A
CR11
CR12
CR4
CR1
avro GSE
PROJECTION
ADD FLASE LIGHT RALAY
Dimension in millimetres (mm)
Unspecified tolelances
Linear ±2 Angular ±2°
Hole position Ø0.5
Drawn by : NithikuK
Checked by :
Approved by :
Material :
Scale : non scale
Model : TITAN PT350
Drawing Date : 21/02/2020
File name :
Revision note
Drawing name : PARK, TAIL, LOW , HIGH BEAM
Part No.
FM-EN-XX-02-2 Eff.Date 01/07/17
10/11/2020
Sheet :01 / 22


JOB2000004-5
FLASHER RELAY
COLUMN STALK TURN LIGHT
HAZARD SWITCH
TURN RIGHT
TURN LEFT FRONT
TURN LEFT REAR
LEFT/RIGHT LAMP
TURN RIGHT FRONT
TURN RIGHT REAR
TURN LAMP TO ECU
F6 15A
avro GSE
PROJECTION
Dimension in millimetres (mm)
Unspecified tolerances
Linear ±2 Angular ±2°
Hole position ⌖ Ø0.5
Drawn by : NirthikulK
Checked by :
Material :
Scale : non scale
Approved by :
File name :
Model : TITAN PT350
Drawing Date : 21/02/2020
Drawing name : TURN LIGHT, HAZARD
Part No. FM-EN-XX-02-2 Eff.Date 01/07/17
Revise circuit
Revision note
Rev. date 02/07/2020
REV. 1
Sheet : 05 / 22


JOB2000004-5
WASH PUMP
INTERMITTENT
SPEED1
SPEED2
WIPER MOTOR LEFT
HORN FRONT
PULSE GENERATOR
WIPER MOTOR LEFT
HORN
WASH
CR13
CR14
BK-V
BK-BW
BK-Y
BK
HORN FROM COLUMN STALK
PROJECTION
ORIGINAL SIZE
Dimension in millimetres (mm)
Unspecified tolerances
Linear ±2 Angular ±2°
Hole position Ø0.5
Drawn by : NithikuK
Checked by :
Approved by :
Material :
Scale : non scale
Model : TITAN PT350
Drawing Date : 21/02/2020
Part No.
Drawing name : WIPER, MIRROR SIDE
REV.
Sheet : 06 / 22
File name :
Revision note
Rev. No.
Rev. date
FM-EN-XX-02-2 Eff.Date 01/07/17


JOB2000004-5
DISPLAY EATON
IGNITION IN
FROM CAN BUS
DISPLAY DUETZ
FROM CAN BUS
FROM CAN BUS
CANH1
CANL1
VIDEO INPUT 1
VIDEO INPUT GND 1
YELLOW
GREEN
RED/BROWN
CAMERA REAR
CANH1
CANL1
F7 15A
5700
5000
avro GSE
PROJECTION
Dimension in millimetres (mm)
Unspecified tolelances
Linear ±2 Angular ±2°
Hole position Ø0.5
Material :
Scale : non scale
Drawn by : NithikulK
Checked by :
Approved by :
File name :
Rev. No.
1
Revise circuit
02/07/2020
Revision note
Rev. date
Model : TITAN PT350
Drawing Date : 21/02/2020
Drawing name : EATON, DUETZ, CAMARA DISPLAY
REV.
Part No.
Sheet :07 / 22
FM-EN-XX-02-2 Eff.Date 01/07/17


JOB2000004-5
PARK BRAKE SOLENOID "ON"
PARK BRAKE SOLENOID "OFF"
ACCUMULATOR BLOWDOWN
HYDRAULIC TEMP SENSOR
HYDRAULIC LOW LEVEL SENSOR
HYDRAULIC FAULT LAMP
PARK BRAKE LAMP
REAR BRAKE LIGHT R
REAR BRAKE LIGHT L
HYDRAULIC TEMP SENSOR
REVERSING LIGHT R
REVERSING LIGHT L
REVERSING BUZZER
CR15
CR16
CR18
CR20
F8 15A
F20 10A
HYD LOW LEVEL TO ECU
PARK BRAKE ON FROM ECU
BRAKE LIGHT FROM ECU
REVERSING LIGHT FROM TCM
avro GSE
PROJECTION
Dimension in millimetres (mm)
Unspecified tolerances
Linear ±2 Angular ±2°
Hole position ⌖ Ø0.5
Drawn by : Nithikulk
Checked by :
Approved by :
Material :
Scale : non scale
File name : D:\Data Nithikulk\Documents\Projet\2019\FT1-150D NEW\2020\FT1-150D
Model : TITAN PT350
Drawing Date : 21/02/2020
Part No.
Drawing name : PARK BRAKE, HYD FUALT BRAKE LIGHT, REVERSE LIGHT
REV.
Sheet : 08 / 22
Revise circuit
ORIGINAL SIZE
Revision note
Rev. date
02/07/2020
FM-ENI-XX-02-2 Eff.Date 01/07/17
PROPRIETARY AND CONFIDENTIAL
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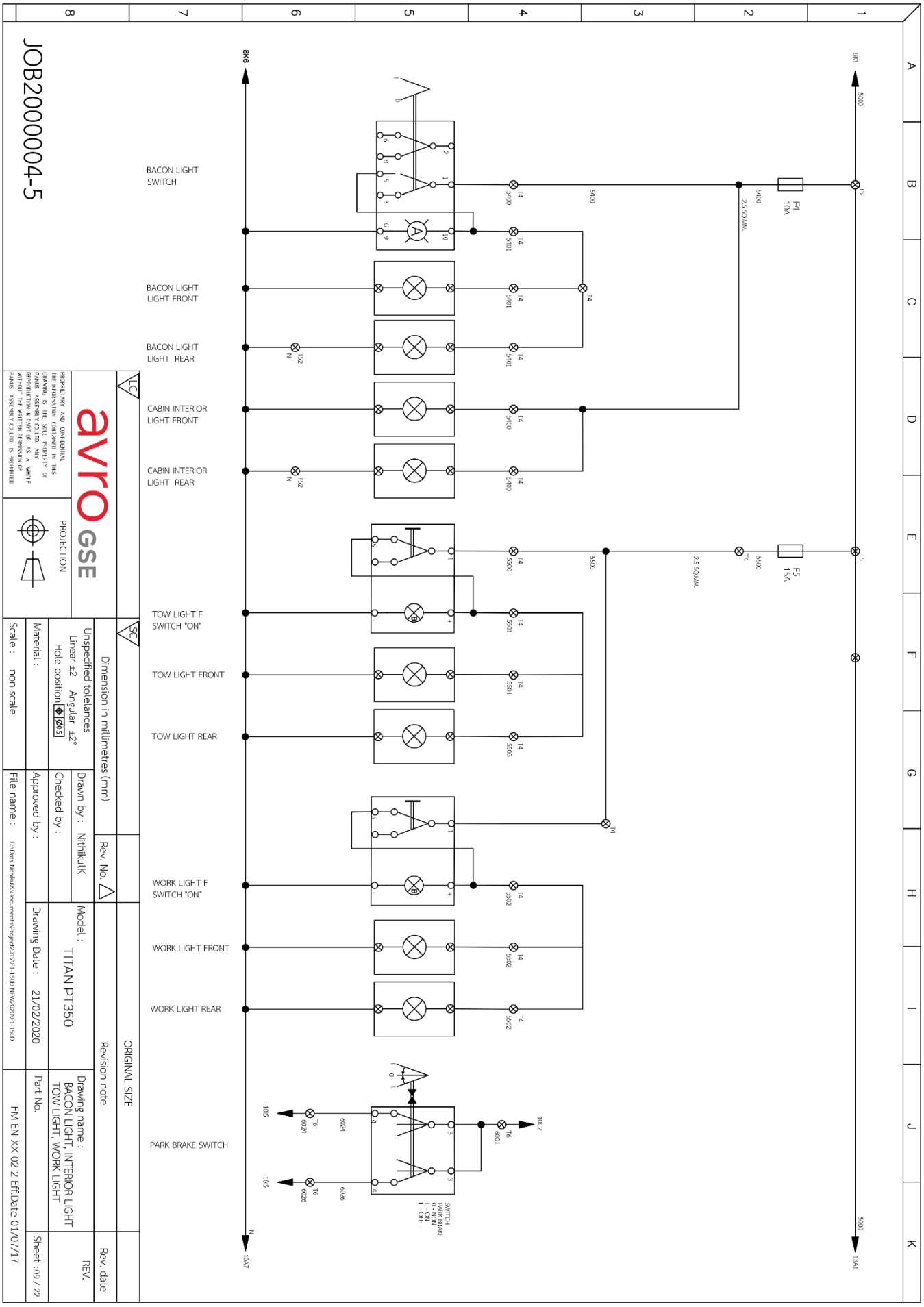
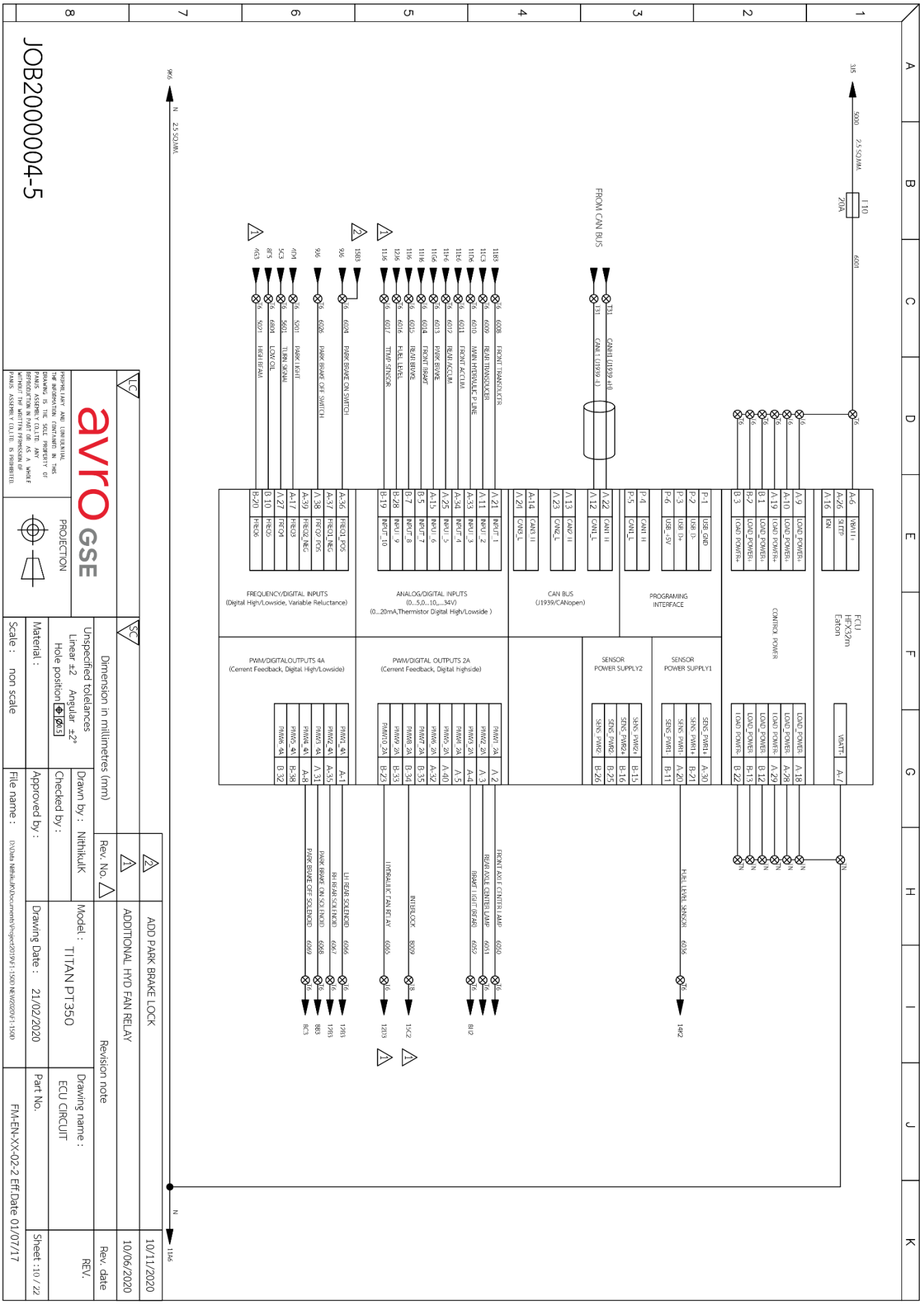

JOB2000004-5
BACON LIGHT SWITCH
BACON LIGHT LIGHT FRONT
BACON LIGHT LIGHT REAR
CABIN INTERIOR LIGHT FRONT
CABIN INTERIOR LIGHT REAR
TOW LIGHT F SWITCH "ON"
TOW LIGHT FRONT
TOW LIGHT REAR
WORK LIGHT F SWITCH "ON"
WORK LIGHT FRONT
WORK LIGHT REAR
PARK BRAKE SWITCH
F1 10A
F5 15A
2.5 SQ.MM.
avro GSE
PROJECTION
Dimension in millimetres (mm)
Unspecified tolerances
Linear ±2 Angular ±2°
Hole position Ø0.5
Drawn by : NithikuK
Checked by :
Approved by :
Material :
Scale : non scale
Model : TITAN PT350
Drawing Date : 21/02/2020
Part No.
Drawing name : BACON LIGHT, INTERIOR LIGHT TOW LIGHT, WORK LIGHT
Sheet : 09 / 22
FM-EN-XX-02-2 Eff.Date 01/07/17
Rev. No.
Revision note
Rev. date
REV.
ORIGINAL SIZE


JOB2000004-5
avro GSE
PROJECTION
Dimension in millimetres (mm)
Unspecified tolerances
Linear ±2 Angular ±2°
Hole position Ø0.5
Drawn by : Nithikuk
Checked by :
Material :
Approved by :
Scale : non scale
Drawing Date : 21/02/2020
Model : TITAN PT350
Revision note
ADDITIONAL HYD FAN RELAY
ADD PARK BRAKE LOCK
10/06/2020
10/11/2020
Drawing name : ECU CIRCUIT
Part No.
FM-EN-XX-02-2 Eff.Date 01/07/17
Sheet :10 / 22
FROM CAN BUS
FREQUENCY/DIGITAL INPUTS (Digital High/Lowside, Variable Reluctance)
ANALOG/DIGITAL INPUTS (0...5,0...10,...34V) (0...20mA,Thermistor Digital High/Lowside)
CAN BUS (J1939/CANopen)
PROGRAMING INTERFACE
SENSOR POWER SUPPLY2
SENSOR POWER SUPPLY1
CONTROL POWER
ECU HFX32m Eaton
PWM/DIGITALOUTPUTS 4A (Cerrent Feedback, Digital High/Lowside)
PWM/DIGITAL OUTPUTS 2A (Cerrent Feedback, Digital highside)
FRONT TRANSDUCER
REAR TRANSDUCER
MAIN HYDRAULIC P. LINE
FRONT ACCUM.
REAR ACCUM.
PARK BRAKE
FRONT BRAKE
REAR BRAKE
FUEL LEVEL
TEMP. SENSOR
PARK BRAKE ON SWITCH
PARK BRAKE OFF SWITCH
PARK LIGHT
TURN SIGNAL
LOW OIL
HIGH BEAM
FRONT AXLE CENTER LAMP
REAR AXLE CENTER LAMP
BRAKE LIGHT (REAR)
LH REAR SOLENOID
RH REAR SOLENOID
PARK BRAKE ON SOLENOID
PARK BRAKE OFF SOLENOID
INTERLOCK
HYDRAULIC FAN RELAY
FUEL LEVEL SENSOR
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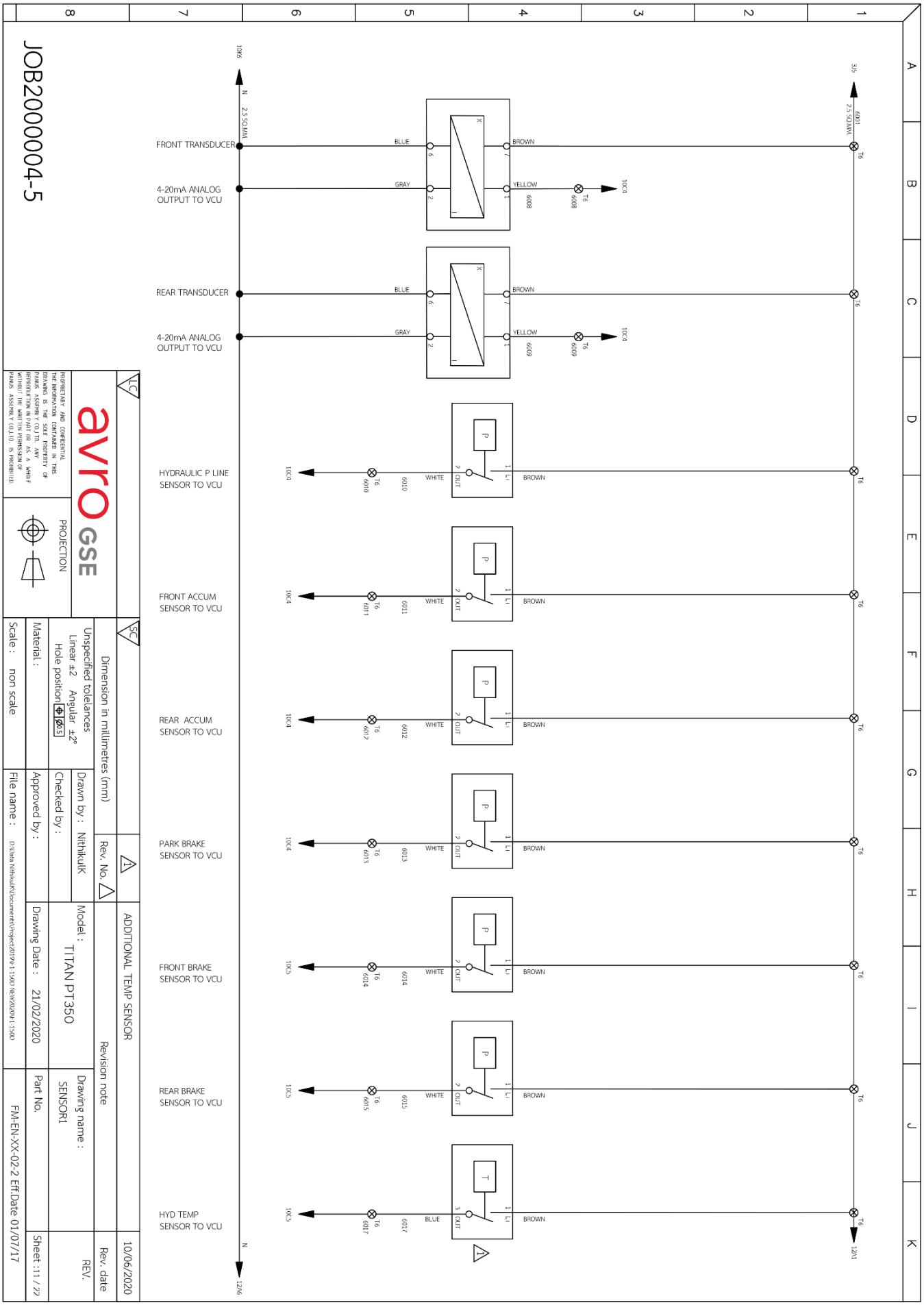
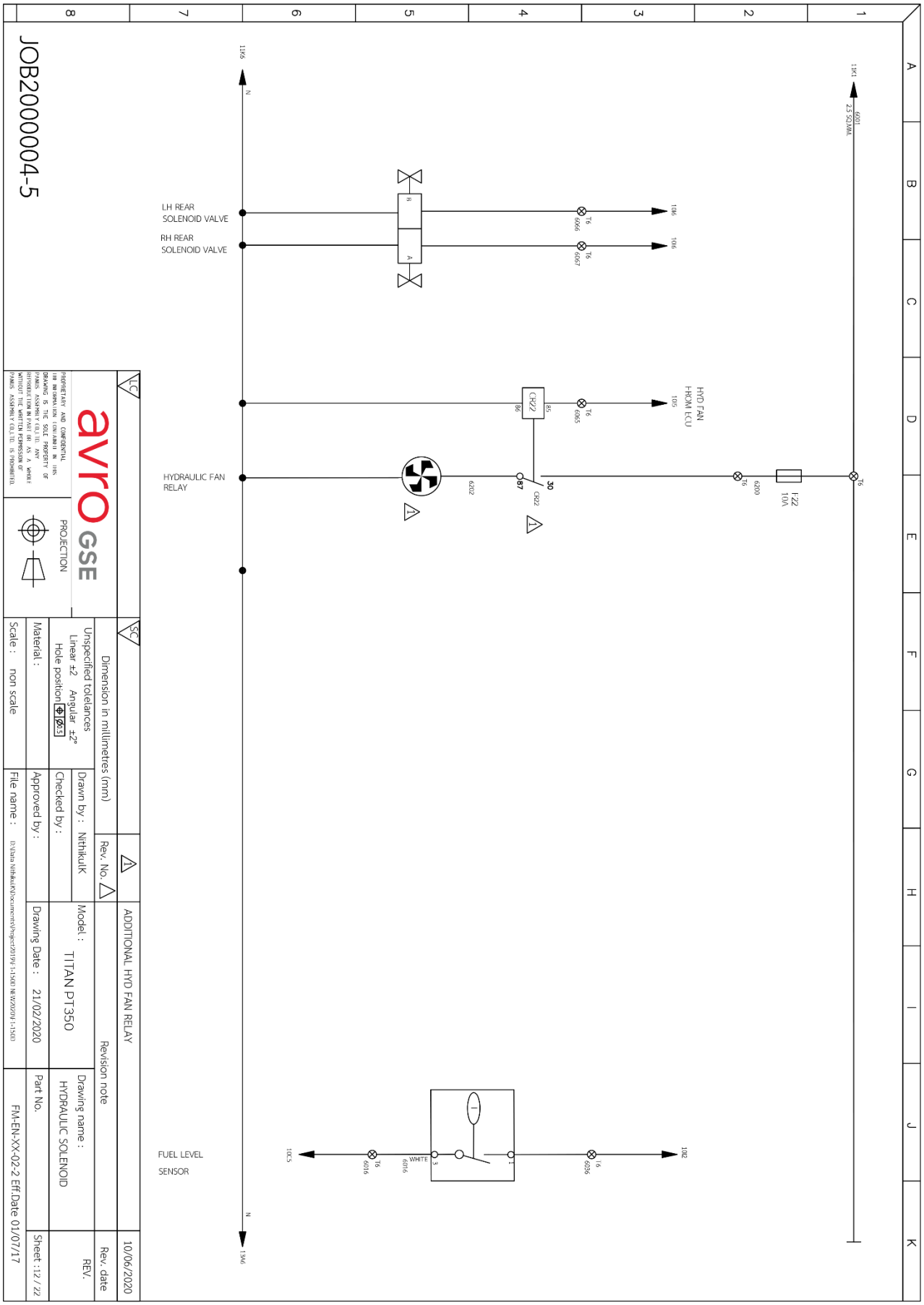

JOB2000004-5
FRONT TRANSDUCER
4-20mA ANALOG OUTPUT TO VCU
REAR TRANSDUCER
4-20mA ANALOG OUTPUT TO VCU
HYDRAULIC P LINE SENSOR TO VCU
FRONT ACCUM SENSOR TO VCU
REAR ACCUM SENSOR TO VCU
PARK BRAKE SENSOR TO VCU
FRONT BRAKE SENSOR TO VCU
REAR BRAKE SENSOR TO VCU
HYD TEMP SENSOR TO VCU
BLUE
GRAY
BROWN
YELLOW
WHITE
2.5 SQ.MM.
PROJECTION
Dimension in millimetres (mm)
Unspecified tolerances
Linear ±2 Angular ±2°
Hole position Ø0.1
Drawn by : NithikuK
Checked by :
Approved by :
Material :
Scale : non scale
Model : TITAN PT350
Drawing Date : 21/02/2020
Drawing name : SENSOR1
Part No.
Revision note
ADDITIONAL TEMP SENSOR
Rev. No.
Rev. date
10/06/2020
REV.
Sheet :11 / 22
FM-EN-XX-02-2 Eff.Date 01/07/17


JOB2000004-5
LH REAR SOLENOID VALVE
RH REAR SOLENOID VALVE
HYDRAULIC FAN RELAY
HYD FAN FROM ECU
FUEL LEVEL SENSOR
WHITE
ADDITIONAL HYD FAN RELAY
TITAN PT350
HYDRAULIC SOLENOID
FM-EN-XX-02-2 Eff.Date 01/07/17
10/06/2020
Dimension in millimetres (mm)
Unspecified tolerances
Linear ±2 Angular ±2°
Hole position Ø0.5
Drawn by : NithikulK
Checked by :
Approved by :
Material :
Scale : non scale
Drawing Date : 21/02/2020
Revision note
Rev. No.
Rev. date
Part No.
Sheet : 12 / 22
PROJECTION
PROPRIETARY AND CONFIDENTIAL
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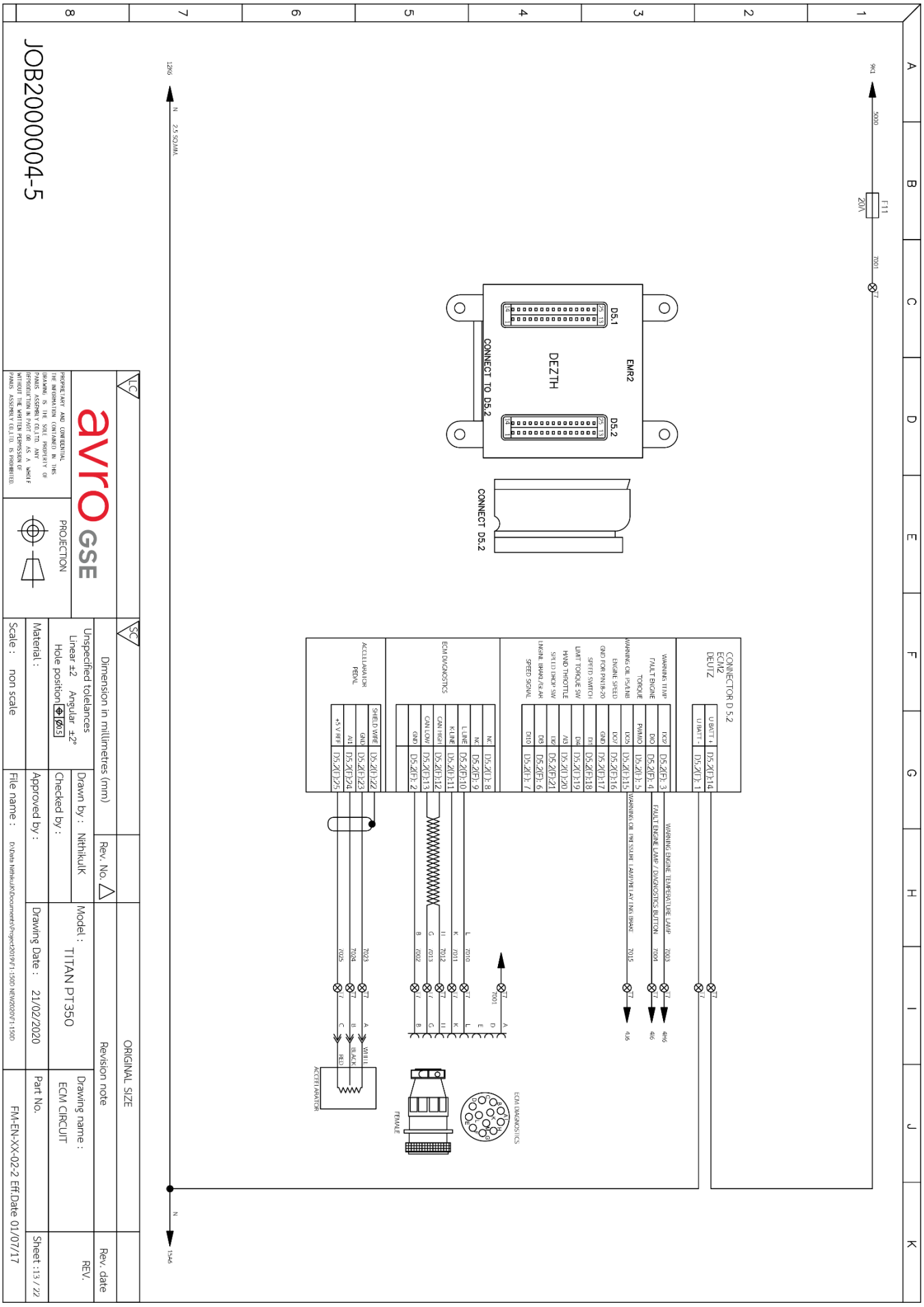
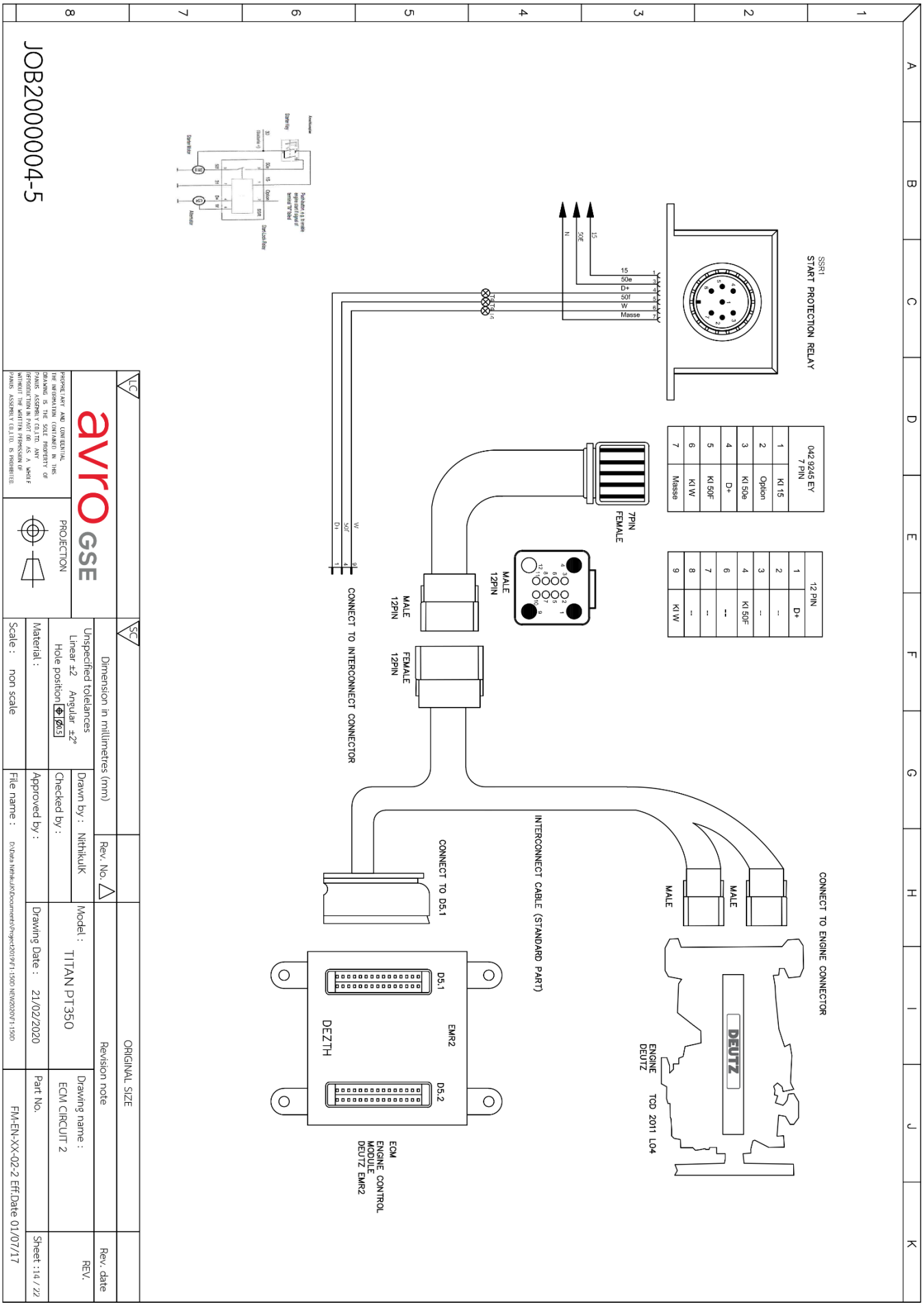

JOB2000004-5
avro GSE
PROJECTION
Dimension in millimetres (mm)
Unspecified tolerances
Linear ±2 Angular ±2°
Hole position ⌖ Ø0.5
Drawn by : NithikuK
Checked by :
Approved by :
Material :
Scale : non scale
File name : D:\Data Nithiku\AllDocuments\Project\2019\FT1-1500 NEW\2020\FT-1500
Model : TITAN PT350
Drawing Date : 21/02/2020
Drawing name : ECM CIRCUIT
Part No.
FM-EN-XX-02-2 Eff.Date 01/07/17
ORIGINAL SIZE
Revision note
Rev. No.
Rev. date
REV.
Sheet : 13 / 22
CONNECTOR D 5.2
ECM2
DEUTZ
EMR2
DEZTH
D5.1
D5.2
CONNECT TO D5.2
CONNECT D5.2
WARNING ENGINE TEMPERATURE LAMP
FAULT ENGINE LAMP / DIAGNOSTICS BUTTON
WARNING OIL PRESSURE LAMP/RELAY ENGINE BRAKE
ECM DIAGNOSTICS
ACCELLARATOR PEDAL
FEMALE
RED
BLACK
WHITE
ACCELLARATOR


SSR1
START PROTECTION RELAY
042 9245 EY
7 PIN
1 KI 15
2 Option
3 KI 50e
4 D+
5 KI 50F
6 KI W
7 Masse
15
50e
D+
50f
W
Masse
7PIN
FEMALE
12 PIN
1 D+
2 --
3 --
4 KI 50F
6 --
7 --
8 --
9 KI W
MALE
12PIN
MALE
12PIN
FEMALE
12PIN
CONNECT TO INTERCONNECT CONNECTOR
CONNECT TO ENGINE CONNECTOR
MALE
MALE
MALE
INTERCONNECT CABLE (STANDARD PART)
CONNECT TO D5.1
D5.1
EMR2
D5.2
DEZTH
ECM
ENGINE CONTROL
MODULE
DEUTZ EMR2
ENGINE
DEUTZ
TCD 2011 L04
DEUTZ
JOB2000004-5
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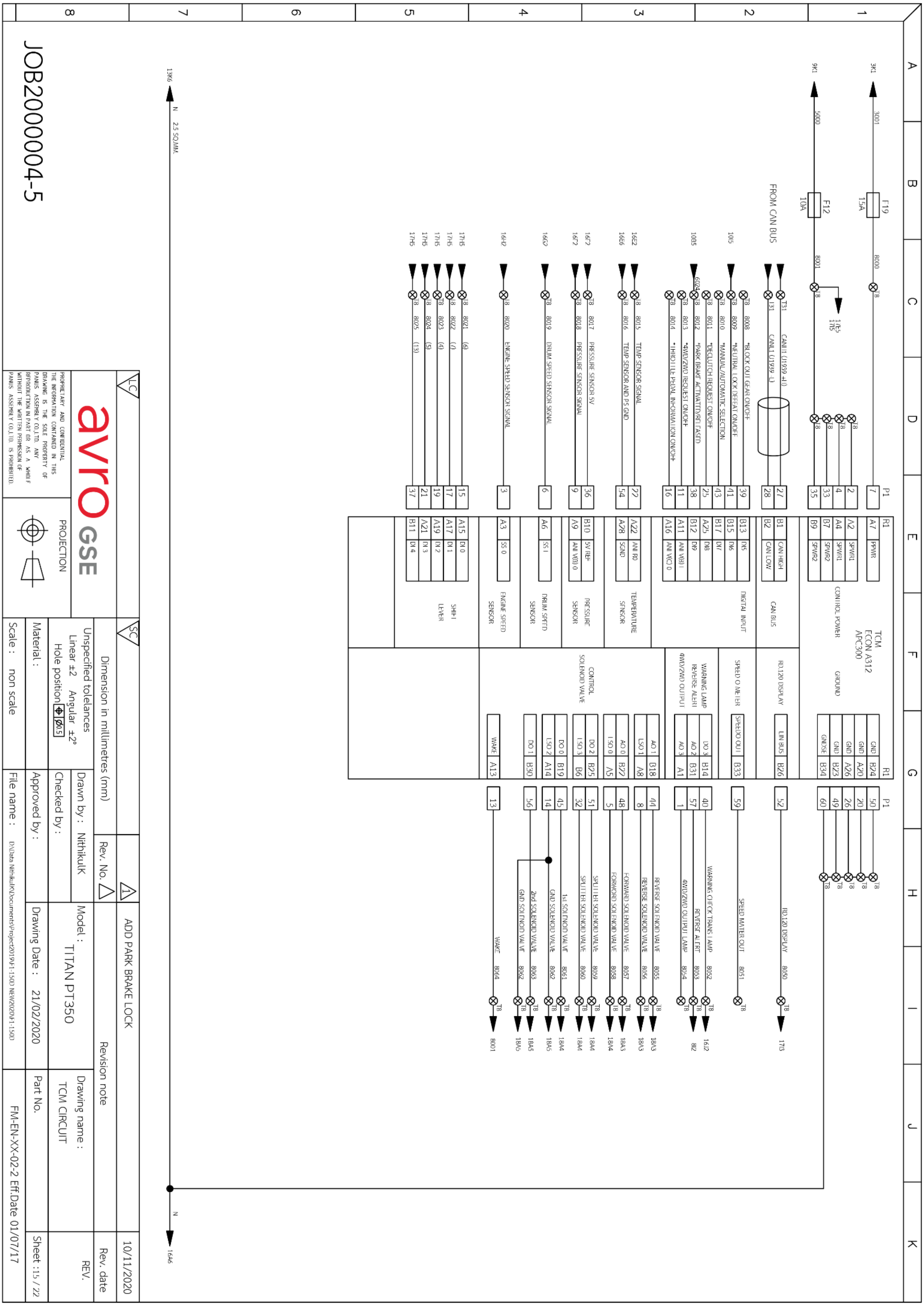
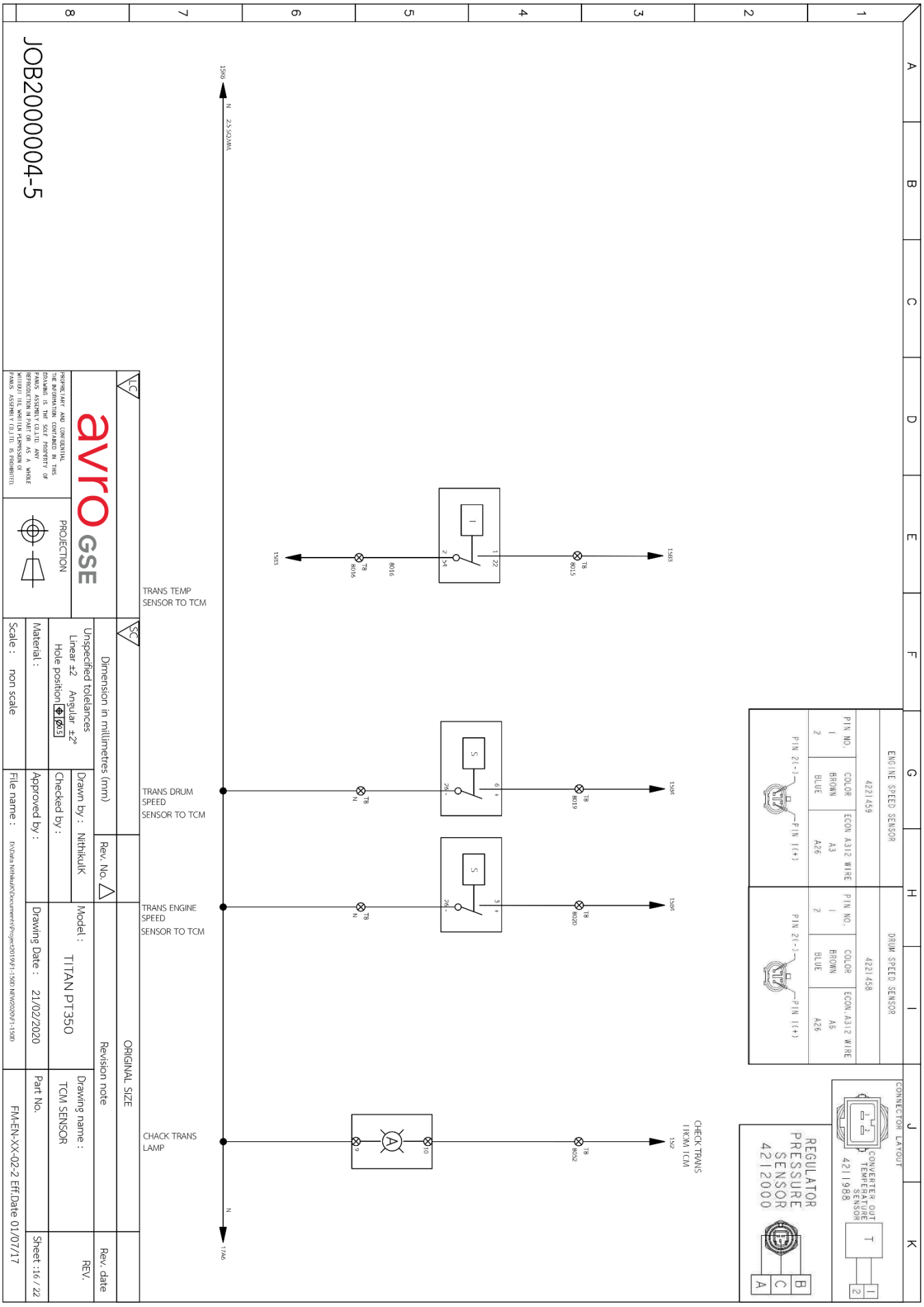
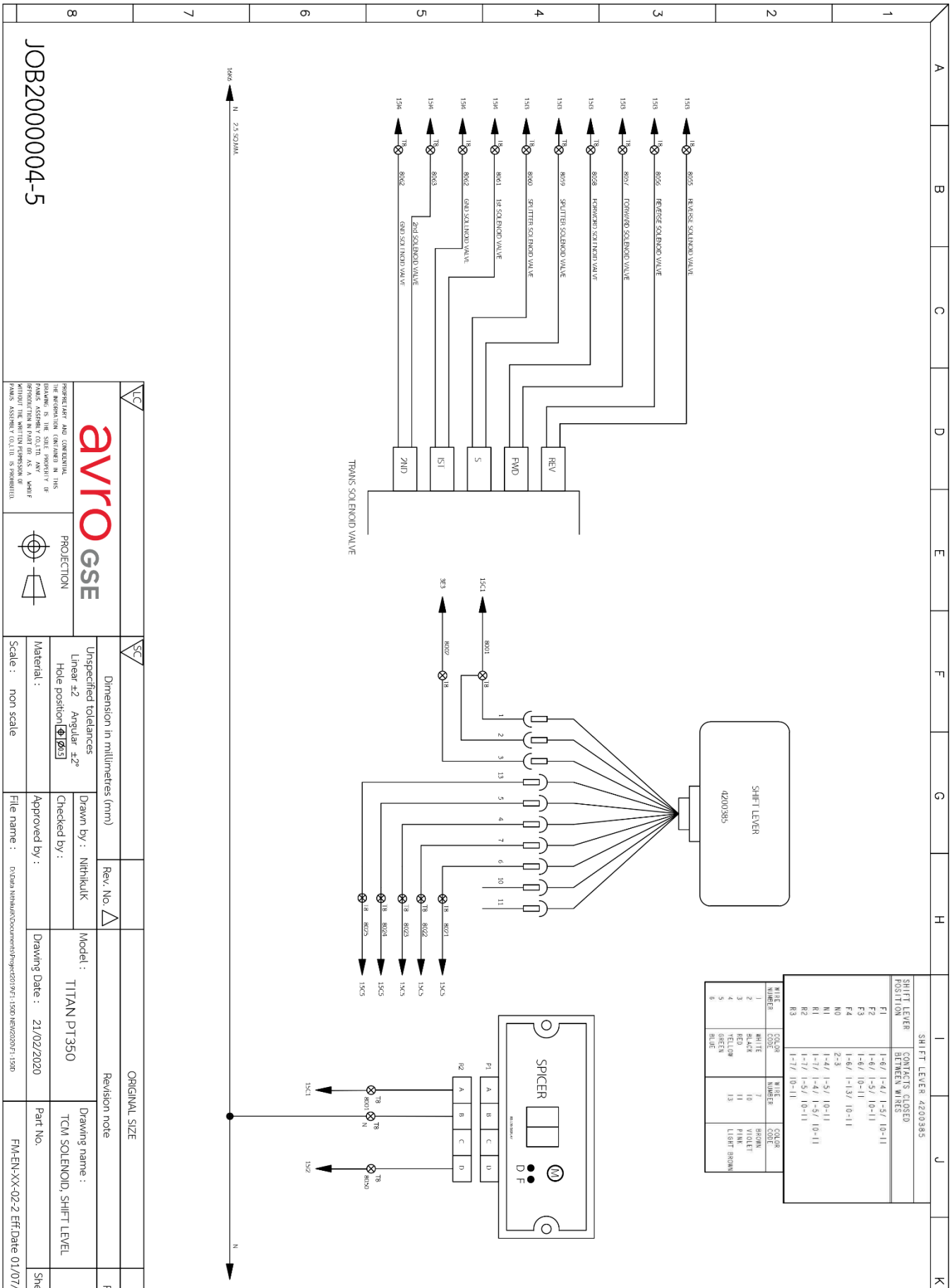
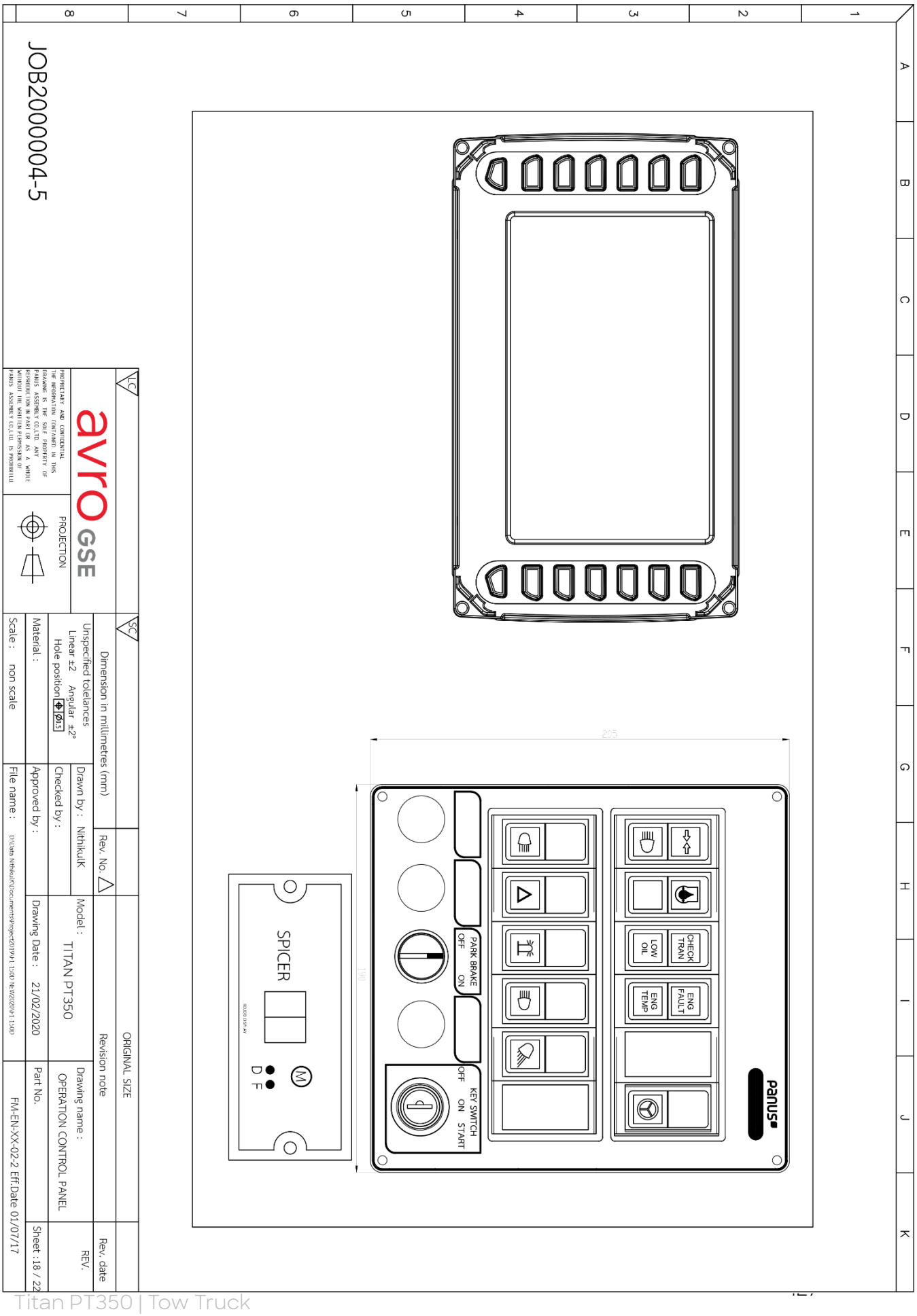
PROJECTION
LC
SC
Dimension in millimetres (mm)
Unspecified tolerances
Linear ±2 Angular ±2°
Hole position Ø0.5
Drawn by : Nithikul K
Checked by :
Rev. No.
ORIGINAL SIZE
Revision note
Rev. date
Material :
Approved by :
Model : TITAN PT350
Drawing Date : 21/02/2020
Drawing name : ECM CIRCUIT 2
Part No.
REV.
Scale : non scale
File name : D:\Data Nithikul\Documents\Project\2019\PT1-1500 REV\2020\PT1-1500
FM-EN-XX-02-2 Eff.Date 01/07/17
Sheet : 14 / 22


JOB20000004-5
TCM
FCON A312
AFC300
FROM CAN BUS
Dimension in millimetres (mm)
Unspecified tolerances
Linear ±2 Angular ±2°
PROJECTION
Rev. No.
ADD PARK BRAKE LOCK
Revision note
Rev. date
10/11/2020
Drawn by : NithikulK
Checked by :
Approved by :
Material :
Scale : non scale
File name :
Model : TITAN PT350
Drawing name : TCM CIRCUIT
Drawing Date : 21/02/2020
Part No.
REV.
Sheet : 15 / 22
FM-EN-XX-02-2 Eff.Date 01/07/17


JOB2000004-5
avro GSE
PROJECTION
TRANS TEMP SENSOR TO TCM
TRANS DRUM SPEED SENSOR TO TCM
TRANS ENGINE SPEED SENSOR TO TCM
CHACK TRANS LAMP
CHECK TRANS FROM TCM
ENGINE SPEED SENSOR
DRUM SPEED SENSOR
CONNECTOR LAYOUT
REGULATOR PRESSURE SENSOR 4212000
CONVERTER OUT TEMPERATURE SENSOR 4211988
Dimension in millimetres (mm)
Unspecified tolelances
Linear ±2 Angular ±2°
Hole position Ø0.5
Drawn by : NithikuK
Checked by :
Approved by :
Material :
Scale : non scale
Model : TITAN PT350
Drawing Date : 21/02/2020
Drawing name : TCM SENSOR
Part No.
Revision note
Rev. No.
Rev. date
ORIGINAL SIZE
SHEET SIZE
REV.
Sheet :16 / 22
FM-EN-XX-02-2 Eff.Date 01/07/17


JOB2000004-5
avro GSE
PROJECTION
ORIGINAL SIZE
Dimension in millimetres (mm)
Unspecified tolelances
Linear ±2 Angular ±2°
Hole position Ø0.3
Drawn by : Nithikul K
Checked by :
Material :
Scale : non scale
Approved by :
File name : D:\Data Nithikul\Documents\Project\2019\F1-1500 REV\2020\F1-1500
Model : TITAN PT350
Revision note
Drawing Date : 21/02/2020
Part No.
Drawing name : TCM SOLENOID, SHIFT LEVEL
REV.
Rev. date
Sheet : 11 / 22
FM-EN-XX-02-2 Eff.Date 01/07/17
SHIFT LEVER 4200385
SHIFT LEVER POSITION
CONTACTS CLOSED BETWEEN WIRES
SHIFT LEVER
4200385
REVERSE SOLENOID VALVE
FORWARD SOLENOID VALVE
SPLITTER SOLENOID VALVE
1st SOLENOID VALVE
GND SOLENOID VALVE
2nd SOLENOID VALVE
TRANS SOLENOID VALVE
REV
FWD
S
1ST
2ND
SPICER
1646
2.5 SQ.MM.


JOB2000004-5
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Dimension in milimetres (mm)
Unspecified tolelances
Linear ±2 Angular ±2°
Hole position Ø0.5
Rev. No.
Drawn by : Nithikul K
Checked by :
Material :
Scale : non scale
Approved by :
File name :
Model : TITAN PT350
Drawing Date : 21/02/2020
ORIGINAL SIZE
Revision note
Rev. date
Drawing name : OPERATION CONTROL PANEL
Part No.
REV.
Sheet :18 / 22
FM-EN-XX-02-2 Eff.Date 01/07/17
panus
CHECK TRAN
LOW OIL
ENG FAULT
ENG TEMP
PARK BRAKE
OFF ON
KEY SWITCH
OFF ON START
SPICER
205

FUSE

LABEL	FUNCTION	REFERANCE	RATING	SHEET
F1	MAIN SUPPLY CONTROL, EMERGENCY, START	3100	10A	3B2
F2	PARK, TAIL LIGHT, LOW BEAM,HIGH BEAM F	5200	15A	4B2
F3	STARTER LOCK RELAY	50e	15A	2F2
F4	BEACON LIGHT, INTERIOR LIGHT	5400	10A	9B2
F5	TOW LIGHT, WORK LIGHT	5500	15A	9F2
F6	HAZARD LIGHT, TURN LIGHT	5600	15A	5B2
F7	SUPPLY DISPLAY EATON, DUETZ, CAMERA	5700	15A	7B2
F8	PARK BRAKE, HYDRAULIC SENSOR	5800	15A	8B2
F9	WIPER / SIDE MIRROR	5900	15A	6B2
F10	ECU	6001	20A	10B1
F11	ECM	7001	20A	11B1
F12	TCM DRIVE	8001	10A	12B1
F13	ENGINE WARNING LAMP	5300	15A	4H2
F14	EMERGENCY STREERING	3400	15A	2I2
F15	LOW BEAM LEFT/RIGHT F	5011	10A	4F3
F16	SPARE		15A	
F17	HIGH BEAM LEFT/RIGHT F	5021	15A	4G3
F18	SPARE		15A	
F19	TCM POWER	8000	15A	15A1
F20	REVERSE LIGHT	5800	10A	8I2
F21	AIR CONDITIONER	3500	10A	3H2
F22	HYDRAULIC FAN	6200	10A	12D2
F23	AIR HOT WATER	3700	10A	3J2
F24	AIR COMPRESSURE	3600	10A	3I2
F25	SPARE		10A	
F26	SPARE		15A	
F27	SPARE			
F28	SPARE			

RELAY

LABEL	FUNCTION	COIL	NO	NC
CR1	KEY ON RELAY	3C3	3F3	
CR2	AIR CONDITION RELAY	3E3	3F3	
CR3	KEY START RELAY	3D3	3D3	
CR4	FLASE HEAD LIGHT RELAY	4E3	4I2	
CR5				
CR6	TRANS NEUTRAL GEAR	3E4	3D4	
CR7	CRANKING RELAY	3D5	2G3	
CR8				
CR9	AIR COMPRESSOR RELAY	3E3	3F3	
CR10	AIR HOT WATER RELAY	3K6	3J2	
CR11	LOW BEAM RELAY FRONT	4D3	4G2	
CR12	HIGH BEAM RELAY FRONT	4E3	4H2	
CR13	WIPER SPEED 1 RELAY	6E5	6G3	6G3
CR14	WIPER SPEED 2 RELAY	6F5	6G4	6G4
CR15	PARK BRAKE ON RELAY	8A3	8B3	
CR16	PARK BRAKE OFF RELAY	8B3	8C3	
CR17	HYDRAULIC TEMP OVER RELAY	8D6	8F3	
CR18	HYDRAULIC LOW LEVEL RELAY	8E6	8G3	
CR19				
CR20	REVERSE LIGHT RELAY	8I3	8I3	
CR21	4WD SOLENOID VALVE RELAY	16B5	16C4	16C4
CR22	HYDRAULIC FAN RELAY	12D4	12D4	
CR23				
CR24	HYDRAULIC DC PUMP RELAY	2K5	2K5	
CR25				
CCR1	ACCESSORIES RELAY	3F6	4B1	
FR1	FLASHER RELAY TURN LIGHT FRONT	5D3	5D3	
TR1	HYDRAULIC DC PUMP TIMER RELAY	2I6	2J3	

JOB2000004-5

avro GSE

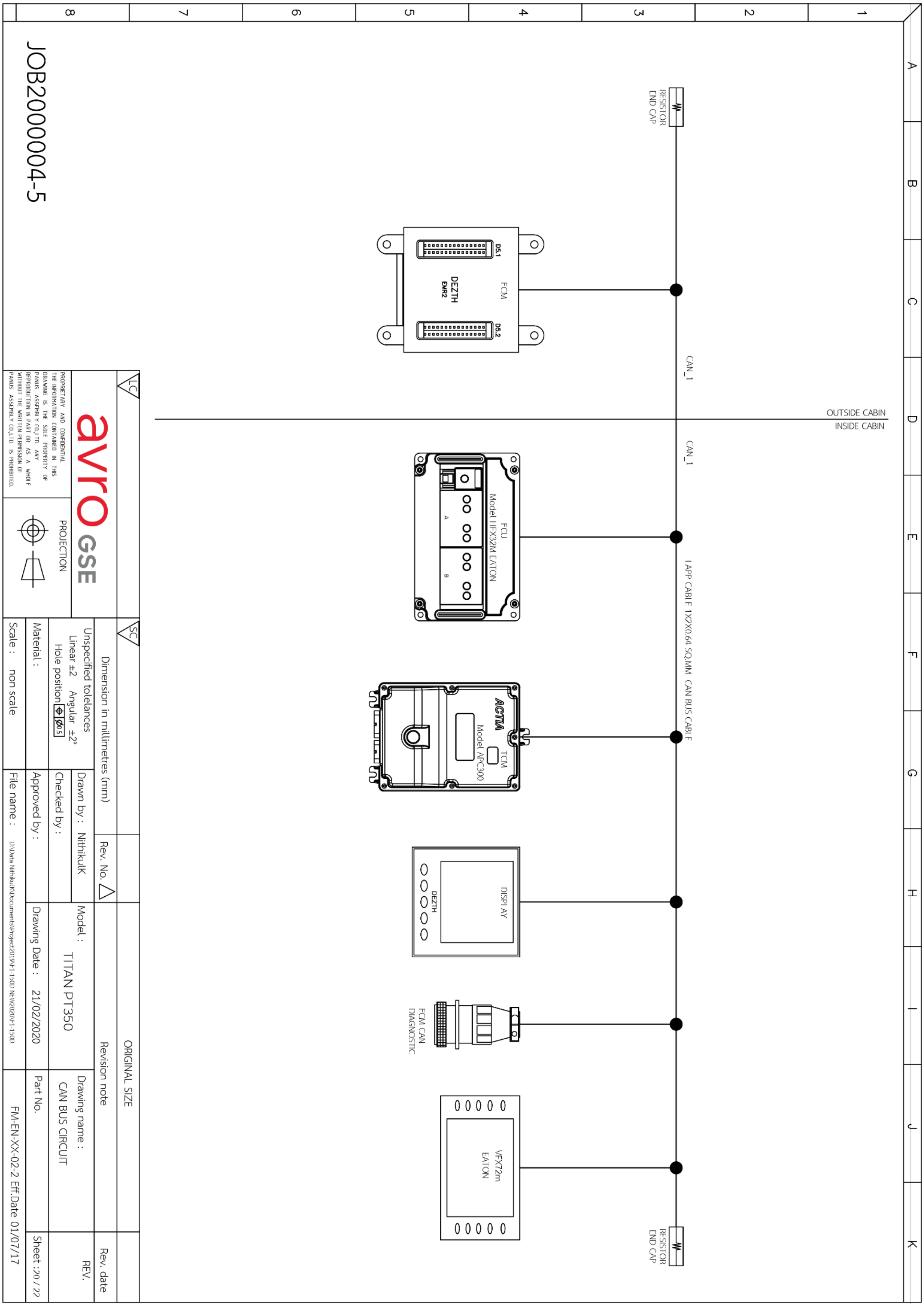
PROJECTION

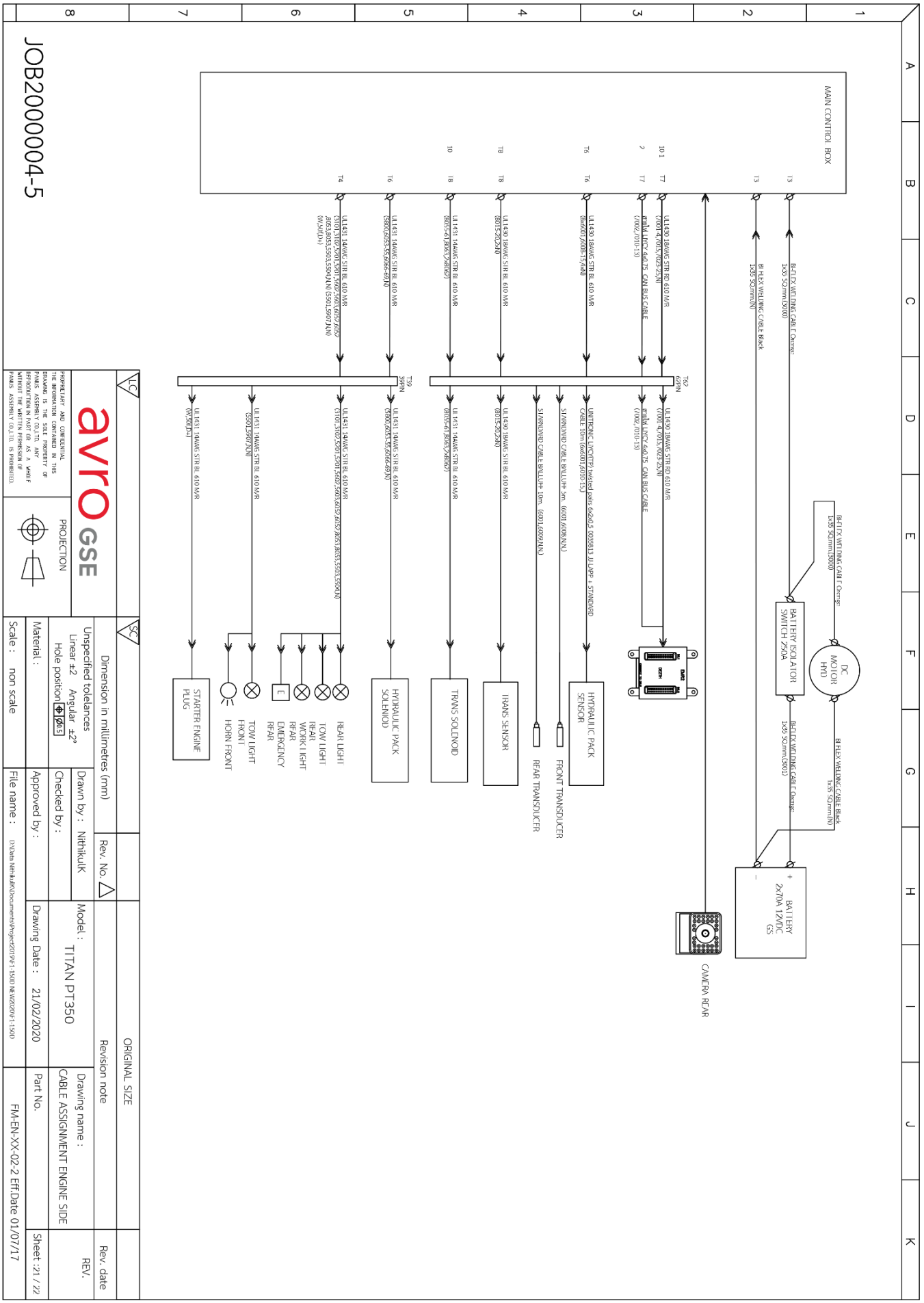
Dimension in millimetres (mm) | Rev. No. | ORIGINAL SIZE | Revision note | Rev. date

Unspecified tolelances
Linear ±2 Angular ±2°
Hole position ⌖ Ø0.5

Drawn by : NithikulK
Checked by :
Approved by :
Material :
Scale : non scale
File name : D:\Data Nithikul\K\Documents\Project2019\F1-150D NEW2020\F1-150D

Model : TITAN PT350
Drawing Date : 21/02/2020
Drawing name : FUSE / RELAY DESCRIPTION
Part No.
REV.
Sheet : 19 / 22
FM-EN-XX-02-2 Eff.Date 01/07/17


JOB20000004-5
RESISTOR END CAP
FCM
DEZTH EMR2
D5.1
D5.2
CAN_1
OUTSIDE CABIN
INSIDE CABIN
FCU
Model HFX32M EATON
TCM
Model APC300
ACTIA
LAPP CABLE 1X2X0.64 SQ.MM CAN BUS CABLE
DISPLAY
DEZTH
FCM CAN DIAGNOSTIC
VFX72m
EATON
RESISTOR END CAP
PROPRIETARY AND CONFIDENTIAL
avro GSE
PROJECTION
Dimension in millimetres (mm)
Unspecified tolelances
Linear ±2 Angular ±2°
Hole position ⌖ Ø0.5
Material :
Scale : non scale
Rev. No.
Drawn by : NithikulK
Checked by :
Approved by :
File name :
Model :
TITAN PT350
Drawing Date : 21/02/2020
Revision note
Drawing name :
CAN BUS CIRCUIT
Part No.
FM-EN-XX-02-2 Eff.Date 01/07/17
ORIGINAL SIZE
Rev. date
REV.
Sheet : 20 / 22
LC
SC


MAIN CONTROL BOX
BI-FLEX WELDING CABLE Orange 1x35 SQ.mm(30000)
BI-FLEX WELDING CABLE Black 1x35 SQ.mm(N)
DC MOTOR HYD
BATTERY ISOLATOR SWITCH 250A
BI-FLEX WELDING CABLE Orange 1x35 SQ.mm(3001)
BI-FLEX WELDING CABLE Black 1x35 SQ.mm(N)
BATTERY 2x70A 12VDC GS
CAMERA REAR
ULL430 18AWG STR RD 610 M/R (7001.4/7015/7025-2/N)
ULL430 18AWG STR BL 610 M/R (8015-20/2-N)
ULL430 18AWG STR BL 610 M/R (8006-1.6038-15/4-N)
UNITRONIC LiYCY(TP) twisted pairs 6x2x0,5 0035813 JJ-LAPP + STANDARD CABLE 10m (6x6001.6010-15/)
SI-NRNEWID CABLE BK-LLI-P+ 5m (6031.6008-N/N)
SI-NRNEWID CABLE BK-LLI-P+ 10m (6001.6009-N/N)
ULL431 14AWG STR BL 610 M/R (5901.5907-7/N)
ULL431 14AWG STR BL 610 M/R (5907.5908-5/6.066-69/N)
ULL431 14AWG STR BL 610 M/R (8015-20/2-N)
ULL431 14AWG STR BL 610 M/R (8015-45.8065-7.9806/)
ULL431 14AWG STR BL 610 M/R (5806.0035-55.6066-69/N)
ULL431 14AWG STR BL 610 M/R (5901.5907-7/N)
ULL431 14AWG STR BL 610 M/R (5907.5908-5/6.066-69/N)
ULL431 14AWG STR BL 610 M/R (W.5/6-1/N)
T6/2 6PIN
T39 39PIN
HYDRAULIC PACK SENSOR
FRONT TRANSDUCER
REAR TRANSDUCER
TRANS SENSOR
TRANS SOLENOID
HYDRAULIC PACK SOLENOID
REAR LIGHT
TOW LIGHT REAR
WORK LIGHT REAR
EMERGENCY REAR
TOW LIGHT FRONT
HORN FRONT
STARTER ENGINE PLUG
avro GSE
PROJECTION
Dimension in millimetres (mm)
Unspecified tolerances
Linear ±2 Angular ±2°
Hole position ⌖ Ø0.5
Rev. No.
Drawn by : Nithikulk
Checked by :
Material :
Scale : non scale
Approved by :
File name : D:\Data Nithikul\Documents\Project\2019\V3 1:5(8) NEW\2019\V3 1:5(8)
Model : TITAN PT350
Drawing Date : 21/02/2020
ORIGINAL SIZE
Revision note
Rev. date
Drawing name : CABLE ASSIGNMENT ENGINE SIDE
Part No.
REV.
Sheet :21 / 22
FM-EN-XX-02-2 Eff.Date 01/07/17
JOB2000004-5
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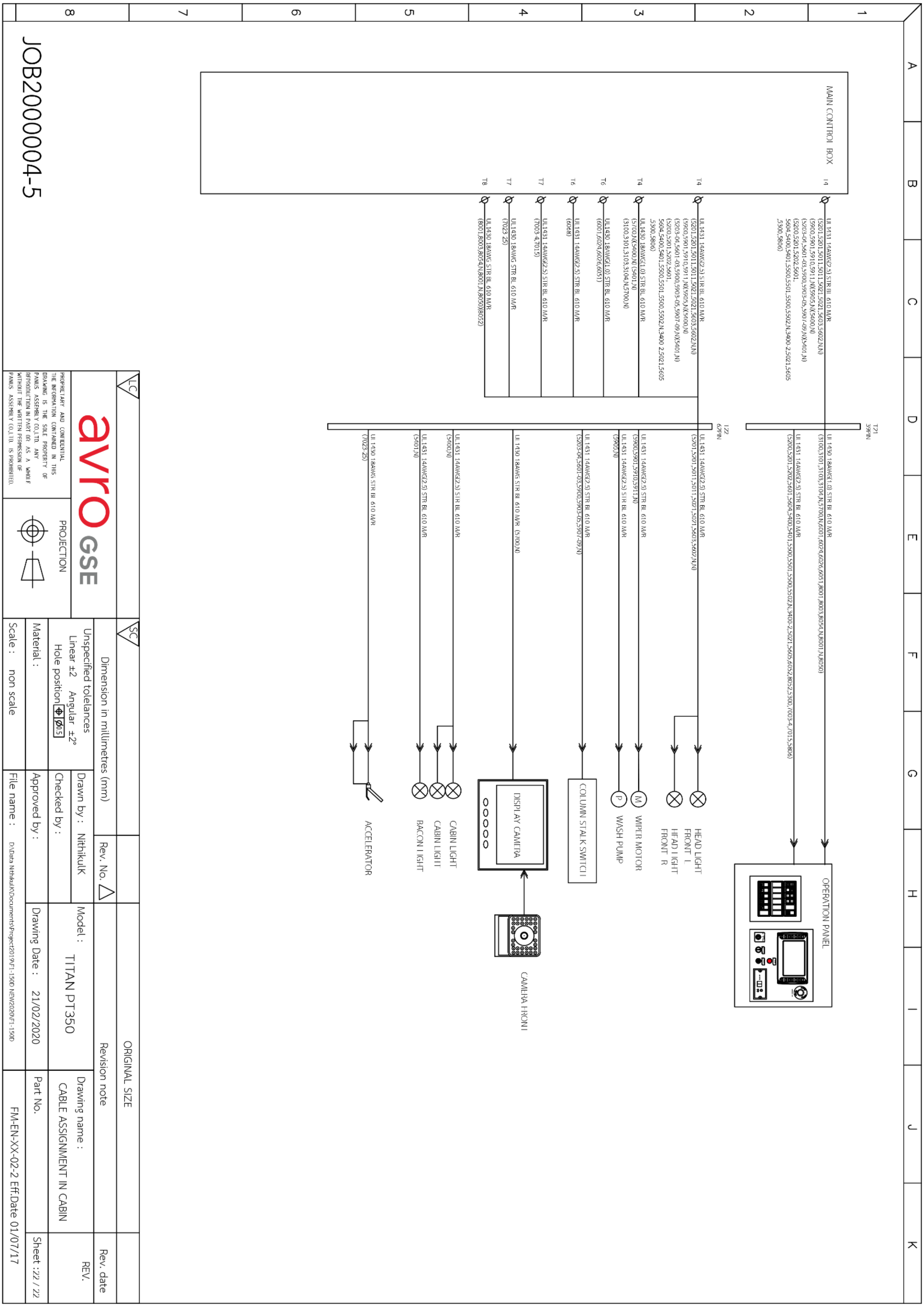
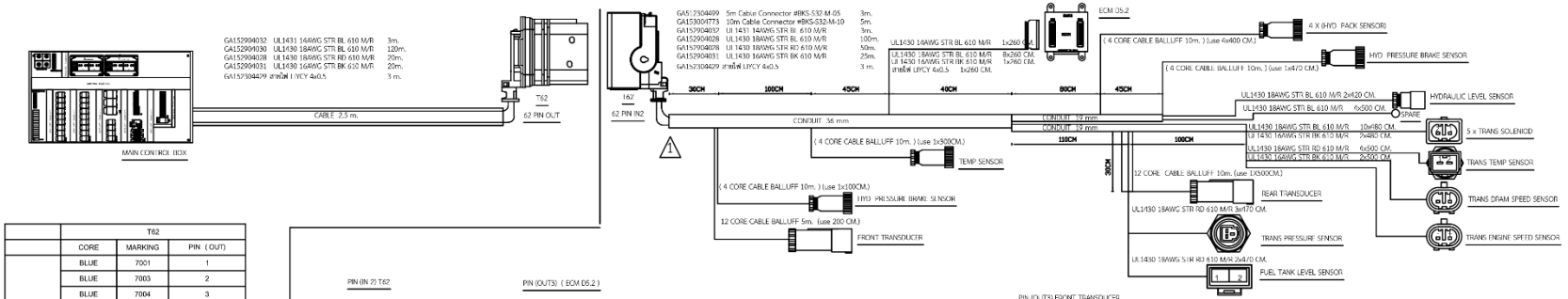
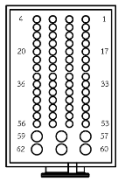

MAIN CONTROL BOX
OPERATION PANEL
HEAD LIGHT FRONT L
HEAD LIGHT FRONT R
WIPER MOTOR
WASH PUMP
COLUMN STALK SWITCH
DISPLAY CAMERA
CAMERA FRONT
CABIN LIGHT
CABIN LIGHT
BACON LIGHT
ACCELERATOR
JOB20000004-5
PROJECTION
Dimension in millimetres (mm)
Unspecified tolelances
Linear ±2 Angular ±2°
Hole position
Material :
Scale : non scale
ORIGINAL SIZE
Revision note
Rev. No.
Rev. date
Drawn by : Nithikulk
Checked by :
Approved by :
Model : TITAN PT350
Drawing name : CABLE ASSIGNMENT IN CABIN
REV.
Drawing Date : 21/02/2020
Part No.
Sheet :22 / 22
File name :
FM-EN-XX-02-2 Eff.Date 01/07/17



PIN (OUT) T62



PIN 62 TYPE MALE

	T62		
	CORE	MARKING	PIN (OUT)
UL1431 14AWG STR BL 610 M/R UL1430 18AWG STR BL 610 M/R UL1430 16AWG STR BK 610 M/R	BLUE	7001	1
	BLUE	7003	2
	BLUE	7004	3
	BLUE	7015	4
	BLACK	N	5
	BLUE	7023	6
	BLUE	7024	7
	BLUE	7025	8
	BLUE	SP9	9
	BLUE	SP10	10
สายไฟ LIYCY 4x0.75	BROWN	7010	11
	WHITE	7011	12
	GREEN	CAN1 H	13
	YELLOW	CAN1 L	14
	SHIELD	7002	15
UL1/30 18AWG STR BL 610 M/R	BLUE	6001	16
	BLUE	6010	17
	BLUE	6001	18
	BLUE	6011	19
	BLUE	6001	20
	BLUE	6012	21
	BLUE	6001	22
	BLUE	6013	23
	BLUE	6001	24
	BLUE	6014	25
	BLUE	6001	26
	BLUE	6015	27
	BLUE	6001	28
	BLUE	6029	29
	BLUE	6036	30
	BLUE	6016	31
	BLUE	6001	32
	BLUE	6017	33
UL1/30 18AWG STR BL 610 M/R UL1/30 16AWG STR BK 610 M/R	BLUE	6001	34
	BLUE	8008	35
	BLACK	N	36
	BLACK	N	37
	BLUE	6001	38
	BLUE	6009	39
	BLACK	N	40
	BLACK	N	41
UL 1430 18AWG STR RD 610 M/R UL 1430 16AWG STR BK 610 M/R	RED	8015	42
	RED	8016	43
	RED	8016	44
	RED	8017	45
	RED	8018	46
	RED	8019	47
	BLACK	N	48
	RED	8020	49
	BLACK	N	50
UL1430 18AWG STR BL 610 M/R	BLUE	8055	51
	BLUE	8056	52
	BLUE	8057	53
	BLUE	8058	54
	BLUE	8059	55
	BLUE	8060	56
	BLUE	8061	57
	BLUE	8062	58
	BLUE	8063	59
	BLUE	8062	60
	BLUE	SP61	61
	BLUE	SP62	62

GA153004653 1 PCS
คอนเนคเตอร์ 62pin ตัวผู้ ไซส์1.5k
1-1/1832H-1

GA153004657 1 PCS
ตัวครอบสายไฟของคอนเนคเตอร์ 39-62
ตัวเมีย/ตัวผู้ 1418882-1

GA153004661 100 PCS
ขาpinคอนเนคเตอร์ตัวเมีย(1.5) 1418884-1

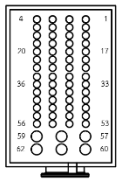
GA153004662 10 PCS
ขาpinคอนเนคเตอร์ตัวเมีย(2.8) 1-968857-2

GA153004667 100 PCS
ปลั๊กอุดกันน้ำสำหรับคอนเนคเตอร์ 963530-1

GA153004668 10 PCS
ปลั๊กอุดกันน้ำสำหรับคอนเนคเตอร์ 963531-1

GA153004659 1 PCS
ตัวล็อกหัวคอนเนคเตอร์ 1/1832H-1
(39/60pin)

PIN (IN 2) T62



PIN 62 TYPE FEMALE

GA153004652 1 PCS
คอนเนคเตอร์ 62pin ตัวเมีย ไซส์1.5k
1-1418883-1

GA153004657 1 PCS
ตัวครอบสายไฟของคอนเนคเตอร์ 39-62
ตัวเมีย/ตัวผู้ 1418882-1

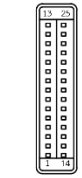
GA153004664 100 PCS
ขาpinคอนเนคเตอร์ตัวผู้(1.5) 1703278-2

GA153004665 10 PCS
ขาpinคอนเนคเตอร์ตัวผู้(2.8) 1-963749-1

GA153004667 100 PCS
ปลั๊กอุดกันน้ำสำหรับคอนเนคเตอร์ 963530-1

GA153004668 10 PCS
ปลั๊กอุดกันน้ำสำหรับคอนเนคเตอร์ 963531-1

PIN (OUT3) (ECM D5.2)



PIN 25 TYPE FEMALE

	CORE	MARKING	PIN (IN 2)	PIN (OUT 3)	NOTE	LENGTH (CM)
ECM UL1431 14AWG STR BL 610 M/R UL1430 18AWG STR BL 610 M/R UL1430 16AWG STR BK 610 M/R	BLUE	7001	1	14	U BATT +	260
	BLUE	7003	2	3	ENG TEMP	260
	BLUE	7004	3	4	ENG FAULT	260
	BLUE	7015	4	15	LOW OIL	260
	BLACK	N	5	1	U BATT -	260
	BLUE	7023	6	23	PEDAL -	260
	BLUE	7024	7	24	PEDAL AL	260
	BLUE	7025	8	25	PEDAL +	260
	BLUE	SP9	9			500
	BLUE	SP10	10			500
ECM สายไฟ LIYCY 4x0.5	BROWN	7010	11	10	L LINE	260
	WHITE	7011	12	11	K LINE	
	m	CAN1 H	13	12	CAN1 H	
	YELLOW	CAN1 L	14	13	CAN1 L	
	SHIELD	7002	15	2	CAN GND	

PIN (OUT3) 6 X (HYD PACK SENSOR)

PIN 5 TYPE FEMALE

	CORE	MARKING	PIN (IN 2)	PIN (OUT 3)	NOTE	LENGTH (CM)
HYDRAULIC PACK SENSOR 6 X (STANDARD CABLE BALLUFF)	BROWN	6001	16	1	P-LINE	400
	WHITE	6010	17	2		
	BROWN	6001	18	1	FRONT ACCUM	400
	WHITE	6011	19	2		
	BROWN	6001	20	1	REAR ACCUM	400
	WHITE	6012	21	2		
	BROWN	6001	22	1	PARK BREAK	400
	WHITE	6013	23	2		
	BROWN	6001	24	1	FRONT BREAK	100
	WHITE	6014	25	2		
	BROWN	6001	26	1	REAR BREAK	470
	WHITE	6015	27	2		
LEVEL SENSOR UL 1430 18AWG STR BL 610 M/R	BLUE	6001	28	1	HYD LOW LEVEL	420
	BLUE	6029	29	2		
FUEL SENSOR UL1430 18AWG STR BL 610 M/R	BLUE	6036	30	1	FUEL SENSOR	470
	BLUE	6016	31	2		
TEMP SENSOR STANDARD CABLE BALLUFF)	BROWN	6001	32	1	HYD. TEMP	300
	BLUE	6017	33	3		

PIN (OUT 3) (HYD LEVEL SENSOR)

PIN 3 TYPE FEMALE

PIN (OUT 3) (FUEL SENSOR)

PIN (OUT3) (HYD TEMP SENSOR)

PIN 5 TYPE FEMALE

PIN (OUT3) FRONT TRANSDUCER

GA512304499
5m Cable Connector
#BKS 532 M 05

GA153004773
10m Cable Connector
#BKS-532-M-10

	CORE	MARKING	PIN (IN 2)	PIN (OUT 3)	NOTE	LENGTH (CM)
FRONT TRANSDUCER STANDARD CABLE BALLUFF 5 m.	BROWN	6001	34	7		200
	YELLOW	6008	35	1		
	BLUE	N	36	6		
	GRAY	N	37	2		
REAR TRANSDUCER STANDARD CABLE BALLUFF 10 m.	BROWN	6001	38	7		500
	YELLOW	6009	39	1		
	BLUE	N	40	6		
	GRAY	N	41	2		

PIN (OUT3) TRANS PRESSURE SENSOR

	CORE	MARKING	PIN (IN 2)	PIN (OUT 3)	NOTE	LENGTH (CM)
TRANS PS SENSOR UL1430 18AWG STR RD 610 M/R UL1430 16AWG STR BK 610 M/R	RED	8016	44	A	PRESURE GND	470
	RED	8017	45	B	PRESSURE 5V	470
	RED	8018	46	C	PS SIGNAL	470

PIN (OUT3) TRANS TEMP SENSOR

PIN (OUT3) TRANS DIAM SPEED

PIN (OUT3) TRANS ENGINE SPEED

	CORE	MARKING	PIN (IN 2)	PIN (OUT 3)	NOTE	LENGTH (CM)
TRANS SENSOR UL1430 18AWG STR RD 610 M/R UL1430 16AWG STR BK 610 M/R	RED	8015	42	1	TEMP SIGNAL	500
	RED	8016	43	2	TEMP GND	500
	RED	8019	47	1 (+)	SR SIGNAL	500
	BLACK	N	48	2 (-)	SR GND	500
	RED	8020	49	1 (+)	SR SIGNAL	500
	BLACK	N	50	2 (-)	SR GND	500

PIN (OUT 3) SX (TRANS SOLENOID)

	CORE	MARKING	PIN (IN 2)	PIN (OUT 3)	NOTE	LENGTH (CM)
TRANS SOLENOID UL1430 18AWG STR BL 610 M/R	BLUE	8055	51	1	REVERSE	480
	BLUE	8056	52	2	GND	480
	BLUE	8057	53	1	FORWARD	480
	BLUE	8058	54	2	GND	480
	BLUE	8059	55	1	SPLITTER	480
	BLUE	8060	56	2	GND	480
	BLUE	8061	57	1	1st	480
	BLUE	8062	58	2	GND	480
	BLUE	8063	59	1	2nd	480
	BLUE	8062	60	2	GND	480
	BLUE	SP61	61			500
	BLUE	SP62	62			500

JOB2000004-5

LC	SC	1	REVISE CABLE LENGHT — 20/05/2020
avro GSE	Dimension in millimetres (mm)	00	ORIGINAL SIZE
	Unspecified tolelances Linear ±2 Angular ±2° Hole position Ø0.5	Rev. No.	Revision note — Rev. date
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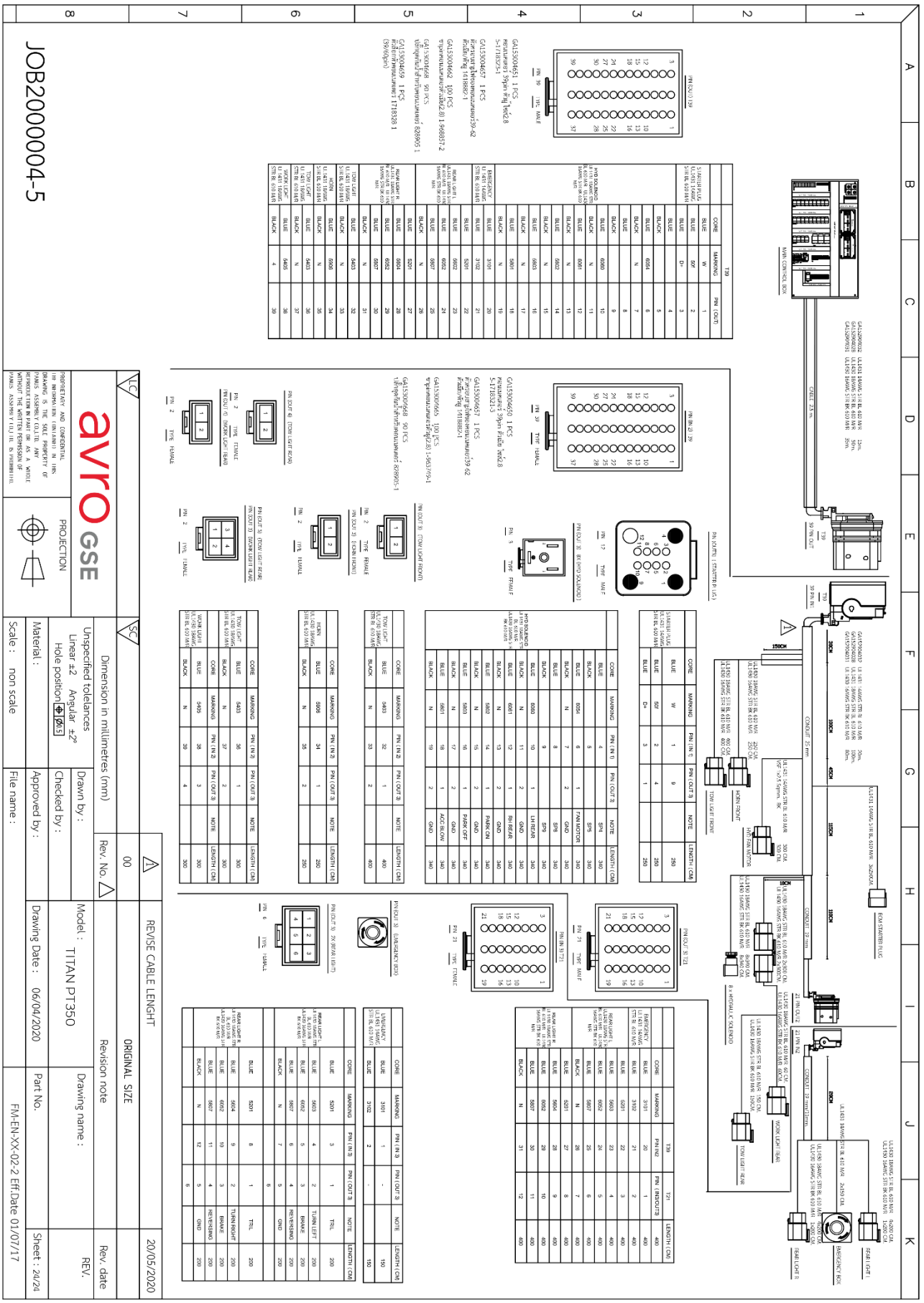
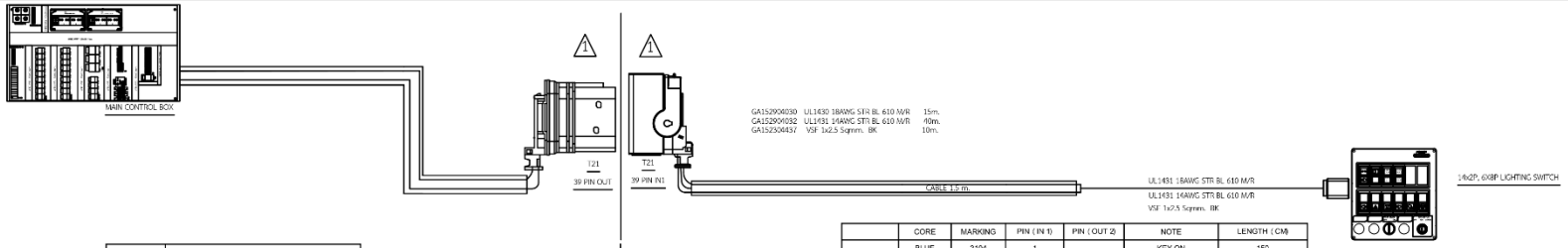
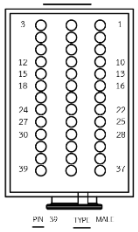
PROJECTION	Checked by :		
	Material :	Approved by :	Drawing Date : 06/04/2020 — Part No. — Sheet : 23/24
	Scale : non scale	File name :	FM-EN-XX-02-2 Eff.Date 01/07/17


JOB2000004-5
avro GSE
PROJECTION
Unspecified tolelances
Linear ±2 Angular ±2°
Hole position ⌖ Ø0.5
Dimension in millimetres (mm)
Drawn by :
Checked by :
Rev. No. 00
REVISE CABLE LENGHT
20/05/2020
ORIGINAL SIZE
Model : TITAN PT350
Revision note
Rev. date
Drawing name :
REV.
Material :
Approved by :
Drawing Date : 06/04/2020
Part No.
Sheet : 24/24
Scale : non scale
File name :
FM-EN-XX-02-2 Eff.Date 01/07/17





	T21		
	CORE	MARKING	PIN (OUT)
CONTROL UL1431 14AWG STR BL 610 M/R VSF 1x2.5 Sqmm BK	BLUE	3104	1
	BLUE	3105	2
	BLACK	N	3
	BLUE	6001	4
	BLUE	6018	5
	BLUE	6020	6
	BLUE	SP7	7
	BLUE	SP8	8
	BLUE	SP9	9
	BLACK	SP10	10
	BLUE	SP11	11
	BLUE	SP12	12
	BLUE	SP13	13
LIGHTING UL1431 14AWG STR BL 610 M/R VSF 1x2.5 Sqmm BK	BLUE	5202	14
	BLUE	5201	15
	BLUE	5203	16
	BLUE	5602	17
	BLUE	5605	18
	BLUE	5402	19
	BLUE	5401	20
	BLUE	5404	21
	BLUE	5403	22
	BLUE	5404	23
	BLUE	5405	24
	BLUE	3403	25
	BLUE	3402	26
	BLUE		27
	BLACK	N	28
INDICATING UL1431 18AWG STR BL 610 M/R VSF 1x2.5 Sqmm BK	BLACK	N	29
	BLUE	5606	30
	BLUE	5201	31
	BLUE	6062	32
	RED	8052	33
	BLUE	5805	34
	BLUE		35
	BLUE	5301	36
	BLUE	7003	37
	BLUE	7004	38
	BLUE	7015	39

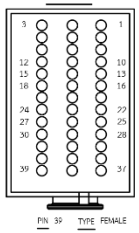
GA153004651 1 PCS
คอนเนคเตอร์ 39pin ตัวผู้ ไซส์2.8
5-1718323-1

GA153004657 1 PCS
ตัวครอบสายไฟของคอนเนคเตอร์ 39-62
ตัวเมีย/ตัวผู้ 1418882-1

GA153004662 100 PCS
ขาpinคอนเนคเตอร์ตัวเมีย(2.8) 1-968857-2

GA153004668 90 PCS
ปลั๊กอุดกันน้ำสำหรับคอนเนคเตอร์ 828905-1

GA153004659 1 PCS
ตัวล็อกหัวคอนเนคเตอร์ 1/18328-1
(39/60pin)

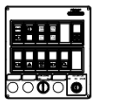


GA153004650 1 PCS
คอนเนคเตอร์ 39pin ตัวเมีย ไซส์2.8
5-1718321-3

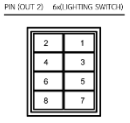
GA153004657 1 PCS
ตัวครอบสายไฟของคอนเนคเตอร์ 39-62
ตัวเมีย/ตัวผู้ 1418882-1

GA153004665 100 PCS
ขาpinคอนเนคเตอร์ตัวผู้ (2.8) 1-963749-1

GA153004668 90 PCS
ปลั๊กอุดกันน้ำสำหรับคอนเนคเตอร์ 828905-1



	CORE	MARKING	PIN (IN 1)	PIN (OUT 2)	NOTE	LENGTH (CM)
CONTROL UL1431 14AWG STR BL 610 M/R VSF 1x2.5 Sqmm. BK	BLUE	3104	1		KEY ON	150
	BLUE	3105	2		KEY IGNITION	150
	BLACK	N	3		KEY SWITCH	150
	BLUE	6001	4		PARK BRAKE	150
	BLUE	6018	5		PARK ON	150
	BLUE	6020	6		PARK OFF	150
	BLUE		7			150
	BLUE		8			150
	BLUE		9			150
	BLACK		10			150
	BLUE		11			150
	BLUE		12			150
	BLUE		13			150



GA152304665 6 PCS
SOCKET HOUSING, 8 PIN
(0183-0001)

	CORE	MARKING	PIN (IN 1)	PIN (OUT 2)	NOTE	LENGTH (CM)
LIGHTING UL1431 14AWG STR BL 610 M/R VSF 1x2.5 Sqmm. BK	BLUE	5202	14	1 , 2	HEAD LIGHT SW	150
	BLUE	5201	15	6 , 10	HEAD LIGHT ON	150
	BLUE	5203	16	3	LOW BEAM ON	150
	BLUE	5602	17	1	HAZARD SW	150
	BLUE	5605	18	5 , 10	HAZARD ON	150
	BLUE	5402	19	1	BACON SW	150
	BLUE	5401	20	5 , 10	BACON ON	150
	BLUE	5404	21	1	TOW SW	150
	BLUE	5403	22	5 , 10	TOW ON	150
	BLUE	5404	23	1	WORK SW	150
	BLUE	5405	24	5 , 10	WORK ON	150
	BLUE	3403	25	1	EMER STREERING SW	150
	BLUE	3402	26	5	EMER STREERING SW	150
	BLUE		27			150
	BLACK	N	28	9	GND COMON SW	150

GA152304679 14 PCS
SOCKET HOUSING, 2 PIN
(0183-0002)

	CORE	MARKING	PIN (IN 1)	PIN (OUT 2)	NOTE	LENGTH (CM)
INDICATING UL1431 18AWG STR BL 610 M/R VSF 1x2.5 Sqmm. BK	BLACK	N	29	9	GND COMON SW	150
	BLUE	5606	30	10	TURN LAMP	150
	BLUE	5201	31	10	HEAD LIGHT LAMP	150
	BLUE	6062	32	10	PARK BARKE LAMP	150
	BLUE	8052	33	10	CHECK TRANS LAMP	150
	BLUE	5805	34	10	HYD FAULT LAMP	150
	BLUE		35			150
	BLUE	5301	36	10	SUPPLY 24V COMON	150
	BLUE	7003	37	9	ENG TEMP LAMP	150
	BLUE	7004	38	9	ENG FAULT LAMP	150
	BLUE	7015	39	9	ENG LOW OIL LAMP	150

JOB2000004-5

LC	SC	1 ADDITIONAL CONNECTOR	20/05/2020
avro GSE		00 ORIGINAL SIZE	
	Dimension in millimetres (mm)	Rev. No.	Revision note / Rev. date
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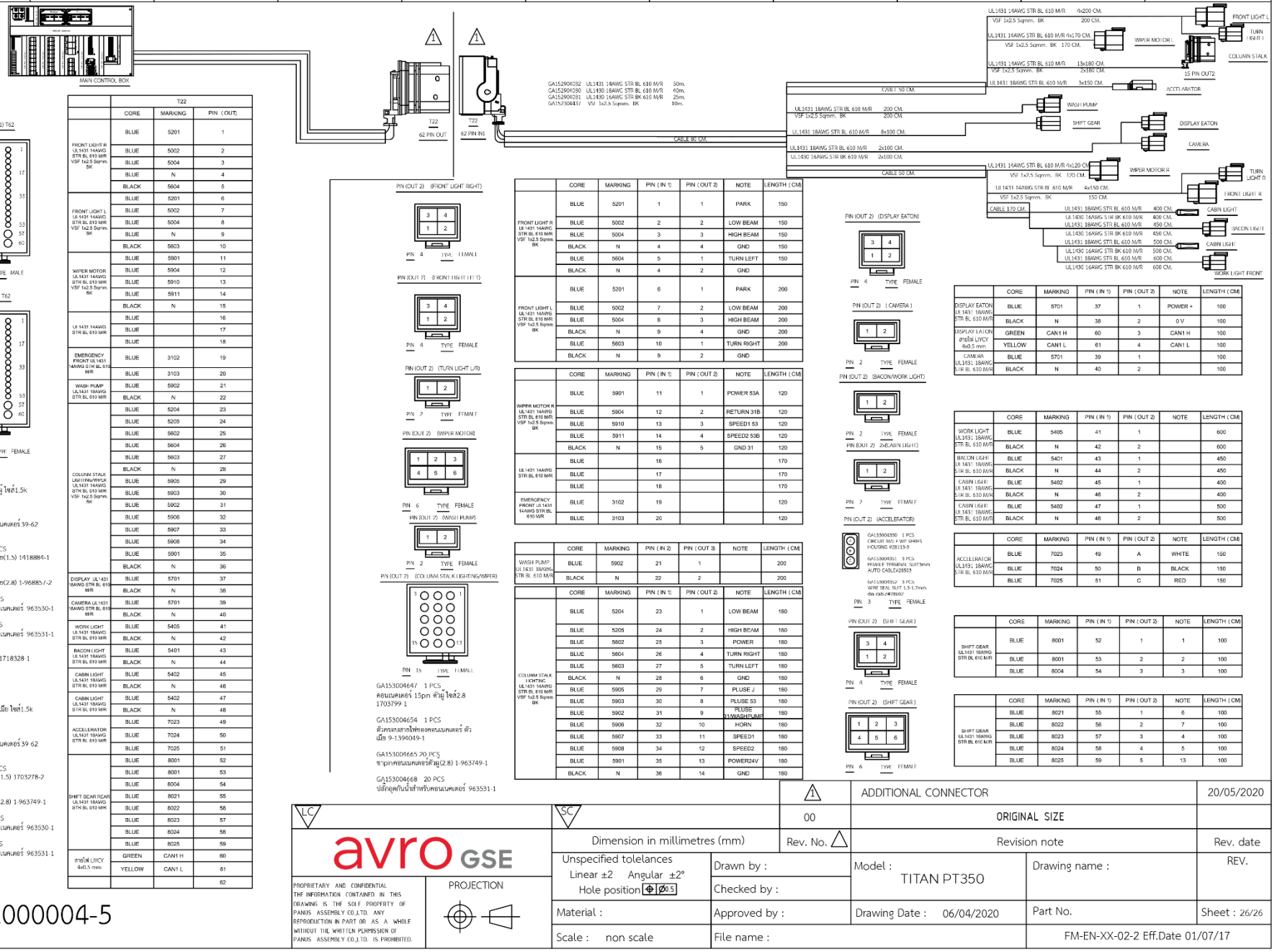
PROJECTION		Checked by :	
	Material :	Approved by :	Drawing Date : 06/04/2020 / Part No. / Sheet : 25/26
	Scale : non scale	File name :	FM-EN-XX-02-2 Eff.Date 01/07/17

avro GSE

Titan PT350 – User Manual



GA152904032 UL1431 14AWG STR BL 610 M/R 50m.
GA152904030 UL1430 18AWG STR BL 610 M/R 40m.
GA152904031 UL1430 16AWG STR BK 610 M/R 25m.
GA152304417 VSF 1x2.5 Sqmm. BK 10m.

	CORE	MARKING	PIN (OUT)
FRONT LIGHT R UL1431 14AWG STR BL 610 M/R VSF 1x2.5 Sqmm. BK	BLUE	5201	1
	BLUE	5002	2
	BLUE	5004	3
	BLUE	N	4
	BLACK	5604	5
FRONT LIGHT L UL1431 14AWG STR BL 610 M/R VSF 1x2.5 Sqmm. BK	BLUE	5201	6
	BLUE	5002	7
	BLUE	5004	8
	BLUE	N	9
	BLACK	5603	10
WIPER MOTOR UL1431 14AWG STR BL 610 M/R VSF 1x2.5 Sqmm. BK	BLUE	5901	11
	BLUE	5904	12
	BLUE	5910	13
	BLUE	5911	14
	BLACK	N	15
UL 1431 14AWG STR BL 610 M/R	BLUE		16
	BLUE		17
	BLUE		18
EMERGENCY FRONT UL1431 14AWG STR BL 610 M/R	BLUE	3102	19
	BLUE	3103	20
WASH PUMP UL1431 18AWG STR BL 610 M/R	BLUE	5902	21
	BLACK	N	22
COLUMN STALK LIGHTING/WIPER UL1431 14AWG STR BL 610 M/R VSF 1x2.5 Sqmm. BK	BLUE	5204	23
	BLUE	5205	24
	BLUE	5602	25
	BLUE	5604	26
	BLUE	5603	27
	BLACK	N	28
	BLUE	5905	29
	BLUE	5903	30
	BLUE	5902	31
	BLUE	5906	32
	BLUE	5907	33
	BLUE	5908	34
	BLUE	5901	35
	BLACK	N	36
DISPLAY UL1431 18AWG STR BL 610 M/R	BLUE	5701	37
	BLACK	N	38
CAMERA UL1431 18AWG STR BL 610 M/R	BLUE	5701	39
	BLACK	N	40
WORK LIGHT UL1431 18AWG STR BL 610 M/R	BLUE	5405	41
	BLACK	N	42
BACON LIGHT UL1431 18AWG STR BL 610 M/R	BLUE	5401	43
	BLACK	N	44
CABIN LIGHT UL1431 18AWG STR BL 610 M/R	BLUE	5402	45
	BLACK	N	46
CABIN LIGHT UL1431 18AWG STR BL 610 M/R	BLUE	5402	47
	BLACK	N	48
ACCELERATOR UL1431 18AWG STR BL 610 M/R	BLUE	7023	49
	BLUE	7024	50
	BLUE	7025	51
SHIFT GEAR REAR UL1431 18AWG STR BL 610 M/R	BLUE	8001	52
	BLUE	8001	53
	BLUE	8004	54
	BLUE	8021	55
	BLUE	8022	56
	BLUE	8023	57
	BLUE	8024	58
	BLUE	8025	59
สายไฟ LIYCY 4x0.5 mm	GREEN	CAN1 H	60
	YELLOW	CAN1 L	61
			62

GA153004653 3 PCS
คอนเนคเตอร์ 62pin ตัวผู้ ไซส์1.5k
1-1718324-1

GA153004657 3 PCS
ตัวครอบสายไฟของคอนเนคเตอร์ 39-62
ตัวเมีย/ตัวผู้ 1418882-1

GA153004661 300 PCS
ขาpinคอนเนคเตอร์ตัวเมีย(1.5) 1418884-1

GA153004662 30 PCS
ขาpinคอนเนคเตอร์ตัวเมีย(2.8) 1-968854-2

GA153004667 300 PCS
ปลั๊กอุดกันน้ำสำหรับคอนเนคเตอร์ 963530-1

GA153004668 30 PCS
ปลั๊กอุดกันน้ำสำหรับคอนเนคเตอร์ 963531-1

GA153004659 3 PCS
ตัวล็อกหัวคอนเนคเตอร์ 1718328-1
(39/60pin)

GA153004652 3 PCS
คอนเนคเตอร์ 62pin ตัวเมีย ไซส์1.5k
1 1418883 1

GA153004657 3 PCS
ตัวครอบสายไฟของคอนเนคเตอร์ 39 62
ตัวเมีย/ตัวผู้ 1418882-1

GA153004664 300 PCS
ขาpinคอนเนคเตอร์ตัวผู้(1.5) 1703278-2

GA153004665 30 PCS
ขาpinคอนเนคเตอร์ตัวผู้(2.8) 1-963749-1

GA153004667 300 PCS
ปลั๊กอุดกันน้ำสำหรับคอนเนคเตอร์ 963530-1

GA153004668 30 PCS
ปลั๊กอุดกันน้ำสำหรับคอนเนคเตอร์ 963531-1

GA153004647 1 PCS
คอนเนคเตอร์ 15pin ตัวผู้ ไซส์2.8
1703799-1

GA153004654 1 PCS
ตัวครอบสายไฟของคอนเนคเตอร์ ตัว
เมีย 9-1396049-1

GA153004665 20 PCS
ขาpinคอนเนคเตอร์ตัวผู้(2.8) 1-963749-1

GA153004668 20 PCS
ปลั๊กอุดกันน้ำสำหรับคอนเนคเตอร์ 963531-1

	CORE	MARKING	PIN (IN 1)	PIN (OUT 2)	NOTE	LENGTH (CM)
FRONT LIGHT R UL1431 14AWG STR BL 610 M/R VSF 1x2.5 Sqmm. BK	BLUE	5201	1	1	PARK	150
	BLUE	5002	2	2	LOW BEAM	150
	BLUE	5004	3	3	HIGH BEAM	150
	BLACK	N	4	4	GND	150
	BLUE	5604	5	1	TURN LEFT	150
	BLACK	N	4	2	GND	
FRONT LIGHT L UL1431 14AWG STR BL 610 M/R VSF 1x2.5 Sqmm. BK	BLUE	5201	6	1	PARK	200
	BLUE	5002	7	2	LOW BEAM	200
	BLUE	5004	8	3	HIGH BEAM	200
	BLACK	N	9	4	GND	200
	BLUE	5603	10	1	TURN RIGHT	200
	BLACK	N	9	2	GND	

	CORE	MARKING	PIN (IN 1)	PIN (OUT 2)	NOTE	LENGTH (CM)
WIPER MOTOR R UL1431 14AWG STR BL 610 M/R VSF 1x2.5 Sqmm. BK	BLUE	5901	11	1	POWER 53A	120
	BLUE	5904	12	2	RETURN 31B	120
	BLUE	5910	13	3	SPEED1 53	120
	BLUE	5911	14	4	SPEED2 53B	120
	BLACK	N	15	5	GND 31	120
UL 1431 14AWG STR BL 610 M/R	BLUE		16			170
	BLUE		17			170
	BLUE		18			170
EMERGENCY FRONT UL1431 14AWG STR BL 610 M/R	BLUE	3102	19			120
	BLUE	3103	20			120

	CORE	MARKING	PIN (IN 2)	PIN (OUT 3)	NOTE	LENGTH (CM)
WASH PUMP UL1431 18AWG STR BL 610 M/R	BLUE	5902	21	1		200
	BLACK	N	22	2		200

	CORE	MARKING	PIN (IN 1)	PIN (OUT 2)	NOTE	LENGTH (CM)
COLUMN STALK LIGHTING UL1431 14AWG STR BL 610 M/R VSF 1x2.5 Sqmm. BK	BLUE	5204	23	1	LOW BEAM	180
	BLUE	5205	24	2	HIGH BEAM	180
	BLUE	5602	25	3	POWER	180
	BLUE	5604	26	4	TURN RIGHT	180
	BLUE	5603	27	5	TURN LEFT	180
	BLACK	N	28	6	GND	180
	BLUE	5905	29	7	PLUSE J	180
	BLUE	5903	30	8	PLUSE S3	180
	BLUE	5902	31	9	PLUSE S1/WASHPUMP	180
	BLUE	5906	32	10	HORN	180
	BLUE	5907	33	11	SPEED1	180
	BLUE	5908	34	12	SPEED2	180
	BLUE	5901	35	13	POWER24V	180
	BLACK	N	36	14	GND	180

GA153004650 1 PCS
CIRCUIT MX + WP STRIPS HOUSING #3B113-5

GA153004351 3 PCS
PRIMUP TERMINAL SUIT5mm AUTO CABLE#28SQ

GA153004352 3 PCS
WIRE SEAL SUIT 1.5-1.7mm dia cable#28SQ

	CORE	MARKING	PIN (IN 1)	PIN (OUT 2)	NOTE	LENGTH (CM)
DISPLAY EATON UL1431 18AWG STR BL 610 M/R	BLUE	5701	37	1	POWER +	100
	BLACK	N	38	2	0 V	100
DISPLAY EATON สายไฟ LIYCY 4x0.5 mm	GREEN	CAN1 H	60	3	CAN1 H	100
	YELLOW	CAN1 L	61	4	CAN1 L	100
CAMERA UL1431 18AWG STR BL 610 M/R	BLUE	5701	39	1		100
	BLACK	N	40	2		100

	CORE	MARKING	PIN (IN 1)	PIN (OUT 2)	NOTE	LENGTH (CM)
WORK LIGHT UL1431 18AWG STR BL 610 M/R	BLUE	5405	41	1		600
	BLACK	N	42	2		600
BACON LIGHT UL1431 18AWG STR BL 610 M/R	BLUE	5401	43	1		450
	BLACK	N	44	2		450
CABIN LIGHT UL1431 18AWG STR BL 610 M/R	BLUE	5402	45	1		400
	BLACK	N	46	2		400
CABIN LIGHT UL1431 18AWG STR BL 610 M/R	BLUE	5402	47	1		500
	BLACK	N	48	2		500

	CORE	MARKING	PIN (IN 1)	PIN (OUT 2)	NOTE	LENGTH (CM)
ACCELERATOR UL1431 18AWG STR BL 610 M/R	BLUE	7023	49	A	WHITE	150
	BLUE	7024	50	B	BLACK	150
	BLUE	7025	51	C	RED	150

	CORE	MARKING	PIN (IN 1)	PIN (OUT 2)	NOTE	LENGTH (CM)
SHIFT GEAR UL1431 18AWG STR BL 610 M/R	BLUE	8001	52	1	1	100
	BLUE	8001	53	2	2	100
	BLUE	8004	54	3	3	100

	CORE	MARKING	PIN (IN 1)	PIN (OUT 2)	NOTE	LENGTH (CM)
SHIFT GEAR UL1431 18AWG STR BL 610 M/R	BLUE	8021	55	1	6	100
	BLUE	8022	56	2	7	100
	BLUE	8023	57	3	4	100
	BLUE	8024	58	4	5	100
	BLUE	8025	59	5	13	100

JOB2000004-5

1	ADDITIONAL CONNECTOR	20/05/2020
00	ORIGINAL SIZE	
Rev. No.	Revision note	Rev. date

LC

avro GSE

PROJECTION

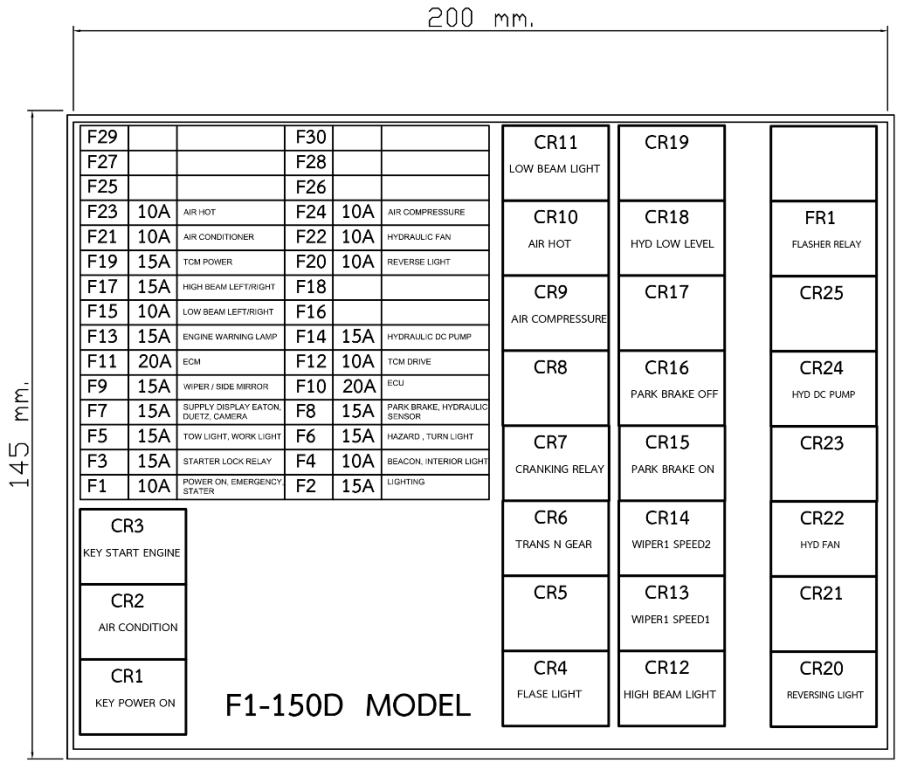
SC

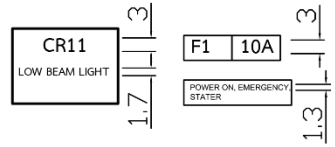
Dimension in millimetres (mm)

Unspecified tolelances
Linear ±2 Angular ±2°
Hole position ⌖ Ø0.5

Drawn by :	Model : TITAN PT350	Drawing name :	REV.
Checked by :			
Material :	Approved by :	Drawing Date : 06/04/2020	Part No. / Sheet : 26/26
Scale : non scale	File name :	FM-EN-XX-02-2 Eff.Date 01/07/17	

Titan PT350 | LOW TRUCK





STICKER PLATE

LC			SC		ORIGINAL SIZE
avro GSE			Dimension in millimetres (mm)	Rev. No.	Revision note / Rev. date
PROPRIETARY AND CONFIDENTIAL. THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF PANUS ASSEMBLY CO,LTD. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF PANUS ASSEMBLY CO,LTD. IS PROHIBITED.	PROJECTION		Unspecified tolelances Linear ±2 Angular ±2° Hole position ⌖ Ø0.5	Drawn by : NithikulK	Model : TITAN PT350 / Drawing name : FUSE, RELAY PLATE / REV.
				Checked by :	
			Material :	Approved by :	Drawing Date : 21/02/2020 / Part No. / Sheet : 27 / 27
			Scale : non scale	File name : D:\Data Nithikul\K\Documents\Project2019\N-1-150D NEW2020\N-1-150D	FM-EN-XX-02-2 Eff.Date 01/07/17

JOB2000004-5

SECTION VII: AXLES

Please refer to manufacturer's supplied manual attached to this document.

SECTION VIII: ENGINE

Please refer to manufacturer's supplied manual attached to this document.

SECTION IX: APPENDIX

Torque Reference Table

This table is used only when specific torques are not available.

This table refers to both metric and imperial Lubricated (WET), Not Lubricated (DRY) and includes fastener conversion chart.

TIGHTENING TORQUE **REFERENCE CHART** FOR SAE AND METRIC **BOLTS**

NL = Not Lubricated
L = Lubricated
1 lbs ft = 1.356 N*M

TIGHTENING TORQUE FOR SAE BOLTS (80% of yield strength Sy) in lbs ft

MATERIAL	UNC	1/4"-20	5/16"-18	3/8"-16	7/16"-14	1/2"-13	9/16"-12	5/8"-11	3/4"-10	7/8"-9	1"-8	1 1/8"-7	1 1/4"-7	1 3/8"-6	1 1/2"-6
GRADE 1	NL	4	8	14	22	34	49	68	120	194	291	412	581	762	1012
	L	3	6	10	17	26	37	51	90	145	218	309	436	572	759
GRADE 2	NL	6	12	22	35	54	78	107	191	194	291	412	581	762	1012
	L	5	9	17	27	40	58	81	143	145	218	309	436	572	759
GRADE 5/5.2	NL	10	20	36	57	87	126	173	308	496	743	1053	1486	1948	2586
	L	7	15	27	43	65	94	130	231	372	557	790	1114	1461	1939
GRADE 8	NL	14	28	50	81	123	177	245	435	700	1050	1488	2100	2752	3654
	L	10	21	38	60	92	133	184	326	525	787	1116	1575	2064	2740
MATERIAL	UNF	1/4"-28	5/16"-24	3/8"-24	7/16"-20	1/2"-20	9/16"-18	5/8"-18	3/4"-16	7/8"-14	1"-14	1 1/8"-12	1 1/4"-12	1 3/8"-12	1 1/2"-12
GRADE 1	NL	4	9	16	25	38	55	77	134	214	326	462	644	868	1138
	L	3	7	12	19	29	41	58	101	160	245	347	483	651	854
GRADE 2	NL	7	14	25	39	61	87	122	213	214	326	462	644	868	1138
	L	5	10	19	30	46	65	91	159	160	245	347	483	651	854
GRADE 5/5.2	NL	11	22	40	64	98	140	196	343	547	834	1181	1645	2217	2909
	L	8	17	30	48	74	105	147	257	410	625	886	1234	1663	2182
GRADE 8	NL	16	31	57	90	139	198	277	485	773	1178	1669	2325	3133	4111
	L	12	24	43	68	104	148	208	364	580	884	1251	1744	2350	3083

TIGHTENING TORQUE FOR METRIC BOLTS (80% of yield strength Sy) in lbs ft

MATERIAL	ST. PITCH	M6-1	M8-1.25	M10-1.5	M12-1.75	M14-2	M16-2	M18-2.5	M20-2.5	M22-2.5	M24-3	M27-3	M30-3.5	M33-3.5	M36-4
CLASS 4.6	NL	3	8	16	29	46	71	98	139	189	240	351	477	649	833
	L	3	6	12	21	34	53	74	104	142	180	263	357	486	625
CLASS 8.8	NL	9	22	44	76	122	190	262	370	503	640	936	1271	1730	2221
	L	7	17	33	57	91	142	197	278	378	480	702	953	1297	1666
CLASS 10.9	NL	13	32	64	112	179	279	385	544	739	940	1375	1867	2540	3263
	L	10	24	48	84	134	209	289	408	555	705	1031	1400	1905	2447
CLASS 12.9	NL	16	38	75	131	209	326	451	636	865	1100	1609	2185	2973	3818
	L	12	29	56	98	157	245	338	477	649	825	1207	1639	2230	2863
MATERIAL	FINE PITCH	M6-0.75	M8-1	M10-1	M12-1.25	M14-1.5	M16-1.5	M18-1.5	M20-1.5	M22-1.5	M24-1.5	M27-1.5	M30-1.5	M33-1.5	M36-1.5
CLASS 4.6	NL	4	9	18	31	50	76	110	154	207	273	393	545	733	958
	L	3	7	14	23	37	57	83	116	156	204	295	409	550	719
CLASS 8.8	NL	10	24	49	83	132	202	294	411	553	727	1048	1455	1954	2556
	L	7	18	37	63	99	151	220	308	415	545	786	1091	1466	1917
CLASS 10.9	NL	15	35	72	123	194	296	431	603	813	1068	1539	2136	2870	3754
	L	11	26	54	92	146	222	323	453	610	801	1155	1602	2152	2815
CLASS 12.9	NL	17	41	84	143	227	347	505	706	951	1249	1802	2500	3358	4393
	L	13	31	63	108	170	260	379	530	713	937	1351	1875	2519	3295

HEX KEY INTERCHANGE

SAE	Metric
5/64	2
3/32	2.5
7/64	3
1/8	3.5
5/32	4
3/16	5
7/32	6
1/4	7
5/16	8
3/8	10

Standard Conversion Table

Standard conversion factors and terms related to this vehicle

Length				
Kilometers (km)	x	062	=	Miles (mi)
Miles (mi)	x	1.61	=	Kilometers (km)
Kilometers (km)	x	3280.8	=	Feet (ft)
Feet (ft)	x	.0003048	=	Kilometers (km)
Meters (m)	x	3.28	=	Feet (ft)
Feet (ft)	x	0.3	=	Meters (m)
Centimeters (cm)	x	0.39	=	Inches (in)
Inches (in)	x	2.54	=	Centimeters (cm)
Millimeters (mm)	x	0.039	=	Inches (in)
Inches (in)	x	25.4	=	Millimeters (mm)
Meters (m)	x	39.37	=	Inches (in)
Inches (in)	x	0.0254	=	Meters (m)
Meters (m)	x	1.09361	=	Yards (yd)
Yards (yd)	x	0.91	=	Meters (m)
Kilometers (km)	x	1093.61	=	Yards (yd)
Yards (yd)	x	0.00091	=	Kilometers (km)
Temperature				
Fahrenheit (F)	(Temperature (F) – 32)*(5/9)			Celsius (C)
Celsius (C)	(Temperature (C)*(9/5)+32)			Fahrenheit (F)
Volume				
Liters (L)	x	1.057	=	Quarts (qt)
Quarts (qt)	x	0.95	=	Liters (L)
Liters (L)	x	0.264	=	Gallons (gal)
Gallons (gal)	x	3.785	=	Liters (L)
Milliliters (ml)	x	0.0042	=	Cups (c)
Cups (c)	x	236.6	=	Milliliters (ml)
Milliliters (ml)	x	0.0338	=	Ounces (oz)
Ounces (oz)	x	29.57	=	Milliliters (ml)
Mass				
Kilograms (kg)	x	0.0011	=	Tons (ton)
Tons (ton)	x	907.18	=	Kilograms (kg)
Kilograms (kg)	x	2.2046	=	Pounds(lb)
Pounds(lb)	x	0.454	=	Kilograms (kg)
Grams (g)	x	0.035	=	Ounces (oz)
Ounces (oz)	x	28.35	=	Grams (g)
Grams (g)	x	0.002205	=	Pounds (lb)
Pounds (lb)	x	453.592	=	Grams (g)
Milligrams (mg)	x	0.000035	=	Ounces (oz)
Ounces (oz)	x	28350	=	Milligrams (mg)

Pressure And Torque Conversion Table

CONVERSION TABLES

CONVERSION TABLES

UNITS OF PRESSURE
1 ATM=1 BAR=105 PA=14.4 PSI
UNIT OF WEIGHT

	N	daN	kN	kg	lbs
1N	1	0,1	0,001	0,102	0,225
1daN	10	1	0,01	1,02	2,25
1kN	1000	100	1	102	225
1kg	9,81	0,981	0,00981	1	2,205

UNITS OF TORQUE

	N·m	daN·m	kN·m	kg·m	lb·in
1N·m	1	0,1	0,001	0,102	8,854
1daN·m	10	1	0,01	1,02	88,54
1kN·m	1000	100	1	102	8854
1kg·m	9,81	0,981	0,00981	1	86,8
1 lb·in	0,1129	0,01129	0,0001129	0,01152	1

Torque Specification

COARSE PITCH

SIZE OF BOLT	TYPE OF BOLT					
	8.8	8.8 + Loctite 270	10.9	10.9 + Loctite 270	12.9	12.9 + Loctite 270
M6 x 1 mm	9,5 – 10,5 N·m	10,5 – 11,5 N·m	14,3 – 15,7 N·m	15,2 – 16,8 N·m	16,2 – 17,8 N·m	18,1 – 20 N·m
M8 x 1,25 mm	23,8 – 26,2 N·m	25,6 – 28,4 N·m	34,2 – 37,8 N·m	36,7 – 40,5 N·m	39 – 43 N·m	43,7 – 48,3 N·m
M10 x 1,5 mm	48 – 53 N·m	52 – 58 N·m	68 – 75 N·m	73 – 81 N·m	80 – 88 N·m	88 – 97 N·m
M12 x 1,75 mm	82 – 91 N·m	90 – 100 N·m	116 – 128 N·m	126 – 139 N·m	139 – 153 N·m	152 – 168 N·m
M14 x 2 mm	129 – 143 N·m	143 – 158 N·m	182 – 202 N·m	200 – 221 N·m	221 – 244 N·m	238 – 263 N·m
M16 x 2 mm	200 – 221 N·m	219 – 242 N·m	283 – 312 N·m	309 – 341 N·m	337 – 373 N·m	371 – 410 N·m
M18 x 2,5 mm	276 – 305 N·m	299 – 331 N·m	390 – 431 N·m	428 – 473 N·m	466 – 515 N·m	509 – 562 N·m
M20 x 2,5 mm	390 – 431 N·m	428 – 473 N·m	553 – 611 N·m	603 – 667 N·m	660 – 730 N·m	722 – 798 N·m
M22 x 2,5 mm	523 – 578 N·m	575 – 635 N·m	746 – 824 N·m	817 – 903 N·m	893 – 987 N·m	974 – 1076 N·m
M24 x 3 mm	675 – 746 N·m	732 – 809 N·m	950 – 1050 N·m	1040 – 1150 N·m	1140 – 1260 N·m	1240 – 1370 N·m
M27 x 3 mm	998 – 1103 N·m	1088 – 1202 N·m	1411 – 1559 N·m	1539 – 1701 N·m	1710 – 1890 N·m	1838 – 2032 N·m
M30 x 3,5 mm	1378 – 1523 N·m	1473 – 1628 N·m	1914 – 2115 N·m	2085 – 2305 N·m	2280 – 2520 N·m	2494 – 2757 N·m

FINE PITCH

SIZE OF BOLT	TYPE OF BOLT					
	8.8	8.8 + Loctite 270	10.9	10.9 + Loctite 270	12.9	12.9 + Loctite 270
M8 x 1 mm	25,7 – 28,3 N·m	27,5 – 30,5 N·m	36,2 – 39,8 N·m	40 – 44 N·m	42,8 – 47,2 N·m	47,5 – 52,5 N·m
M10 x 1,25 mm	49,4 – 54,6 N·m	55,2 – 61 N·m	71,5 – 78,5 N·m	78 – 86 N·m	86 – 94 N·m	93 – 103 N·m
M12 x 1,25 mm	90 – 100 N·m	98 – 109 N·m	128 – 142 N·m	139 – 154 N·m	152 – 168 N·m	166 – 184 N·m
M12 x 1,5 mm	86 – 95 N·m	94 – 104 N·m	120 – 132 N·m	133 – 147 N·m	143 – 158 N·m	159 – 175 N·m
M14 x 1,5 mm	143 – 158 N·m	157 – 173 N·m	200 – 222 N·m	219 – 242 N·m	238 – 263 N·m	261 – 289 N·m
M16 x 1,5 mm	214 – 236 N·m	233 – 257 N·m	302 – 334 N·m	333 – 368 N·m	361 – 399 N·m	394 – 436 N·m
M18 x 1,5 mm	312 – 345 N·m	342 – 378 N·m	442 – 489 N·m	485 – 536 N·m	527 – 583 N·m	580 – 641 N·m
M20 x 1,5 mm	437 – 483 N·m	475 – 525 N·m	613 – 677 N·m	674 – 745 N·m	736 – 814 N·m	808 – 893 N·m
M22 x 1,5 mm	581 – 642 N·m	637 – 704 N·m	822 – 908 N·m	903 – 998 N·m	998 – 1103 N·m	1078 – 1191 N·m
M24 x 2 mm	741 – 819 N·m	808 – 893 N·m	1045 – 1155 N·m	1140 – 1260 N·m	1235 – 1365 N·m	1363 – 1507 N·m
M27 x 2 mm	1083 – 1197 N·m	1178 – 1302 N·m	1520 – 1680 N·m	1672 – 1848 N·m	1834 – 2027 N·m	2000 – 2210 N·m
M30 x 2 mm	1511 – 1670 N·m	1648 – 1822 N·m	2138 – 2363 N·m	2332 – 2577 N·m	2565 – 2835 N·m	2788 – 3082 N·m

Notes

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