HiT500

Compact Tracked Carrier Mk 5 v1

Workshop Manual

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DCA 00257
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Preliminary

Foreword

Thank you very much for purchasing this product. We believe that it will serve you without fail. Ensure that you read the operating instructions carefully before use. With proper handling and maintenance, this product will provide reliable, long-term service.

This manual is intended to serve as a manual for workshop engineers. It assumes an engineering knowledge commensurate with tasks that will be undertaken in a workshop. For completeness, the manual incorporates operating instructions necessary to familiarise the operator and service engineer with the controls, recommended inspections, start-up, operating, and shutdown procedures for HiT range of equipment.

Please read the operating instructions carefully and understand them before operating the equipment.

Warranty

Registration

Each machine supplied by **Taylor Construction Plant (TCP) Ltd** is accompanied by a registration card. This card must be completed in full and returned to:

Warranty Manager (email: warranty@tcp.eu.com)
Taylor Construction Plant Ltd.
Quayside Industrial Park
Bates Road
Maldon
Essex, CM9 5FA UK
Failure to register your machine may invalidate the manufacturer's warranty.

Liability

The warranty period begins when the product is delivered to and installed at the first purchaser. Only genuine parts may be used to carry out repairs. Failure to use only genuine parts may invalidate the manufacturers warranty.

TCP Ltd will not be held responsible if:

- the machine has been used to perform tasks that demand more than it's design and strength limitations, or
- the machine has undergone modifications not approved by TCP Ltd, or
- conditions of use have been abnormal, or
- normal maintenance, with regard to requirements as set out and detailed by the manufacturer, have not been adhered to.

TCP Ltd will not pay for normal maintenance or servicing nor any materials used to carry out routine servicing.

The warranty liability of TCP Ltd is limited to diagnosis, repair or replacement of the defective part, and actuating the repair - depending on the product terms and conditions, this will be free of charge.

TCP Ltd shall be under no liability whatever to the customer for any indirect loss and/or expense (including loss of profit) suffered by the customer arising out of a breach by TCP Ltd of this contract.

Audits and Surveys

TCP Ltd reserves the right to carry out audits and inspections from time to time in relation to any reimbursed or outstanding warranty claims in order to determine that all relevant details and information is correct.

Service and Warranty Training

Service and warranty training for service fitters can be requested in writing. Initial training is to be carried out at an appropriate TCP Ltd workshop. Once this initial training has been carried out, you are responsible for any further training required by your own service centre or depot network.

Warranty Terms

One year or 1000 hours whichever occurs first from date of installation

All engine warranty issues must be directed to the engine manufacturer, or the manufacturer's approved/appointed engine dealer.

General Exclusions:

THE FOLLOWING ARE WARRANTY EXCLUSIONS AS DETERMINED BY KUBOTA:

Service items including lubricants, coolants, filters, glow plugs, fan belts, fuel injection equipment, stop solenoid/relay, charge regulator, leaks (oil, water and air).

IN ADDITION: paintwork, wear parts and tracks.

Warranty Claim Submission Procedures

Claims must be reported accurately and all relevant details given, as follows:

OWNERS NAME AND ADDRESS: full name and address of customer and site location, if different

MACHINE TYPE: State machine type, i.e. Hi-T500, tracked dumper, Hi-C40, crusher

Date of Failure:

SERIAL NUMBER: Serial number of unit

ENGINE NUMBER: Serial number of engine

HOURS USED: State hours used on hour clock. Please do not guess the hours used

DETAILS OF FAILURE: Give a full report on the failure

ORDER NUMBER: An order number **will** be required

Note that the order number is to cover the diagnostic and call out time, as well as to determine the following:

- That the failure is to be covered under the terms and conditions of warranty. If this is the case, then the costs will be covered by TCP Ltd and the **order number will not be used**.
- If the failure is determined to be of a non-warrantable nature, further authorisation to continue will be sought before any rectification work takes place.

The information above must be provided even if your warranty claim is a “parts only” claim. An invoice will be raised for the exchange parts. The reported faulty/defective part must immediately be returned to TCP Ltd and full inspection of the parts carried out, if the failure is covered under the terms and conditions of warranty a credit note corresponding to the invoice will be despatched to the customer. If the failure is deemed to be of a non-warrantable nature, the invoice should be settled immediately.

Certificate of Conformity

This is a sample Certificate Of Conformity inserted in this manual for reference, each machine is issued with a bespoke certificate sent to the head office of the purchaser and copies are available on the request of purchaser.

Kubota Engine Dealers

To locate your nearest Kubota dealer, access the Kubota web site at http://www.kubota.co.uk/ (for the UK) or http://www.kubotaengine.com/kubotaworldwide.htm (for elsewhere).

Service Bulletins

TCPLtd may from time to time issue service bulletins to keep you up to date as to any improvements or changes that may take place on the complete assembly or component parts.

Machine Identification

This manual may refer to controls and equipment that are not present on your particular machine. It is important that you know your machine and its equipment and how to operate it properly.

Information regarding the machine model, code and chassis serial number is on the unit serial number plate (*Fig 1*). This plate is on the rear left-hand side. Always quote the machine model and serial number in correspondence with your dealer or the factory.

CERTIFICATE OF CONFORMITY

We declare that this product complies with the following Standards/Directives.

- Machinery Directive 89/392/EEC as implemented by The Supply of Machinery (Safety) Regulations 1992 (Amended 1994).
- BS/EN500 Mobile road construction machinery (Safety)

Product	:Tracked Carrier
Model	:HiT 500
Serial No	:HT-Bxxxx
Manufacturer Date	:xx/xx/2006

Signed: P Drew

Date: xx/xx/2006

Mr Paul Drew

Development Manager

Fig 1 Data plate

Theft Deterrence

The owner/operator should take the following precautions to discourage theft, to aid in recovery in the event that the machine is stolen, or to reduce vandalism.

- Remove all keys any time the machine is left unattended.
- Immobilise the machine by removing a critical electrical or starting system device.
- Upon receipt of a machine, record the machine serial number and the serial numbers of all-major components and attachments. Keep this list up to date and filed in a safe location for fast retrieval.
- Place a decal or notice on the machine stating that all serial numbers are recorded.
- Discourage the thief! Inspect the gates and fences of the machinery storage yard or construction site. Keep machines in well-lit areas and ask the local law enforcement authorities to make frequent checks around the storage yard or work site.
- Liaise with neighbours. Ask them to watch equipment left at job sites and to report any suspicious activities to local allow enforcement authorities.
- Make frequent inventories of machines to promptly detect losses or vandalism.

Recovery of a Stolen Machine

In the event of theft, immediately notify the law enforcement authorities having jurisdiction. Provide the investigating officer with name, type of equipment, chassis and serial numbers of major attachments and components. It would be helpful to show the investigating officer an Operator's Handbook, photographs, and advertising, to familiarise him with the appearance of the machine.

Report the theft to the insurance company. Provide the model and all serial numbers.

Report the model and serial numbers of the stolen machine to a dealer handling the respective line of equipment. Request that the dealer forward this same information to the equipment manufacturer.

Safety

This piece of equipment is designed as a compact tracked carrier with the carrying capacity of 500 Kg only.
Always carry loads with the body in the low position and only raise it for tipping when the unit is stationery

FAILURE TO COMPLY WITH WARNINGS COULD RESULT IN SERIOUS PROPERTY DAMAGE AND POSSIBLE PERSONAL INJURY.

The machine should be properly operated and maintained to keep it in safe efficient operating condition. Be sure that all controls are free of mud, grease, or other matter that might cause slips hazardous to the operator, service engineer, or other personnel or equipment.

Report all malfunctions to those responsible for maintenance. Do not operate the equipment until corrected. Normal service or maintenance performed as required can prevent unexpected and unnecessary down time. This handbook describes general inspections, servicing and operation with the normal safety precautions required for normal servicing and operating conditions. It is not a guide however, for other than normal conditions or situations.

Operators and service engineers must be safety conscious and alert to recognise potential operating or servicing safety hazards at all times, and take, necessary precautions to ensure safe operation and servicing of the machine.

All information, illustrations and specifications contained in this publication are based on the latest product information available at the time of publication. The right is reserved to make changes at any time without notice

Continuing improvement and advancement of the design may cause changes to your machine that may not be included in this publication**.**

This Handbook contains lubrication and routine servicing instructions, most of which can be performed in the field.

General

⚠ WARNING

- Read this operator's Handbook and learn the operating characteristics and limitations of the machine. Know what operating clearances the machine requires.
- Know clearances of all side and overhead obstructions such as wires, etc., for operating safety.
- Be aware of operating hazards that weather changes can create on the job. Know proper procedures to follow when a severe rain or electrical storm strikes.
- Never attempt to operate or work on a machine when not feeling physically fit.
- Know what safety equipment is required and use it. Such equipment may be hardhat, safety glasses, reflector type vests, respirators and earplugs.
- Never wear loose clothing, rings, and watches etc. that might catch levers and controls and cause loss of control.

- Keep hand controls free from water, grease and mud to assure non-slip control.
- Handle fuels and lubricants carefully and clean up spills to avoid fire and slipping hazards.
- Never rush. Walk do not run.

Fire Precautions

⚠ WARNING

- Clean all dirt, oil, grease and other fluids from systems and components to minimise fire hazards and aid in spotting loose or leaking lines, fittings etc.
- Check the engine for rubbish, oily rags or other debris that could cause fires before starting the engine.
- Safely dispose of greasy, oily rags or similar hazards.

Flammable Fluid Precautions

⚠ WARNING

- Take due care when working with fuel. Diesel fuel is a health hazard for contact with eyes or sin, inhalation and ingestion. There is also danger of fire and pollution.
- Don't use diesel fuel or other flammable fluids for cleaning purposes. Use approved non-flammable solvents.
- Make sure all-fluid systems caps, drain, valves, fittings, lines etc., are secure and leak free.
- Never use an open flame (match, lighter etc.) when checking fuel, lubricant, coolant and battery fluid levels or when checking for fluid leaks. Use a flashlight or other safe lighting only.
- Shut off engine and use extra caution if engine is hot when refuelling.
  Never smoke while checking or adding fuel or other fluid or handling fluid containers and lines.
- Use care and do not stand downwind when adding fuel or other flammable fluids to tanks and reservoirs to avoid fluids being blown or splashed onto clothing.
- Close fuel tank shut-off valves, if used, before servicing fuel system.
- When preparing machines or components for storage, seal and tape all openings and close containers tightly to seal in all volatile inhibitor fluids and compounds used.
- Follow manufacturer's recommendations when handling and using engine-starting fluids and disposing of spent containers. Do not puncture or burn empty containers. These fluids are explosive and highly flammable.

Electrical Hazard.

⚠ WARNING

- Never smoke or allow open flames or sparks near batteries.
- Always disconnect batteries before repairing electrical system to avoid danger of fire-causing sparks. Disconnect battery ground cable first and reconnect last.
- Always disconnect batteries and alternator leads before carrying out any welding on the machine.
- Never check battery charge by placing metal objects across battery posts to avoid sparks at battery posts.
- Use jumper cables only as recommended. Improper use can result in battery explosion or unexpected machine motion.
- Never operate engine starter for more than 15 seconds and allow 30 seconds between cranking periods for cooling. An overheated starter could cause a fire.

Pre-Starting

⚠ WARNING

- If engine is to be started and run indoors, ensure proper ventilation to remove deadly exhaust gases.
- Always perform 'Pre-Starting Inspection' instructions described in this manual to ensure the machine is ready for operation.

Starting

⚠ WARNING

- Do not start the engine or operate any control if there is a 'DO NOT OPERATE' or similar warning sign attached to any control.
- Use jumper cables only as recommended. Improper use can result in battery explosion or unexpected machine motion.
- Always obey 'Starting the Engine' instructions.
- Start and operate the machine **only** from the operator's station.

Operating

⚠ WARNING

- Always perform 'Pre-Operating Checks' described in this manual to ensure the machine is ready for operating.
- Do not operate the machine if exposed personnel enter the immediate work area.
- Be sure the body is fully down before moving the machine-warning buzzer will sound if body is not fully down.
- Always try to face or look in the direction the machine is travelling.
- Always operate straight up or down slopes whenever possible. Side-hill operation can cause sideslip and possible rollover.
- Slow down when moving in congested areas. Do not race with other machines. Stop in authorised areas only, except in an emergency.
- Always watch for holes, soft edges or other hazards when dumping over a spoil bank.
- Operate body raising mechanism on firm level surface only, a buzzer will sound to warn the operator and others in the area once the body raises above horizontal.

Lubrication and Servicing

⚠ WARNING

- Do not allow unauthorised personnel to service or maintain the machine. Study the Operator's handbook and Service Manual before starting, operating or servicing the machine.
- Do not work under or near unblocked or unsupported body. Always invert the empty body.
- Do not work under or near any unblocked or unsupported linkage, part or machine.
- Always relieve pressure before servicing any pressurised system.

Specifications

Maximum carrying capacity	500 kg (1100 lb)
Skip volume	255 lt (9.0 ft ³)
Unladen weight	448kg (987 lb)
Width	700 mm (28 in)
Height	1165 mm (45.8 in)
Height over skip	2500 mm (98.4 in)
Height under skip	1200 mm (47 in)
Length	1770 mm (69.6 in)
Max grade ability	45%
Turning circle	2000 mm (78.5 in)
Track ground pressure	0.351 g/cm² (4.99 psi)
Engine (with electric start) Kubota OC95	7.1 kW (9.5 hp)
Speed forward	4 kph max. (2.5 mph)
Speed reverse	2 kph (1.2 mph)
Power take off - optional	20 lt/m @ 120 bar
Noise level	99 dBa

Section 1 Description

1.1 Introduction

The HiT500 is a Compact Tracked Carrier designed for general use on building sites. Its small size and manoeuvrability make it ideal for operation in confined spaces. The rubber tracks give it traction on most kinds of terrain.

A diesel engine drives a hydraulic pump to provide motive power for track motion and skip movement. The pump is coupled directly to the crankshaft at the front of the engine. A hydraulic tank fitted in front of the pump under the skip provides a reservoir of oil for the pump.

Drive to the tracks is by two hydraulic motors at the rear of the track. The motors are individually powered to provide steering.

Skip movement is effected by hydraulic rams – one pair for tipping and one for raising the skip. A warning siren sounds while the skip is raised.

Levers on the control panel route hydraulic oil at pressure to the rams and drive motors to control operations. A Tracking Speed button opens a valve to provide additional hydraulic flow to the motors to increase tracking speed.

A hand throttle provides control of engine power to tailor engine output to the task in hand.

1.2 Electrics

The diagrams in this section are for explanatory purposes only. Refer to drawing TCP-1574 in *Section 7.14 Electrical Schematic OC95 for full information*.

1.2.1 Ignition

The ignition circuit features automatic starting, using a 5s timer and relay to power the glow plug. When the ignition switch is set to Start, the contacts of the 5s timer are initially closed so that relay RLA is energized and contact RLA1 connects 12V to the glow plug. After a 5s delay, the timer contacts open and de-energize relay RLA. Contact RLA1 changes over to disconnect the glow plug and connect the starter motor solenoid instead. Once the engine has started, releasing the ignition switch disconnects the starter motor solenoid. The solenoid connects to the negative side of the battery through the chassis.

The Thermal cutout provides a warm-start option. If the ambient temperature in the engine compartment is greater than 20°C, the thermal cutout will be open circuit. Hence relay RLA will not then operate. As a result, the glow plug will not operate and the starter

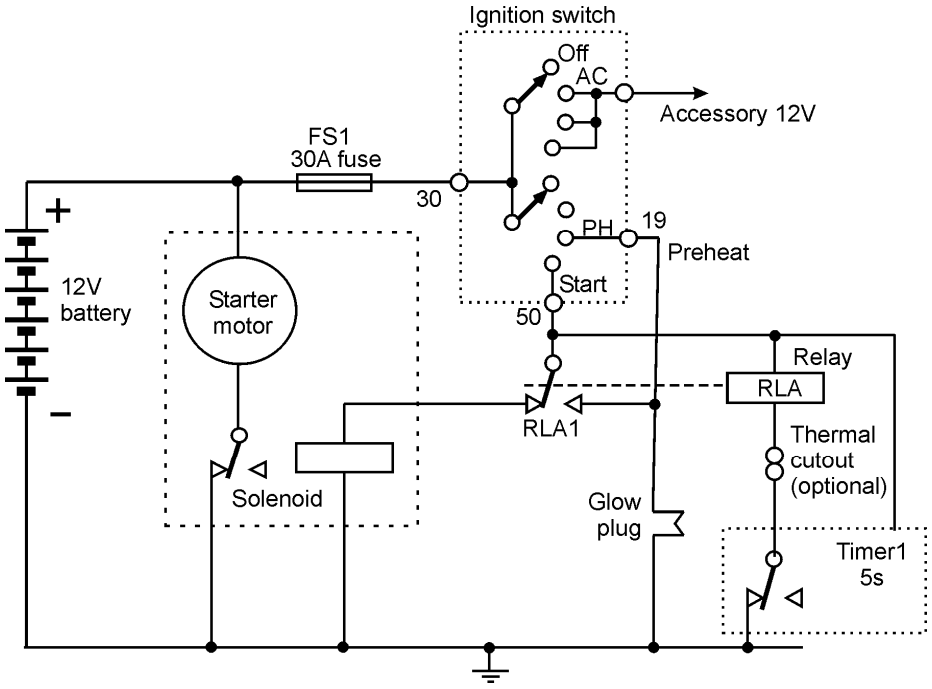


Fig 1-1 Ignition circuit

motor will start immediately the ignition switch is set to Start. If this warm-start option is not required, e.g. for a very cold climate, the cutout is linked out so that the start delay is always used.

If the timer or relay should develop a fault, the engine can still be started in the usual manner for a diesel engine. Setting the ignition switch to PH (Preheat) for 5s will power the glow plug. Moving the switch on to Start will operate the starter motor. This can be done even if the timer is not fitted or if relay RLA will not energize.

1.2.2 Charging Circuit

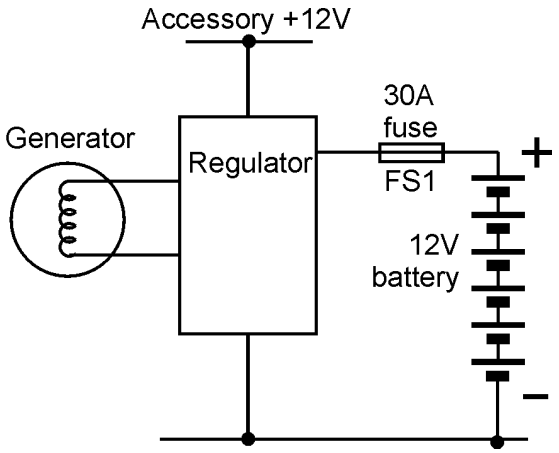


Fig 1-2 Charging circuit

The regulator converts the a.c. output from the generator to d.c. and regulates the charging current it supplies to the battery to maintain a full charge.

1.2.3 Tracking Speed

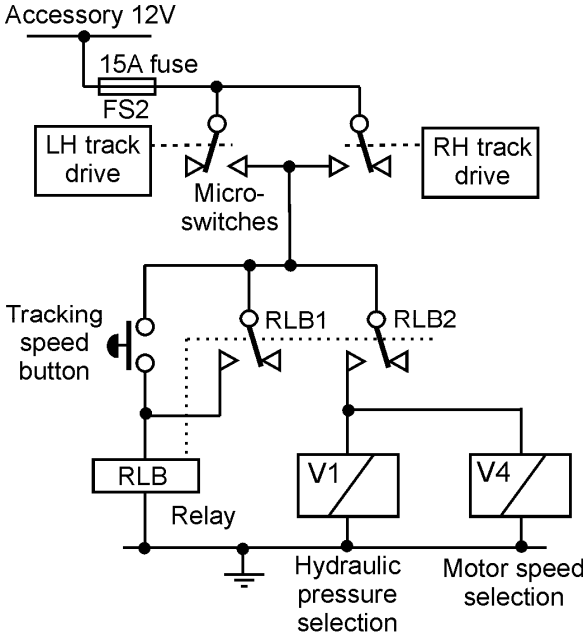


Fig 1-3 Tracking speed

The Tracking Speed button opens hydraulic valve V1 to supply extra power to the track motors. A second valve V4 sets the motors to run at a higher speed. When a drive lever is set to forward or reverse, one of the microswitches is operated. If the tracking speed button is then pressed, the circuit is completed to energize relay RLB. Contact RLB1 holds the relay on when the button is released. Contact RLB2 energizes the high-speed valves.

1.2.4 Sounder Control

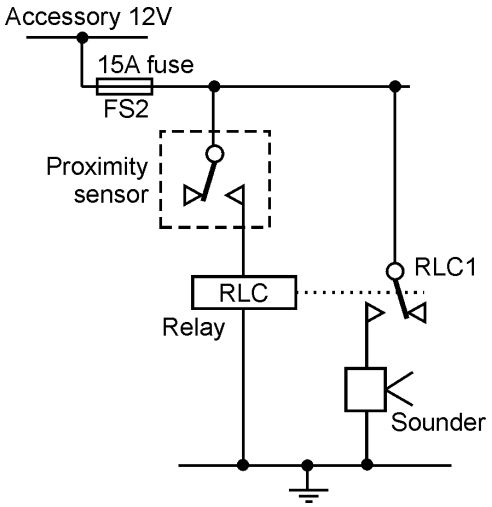


Fig 1-4 Sounder control

A sounder operates while the arm has moved to raise the bucket. A sensor fitted in the frame senses the presence of the arm. When the arm moves away, the sensor contacts close and energize relay RLC. Contact RLC1 activates the sounder.

1.2.5 Oil Cooler Fan

The oil cooler fan is powered from the 12V Accessory supply via a diode. The diode prevents back-emf generated by the fan motor from reaching other circuits when the machine is powered down.

1.2.6 Oil Pressure Light

An oil pressure switch turns on the oil pressure warning light if the oil pressure is low.

1.2.7 Hours Counter

The hours counter, powered from the 12V Accessory supply, via the 15A fuse, measures the elapsed time while the machine is operating.

1.3 Hydraulics

Refer to the Hydraulic Schematic drawing in *Section 7.21 Carrier Hydraulics* .

The diesel engine drives a hydraulic pump coupled to its shaft. This pump provides two outputs:

- a 3 cc per rev, low flow, high pressure output for low speed and general use and
- an 8 cc boost output.

These are combined to provide an 11 cc/rev high flow, high pressure boost drive for the high speed track drive.

In the idling condition, the hydraulic fluid circulates around the system at low pressure.

When a Tipping control valve is operated, it directs the fluid to operate the appropriate rams to move the bucket. The valve controls the direction of fluid flow to the rams and hence controls the direction of movement. Pressure relief valves mounted on the rams control the fluid pressure applied to each ram.

When a Drive control valve is operated, it directs the fluid in the appropriate direction to hydraulic motors on the track sprocket drive shafts. Any leakage within the motor returns to the sump through a return hose..

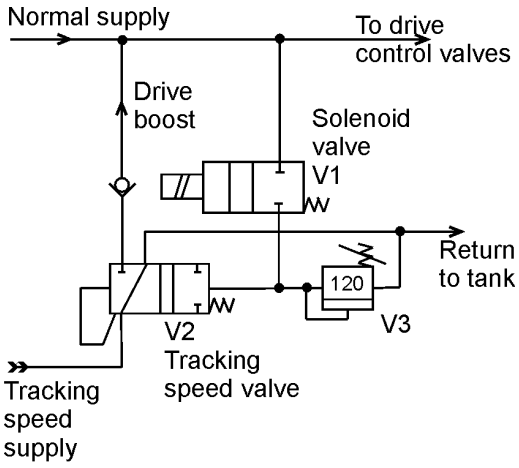


Fig 1-5 Tracking speed hydraulics

The Tracking Speed button provides increased drive speed. If the button is pressed while either of the Drive levers is pushed fully forwards or backwards, solenoid-controlled valve V1 (*Fig 1-5*) feeds pressure to operate the tracking speed valve V2 which routes the boosted pressure from the pump to the drive control valves and hence to the motors. Pressure relief valve V3 regulates the pressure on the line.

The track drive motors employ swash plates. Varying the angle of these plates varies the drive supplied to the shafts. Each motor contains a valve which, when activated, causes the swash plate to be tilted so that extra drive is applied to the shaft, giving increased tracking speed. Solenoid valve V4, energised along with V1, activates the valves in the motors (Fig 1-6).

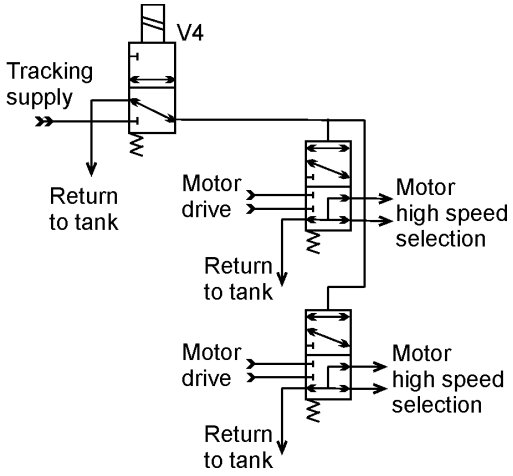
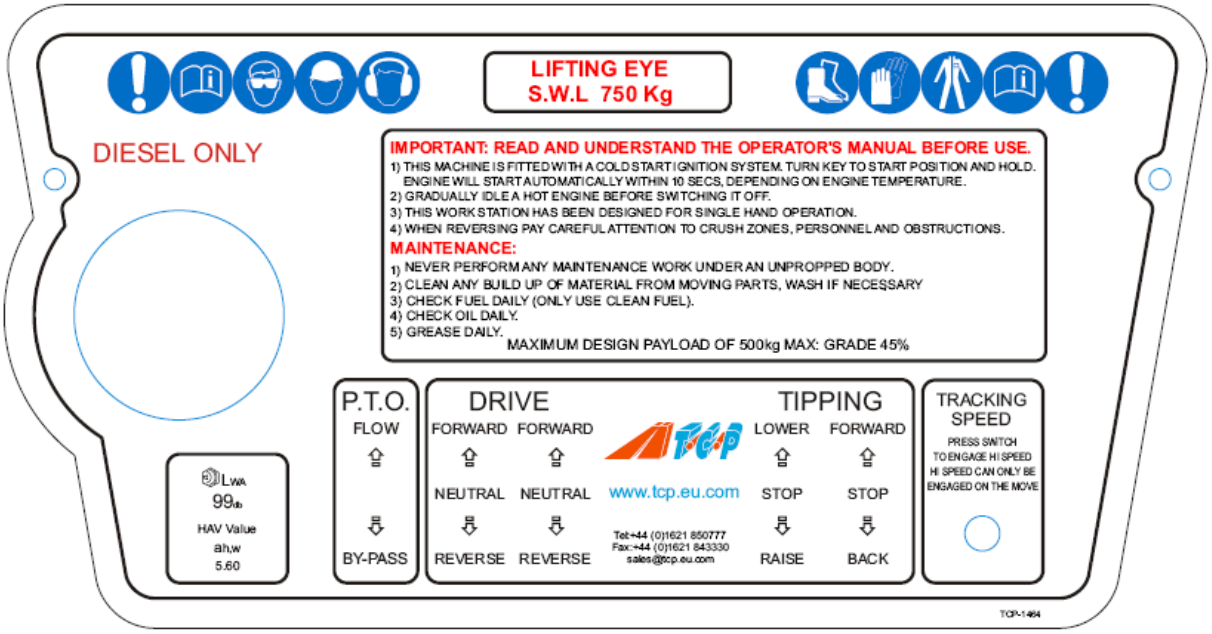


Fig 1-6 Tracking motor speed control

Section 2 Operation



2.1 Controls

2.1.8 Throttle

This is mounted on the left-hand side of handlebar assembly and is operated by hand. Press the lever down to increase fuel flow and accelerate the engine.

Do not place engine under full load at full speed immediately after starting. Always allow the engine to circulate lubricant fully and warm up gradually before operating at full speed and full load. A 20-minute warm-up is recommended. Operate the engine at top rated speed when maximum power is needed for maximum speed or load.

2.1.9 Steering

⚠ WARNING Take due care when driving the machine.

Steering is achieved by driving one track harder than the other.

To drive in a straight line, apply equal pressures to both Drive levers.

To steer left, press the right-hand Drive lever forwards harder than the other and conversely.

To drive in reverse, put the levers in the Reverse positions. The same principles of steering left or right apply as driving forwards.

To turn the machine on the spot, drive one track forwards and the other in reverse.

The machine will stop when both levers are released (dead-man brake).

2.2 Daily Pre-start Inspection

These instructions must be carried out to assure continuance of engine warranty.

Full routine maintenance procedures are given in *Section 3 Maintenance*.

1. Ensure that the machine is ready for operation before the starting it.
2. The machine should be in a level position to permit accurate checking of fluid quantities in the engine and other components.
3. Open the left hand side of the engine enclosure to access to the engine for routine maintenance.

Note: Refer to the engine manufacture's handbook for engine maintenance details.

4. Engine - With engine off, check oil level. The oil should be just over the top thread at filler Add oil if low. (See *Table 3-2* for correct oil).

5. Inspect the engine air cleaner for any damage. (If damaged, replace it immediately. Using an engine with a damaged air cleaner will seriously reduce engine life).
6. Check that oil cooler outlet grill (between body and chassis) is clear of obstructions.
7. Carefully inspect tracks for cuts or other damage and for correct spring preload.
8. Inspect for any leaks whether fuel, engine oil or hydraulic oil.
9. Check fuel level.

To prevent condensation from contaminating the fuel, fill the fuel tank at end of each shift.

2.3 Engine Operation

Do **not** place engine under ***full load*** or ***full speed*** immediately after starting. ***ALWAYS*** allow the engine to fully circulate lubricant and warm up gradually before operating at full speed and full load.

Operate engine at top rated speed when maximum power is needed for the load.

Do not idle the engine for more than five minutes at a time. Shut it off.

If engine operates outside its normal operating range, shut it down immediately and report to service or maintenance personnel.

⚠ WARNING Never start the engine indoors unless proper exhaust ventilation is provided to remove deadly exhaust gases. Once the engine is running, move the machine outdoors as soon as possible. Exhaust gases are hazardous and can cause unconsciousness and death.

Operating the engine beyond high idle speed can cause severe engine damage. The engine speed must not exceed 3,600 rev/min under any circumstances. When descending a steep grade, use a combination of lever and engine speed.

2.4 Starting the Engine

The MK4 is fitted with delay circuit to allow the glow plug to reach its operating temperature before the engine cranks. This delay circuit operates only if the ambient temperature is below 20 degrees.

1. Make sure that all levers are in the neutral position.
2. Insert switch key and turn fully clockwise to position '3' and hold. The engine will crank automatically after approximately 5 seconds.
3. Release key when engine starts.

Never crank the engine for more than 10 seconds continuously.

To avoid overheating, allow starter at least 30 seconds cooling time between cranking periods.

2.5 Starting the Engine with Jumper Cables.

Access to the battery and starter motor terminals is restricted on the Mk4. To allow jump starting to take place a Stud Terminal is located on the left rear of the engine mounting frame, this Stud Terminal is connected to the positive stud on the battery.

To access this Stud Terminal open the left hand side of the engine enclosure.

Charging of Odyssey Batteries

Check polarity of discharged battery connections.

Do not allow charging voltage to exceed 15 volts. Excessive booster voltage and/or incorrect jumper cable connections will destroy plates inside battery.

Keep all sources of ignition away from batteries. Do not lean over batteries.

Do not allow the battery to become fully discharged. The battery may no be able to recover from this state, rendering it unserviceable.

Voltmeter Reading	State of charge
12.84 Volts	100%
12.50 Volts	75%
12.18 Volts	50%
11.88 Volts	25%

Do not jump start a vehicle by using arc welding equipment. Currents and voltages are dangerously high and cannot be sufficiently reduced to make the method safe.

Be sure machines are not touching each other.

Use cables that are the same size as those on the machine.

If jumper cables are used to start an engine, be sure to follow this procedure:

1. Connect one end of the jumper cable, usually coloured red, to the discharged battery '**POSITIVE' (+)** stud terminal.
2. Connect the other end of the same cable to the **'POSITIVE' (+)** post on the booster or charged battery.

3. Connect one end of the second cable, usually coloured black to the **NEGATIVE' (-)** post of the booster battery.
4. Connect one end of the jumper cable to a convenient point on the engine frame **'NEGATIVE' (-)**.
5. Keep grounding point clear of battery so that if a spark occurs, it is away from battery fumes (explosive hydrogen).
6. Locate cause of battery failure.

2.6 Battery Charging

If the battery is not being charged properly, refer to *Section 4.2 Battery Charging.* The battery can be charged from the mains as detailed in *Section 3.14 Charging* the Battery.

2.7 Moving and Stopping

⚠ WARNING Make sure the area around the machine is clear of personnel and obstructions before moving off.

1. In the first few minutes of travel, try out the controls to ensure you operate with maximum safety.
2. Make sure the skip is fully down. The siren will sound if in the raised position.
3. Select the driving direction and the required engine speed.
4. Move levers to the required position; apply more acceleration until the required speed has been reached.
5. If running a good distance on a good surface, press the Tracking Speed button to increase the speed.
6. To stop the machine release the control levers slowly and release the accelerator as the machine slows until it stops.

2.8 Stopping the Engine

1. Cool a hot engine by operating the engine at 1,000 rev/min and then slowly decelerating it over a 5-minute period until the engine is idling. Let it idle for at least 2 minutes.

Always cool a hot engine gradually before shutting it off.

2. Turn ignition key switch off to shut off fuel and stop engine.
3. Make sure body is in the lower position.

2.9 Parking

⚠ WARNING When parking the machine overnight or for an extended period, the following procedure in addition to that given in *Section 2.8 Stopping the Engine* will help maintain it in good condition:

1. To prevent condensation from contaminating the fuel, fill the fuel tank completely before parking the machine overnight or for extended periods. If a security kit is supplied, keep it locked
2. Park on level ground where possible. If it must be parked on a slope, position machine at right angles to the slope and block tracks securely.
3. Remove key to a place of safety

Check tracks, hoses, wiring, tubing and fittings for cuts, abrasion, fraying, or other damage or deterioration. Inspect for damage to the body or chassis.

Attach warning signs to the controls to alert others if lubricant has been drained, batteries removed etc.

2.10 Loading

The most common methods of loading this type of machine are with hydraulic excavators and by hand. These units can be loaded equally well from the front or the side. Ideally, excavators should require 90° or less swing.

Always position the machine on a level firm surface for loading and leave the loading area until indicated by loader driver.

The following precautions should be observed when approaching the loading area and while being loaded wait until it is safe to return to the machine.

Avoid over-filling the skip. Spillage could damage the tracks and other components. Clear up any such debris.

Do not load with machines that are too large and would allow material and fill to fall from the skip, missing the body. This can be dangerous to both operator and the unit.

Pay attention to site conditions: avoid rocks, holes, or other obstacles. Such obstacles present hazards to safe operation but also can needlessly damage tracks.

2.11 Tipping

The tipping operation usually depends on the type of material being hauled.

⚠ WARNING Be aware of other personnel within the operating area.

A warning buzzer sounds whenever the skip is raised above the horizontal position. This is a general warning to the operators and other personnel in the area to take necessary care and precautions.

If tipping at low level, ensure you are clear of all obstacles within the tipping arc of the skip. It is possible to fully invert the body of the Hi-T tracked carrier, care must be taken that the load to be discharged will readily leave the body once tipping commences. A retained load may result in machine instability.

Never leave a machine loaded overnight or for a long period with a material that could settle.

Always clean any retained load from the skip for efficient, safe working.

Be aware of any precautions and additional safety equipment that may be needed when handling, hazardous, caustic or cement materials.

If in doubt seek advice.

On discharging the load, ensure that the machine is on firm, level ground. If one track were to be higher than the other, a twisting strain would be imposed upon the body hinge pins and chassis. This could result in machine instability and damage.

Use the control levers to position the body. Operate from the designed operating position only. Keep clear of the tipping mechanism or you could be injured. Once the load has been tipped, move the Tipping lever into the 'LOWER' position.

If the load does not clear completely, the built-in stops in the mechanism may used to assist discharge. The ram cylinder does not need to be retracted before extending again.

To tip into a waste skip, choose a position that will allow the body to fully discharge its load. Only raise the skip with the machine stationary. Once the skip is raised, the machine may be inched forward until the tracks contact the side of the waste skip. The skip can then be tipped to discharge load.

2.12 Average Specific Gravity

Material	Loose Density		Fill
	kg/m³	*lb/yd³*	%
Snow (Fresh)	200	337	100
Peat (Dry);	400	674	100
Sugar beet	530	894	100
Coke (Loose)	570	961	85
Barley	600	1012	85
Petroleum Coke	680	1146	85
Wheat	730	1231	85
Coal Bituminous	765	1290	100
Fertilizer (Mixed)	1030	1737	85
Coal Anthracite	1046	1764	100
Earth (Dry)(Loose)	1150	1939	100
Nitrate Fertilizer	1250	2180	85
Sodium Chloride (Dry)(Salt)	1300	2192	85
Cement Portland	1440	2428	100
Limestone (Crushed)	1530	2580	100
Sand (Dry)	1550	2613	100
Asphalt	1600	2698	100
Gravel (Dry)	1650	2782	85
Clay (Wet)	1680	2832	110
Sand (Wet)	1890	3187	110
Fire Clay	2080	3507	100
Ready Mixed Concrete	2194	3698	85
Copper (Concentrate)	2300	3878	85
Slate	2800	4721	100
Magnetite	3204	5402	100

Section 3 Maintenance

3.1 General

Lubrication is an essential part of preventive maintenance. It is important that the instructions regarding types of lubricants and the frequency of their application be followed to prolong the useful life of the machine. Periodic lubrications of moving parts reduce mechanical failures.

While servicing, thoroughly clean all fittings, caps, plugs etc., to prevent dirt from entering the system.

Lubricants must be at operating temperatures before draining.

Do not operate any system unless oil level is within the operating range as indicated on the dipstick or level plug.

All change and service periods are recommendations based on average operating conditions. Lubricants showing evidence of excessive heat, oxidation or dirt should be changed more frequently to prevent these conditions. Lubricants change and service periods must be established on the basis of individual job conditions.

3.2 Engine Maintenance

Since the workshop manual provided by the engine manufacturer contains comprehensive information on servicing the engine, this Routine Maintenance section only provides information on the engine for daily servicing and where it differs from the standard application covered by the engine workshop manual. Refer to the manufacturer's manual for all other information and instructions relating to the engine.

3.3 Safety Precautions

⚠ WARNING

- Do not allow unauthorised personnel to service or maintain this machine.
- Study the manual before starting, operating or servicing this machine. Always follow the procedures and safety precautions detailed in this manual.
- Do not work under or near an unblocked or unsupported skip. Always invert the empty skip.
- Do not work under or near any unblocked or unsupported linkage, or any part of machine.
- Always shut down machine according to the procedure described in *Section 2.8 Stopping the Engine* before cleaning, lubricating or servicing the machine
- Always relieve pressure before servicing any pressurised system.
- Always attach a 'DO NOT OPERATE' or similar warning sign to ignition switch or a control before cleaning or servicing the machine.
- The ceramic insulation wrapped around the exhaust pipe and the engine cover ceramic heat barrier are made of toxic material – possible, low risk carcinogenic. Minimise dust release and use appropriate 'Personal Protection Equipment' when handling them.

3.4 Maintenance Intervals

	Service interval					
Operation	**Daily**	**Initial 50 hr**	**Every 100 hr**	**Every 1000 hr**	**Every 2000 hr**	**Ref. Page**
Walk-around	Check					23
Hydraulic filter		Change		Change		27
Hydraulic oil		Check		Check	Change	27
Engine Oil	Check	Change	Change			24
Oil filter			Check	Change		24
Lubrication		Grease	Grease			22
General Inspection			Inspect			23
Air filter	Check*		Replace			24
Fuel Filters			Check			25
Track motor oil				Change		28

* Check/clean air filter daily if operating in dusty conditions

Table 3-1 |Maintenance Intervals

Item	Component	Lubricant	Specifications	API Code	SAE Grade
1	Engine Crankcase and Filter	Engine Oil with 1.85% max. sulphated ash limit		CC/CD	10W-30
2	Hydraulic System	Hydraulic oil	ISO HV32 Viscosity Index 170		
3	Fuel tank	Diesel Fuel Oil with max. Sulphur 0.5%	A.S.T.M. No.2 Diesel Fuel at sub zero temp. blend No. 2 with No.1		
4	Grease Nipples	Extreme Pressure Lithium (No 'Moly')	Stern Tube Grease C/W Extreme Pressure Capabilities		No. 2 Consistency
5	Track motor	Gear Oil	Viscosity Index 95		EP90

Table 3-2 Recommended lubricants

Table 3-1 lists the maintenance intervals.

3.5 Service Access

To access the engine for routine maintenance, open the left hand side of the engine enclosure.

If necessary, the right-hand panel can also be removed as detailed in *Section 5.2 Housing Removal*.

3.6 Lubrication

Do not mix Lubricants

Parts: Grease cartridge – TCP 80-0025

Periodic lubrication (greasing) of moving parts reduces mechanical failures.

Fig 3-1 shows the lubrication points. The circled numbers are the recommended lubricants listed in *Table 3-2*.

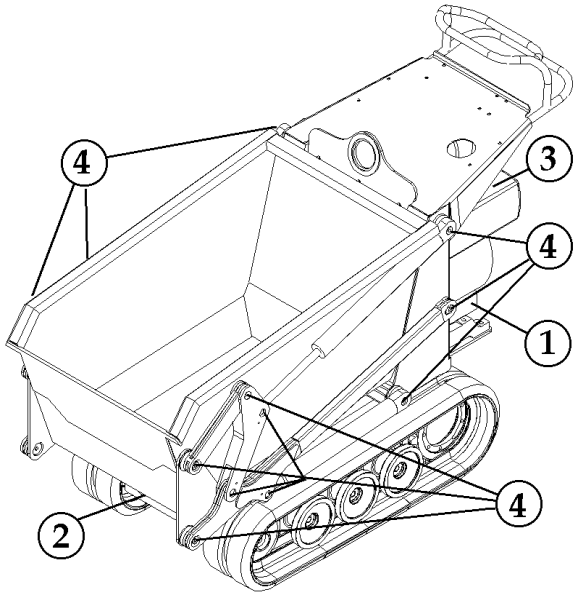


Fig 3-1 Lubrication points

Note: Shown with Engine Enclosure removed.

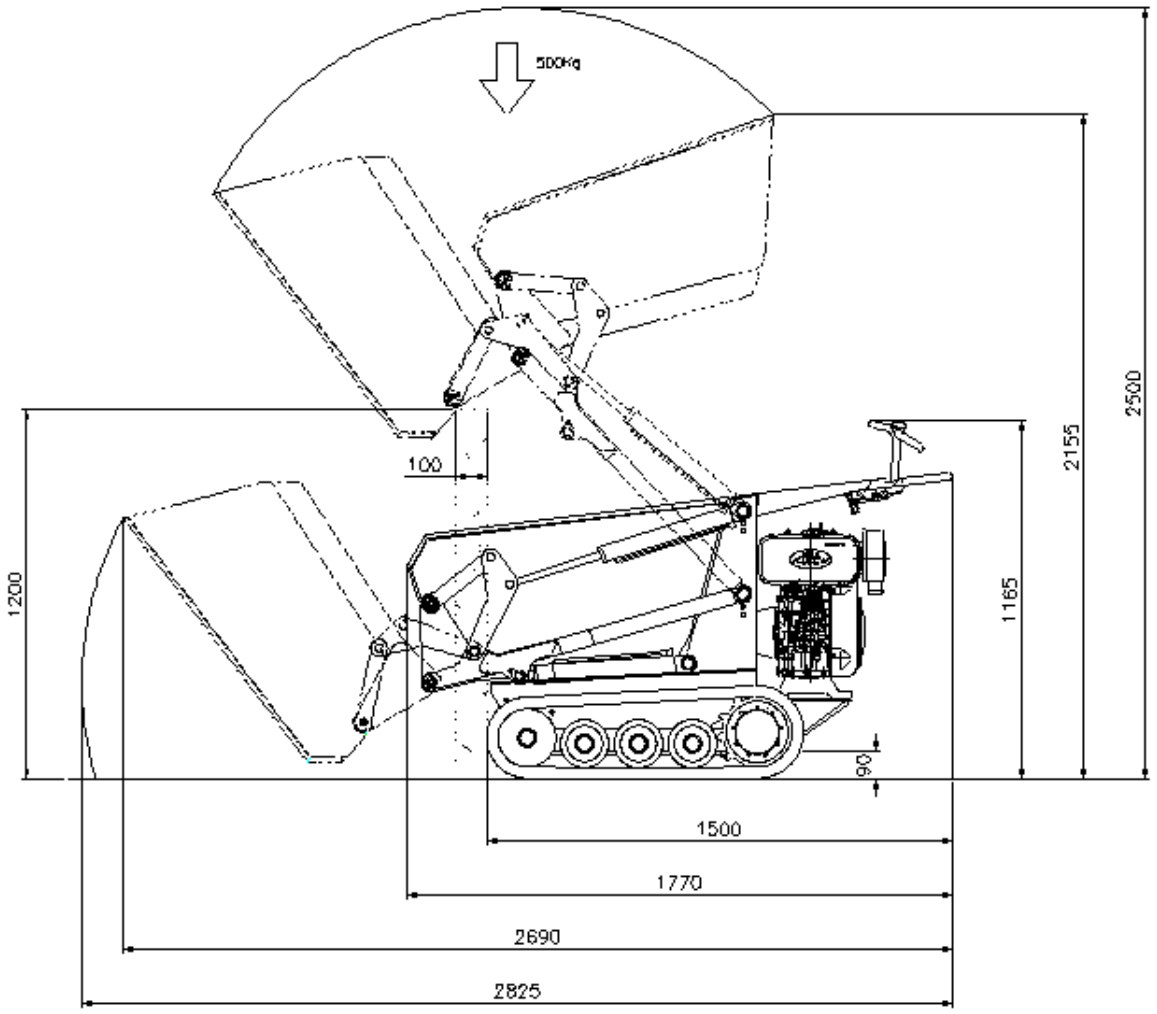


Fig 3-2 Overall dimensions

3.7 General Inspection

- Engine air intake. Check air intake system for wear or damage to piping, loose clamps and leaks.
- Check for loose bolts or fixings. Tighten as per bolt chart in Appendix A.
- Check for oil leaks. Securely tighten any loose joints and replenish any losses:
- Examine the body, particularly the chassis, for cracks or broken welds. Repair where necessary.

3.8 Daily Check

After every 10 hours of operation, do a daily walk around inspection:

- Visually check engine for damage, listen for any unusual noises:
- Engine Air Cleaner, Inspect and remove any obstructions from the air cleaner inlet with the engine stopped:
- Check Engine oil level. See *Section 3.9 Engine Oil Check*.

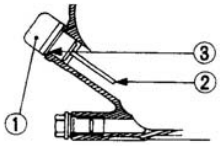
Note:

- Service air cleaners more often when operating under extremely dusty conditions.
- Do not wash the air cleaner element out with detergent. Replace with new.

3.9 Engine Oil Check

Low viscosity oils, such as 10W or 10W - 30, can be used to aid starting and will provide sufficient oil flow at ambient temperatures below -5°C (23°F). Continuous use of low viscosity oils can increase engine wear.

1. Run the engine until it is warm and then turn it off.
2. Put the machine on a level surface.
3. Remove the oil filler dipstick and check the level and condition of the oil. The oil should be between the bottom of the dipstick (2) and the top of the thread (3).



4. Top up or replace the oil, as necessary.

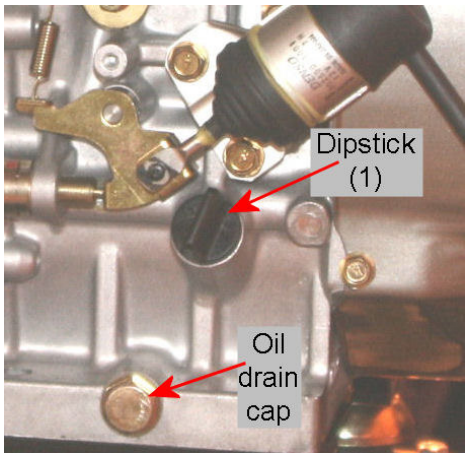
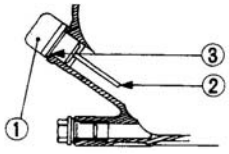


Fig 3-3 Engine oil cap and dipstick

3.10 Engine Oil Change

Parts: Oil filter TCP 10-0007

1. Run the engine until it is warm and then turn it off.
2. Put the machine on a level surface.
3. Remove the oil filler dipstick.
4. Remove the oil drain cap and drain off the oil into a suitable container.
5. Remove the engine oil filter (*Figs 3-4 and 3-5*).
6. Wash oil filter in degreaser. Replace if damaged or, in any case, every 1000 hours of operation.
7. Refit drain cap and refill to the top of the dipstick thread (3) with fresh oil of the grade specified in Table 3-2.



8. Refit dipstick.

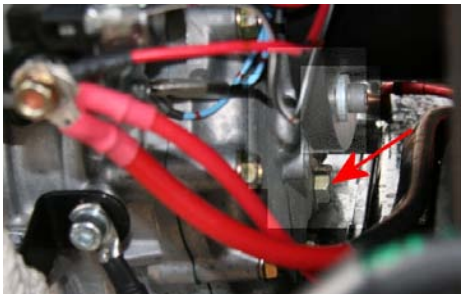


Fig 3-4 Engine oil filter location

Fig 3-5 Engine oil filter

3.11 Air Filter

Parts: Air filter TCP 10-0005

1. Remove the cover (*Fig 3-6*).

Fig 3-6 Air filter cover

2. Remove the wing nut securing the air filter and remove the air filter (*Fig 3-7*).

3. To remove the whole assembly, remove the three screws securing it to the engine body.

Clean the filter or replace if damaged. In any case, replace the filter after 100 hours of use.

Refitting is the reverse of this procedure.

Do not run the engine with the air filter removed as any ingress of dirt will damage the engine.

Fig 3-7 Air filter

3.12 Fuel Filters

⚠ WARNING Take due care when working with fuel. Diesel fuel is a health hazard for contact with eyes or sin, inhalation and ingestion. There is also danger of fire and pollution.

Dirty or contaminated fuel will damage the engine. For this reason, three fuel filters are fitted, as follows:

- In the top of the fuel tank.
- In the base of fuel tank
- On the cold start bracket (*Fig 3-13*).

Fuel can also be contaminated by condensation in the fuel tank, so keep the fuel tank full while the machine is not in use.

3.12.1 Tank Inlet Filter

This is fitted in the top of the fuel tank.

1. Slacken the screws securing the hose on the tank inlet and remove the hose (*Fig 3-8*).

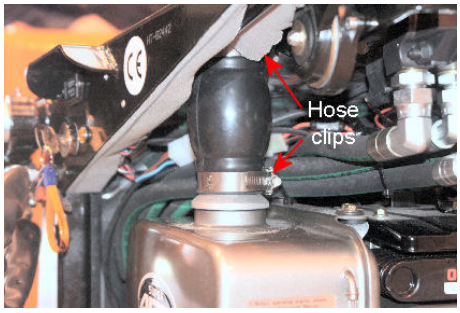


Fig 3-8 Fuel tank inlet hose

2. Remove tank neck bayonet fitting and extract filter from top of tank (*Fig 3-9*).

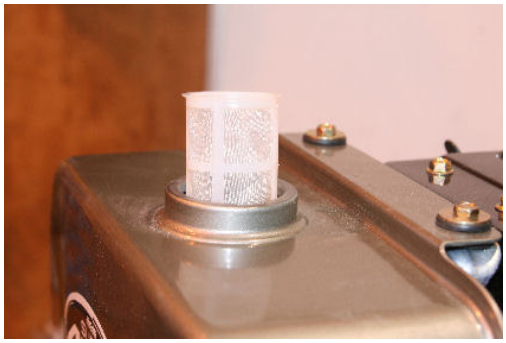


Fig 3-9 Top fuel filter

3. Clean the filter or, if damaged, replace with a new one.
4. Go on to check to bottom filter (next section).

3.12.2 Tank Bottom Filter

Parts: Fuel bottom filter TCP 10-0006.

1. Remove the fuel tank drain plug (*Fig 3-10*) and drain the fuel into a suitable receptacle.

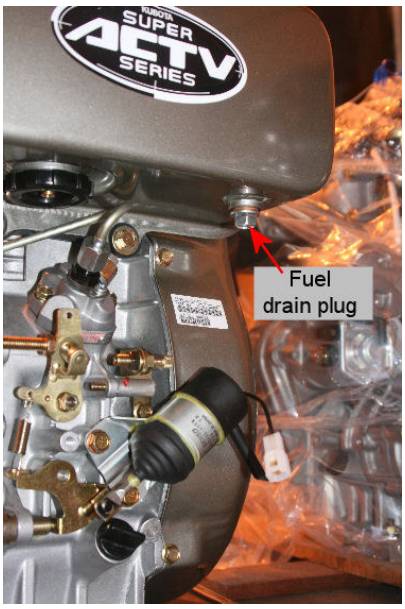


Fig 3-10 Fuel tank drain plug

2. Disconnect the fuel line from the tank (*Fig 3-11*).

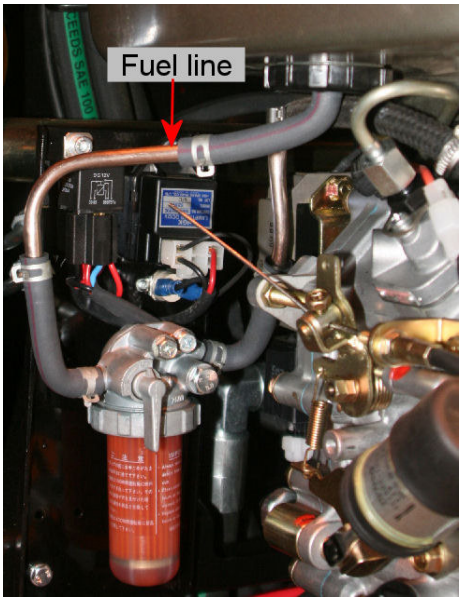


Fig 3-11 Fuel line

3. Unscrew the bottom cap and extract the bottom filter (*Fig 3-12*).

Fig 3-12 Tank bottom filter

4. Clean the filter or, if damaged, replace with a new one.
5. Clean out the tank with clean fuel.
6. Refit the bottom and top filters and refit the drain plug. Tighten the fuel hose clip screws with the torque settings detailed in Appendix A.
7. Reconnect the fuel pipe.

3.12.3 Extra Filter

Parts: Extra fuel filter TCP 10-0250.

This filter (*Fig 3-13*) can be removed without draining the fuel tank.

1. Set the fuel valve to Off (*Fig 3-14*).

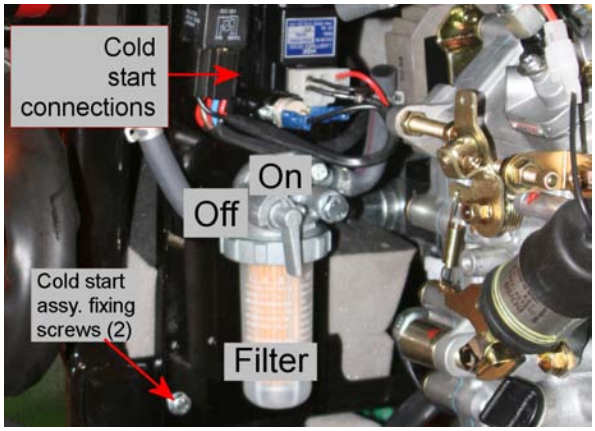


Fig 3-13 Extra fuel filter

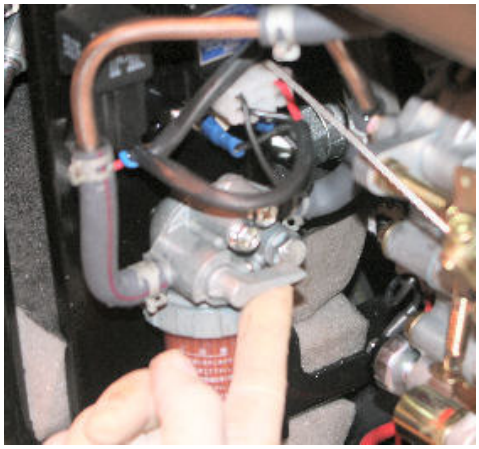


Fig 3-14 Fuel valve

2. Unscrew the securing ring (*Fig 3-15*) and remove the filter reservoir.

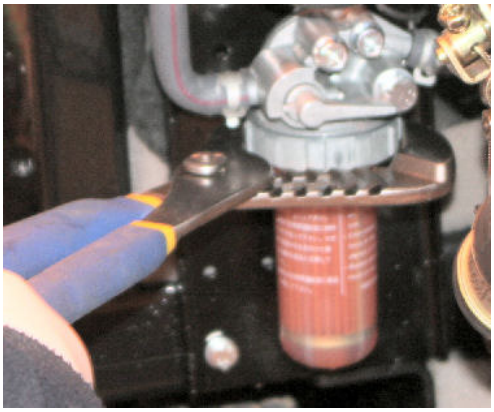


Fig 3-15 Fuel filter removal

3. Clean the filter with clean fuel or, if damaged, replace with a new one.
4. Clean out the filter reservoir.

Refitting is the reverse of this procedure.

3.13 Hydraulic Filter/Oil

Parts: Hydraulic filter TCP 63-0002.

Take care to ensure that no dirt enters the tank or contaminates the cap, filter or dipstick. Dirt in the hydraulic oil could severely damage the machine.

Always use hydraulic oil of the correct specification (see Table 3-2). No other oil is suitable for use in this hydraulic system.

The oil level must be checked when oil is cold.

1. Remove the hydraulic tank cover (*Fig 3-16*) (six screws).

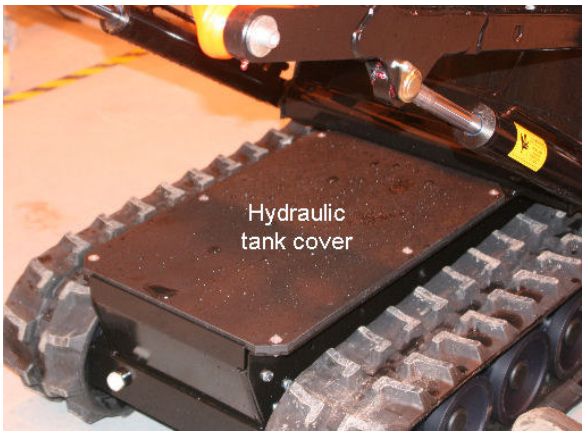


Fig 3-16 Hydraulic tank cover

2. Clean around the cap to prevent any dirt from entering when the cap is removed.
3. Remove the dipstick to vent the tank. This dipstick is not used to check the oil. It is to allow the air in the tank to be displaced when filling.
4. Unscrew the red cap and extract the filter.

Fig 3-17 Hydraulic filter cap

5. Put the filter in the cap to keep it clean (*Fig 3-18*).

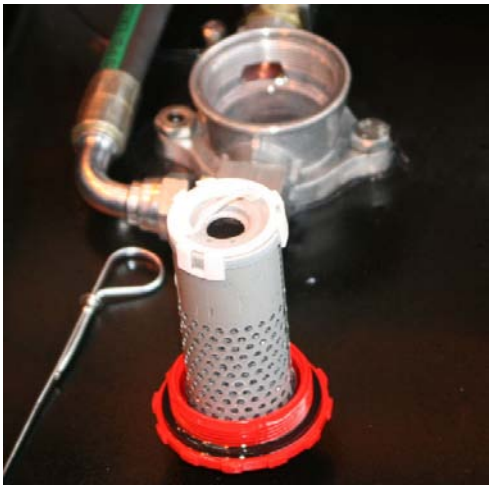


Fig 3-18 Hydraulic filter

6. Check the level and condition of the oil. If the oil is contaminated, consult TCP Ltd.
7. If level is low, fill through the filter housing until the level is 6 mm below the tube in the base of the filter housing (*Fig 3-19*).

Do not overfill the tank.

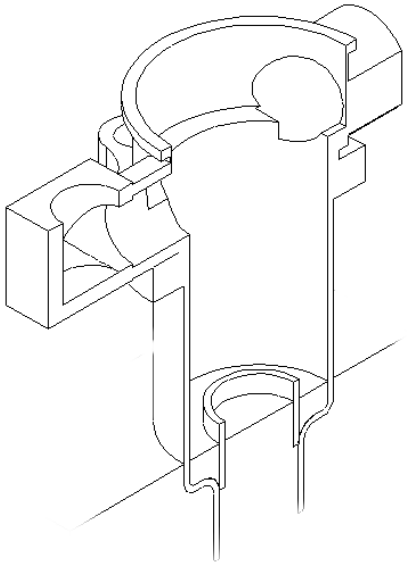


Fig 3-19 Hydraulic tank filler

8. Replace the filter with a new one.
9. Refit the cap and dipstick.
10. Refit the cover

3.14 Charging the Battery

A battery charging connection lead and socket is built into the Mk4 (*Fig 3-20*). This connection point is designed for use with a Coulombi charger (TCP Part No. 82-0004).

Under no circumstances use this connector to jump-start the machine.

The battery can also be charged by means of a standard 12V car battery charger. Connect the charger between chassis (negative) and the battery test stud (*Fig 3-20*).

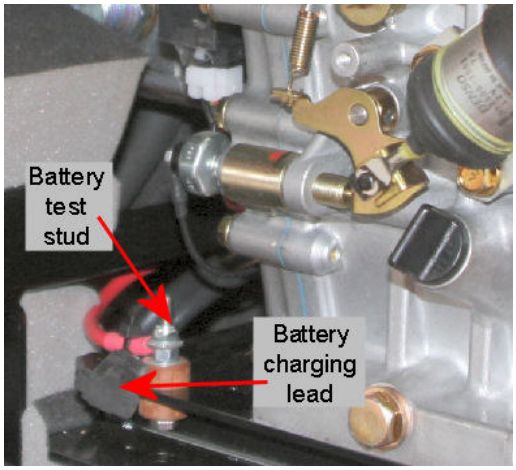


Fig 3-20 Battery test stud

3.15 Changing Track Motor Oil

Change the oil in the track motors every 1000 hours of operation or at least once per year, as follows

1. Run the track motors until they are warm.
2. Position the track motor so that one of the drain/filler caps is at 6 o'clock.
3. Remove both caps and drain the old oil into a suitable receptacle.
4. Reposition the motor so that one of the drain/filler caps is at 3 or 9 o'clock (*Fig 3-21*).

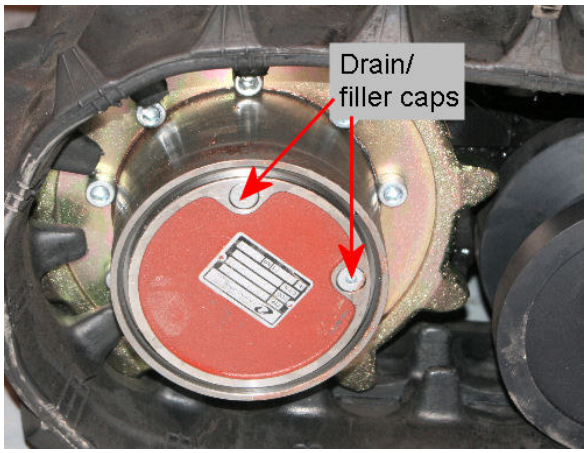


Fig 3-21 Track motor drain caps

5. Fill the motor with EP220 oil to the level of the drain cap at 3 or 9 o'clock.
6. Allow time for the oil to settle and top up the level as necessary.
7. Refit the drain filler caps.
8. Repeat the procedure for the other motor.

Section 4 Fault Finding

4.1 Starting

4.1.1 Engine will not crank properly

1. Check the battery voltage with the ignition switch off. This can be measured between the battery test stud shown in *Fig 4-1* and chassis.

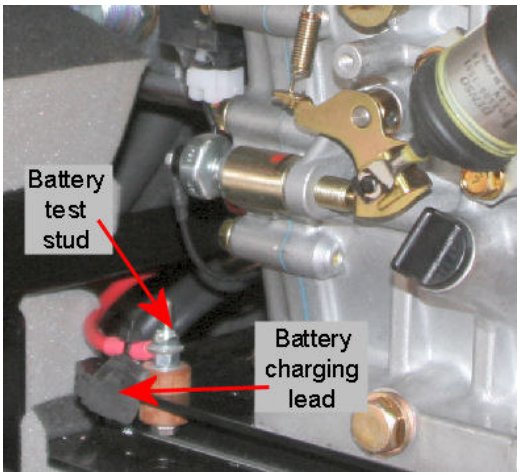


Fig 4-1 Battery test stud

The battery voltage varies with charge as follows:

Voltmeter reading	State of charge
12.84V	100%
12.50V	75%
12.2V	50%
11.9V	25%

Fig 4-2 Starter current check

If a charging problem is suspected, check the charging circuit as detailed in *Section 4.2 Battery Charging*.

2. Connect a clamp meter on the battery positive lead as shown in *Fig* 4-2 to measure the starter current.

Note: Do not crank the engine for more than 40 seconds at a time.

3. Crank the engine and check the battery voltage and starter current.

While cranking, the starter current should be 120-140A and the battery voltage should greater then 10V.

- Low current and low voltage – suspect battery.
- Low current, battery voltage OK – check leads.
- Current OK or high – tight or seized engine.

4.1.2 Engine cranks but will not fire

Note: Do not crank the engine for more than 40 seconds at a time.

1. Connect clamp meter to glow plug supply (wire colour = black with red stripes), as shown in Fig *4-3*, to measure glow plug current.

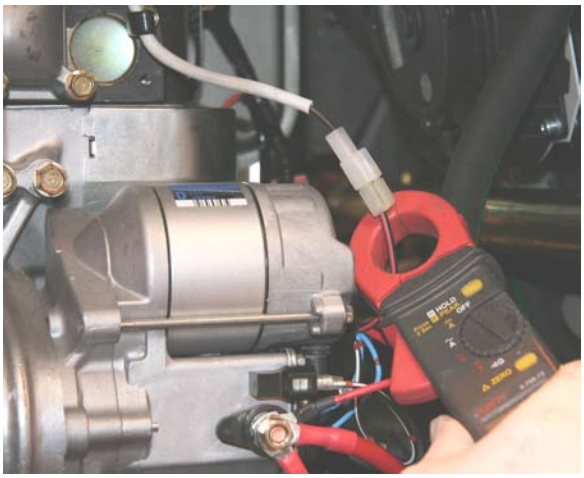


Fig 4-3 Clamp meter current check

2. Watch the current on the meter and set the ignition switch to PH (preheat). The measured current should start at around 15A and fall to around 6A after approximately 15 seconds.

If the glow plug current is correct, suspect a fuel problem.

A low or high current reading indicates a faulty glow plug or wiring.

To check the wiring, disconnect the glow plug at the connector and measure the voltage at the connector socket, with the ignition switch set to PH.

You can check the resistance of the glow plug - measured from the connector plug to chassis this should be 1 Ohm approximately.

Note that a glow plug can be damaged by dirty fuel so check the fuel filters when replacing the glow plug.

Refer to the engine workshop manual for more information.

4.2 Battery Charging Check

The battery is charged from an a.c. alternator driven by the engine. A regulator converts the a.c. to a d.c. charging current, which it regulates to ensure a full battery charge.

To check charging, start the engine and measure the battery voltage with the throttle advanced. The charging voltage should be of the order of 14V. If the battery voltage has not increased significantly from its off-load value, suspect an alternator, regulator or wiring problem.

To check the alternator, switch off the engine, disconnect the connections to the alternator and connect an a.c. voltmeter to the alternator. Start the engine and measure the (off-load) output from the alternator, this should be >22V a.c.

If the alternator output is correct, check the regulator and wiring as detailed in the engine workshop manual.

4.3 Tracking Speed

Pressing the Tracking Speed button with a drive lever fully operated, should give increased drive to both tracks. Check the operation of the tracking speed switches and relay as follows:

1. With the ignition switch off and in a quiet environment, push one of the Drive levers forwards and listen for the operation of the switch fitted at the rear of the valve block. A very faint click should be audible.
2. Repeat step 1 for the other lever.

Also check with the levers in the Reverse positions.

Note: If the bar behind the Drive levers has been damaged, the bar may restrict the forward movement of the levers such that the switches do not operate in the forward position.

If a click is audible, check the tracking speed relay, as follows:

3. Turn the ignition switch to AC.
4. Push the drive levers forward fully, press the Tracking Speed button and listen for the faint click of the tracking relay. This relay is located inside the upper, right-hand side of the frame. In order to repeat this check, it is necessary to release the drive levers to the neutral position before trying again.

If a click is audible, at least one of the lever switches and the tracking relay are operating.

It is possible to check the electrics by removing the solenoid coil module from the rear of the valve block (*Fig 4-4*), energising it and noting the effect on a metal object, such as a screwdriver, inserted into the coil. If the solenoid is operating, check the hydraulics.

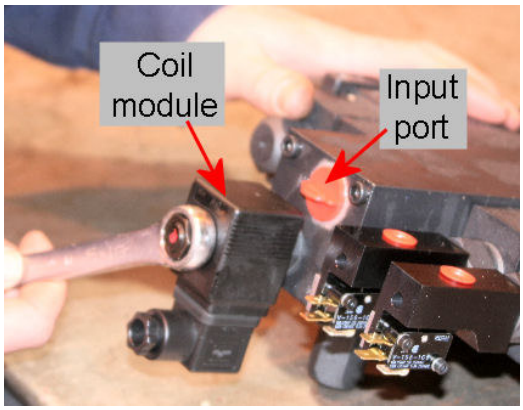


Fig 4-4 Tracking speed solenoid coil

Section 5 Parts Replacement

5.1 Recommended Tools

- Pressure gauge 0-200 bar (for setting hydraulic pressures)
- AC/DC Clamp meter. 0-500 amp
- Spanner snap-on Tool LTAM1719 (for ram relief valve setting)
- Three-leg hydraulic puller (for removal of pump drive coupling)
- Spanner for hydraulic in-tank rock stopper filter (TCP tool 82-0002)

5.2 Housing Removal

Full access to the engine can be achieved by opening the right and left hand engine enclosures, as follows:

1. Remove air cleaner cover and filter. See *Section 5.3 Air Filter*.
2. Release and remove the three M8 bolts securing the air cleaner body and intake extension to the engine.
3. Release the enclosure clips. The right-hand enclosure will now swing outwards.

Note: Should the need arise, both enclosures can be removed.

4. Release and remove the 8no M6 countersunk head screws that attach the enclosures hinges to the chassis.

Do not release the screws that attach the hinges to the enclosures.

Refitting is the reverse of this procedure.

Do not run the engine with the air filter removed. Ingress of dirt can damage the engine.

5.3 Air Filter

Parts: Air filter – TCP 10-0005

To remove the Air Filter Assembly:

1. Remove the cover, secured by a wing nut.

Fig 5-1 Air filter cover

2. Remove the air filter, secured by a wing nut .

Fig 5-2 Air filter

3. Remove the filter assembly from the engine (three screws).

Refitting is the reverse of this procedure.

5.4 Exhaust System

⚠ WARNING

The ceramic wrapping on the exhaust pipe is toxic – possible, low risk carcinogenic. Minimise dust release and use appropriate personal protection equipment when handling it.

Parts: Exhaust down pipe complete with wrap - TCP 99-1944

1. Remove the exhaust pipe.

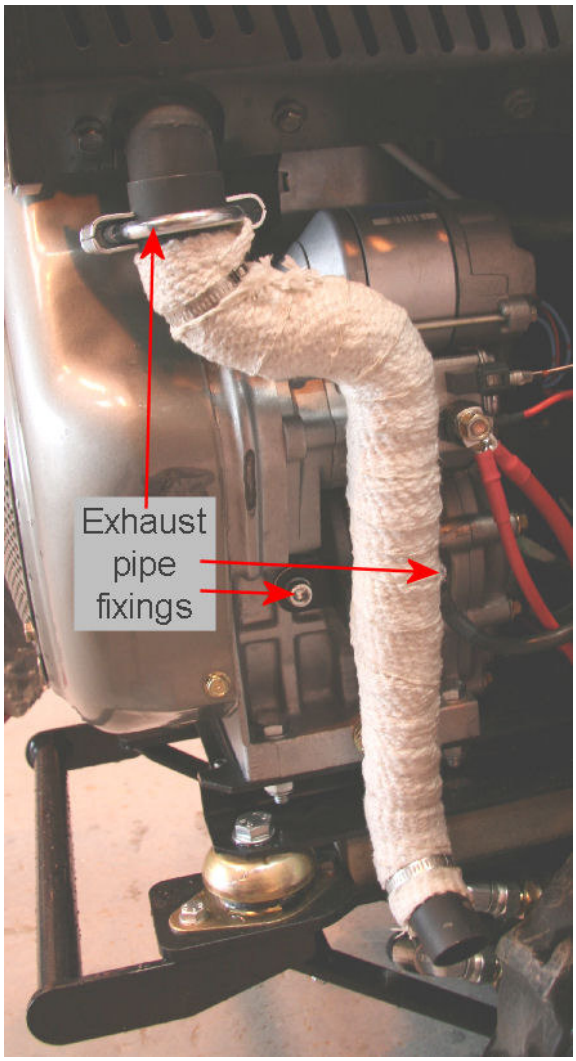


Fig 5-3 Exhaust pipe fixings

2. Remove the exhaust chamber. *Fig 5-4* shows the fixing points.

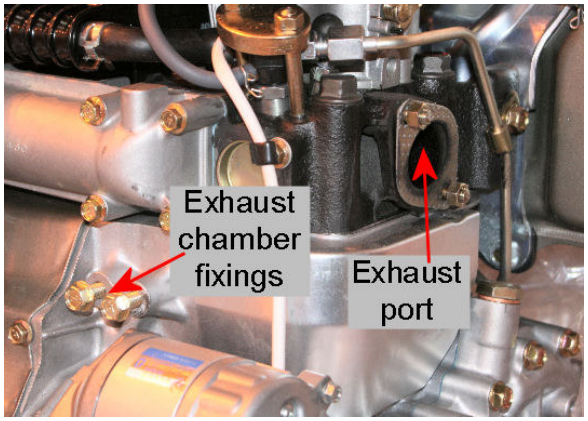


Fig 5-4 Exhaust chamber fixing points

Fitting the exhaust is the reverse of this procedure.

5.5 Ram

Refer to *Section 7.6 Chassis Assy Stage 5 SA-2351-05.*

1. Switch off the engine and remove the key.
2. Disconnect the hydraulic hoses at the Ram (*Fig 5-5*). Plug the hoses and take care to avoid oil spillage as this can be an environmental hazard.

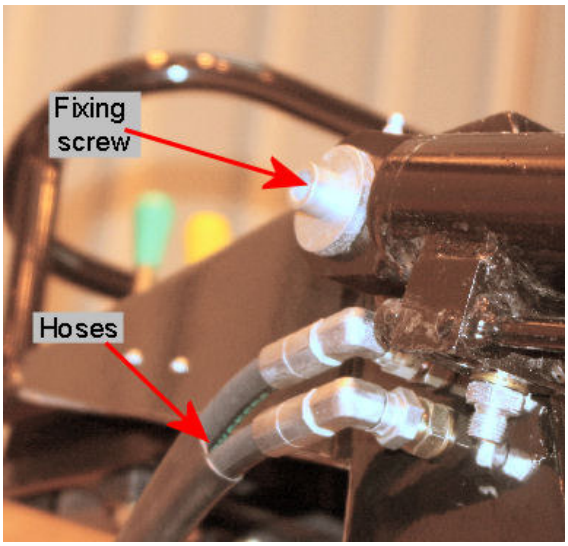


Fig 5-5 Ram connections and fixing

3. At the piston end of the Ram, remove the cylinder pin locking screw and knock out the cylinder pin (*Fig 5-6*).

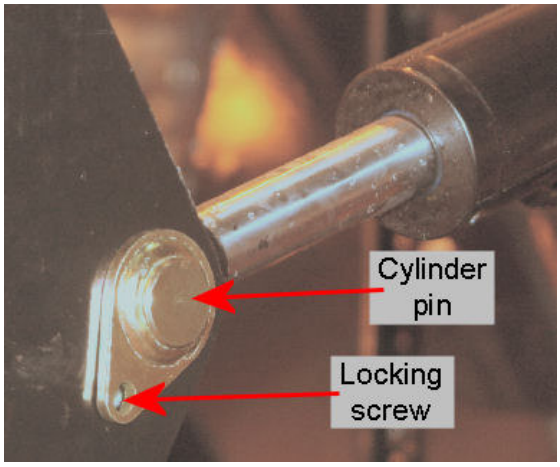


Fig 5-6 Ram cylinder pin

4. At the cylinder end of the Ram, remove the socket head fixing screw (*Fig 5-5*).
5. Remove the Ram.

Fitting a Ram is the reverse of this procedure. Apply retaining compound where the lifting arm fits on the shaft. Apply stud lock compound to the bolts and pin retaining screws. Tighten the fixing screw to the torque specified in Appendix A.

The drawing in *Section 7.22 Hydraulic Hose Assy* shows the hydraulic connections.

Set the hydraulic pressure as detailed in *Section 6 Hydraulic Pressure Adjustments*.

5.6 Hydraulics Purging

If any part of the hydraulics system has been removed or replaced, the system must be purged, as follows, to remove any impurities that could damage the drive motors.

1. Start the engine and allow it to idle for three minutes.

Do not engage the drive motors at this stage.

2. Raise, lower and tip the body to circulate the hydraulic oil for a further one minute.
3. At low speed only, move the tracked carrier by engaging forward and reverse drive. Do this five times.

The unit is now fully operational.

5.7 Valve Block

Refer to the drawing in *Section 7.24 Control Valve SA-1598*.

1. Switch off the engine and remove the key.
2. Disconnect the hoses from the block, labelling each as you go. Plug each hose and take care to avoid oil spillage as this can be an environmental hazard.
3. Disconnect the electrical connections to the microswitches at the rear of the block.
4. Remove the four screws securing the block to the frame and extract the block.

Fitting a valve block is the reverse of this procedure. The drawing in *Section 7.22 Hydraulic Hose Assy* shows the hydraulic connections.

If installing a new block, unions must be fitted to each hydraulic connection prior to connecting each hose. Since the input union at the rear is somewhat inaccessible, it should be fitted and the hose connected before installing the valve block, as follows:

5. Remove the coil module to gain access to the input port.

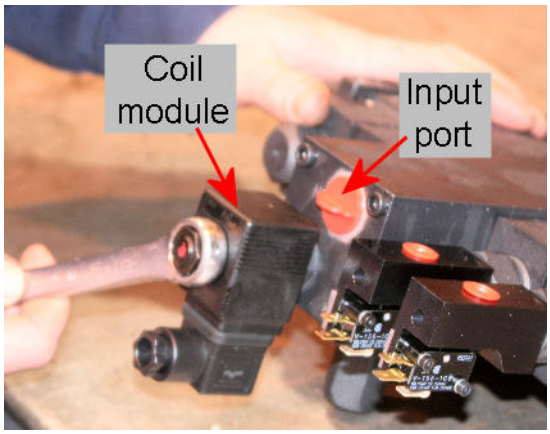


Fig 5-7 Valve block input port

6. Fit the input port union.

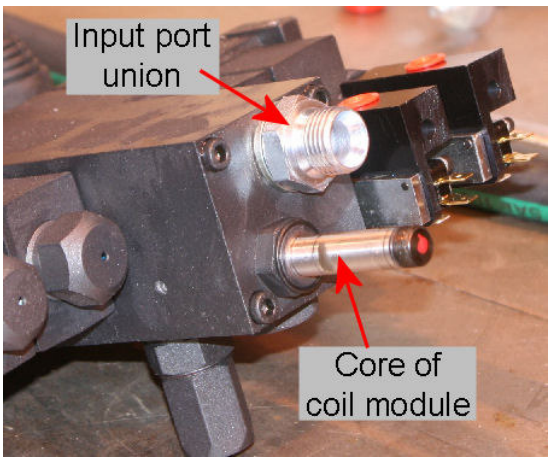


Fig 5-8 Input port union

7. Connect the input hose and refit the coil module.

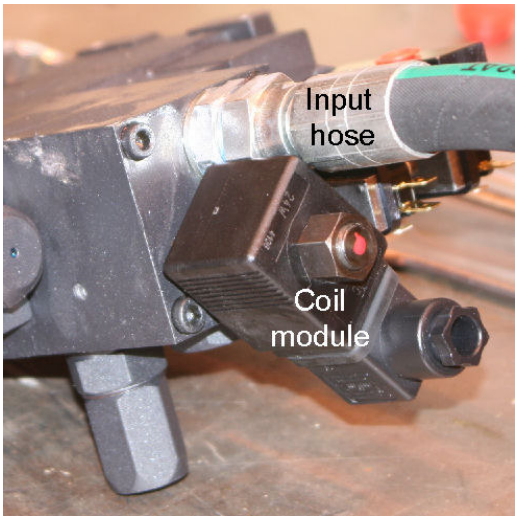


Fig 5-9 Input hose

8. Purge the hydraulics as detailed in *Section 5.6 Hydraulics Purging*.

On completion, set the drive pressures as detailed in *Section 6 Hydraulic Pressure Adjustments*.

5.8 Track Drive Motor

1. Switch off the engine and remove the key.
2. Remove the track from the appropriate side of the machine as described in *Section 5.15 Track*, leaving the chassis still supported on blocks.
3. Disconnect the hoses from the motor, labelling each as you go (Fig 5-10). Plug the hoses and take care to avoid oil spillage as this can be an environmental hazard.

Fig 5-10 Drive motor sprocket & hoses

4. Remove the sprocket from the motor (8 socket head screws) (*Fig 5-10*).
5. Remove the eight socket head bolts securing the motor to the frame and remove the motor.

Fitting a motor is the reverse of this procedure.

Note that the left- and right-hand motors differ in their connections to the control relays. The left-hand motor has a banjo connection and the right-hand one has a union (*Fig 5-11*).

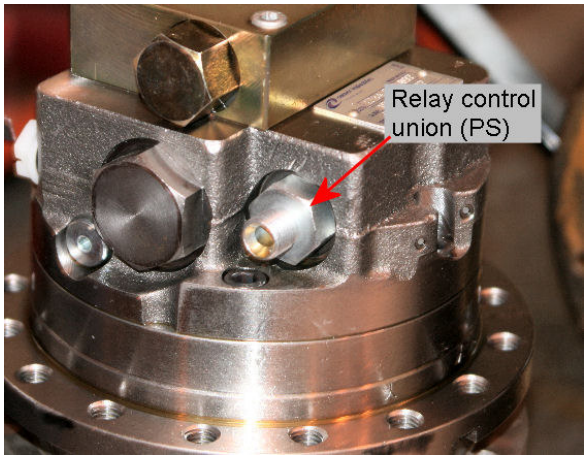


Fig 5-11 Right-hand track motor

Tighten the sprocket and motor fixing screws with the torque specified in Appendix A. The drawing in *Section 7.22 Hydraulic Hose Assy* shows the hydraulic connections.

Before operating the track drive, purge the hydraulics as detailed in *Section 5.6 Hydraulics Purging*.

On completion, fill the track motor with EP220 gear oil as detailed in *Section 3.15 Changing Track Motor Oil*.

5.9 Battery

The battery is located in a box beneath the engine. (Item 4 on the drawing in *Section 7.5 Chassis Assy Stage 4 SA-2351-04*.)

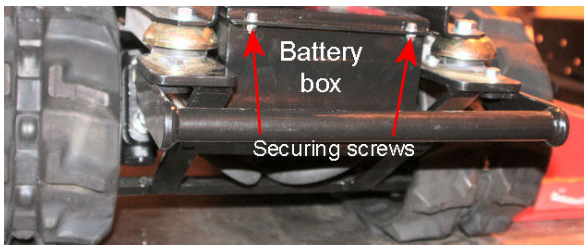


Fig 5-12 Battery box

1. Isolate the positive battery lead. Carefully remove the lead from the terminal (*Fig* 5-13) and insulate it with tape to prevent a short-circuit that would damage the battery.
2. Remove the test stud lead from the terminal (*Fig* 5-13).
3. Remove the negative battery lead from the bolt securing the exhaust (*Fig 5-13*).

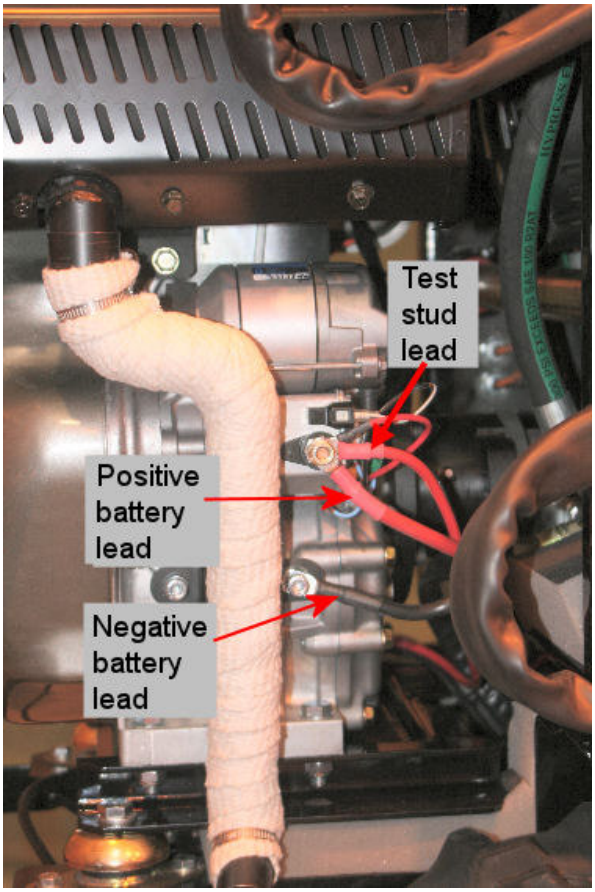


Fig 5-13 Isolate battery

4. Remove the two screws securing the box to the frame Fig (5-12) and extract the box, pulling the lead through as required.

Fig 5-14 Battery box removed

5. Remove the lid (2 screws) to access the battery.

⚠ CAUTION Take care not to connect the battery terminals together.

5.10 Oil Cooler Fan

The Cooler Assembly is shown on the drawing in Section 7.12 Cooler Assy, Hydraulic SA-1470.

1. Disconnect the hydraulic hoses from the fan. Plug the hoses and take care to avoid oil spillage as this can be an environmental hazard.
2. Disconnect the electrical connection.
3. Remove the five screws securing the fan assembly to the frame (Fig *5-15*) and extract the fan assembly from the frame.

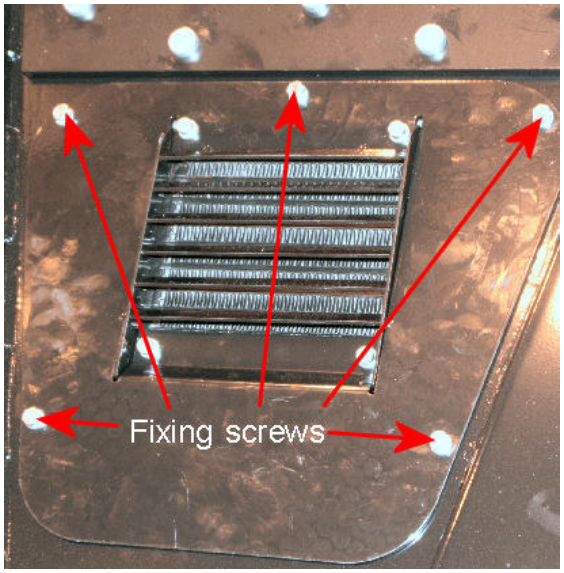


Fig 5-15 Fan fixing screws

If fitting a new fan assembly, prepare it as follows:

4. Separate the fan from the cooler and reassemble with porting as shown in the drawing of *Section 7.12 Cooler Assy, Hydraulic SA-1470*.
5. Remove the blades from the electrical connector and reassemble with the wire colours as shown in drawing TCP-1470 SA (this sets reverse fan rotation).
6. Fit the diode in the line as shown in drawing TCP-1470 SA (note the orientation of the diode).
7. Fit the fan assembly to the frame and complete the electrical and hydraulic connections.

5.11 Engine and Pump Replacement

In order to replace the hydraulic pump, remove the engine as detailed in *Section 5.12 Engine Removal* and then remove the pump as detailed in *Section 5.14 Hydraulic* . Fitting a new pump is the reverse of these procedures.

When replacing an engine, a new engine must be modified and prepared before fitting, as described in *Section 5.13 Engine Preparation.* In addition, various parts, such as the exhaust and air filter,

must be fitted to the new engine. These can either be new parts or parts removed from the old engine. Always fit new gaskets.

5.12 Engine Removal

1. Remove the Engine Enclosure Assy. Refer to the drawing of *Section 7.1 Tracked Carrier Assy 2350 GA*.
2. Isolate the positive battery lead: carefully remove the lead from the terminal (*Fig 5-1*) and insulate it with tape to prevent a short-circuit that would damage the battery.
3. Remove the test stud lead from the terminal.(*Fig 5-1*).
4. Remove the negative battery lead from the bolt securing the exhaust (*Fig 5-1*).

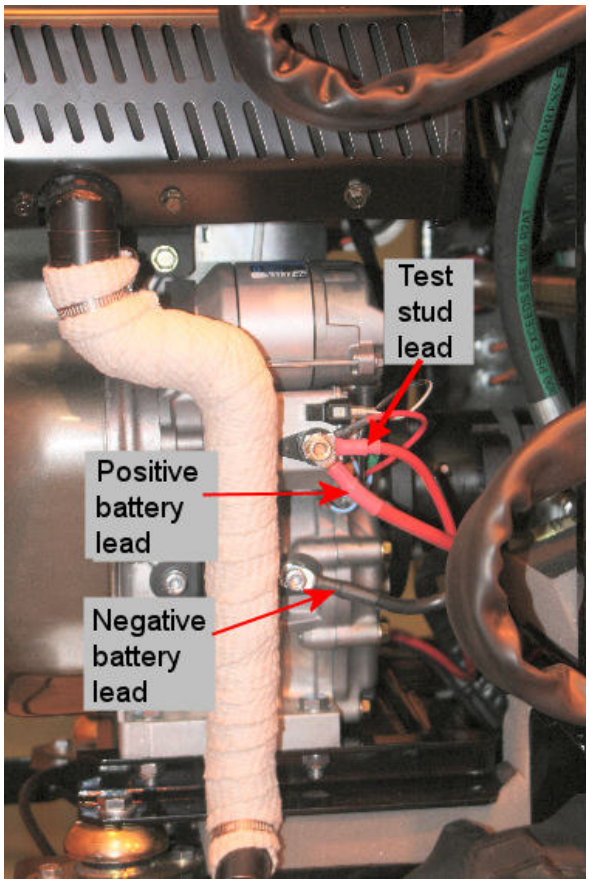


Fig 5-1 Isolate battery

5. Release and remove the throttle cable from the engine (*Fig 5-2*).

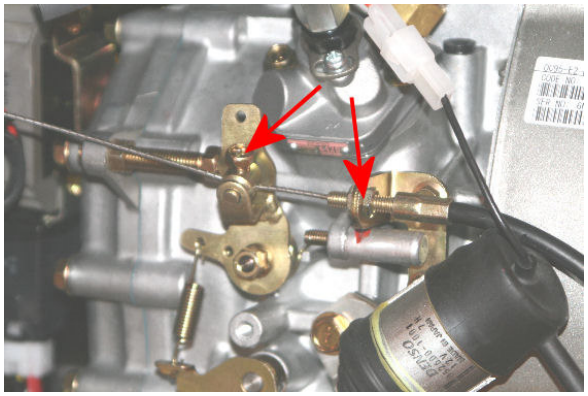


Fig 5-2 Throttle cable

⚠ WARNING Take due care when working with fuel. Diesel fuel is a health hazard for contact with eyes or sin, inhalation and ingestion. There is also danger of fire and pollution.

Note: Take care not to allow dirt to contaminate fuel or fuel components.

6. To drain the fuel tank, arrange to collect the fuel in a suitable receptacle, remove the fuel filler cap, remove the fuel drain plug (Fig 5-3) and drain the tank.

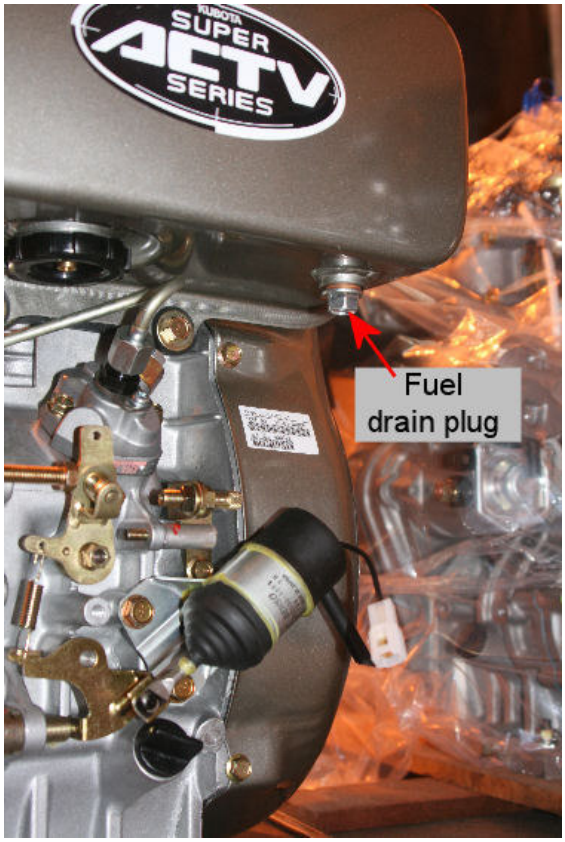


Fig 5-3 Fuel drain plug

7. Refit the drain plug and filler cap.
8. Disconnect the fuel line (Fig 3-11).

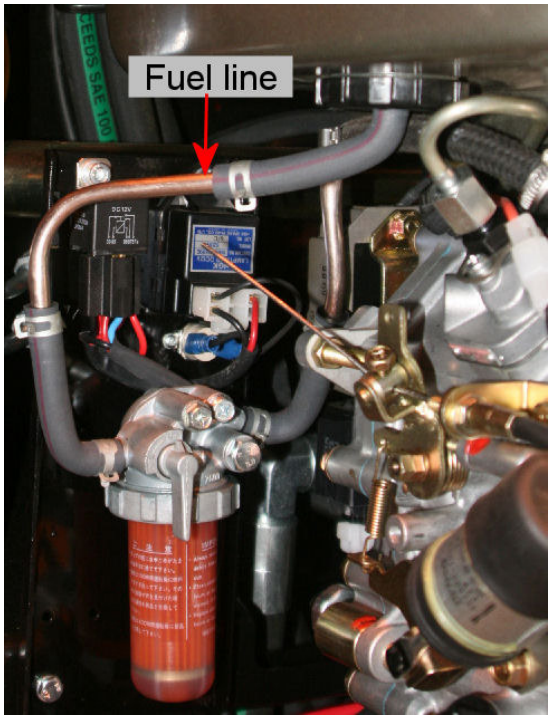


Fig 5-4 Fuel line

9. Disconnect the fuel filler tube from the top of the tank.
10. Disconnect all electrical connections between the engine and the main frame. (Keep a note of connections removed.):

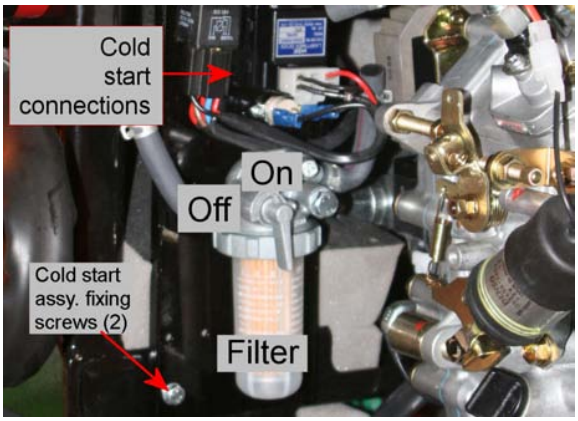


Fig 5-5 Cold start and filter

11. Remove the two Cold Start Assy fixing screws (*Fig 5-5*). Move this assembly to one side to gain access to the pump.
12. Disconnect the three hydraulic hoses from the pump at the front of the engine (Fig 5-6). Plug the hoses and take care to avoid oil spillage as this can be an environmental hazard.

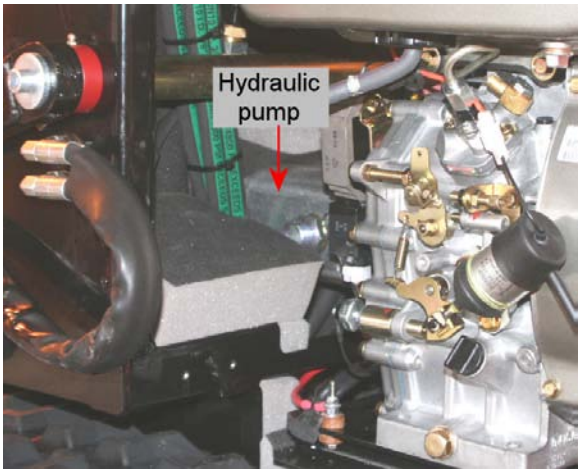


Fig 5-6 Hydraulic pump location

13. Remove the three bolts securing the base of the engine to the shock absorbers (Fig 5-7).

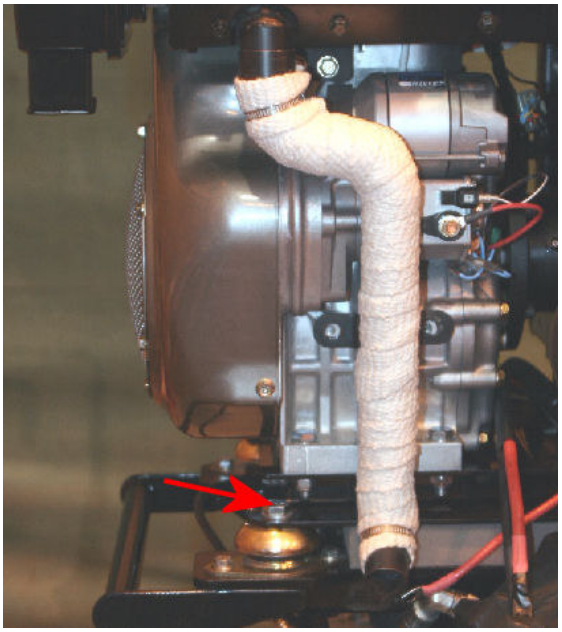


Fig 5-7 Engine bolts – one of three

14. Clear a space on a strong bench to receive the engine.

⚠ WARNING **The engine is heavy. Get the necessary help**

15. With help, carefully remove the engine from the machine and transfer it to the bench.

Refitting the engine (once prepared) is the reverse of this operation. Apply stud lock compound to the bolts securing the PTO adaptor to the block.

Before operating the track drive, purge the hydraulics as detailed in *Section 5.6 Hydraulics Purging*.

5.13 Engine Preparation

Refer to drawing TCP-1928-02 SA.

A replacement engine obtained from TCP will have been at least partly prepared, at the TCP factory, for installation. An engine obtained from elsewhere will require full preparation prior to installation. In addition, there are components to be removed from the old engine and fitted to the new one. Full preparation involves:

- Cutting the drive shaft to length.
- Fitting a new fuel vent tube between new banjo and a new T-piece on the fuel tank overflow pipe.
- Fitting voltage regulator and bracket
- Installing wiring loom.
- Replacing the plastic filler cap with a metal one. Swap for the one on the old engine.
- Removing the hydraulic pump and power takeoff from the old engine and fitting them to the new one.
- Filling engine with fresh oil.
- Fitting exhaust system. This can be done with the engine installed.
- Fitting air filter. This is done after the engine has been installed.

5.13.1 Drive Shaft Preparation

On an engine supplied by TCP, the drive shaft will have been cut to length before dispatch. For an engine obtained from another source, the shaft must be cut precisely to the required size (*Fig 5-10*) and all burrs removed.

1. Knock out the shaft key (Fig 5-8).

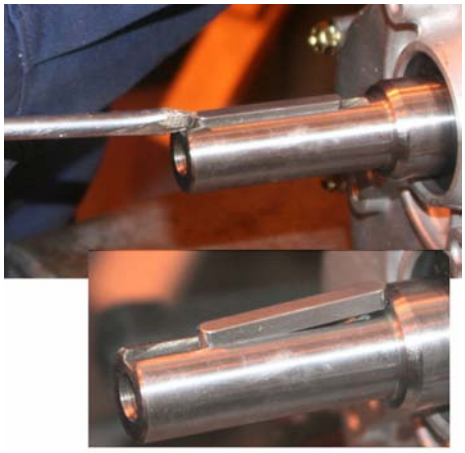


Fig 5-8 Removing shaft key

2. Grind off the corner of the key so that it fits snugly right up to the far end of the groove.

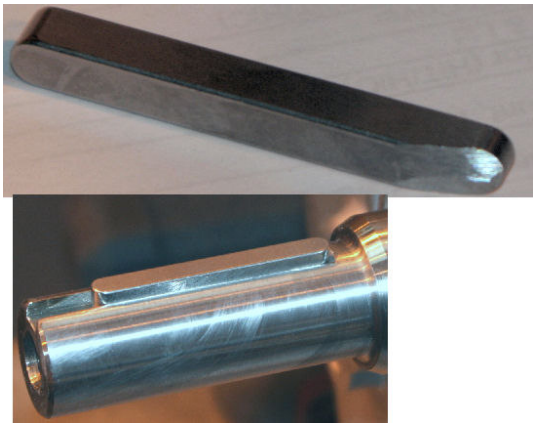


Fig 5-9 Shaping the shaft key

3. Mark the shaft and cut it to the dimensions shown in *Fig 5-10*.

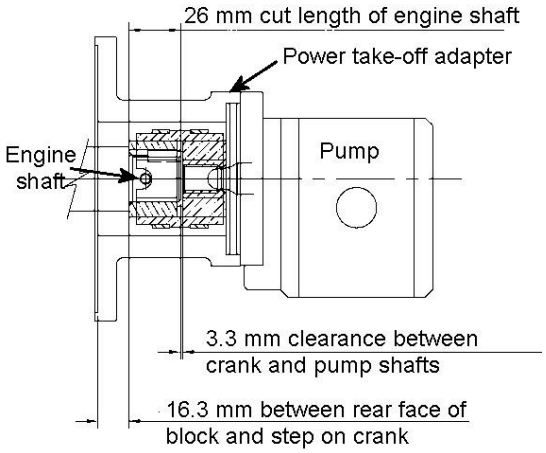


Fig 5-10 Cutting engine shaft

4. On finally fitting the shaft key, apply retaining compound.

5.13.2 Regulator

Remove the Regulator Assembly and bracket from the old engine and fit them on the new one.

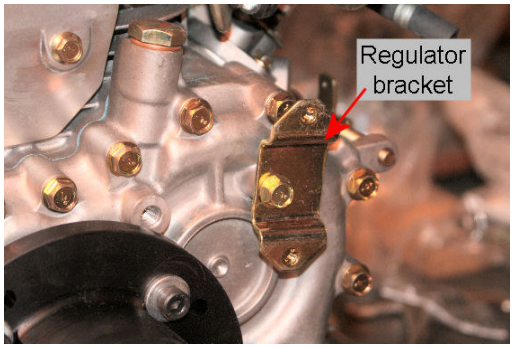


Fig 5-11 Regulator bracket

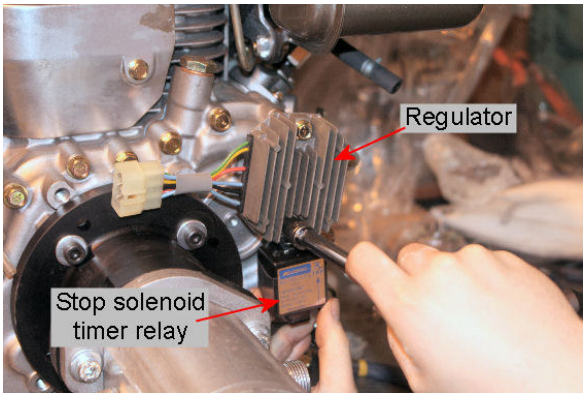


Fig 5-12 Regulator

5.13.3 Fuel Vent

1. Remove the old banjo (Fig 5-13).

Fig 5-13 Injector banjo

2. Connect a length of vent tubing to the new banjo (Fig 5-14) and fit the new, vented version in place of the old one (Fig 5-13).

Fig 5-14 Fuel vent tubing

3. Fit a Tee-piece in the vent tubing of the fuel tank, as in Fig 5-15.

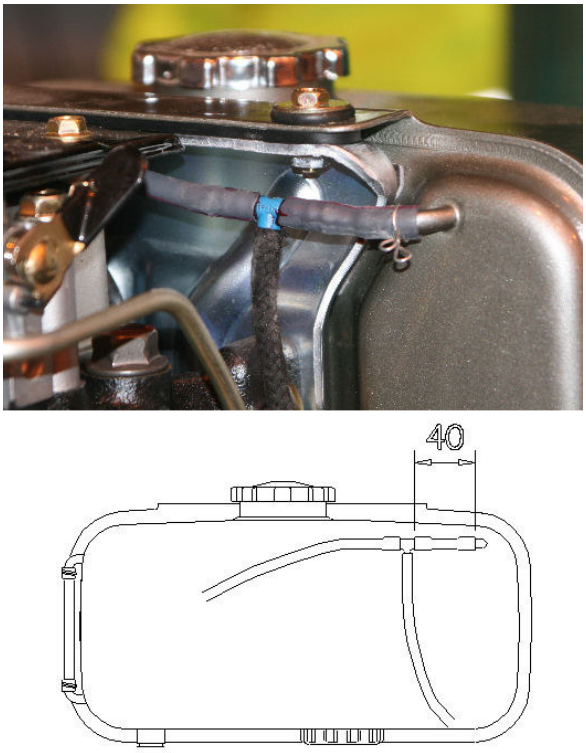


Fig 5-15 Fuel venting

4. Connect the vent tubing from the banjo to the T-piece.

5.13.4 Plastic Filler Cap Replacement

Replace the plastic oil filler cap with a metal one, as shown in Fig 5-16. This cap sits just behind the exhaust pipe and a plastic one could melt.

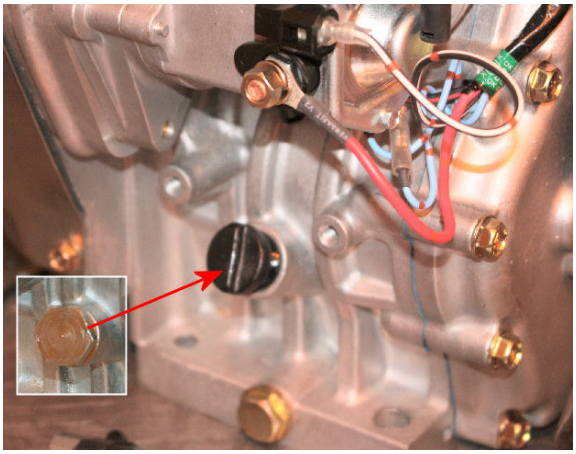


Fig 5-16 New oil filler cap

5.13.5 Engine Oil

1. Remove the dipstick.

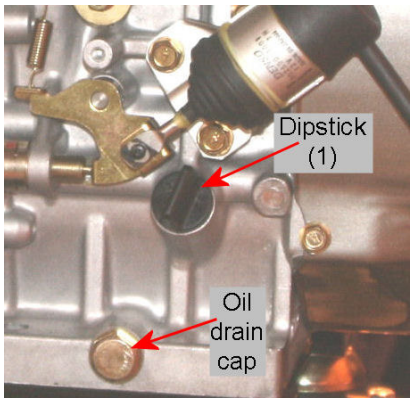


Fig 5-17 Oil filler cap

2. Fill sump with oil of the grade specified in *Table 3-2* to the top of the thread (Fig 5-18) and refit the cap.

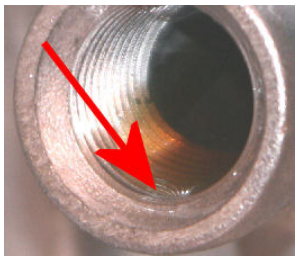


Fig 5-18 Oil level

5.13.6 Hydraulic Pump and Power Take-off

Special tool: Three-legged puller.

1. Remove the hydraulic pump as described in *Section 5.14 Hydraulic Pump*.
2. Remove the four bolts securing the Power Take-off Adaptor to the engine (*Fig 5-19*).

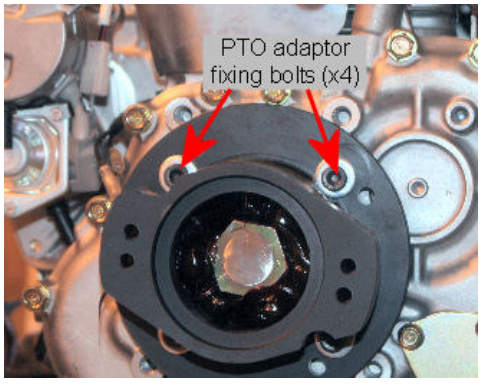


Fig 5-19 PTO adaptor fixings

3. Pull off the power take-off adaptor (*Fig 5-20*). This will pull off the pump drive coupling leaving only the pump coupling adaptor on the motor shaft.

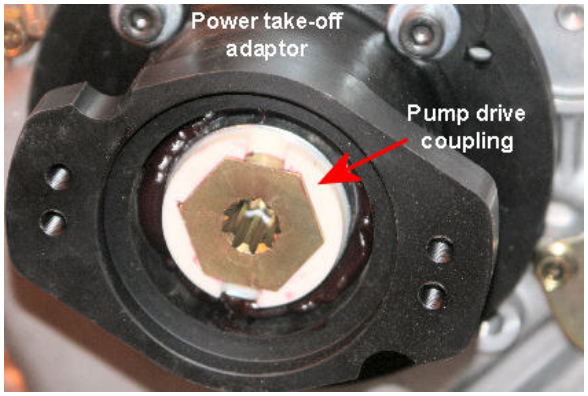


Fig 5-20 Pump drive coupling

4. Remove the pump coupling adaptor from the motor shaft. It is secured by a hex socket screw (*Fig 5-21*). A three-legged puller may be required.

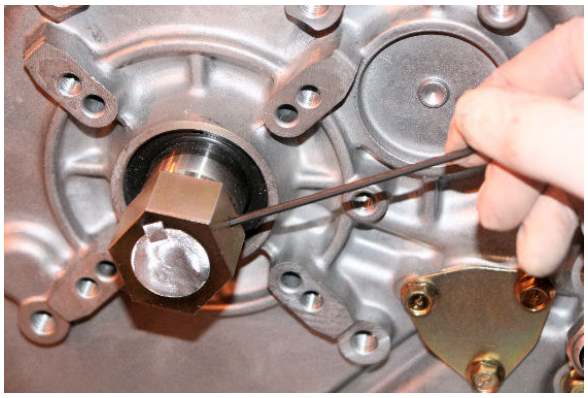


Fig 5-21 Coupling adaptor

On refitting the coupling adaptor, note that the adaptor fits with the chamfered end towards the motor.

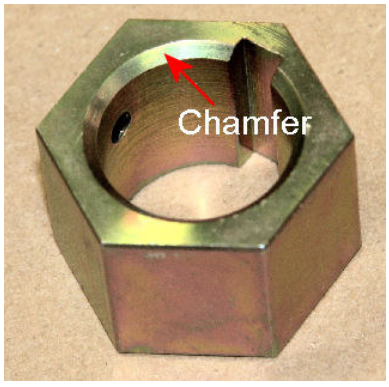


Fig 5-22 Coupling adapter chamfer

Similarly, the pump coupling fits with the chamfered end towards the pump.

On fitting the PTO adaptor, fill the interior cavity with the grease to prevent the ingress of moisture (*Fig 5-23*).

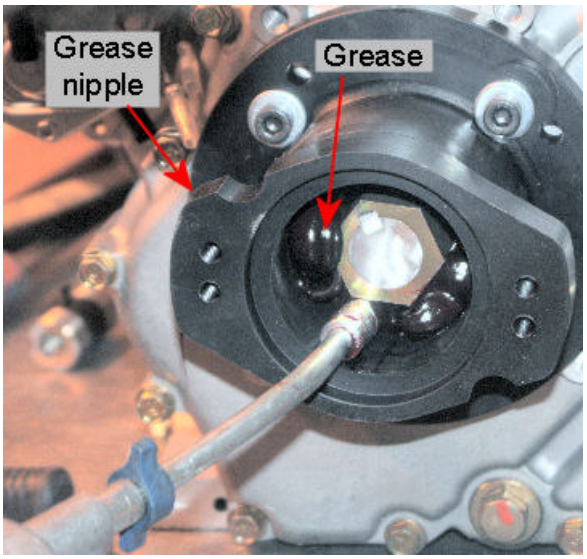


Fig 5-23 PTO grease

5.13.7 Engine Cable Loom

Refer to drawing TCP-1574-01 WL for details of the engine cable loom.

Figures 5-24 to 3-20 show the cable loom connections.

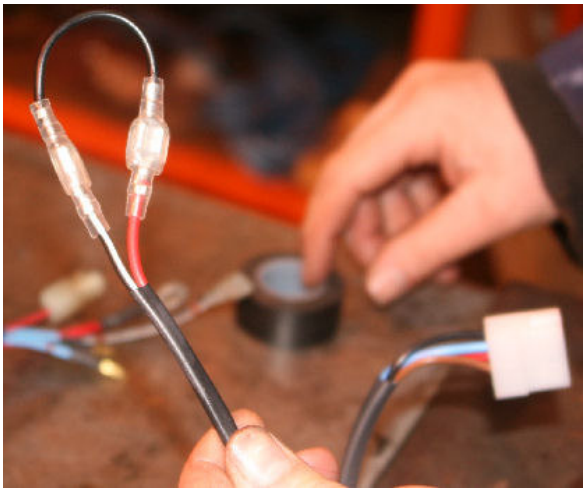


Fig 5-24 Engine cable loom 1

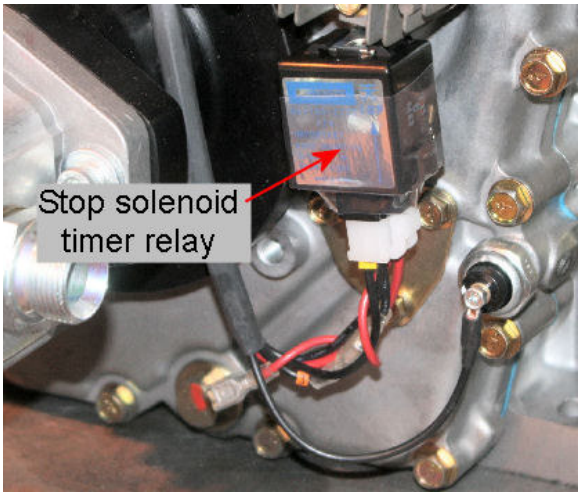


Fig 5-25 Engine cable loom 2

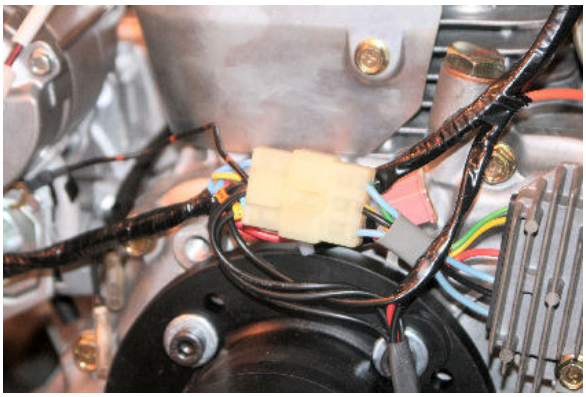


Fig 5-26 Engine cable loom 3

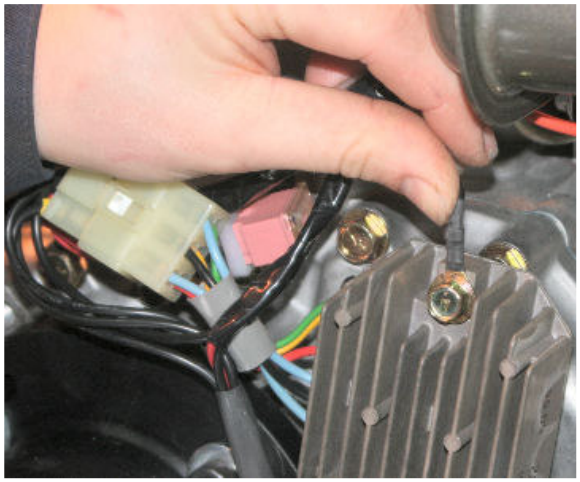


Fig 5-27 Engine cable loom 4

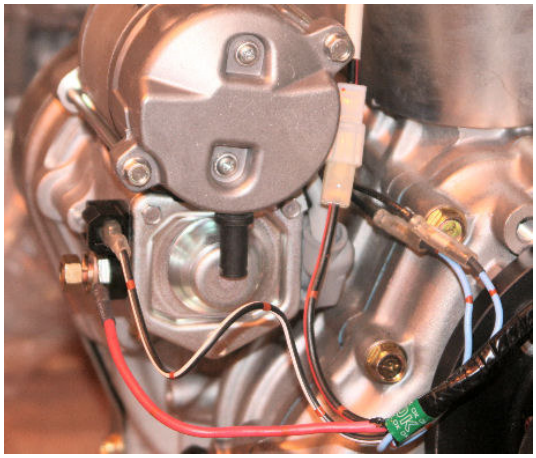


Fig 5-28 Engine cable loom 5

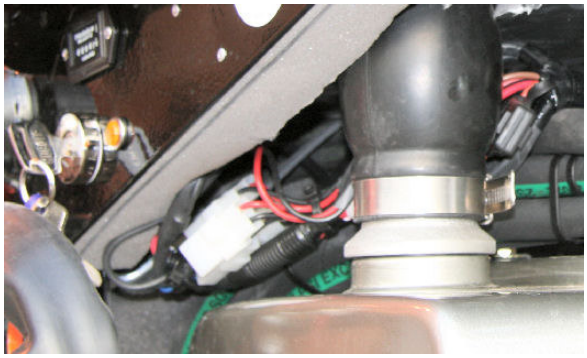


Fig 5-29 Engine cable loom 6

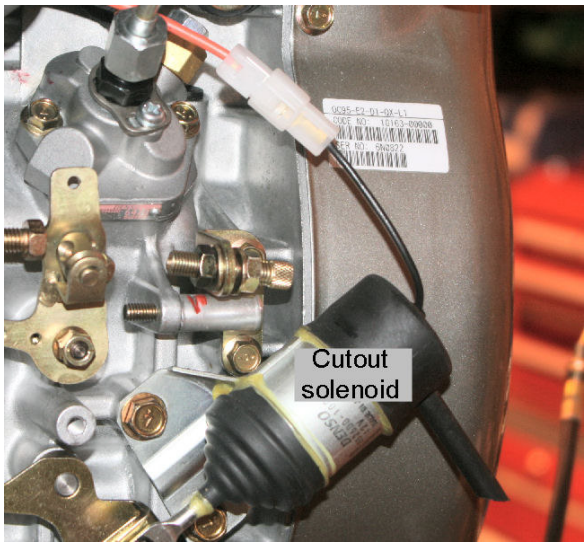


Fig 5-30 Engine cutout solenoid cable

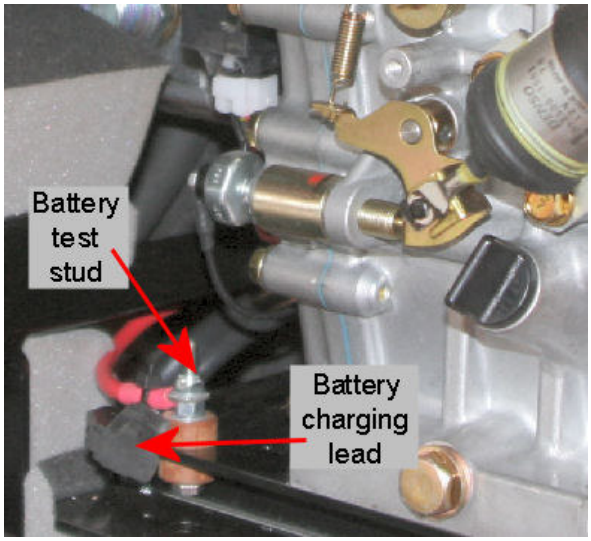


Fig 5-31 Battery test stud

5.14 Hydraulic Pump

1. Remove the engine from the machine as detailed in *Section 5.12 Engine Removal*.
2. Remove the three unions from the pump (*Fig 5-32*).

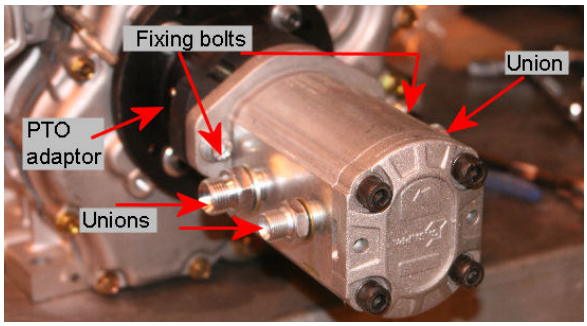


Fig 5-32 Pump unions

3. Remove the two bolts securing the pump to the power takeoff (PTO) adaptor (Fig 5-32) and extract the pump.

Fitting a new pump is the reverse of this procedure. Apply stud lock compound to the pump fixing bolts.

Before operating the track drive, purge the hydraulics as detailed in *Section 5.6 Hydraulics Purging*.

5.15 Track

In the event that the drive track is displaced during use, proceed as follows:

Fig 5-33 Typical displaced track

1. Support the chassis on blocks along its length to lift the track.

Fig 5-34 Track supported

2. Remove the blanking plugs.

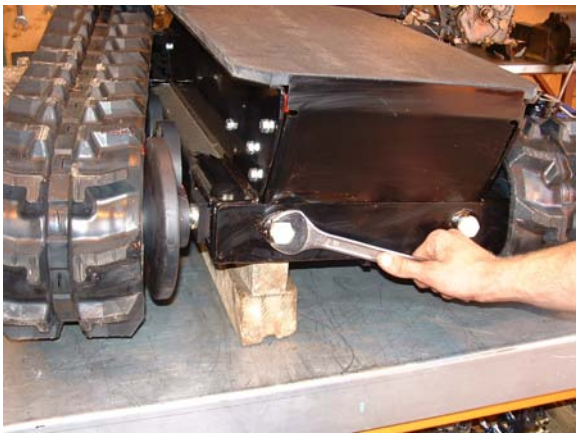


Fig 5-35 Blanking plugs

3. Lubricate jacking bolts (supplied).

Fig 5-36 Jacking bolts

4. Insert jacking bolts and adjust them equally.

Fig 5-37 Adjusting jacking bolts

5. Adjust jacking bolts until idler is almost touching roller (*Fig 5-38*).

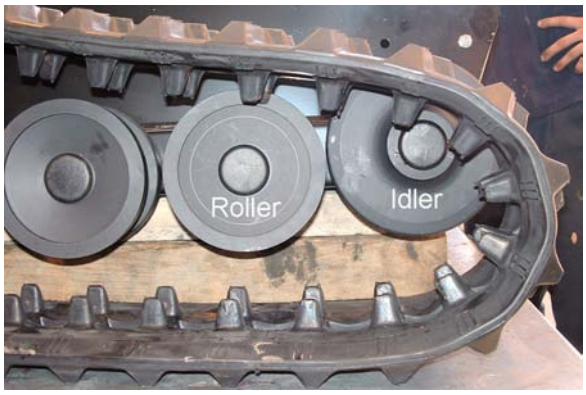


Fig 5-38 Idler touching roller

6. Remove blanking plug.

Fig 5-39 Blanking plug

7. Remove securing bolt.

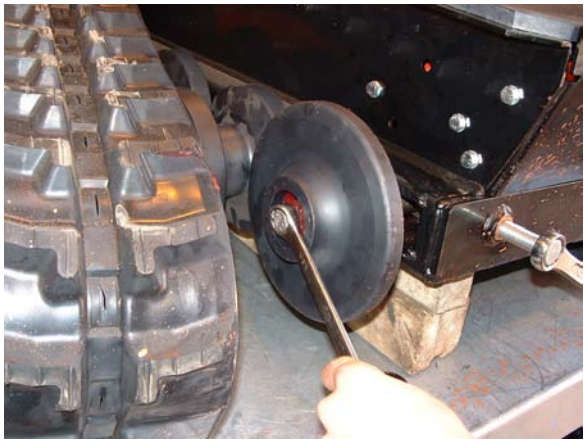


Fig 5-40 Idler securing bolt

8. Remove idler.

Fig 5-41 Remove idler

9. Place Idler in drive track.

Fig 5-42 Idler in drive track

10. Slide drive track and Idler on shaft.

Fig 5-43 Idler on shaft

11. Ensure Idler is fully home.

Fig 5-44 Idler fitted

12. Fit securing bolt (torque 49 Nm).

Fig 5-45 Securing idler

13. Fit blanking plug.

Fig 5-46 Blanking plug fitted

14. Remove jacking bolts.

Fig 5-47 Jacking bolts removed

15. Fit blanking plugs.

Fig 5-48 Blanking plugs

16. Remove chassis support.

Fig 5-49 Remove blocks

17. Run and test.

Section 6 Hydraulic Pressure Adjustments

6.1 Introduction

This section describes how to set hydraulic pressures for the rams and for the track drives. Pressures are measured at a gauge connected to a port (located at **A** in *Fig 6-2*).

Ensure that the machine is at normal operating temperature before adjusting pressures.

A – Pressure gauge test port
B – Upper ram Service Line Relief Valves
C – Lower ram Service Line Relief valves
D – Track drive Service Line Relief valve.

6.2 Fitting Test Gauge

Fit the gauge to the test port as shown in Fig 6-1.

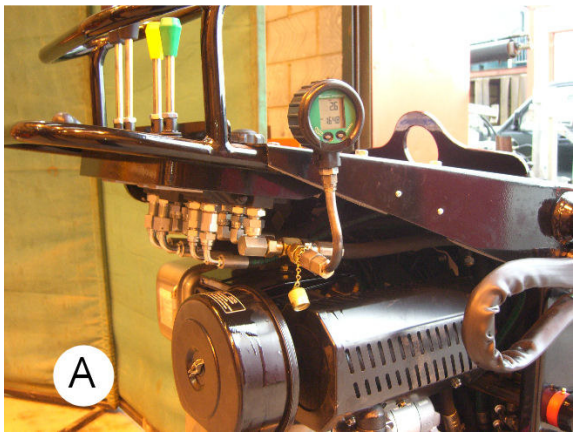


Fig 6-1 Gauge fitted to port

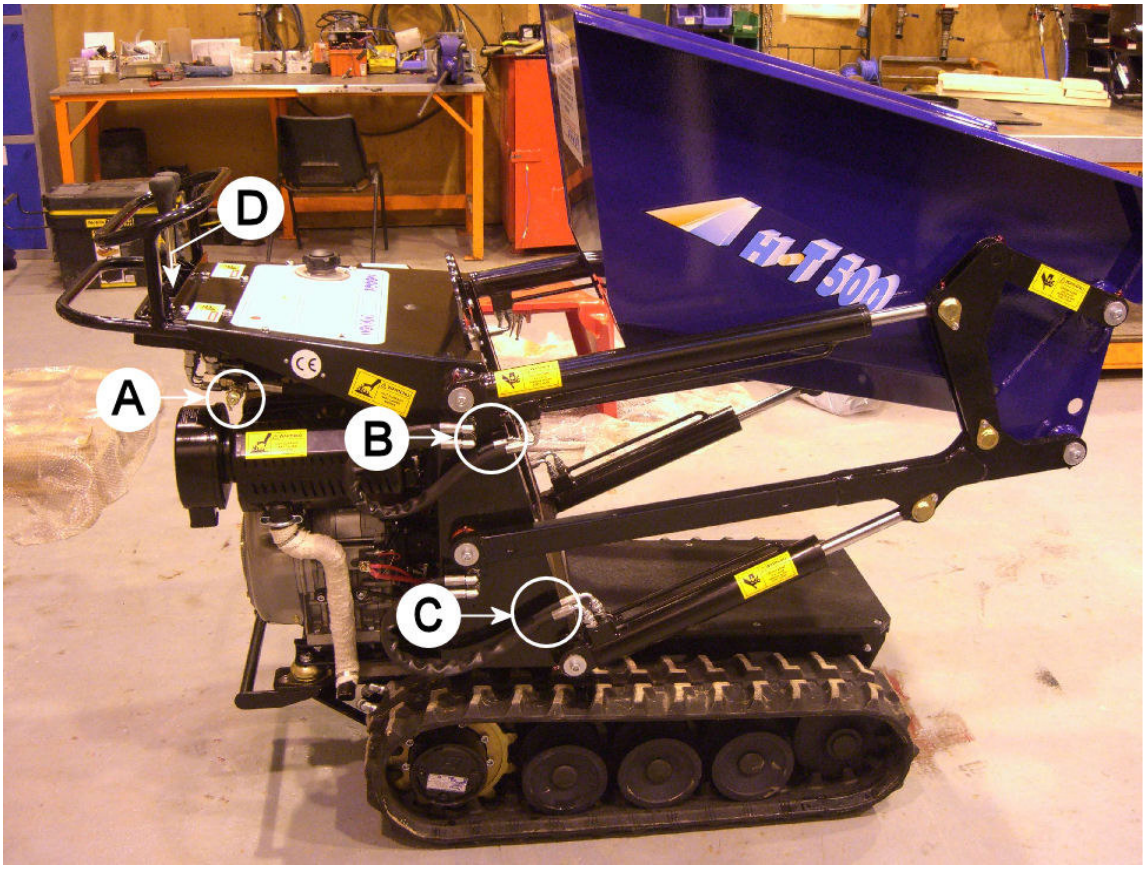


Fig 6-2 Location of test port and service line relief valves

6.3 Service Line Relief Valve Adjustment

Relief valves are fitted in the service lines for the rams and the track drives to control the hydraulic pressures supplied. Details of the pressures are given in *Sections 6.4 Ram Pressure Levels* and *6.5 Track Drive Pressure*.

Note: When removing the valve cap, be sure to use a thin wrench to keep the valve from turning and breaking the seal (Fig *6-3*).

1. Cut bond wire.
2. Remove cap using a 17mm wrench to undo cap and a thin 17mm wrench to stop the service line relief valve from turning in housing (*Fig* 6-3).
3. Push the relevant control lever forward or back as indicated in figure.
4. Select full throttle.
5. Use a 6 mm socket wrench to set pressure on gauge to pressure indicated (*Fig 6-5*).
6. Release ram control lever and reduce throttle.
7. Refit the cap, using two spanners as in step 2.
8. Fit new bond wire to cap.

Fig 6-3 Valve cap removal

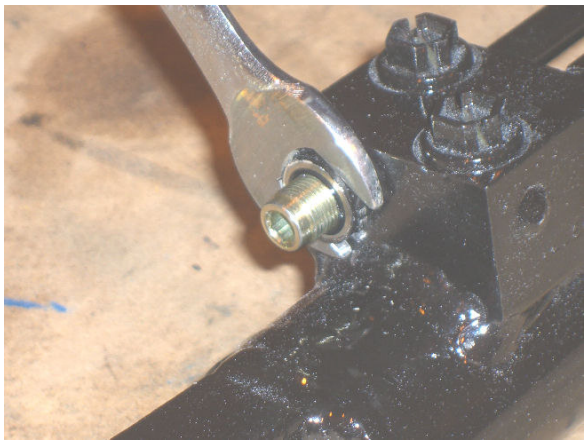


Fig 6-4 Valve with cap removed

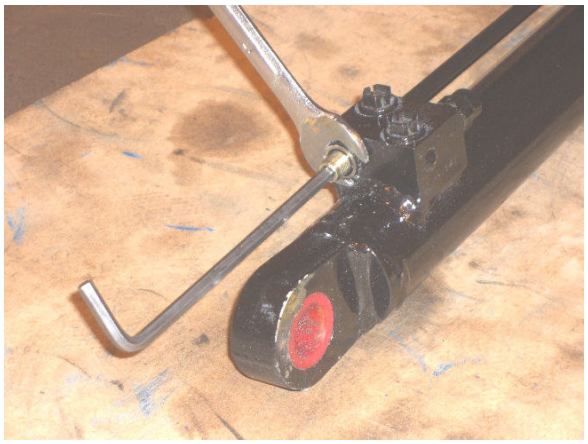


Fig 6-5 Valve adjustment

6.4 Ram Pressure Levels

There are separate pressure adjustment for the full bore and annular (retracted) positions of each ram. The locations of the valves (B upper ram or C lower ram) are shown in *Fig 6-2*.

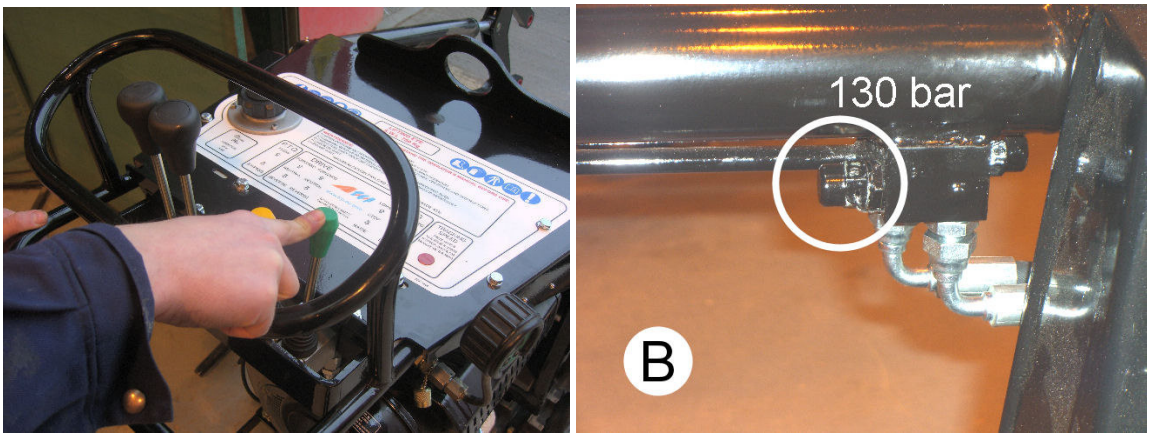


Fig 6-6 Top ram at full bore (Forward)

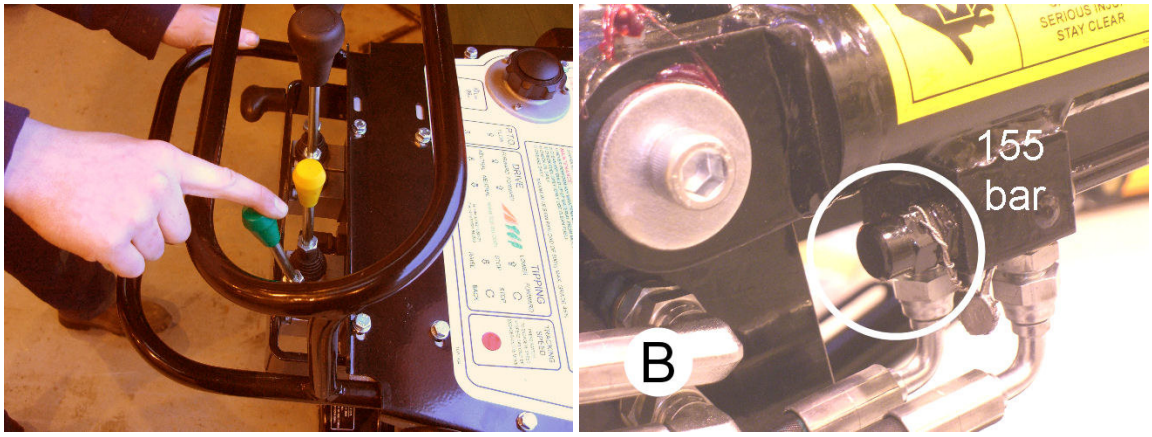


Fig 6-7 Top ram at annular bore (Back)

Fig 6-8 Bottom ram at full bore (Raised)

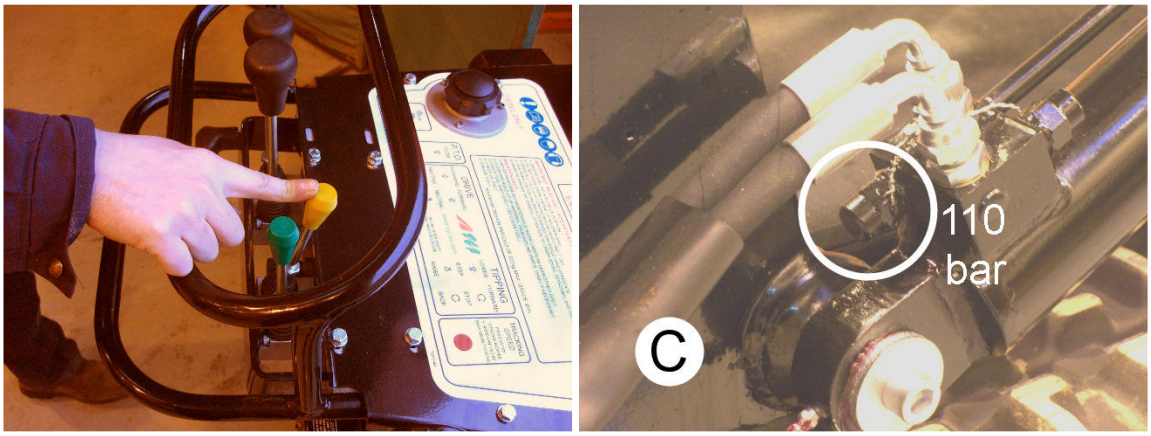


Fig 6-9 Bottom ram at annular bore (Lowered)

6.5 Track Drive Pressures

1. For track drive pressure adjustment, the track motors must receive drive at full throttle. To prevent movement of the machine during the adjustment, the track must be immobilized. This can be done by placing an iron bar right through **BOTH** tracks and driving the machine forwards until the bar locks the drives at the sprockets.

Warning: Take due care to avoid personal injury and equipment damage during this operation.

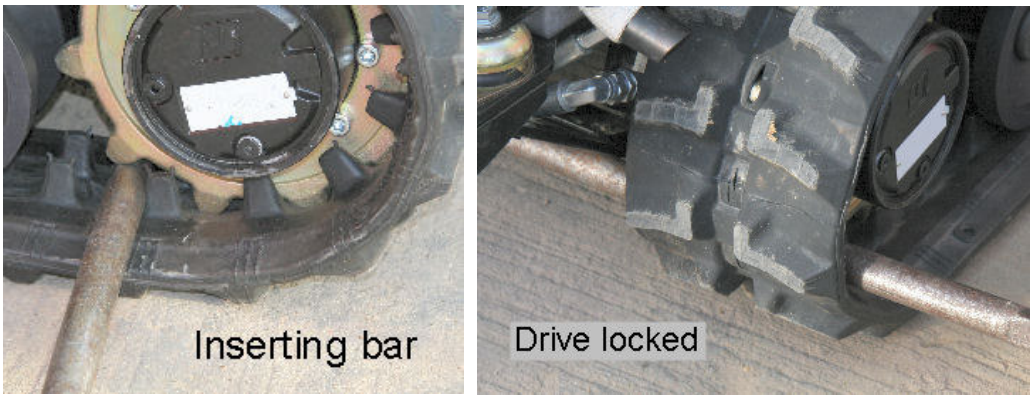


Fig 6-10 Track locking bar

2. Push the drive levers forwards and set the throttle on full.

Fig 6-11 Track drive relief valve

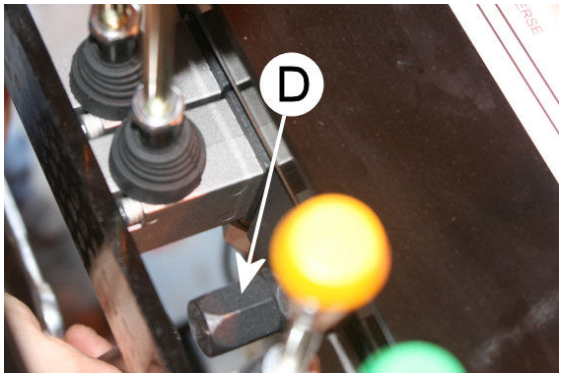


Fig 6-12 Drive forwards

3. Adjust the track drive relief valve (D) for a pressure reading of 170 Bar, using the method described in *Section 6.3 Service Line Relief Valve Adjustment*.

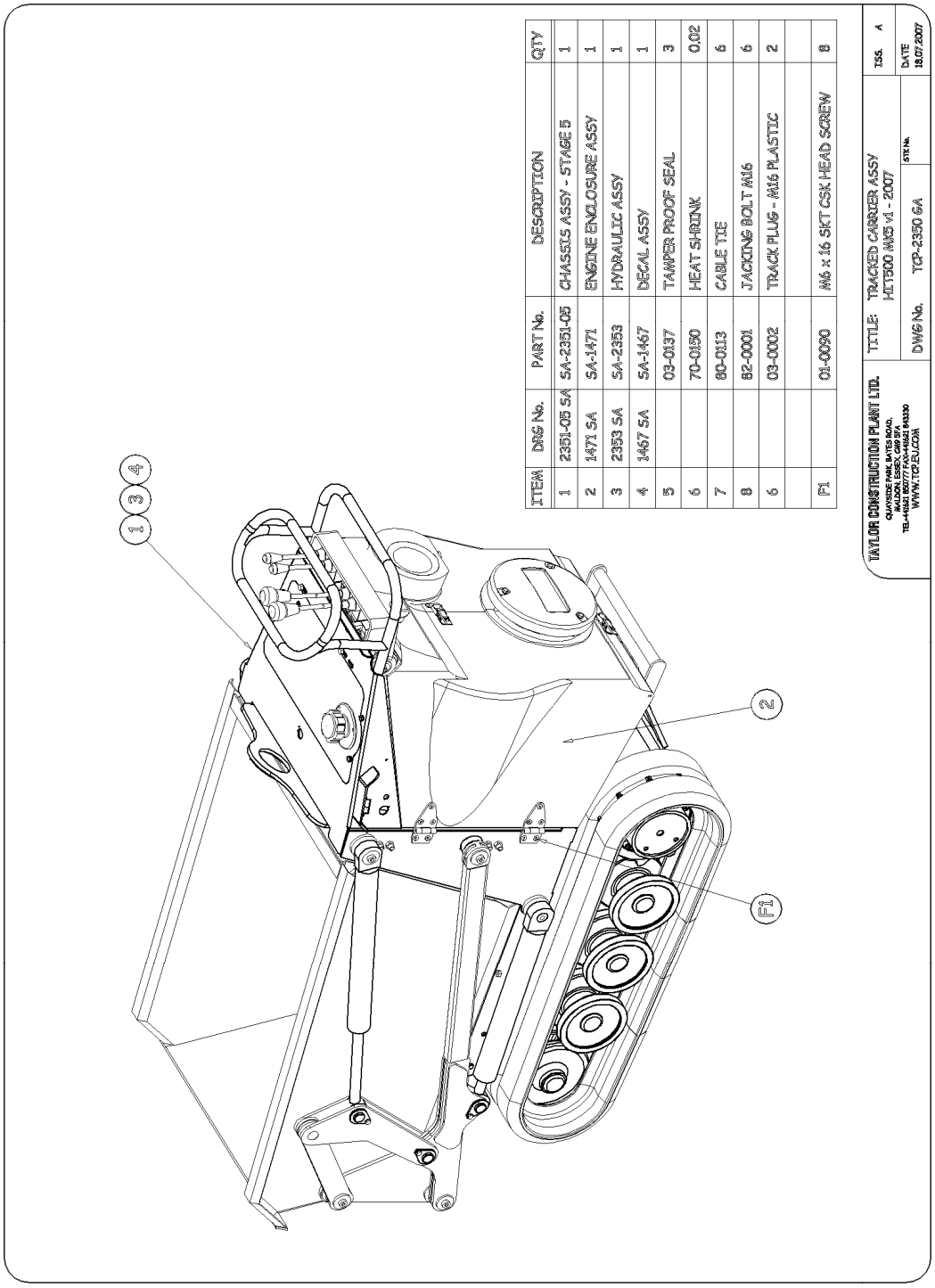
4. With the motors still attempting to drive forwards, press the Tracking Speed button to engage the increased drive speed.
5. Check for a pressure reading of 125 Bar.
6. Release the locking bar by briefly driving the machine in reverse.
7. Turn off the engine and remove the locking bar from the tracks.

6.6 Completion

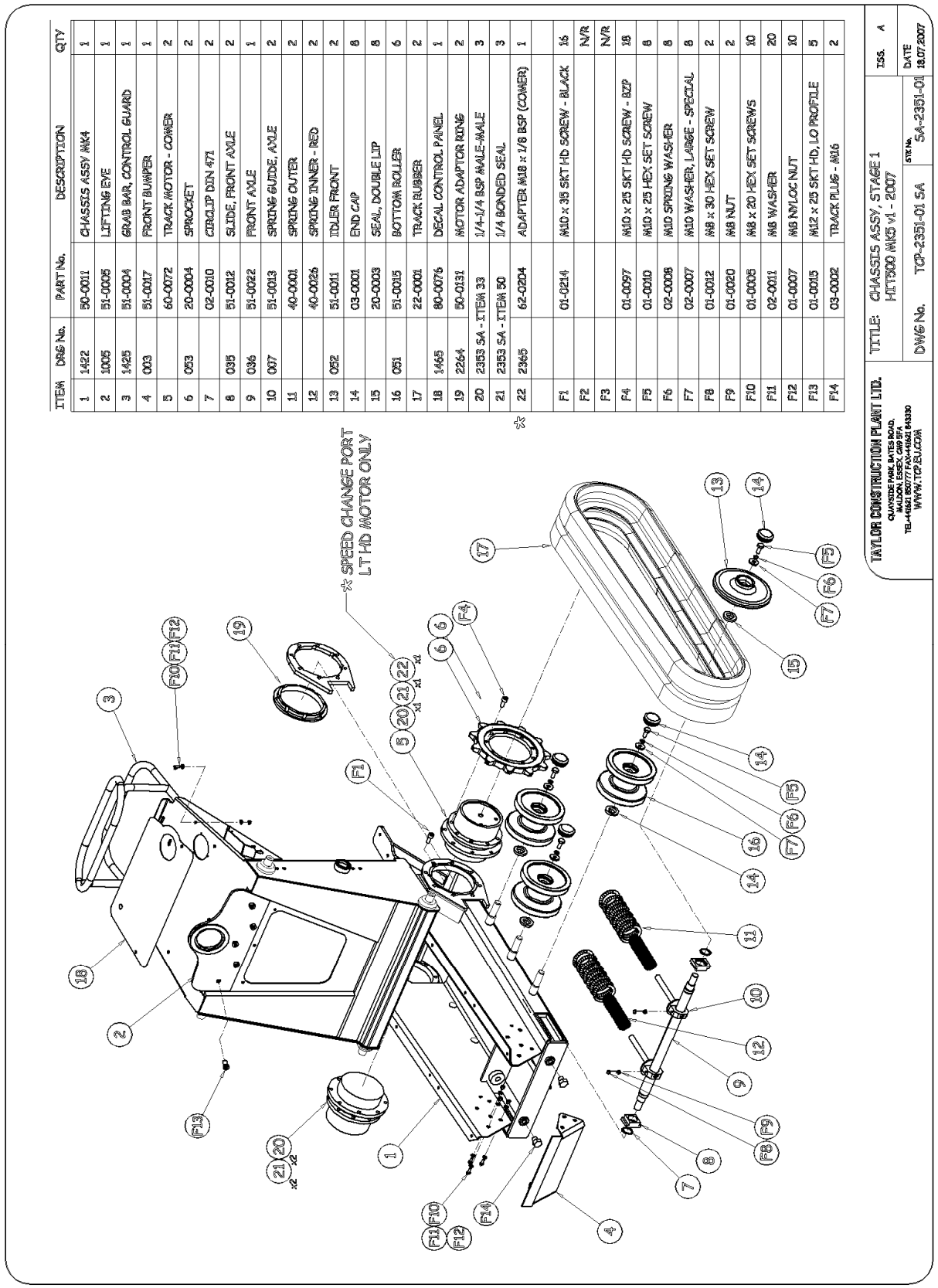
On completion of pressure adjustments, remove pressure gauge and refit protective cap on test port.

Section 7 Drawings

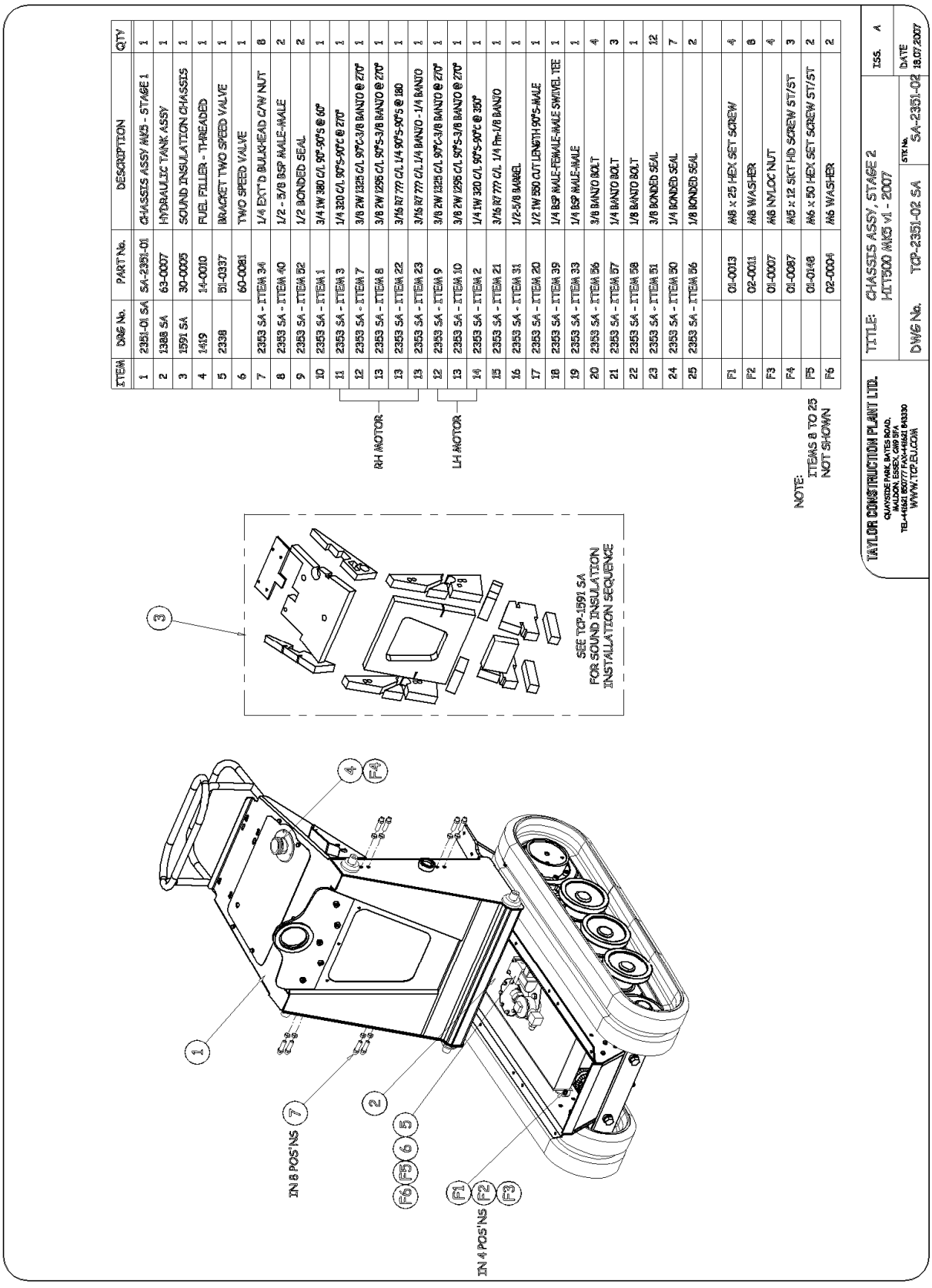
7.1 Tracked Carrier Assy 2350 GA



7.2 Chassis Assy Stage 1 SA-2351-01



7.3 Chassis Assy Stage 2 SA-2351-02



ITEM	DWG No.	PART No.	DESCRIPTION	QTY
1	2351-01 SA	SA-2351-01	CHASSIS ASSY MK5 - STAGE 1	1
2	1388 SA	63-0007	HYDRAULIC TANK ASSY	1
3	1991 SA	30-0005	SOUND INSULATION CHASSIS	1
4	1419	14-0010	FUEL FILLER - TH READED	1
5	2398	51-0337	BRACKET TWO SPEED VALVE	1
6		60-0081	TWO SPEED VALVE	1
7	2353 SA - ITEM 34		1/4 EXT'D BULKHEAD C/W NUT	8
8	2353 SA - ITEM 40		1/2 - 5/8 BSP MALE-MALE	2
9	2353 SA - ITEM 52		1/2 BONDED SEAL	2
10	2353 SA - ITEM 1		3/4 1W 380 C/L 90°S-90°S @ 60°	1
11	2353 SA - ITEM 3		1/4 320 C/L 90°S-90°C @ 270°	1
12	2353 SA - ITEM 7		3/8 2W 1325 C/L 90°C-3/8 BANTO @ 270°	1
13	2353 SA - ITEM 8		3/8 2W 1295 C/L 90°S-3/8 BANTO @ 270°	1
13	2353 SA - ITEM 22		3/16 R7 777 C/L 1/4 90°S-90°S @ 180	1
13	2353 SA - ITEM 23		3/16 R7 777 C/L 1/4 BANTO - 1/4 BANTO	1
12	2353 SA - ITEM 9		3/8 2W 1325 C/L 90°C-3/8 BANTO @ 270°	1
13	2353 SA - ITEM 10		3/8 2W 1295 C/L 90°S-3/8 BANTO @ 270°	1
14	2353 SA - ITEM 2		1/4 1W 320 C/L 90°S-90°C @ 350°	1
15	2353 SA - ITEM 21		3/16 R7 777 C/L 1/4 Fm-1/8 BANJO	1
16	2353 SA - ITEM 31		1/2-5/8 BARREL	1
17	2353 SA - ITEM 20		1/2 1W 350 CUT LENGTH 90°S-MALE	1
18	2353 SA - ITEM 39		1/4 BSP MALE-FEMALE-MALE SWIVEL TEE	1
19	2353 SA - ITEM 33		1/4 BSP MALE-MALE	1
20	2353 SA - ITEM 56		3/8 BANJO BOLT	4
21	2353 SA - ITEM 57		1/4 BANJO BOLT	3
22	2353 SA - ITEM 58		1/8 BANJO BOLT	1
23	2353 SA - ITEM 51		3/8 BONDED SEAL	12
24	2353 SA - ITEM 50		1/4 BONDED SEAL	7
25	2353 SA - ITEM 56		1/8 BONDED SEAL	2
F1		01-0013	M8 x 25 HEX SET SCREW	4
F2		02-0011	M8 WASHER	8
F3		01-0007	M8 NYLOC NUT	4
F4		01-0087	M5 x 12 SKT HD SCREW ST/ST	3
F5		01-0148	M6 x 50 HEX SET SCREW ST/ST	2
F6		02-0004	M6 WASHER	2

RH MOTOR

LH MOTOR

NOTE:
ITEMS 8 TO 25
NOT SHOWN

SEE TCP-1991 SA
FOR SOUND INSULATION
INSTALLATION SEQUENCE

IN 8 POS'NS

IN 4 POS'NS

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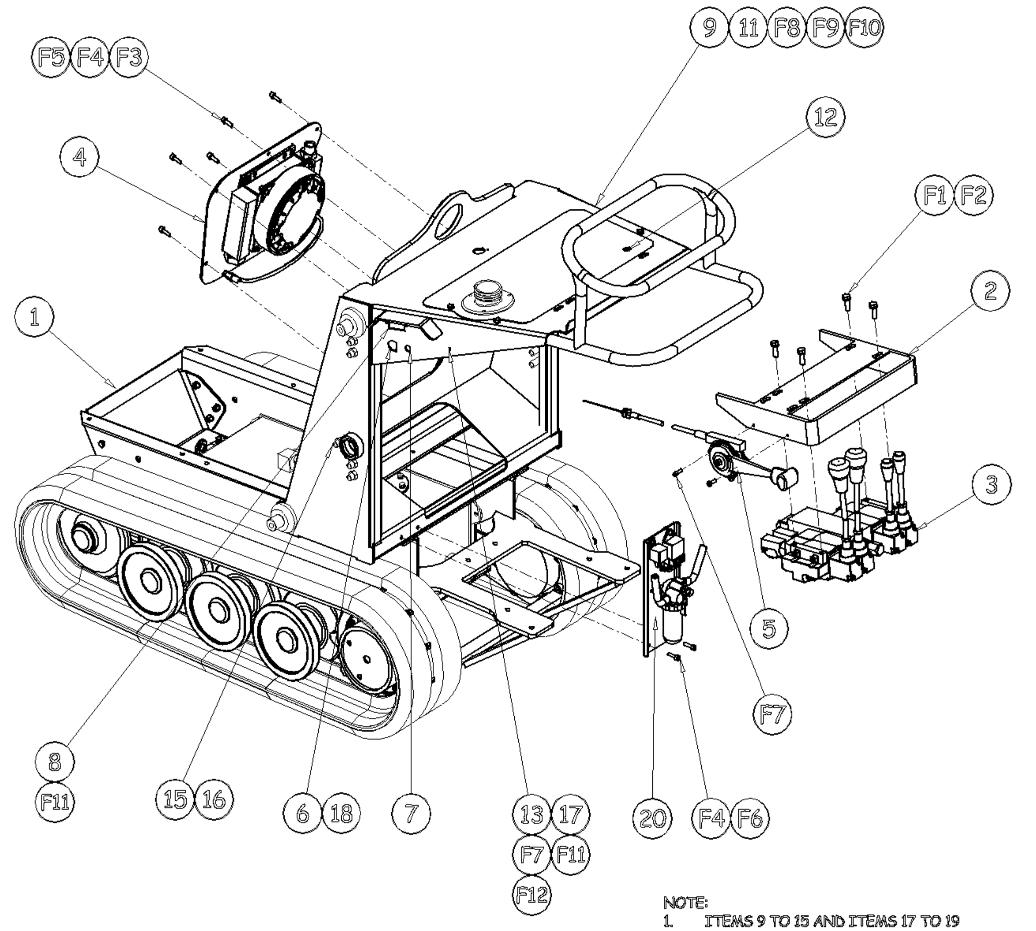
TITLE: CHASSIS ASSY, STAGE 2
HITECH MK5 v1 - 2007

DWG No. TCP-2351-02 SA | STK No. SA-2351-02 | ISS. A | DATE 18.07.2007

7.4 Chassis Assy Stage 3 SA-2351-03



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1	2351-02 SA	SA-2351-02	CHASSIS ASSY MK5 - STAGE 2	1
2	1006	51-0024	VALVE PROTECTOR	1
3	1598SA	60-0045	CONTROL VALVE ASSY - 2 SPEED	1
4	1470 SA	SA-1470	OIL COOLER ASSY	1
5		40-0002	THROTTLE LEVER & CABLE	1
6	SUPPLIED WITH ENGINE		IGNITION SWITCH	1
7		70-0007	IGNITION WARNING LIGHT	1
8		71-0002	HOUR COUNTER	1
9	1574-02A	73-0011	LOOM, TWO SPEED WITH RELAY	1
10		71-0007	RELAY ONLY - 2 POLE C/O 12V	A/R
11	1385	70-0041	RELAY CLIP	1
12	1574-02B	73-0012	LOOM, PIEZO SWITCH	1
13	1574-03A	73-0013	LOOM, AUXILIARIES WITH RELAY	1
14		71-0006	RELAY ONLY - 1 POLE 12V	A/R
15	1574-03B	73-0014	LOOM, PROXIMITY SWITCH	1
16		70-0020	PROXIMITY SWITCH	1
17	1574-03C	73-0015	LOOM, BUZZER	1
18	1574-04	73-0016	LOOM, COLD START	1
19	2355-05	73-0040	LOOM, TWO SPEED C/O VALVE	1
20	1925 SA	SA-1925	COLD START ASSY	1
21	2353 SA	64-0011	HYDRAULIC ASSY LIST	1
F1		01-0013	M8 x 25 HEX SET SCREW	4
F2		02-0011	M8 WASHER	4
F3		01-0002	M6 x 20 HEX SET SCREW	5
F4		02-0004	M6 WASHER	7
F5		02-0003	M6 SPRING WASHER	5
F6		01-0004	M6 x 12 HEX SET SCREW	2
F7		01-0087	M5 x 12 SKT HEAD SCREW	2
F8		01-0031	M3 x 12 POZI PAN HEAD SCREW	2
F9		02-0017	M3 WASHER	2
F10		01-0032	M3 NYLOC NUT	2
F11		02-0015	3mm x 10 AL POP RIVET	4
F12		01-0085	M5 NYLOC NUT	1

NOTE:
1. ITEMS 9 TO 15 AND ITEMS 17 TO 19 NOT SHOWN FOR CLARITY.
2. ALL ELECTRICAL TERMINALS AND CONNECTORS TO BE TREATED WITH DIELECTRIC GREASE.

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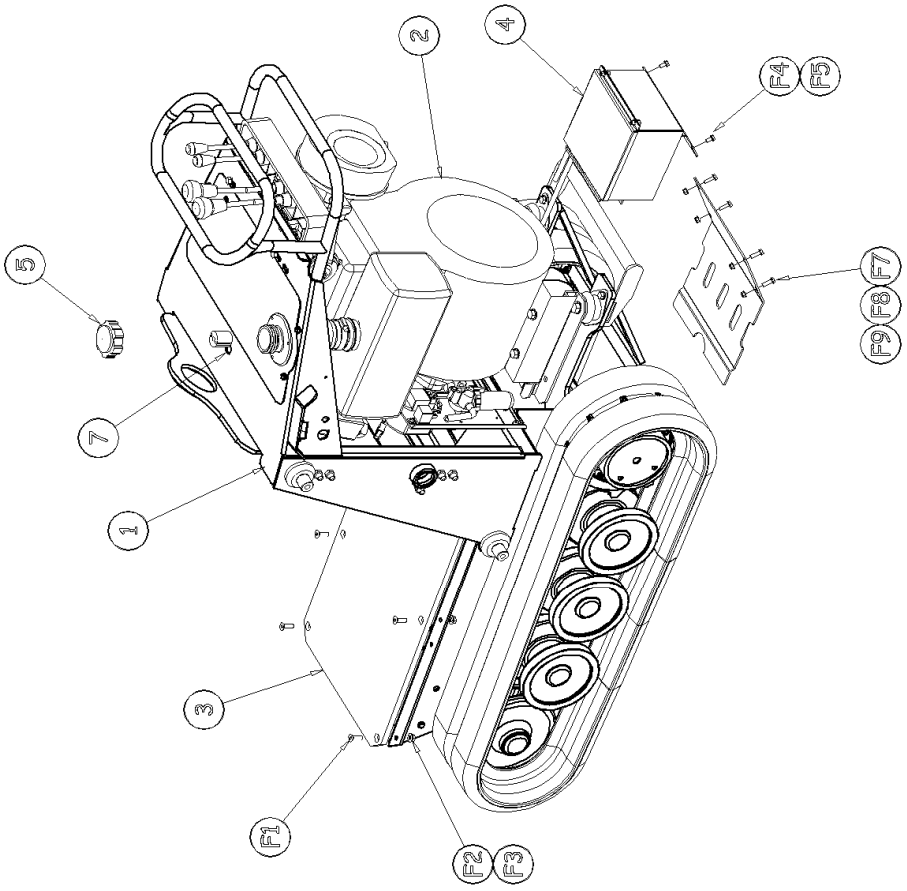
TITLE:	CHASSIS ASSY, STAGE 3 HIT500 MK5 v1 - 2007			ISS. A
DWG No.	TCP-2351-03 SA	STK No.	SA-2351-03	DATE 19.07.2007

7.5 Chassis Assy Stage 4 SA-2351-04

ITEM	DRG No.	PART No.	DESCRIPTION	QTY
1	2351-03 SA	SA-2351-03	CHASSIS ASSY MK5 -STAGE 3	1
2	1928-01 SA	SA-1928-01	ENGINE ASSY & DRESSING KIT	1
3	1008	51-0014	COVER PLATE, CHASSIS	1
4	2356 SA	SA-2356	BATTERY BOX ASSY	1
5		14-0014	FUEL CAP, VENTED	1
6	1101	80-0001	SERIAL NO. PLATE	1
7		03-0016	BLANKING GROMMET Ø23	1
8	2340	50-0070	PROTECTOR HOSE/MOTOR	1
F1		01-0014	M8 x 25 SKT CSK HEAD SCREW	6
F2		01-0007	M8 NYLOC NUTS	6
F3		02-0011	M8 WASHER	6
F4		01-0004	M6 x 12 HEX HEAD SET SCREW	2
F5		02-0004	M6 WASHER	2
F6		02-0015	Ø3 x 10 AL POP RIVETS	4
F7		01-0002	M6 x 20 HEX SET SCREW	4
F8		01-0017	M6 NYLOC NUT	4
F9		02-0004	M6 WASHER	8



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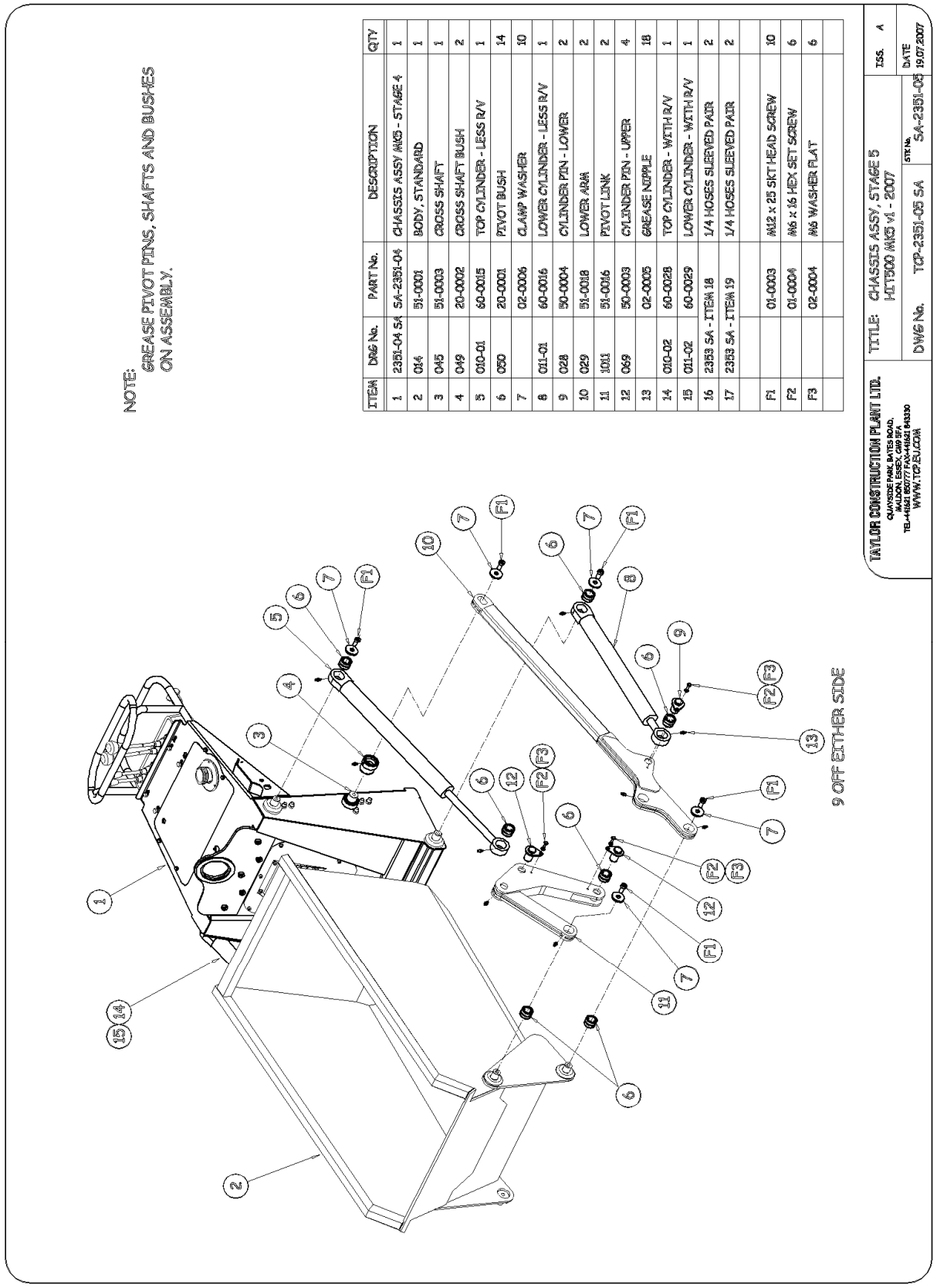
DWG No. TCP-2351-04 SA
STK No. SA-2351-04
ISS. A
DATE 19.07.2007

7.6 Chassis Assy Stage 5 SA-2351-05



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1	2351-04 SA	SA-2351-04	CHASSIS ASSY MK5 - STAGE 4	1
2	014	51-0001	BODY, STANDARD	1
3	045	51-0003	CROSS SHAFT	1
4	049	20-0002	CROSS SHAFT BUSH	2
5	010-01	60-0015	TOP CYLINDER - LESS R/V	1
6	050	20-0001	PIVOT BUSH	14
7		02-0006	CLAMP WASHER	10
8	011-01	60-0016	LOWER CYLINDER - LESS R/V	1
9	028	50-0004	CYLINDER PIN - LOWER	2
10	029	51-0018	LOWER ARM	2
11	1011	51-0016	PIVOT LINK	2
12	069	50-0003	CYLINDER PIN - UPPER	4
13		02-0005	GREASE NIPPLE	18
14	010-02	60-0028	TOP CYLINDER - WITH R/V	1
15	011-02	60-0029	LOWER CYLINDER - WITH R/V	1
16	2353 SA - ITEM 18		1/4 HOSES SLEEVED PAIR	2
17	2353 SA - ITEM 19		1/4 HOSES SLEEVED PAIR	2
F1		01-0003	M12 x 25 SKT HEAD SCREW	10
F2		01-0004	M6 x 16 HEX SET SCREW	6
F3		02-0004	M6 WASHER FLAT	6

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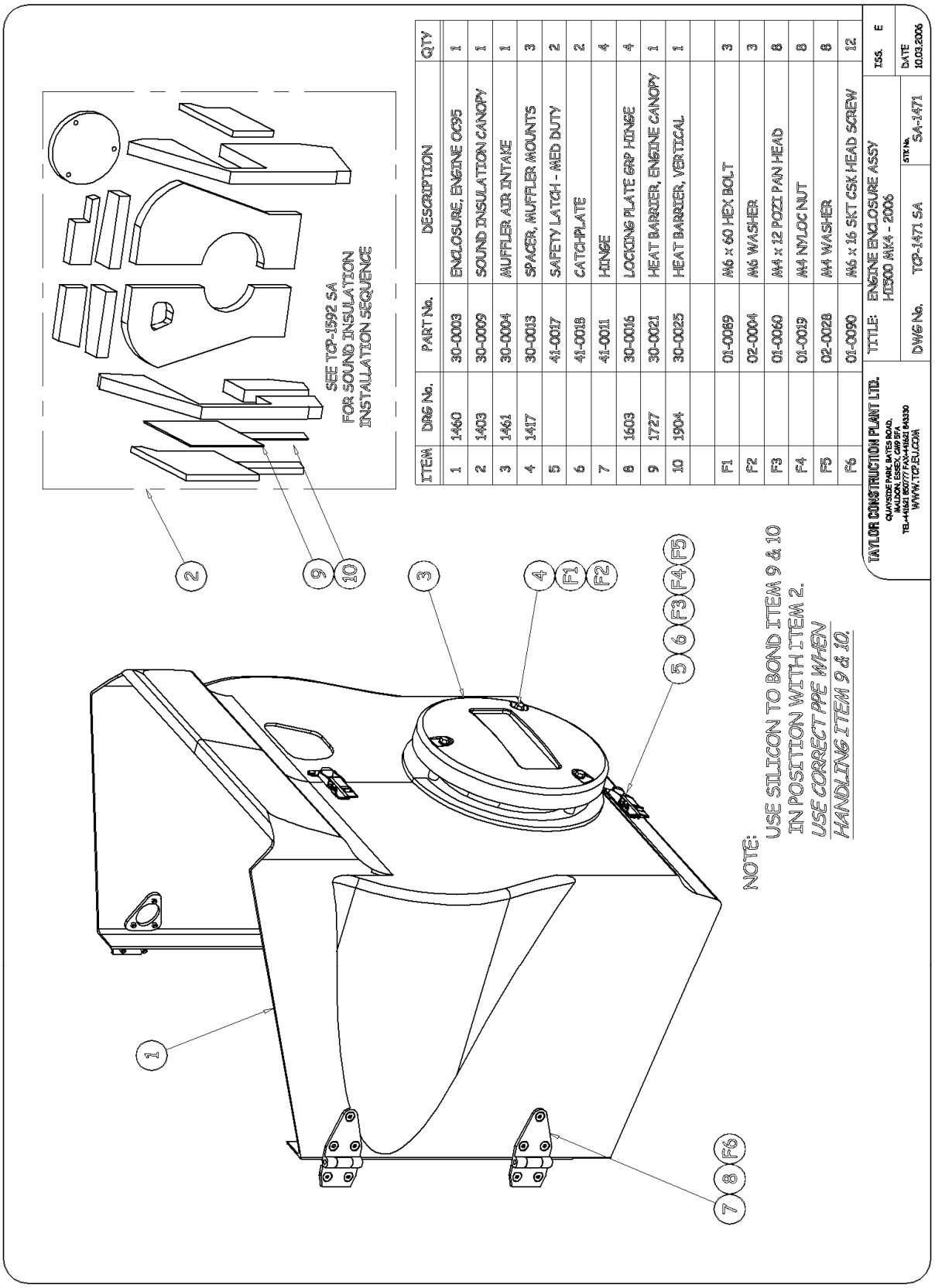
TITLE: CHASSIS ASSY, STAGE 5 HIT900 MK5 v1 - 2007

DWG No. TCP-2351-05 SA | STK No. SA-2351-05 | ISS. A | DATE 19.07.2007

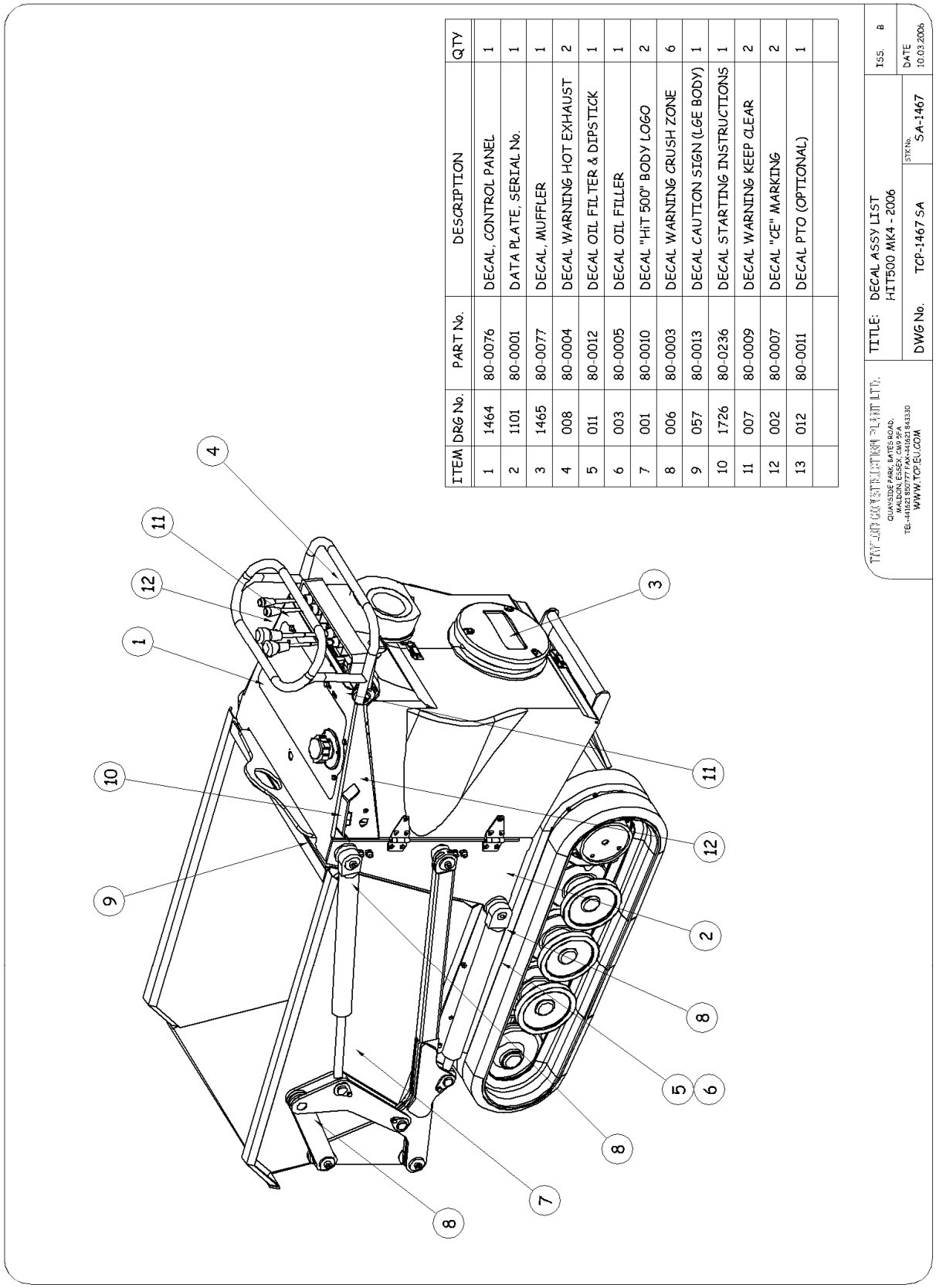
7.7 Engine Enclosure Assy SA-1471



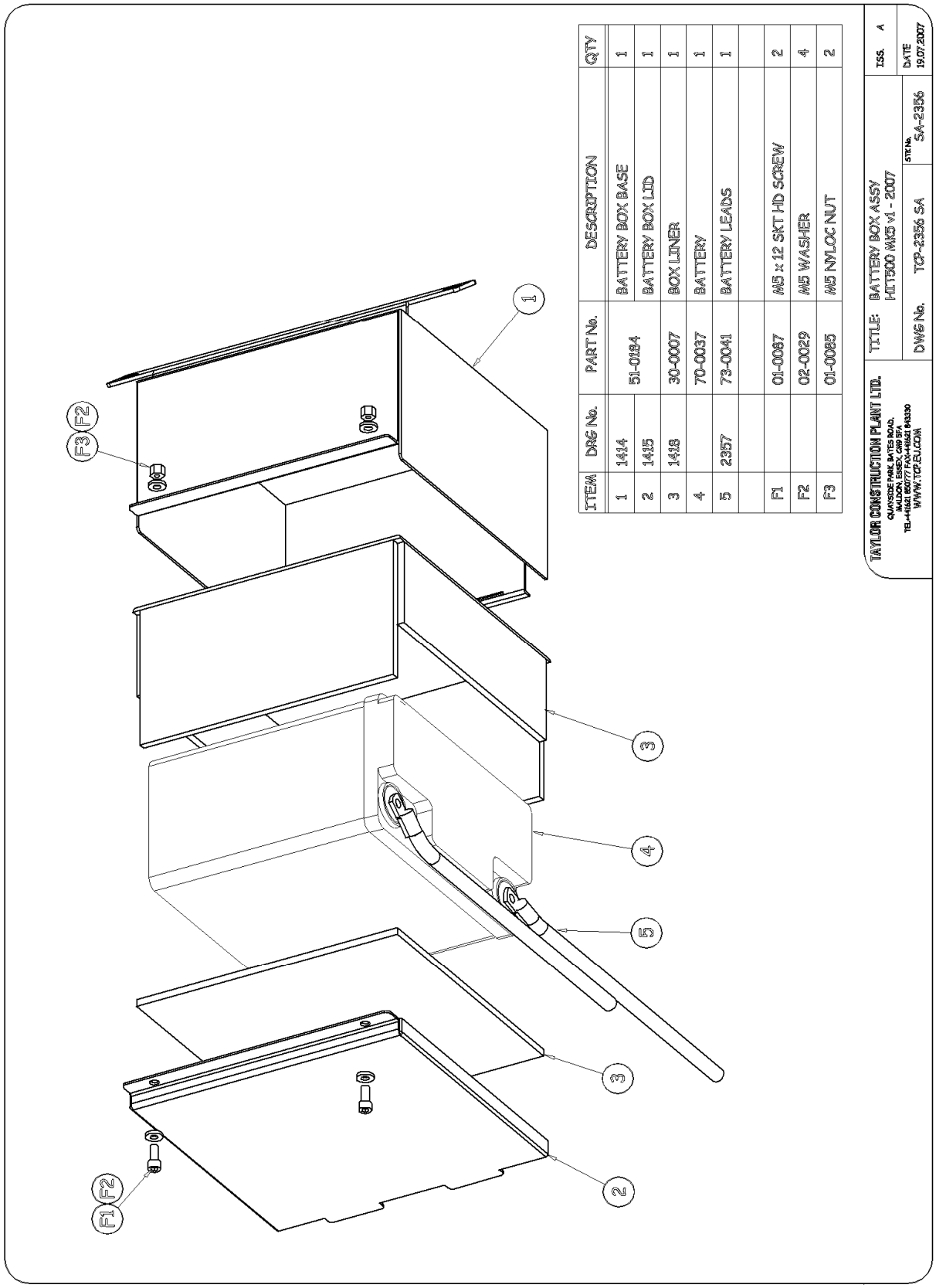
ITEM	DWG No.	PART No.	DESCRIPTION	QTY
1	1460	30-0003	ENCLOSURE, ENGINE OC95	1
2	1403	30-0009	SOUND INSULATION CANOPY	1
3	1461	30-0004	MUFFLER AIR INTAKE	1
4	1417	30-0013	SPACER, MUFFLER MOUNTS	3
5		41-0017	SAFETY LATCH - MED DUTY	2
6		41-0018	CATCHPLATE	2
7		41-0011	HINGE	4
8	1603	30-0016	LOCKING PLATE GRP HINGE	4
9	1727	30-0021	HEAT BARRIER, ENGINE CANOPY	1
10	1904	30-0025	HEAT BARRIER, VERTICAL	1
F1		01-0069	M6 x 60 HEX BOLT	3
F2		02-0004	M6 WASHER	3
F3		01-0060	M4 x 12 POZI PAN HEAD	8
F4		01-0019	M4 NYLOC NUT	8
F5		02-0028	M4 WASHER	8
F6		01-0090	M6 x 16 SKT CSK HEAD SCREW	12

7.8 Labels (Decals) SA-1467

Decals fitted to machines may vary from country to country to suit local needs.



7.9 Battery Box Assy SA-2356



ITEM	DRG No.	PART No.	DESCRIPTION	QTY
1	1414	51-0184	BATTERY BOX BASE	1
2	1415		BATTERY BOX LID	1
3	1418	30-0007	BOX LINER	1
4		70-0037	BATTERY	1
5	2357	73-0041	BATTERY LEADS	1
F1		01-0087	M5 x 12 SKT HD SCREW	2
F2		02-0029	M5 WASHER	4
F3		01-0085	M5 NYLOC NUT	2

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TITLE: BATTERY BOX ASSY
HITSOO MK5 v1 - 2007

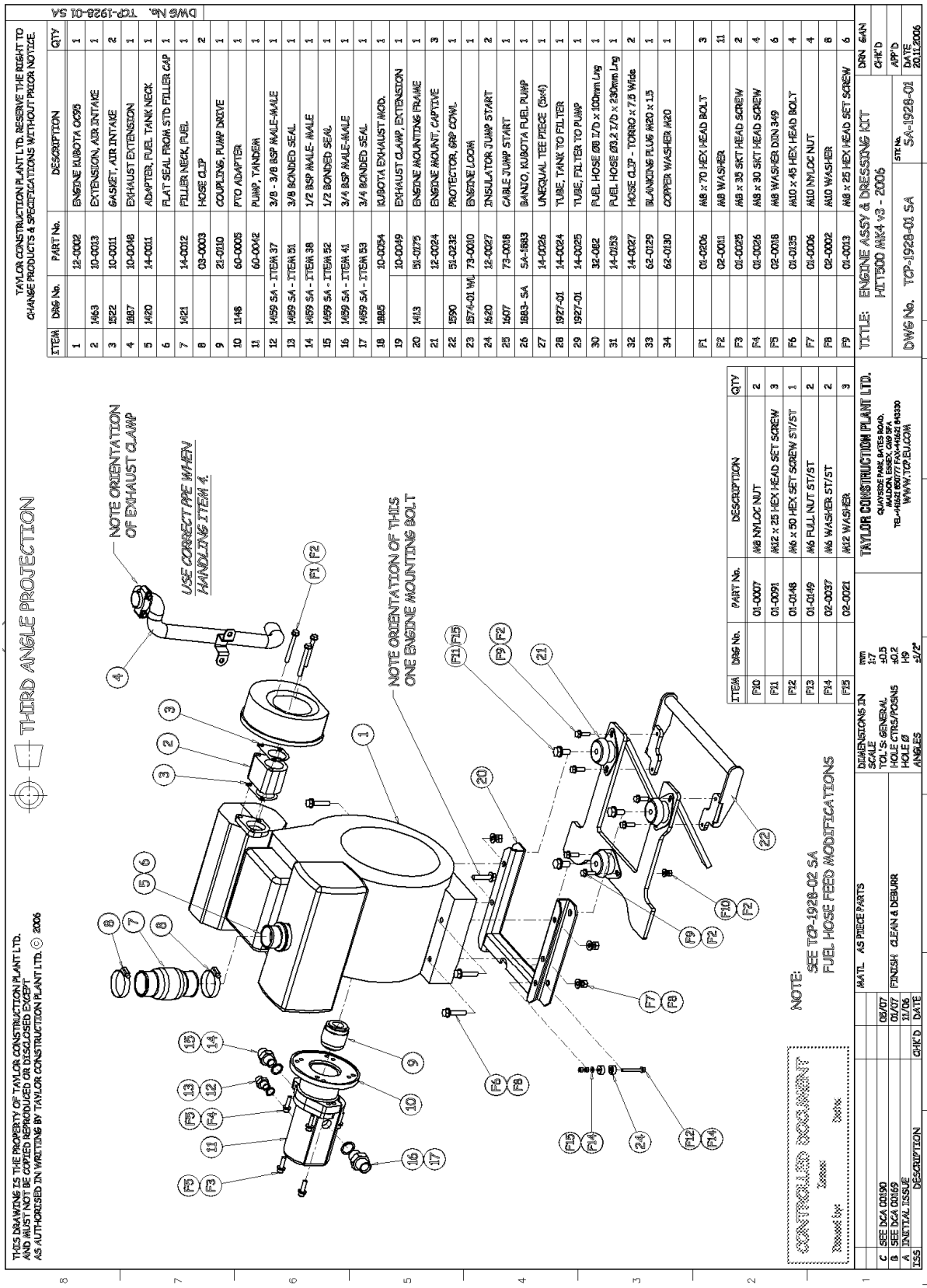
DWG No. TCP-2356 SA

STK No. SA-2356

ISS. A

DATE 19.07.2007

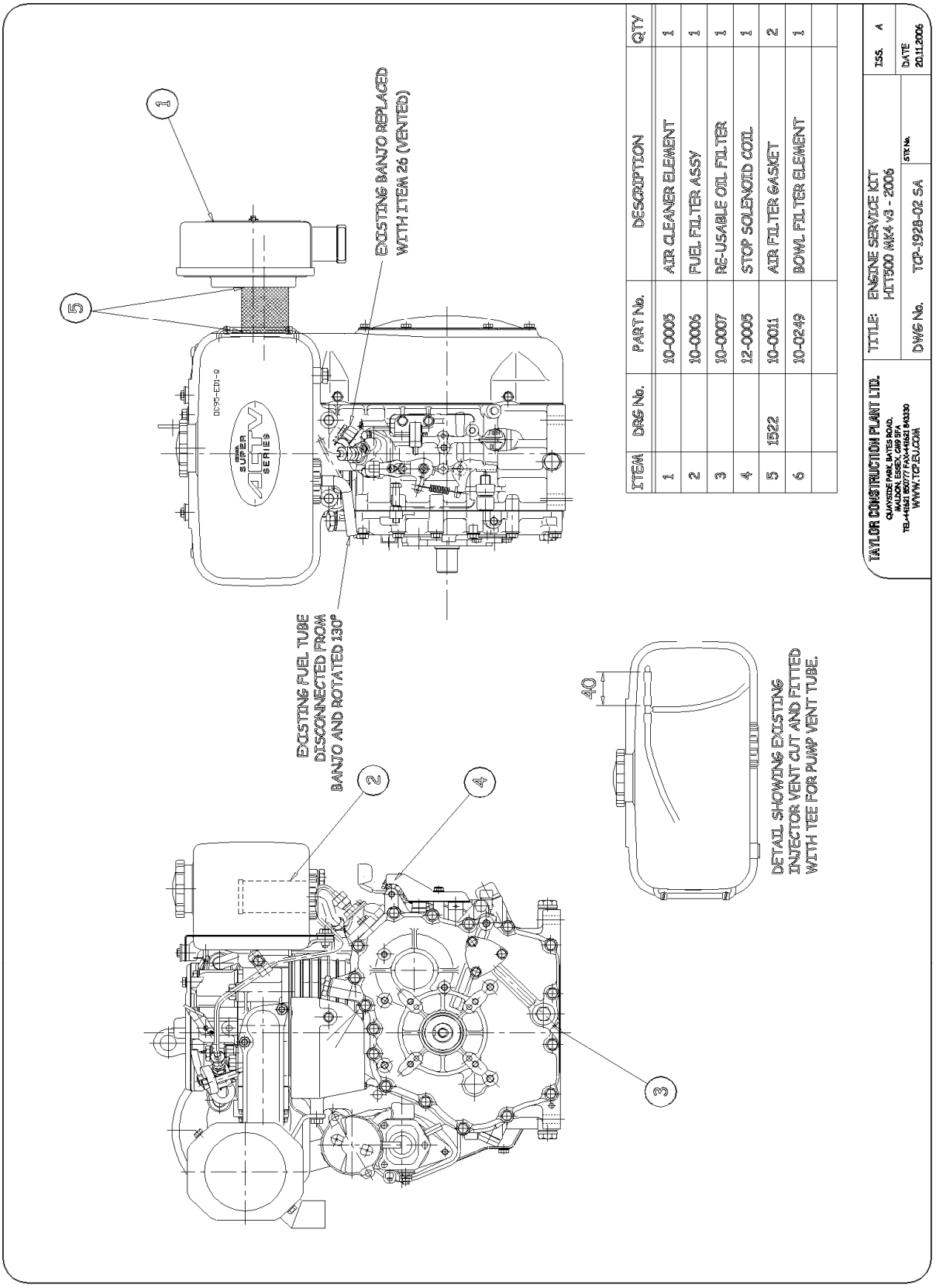
7.10 Engine Assy & Dressing Kit SA-1928-01



ITEM	DWG No.	PART No.	DESCRIPTION	QTY
1		12-0002	ENGINE KUBOTA OC95	1
2	1463	10-0013	EXTENSION, AIR INTAKE	1
3	1522	10-0011	GASKET, AIR INTAKE	2
4	1887	10-0048	EXHAUST EXTENSION	1
5	1420	14-0011	ADAPTER, FUEL TANK NECK	1
6			FLAT SEAL FROM STD FILLER CAP	1
7	1421	14-0012	FILLER NECK, FUEL	1
8		03-0003	HOSE CLIP	2
9		21-0110	COUPLING, PUMP DRIVE	1
10	1148	60-0005	PTO ADAPTER	1
11		60-0042	PUMP, TANDEM	1
12	1459 SA	- ITEM 37	3/8 - 3/8 BSP MALE-MALE	1
13	1459 SA	- ITEM 51	3/8 BONDED SEAL	1
14	1459 SA	- ITEM 38	1/2 BSP MALE - MALE	1
15	1459 SA	- ITEM 52	1/2 BONDED SEAL	1
16	1459 SA	- ITEM 41	3/4 BSP MALE-MALE	1
17	1459 SA	- ITEM 53	3/4 BONDED SEAL	1
18	1885	10-0054	KUBOTA EXHAUST MOD.	1
19		10-0049	EXHAUST CLAMP, EXTENSION	1
20	1413	51-0175	ENGINE MOUNTING FRAME	1
21		12-0024	ENGINE MOUNT, CAPTIVE	3
22	1590	51-0232	PROTECTOR, GRP COWL	1
23	1574-01 WL	73-0010	ENGINE LOOM	1
24	1620	12-0027	INSULATION JUMP START	2
25	1607	73-0018	CABLE JUMP START	1
26	1883-SA	SA-1883	BANJO, KUBOTA FUEL PUMP	1
27		14-0026	UNEQUAL TEE PIECE (3x4)	1
28	1927-01	14-0024	TUBE, TANK TO FILTER	1
29	1927-01	14-0025	TUBE, FILTER TO PUMP	1
30		32-062	FUEL HOSE Ø8 I/D x 100mm Lng	1
31		14-0153	FUEL HOSE Ø3.2 I/D x 230mm Lng	1
32		14-0027	HOSE CLIP - TORRO x 7.5 Wide	2
33		62-0129	BLANKING PLUG M20 x 1.5	1
34		62-0130	COPPER WASHER M20	1
F1		01-0206	M8 x 70 HEX HEAD BOLT	3
F2		02-0011	M8 WASHER	11
F3		01-0025	M8 x 35 SKT HEAD SCREW	2
F4		01-0026	M8 x 30 SKT HEAD SCREW	4
F5		02-0018	M8 WASHER DIN 349	6
F6		01-0135	M10 x 45 HEX HEAD BOLT	4
F7		01-0006	M10 NYLOC NUT	4
F8		02-0002	M10 WASHER	8
F9		01-0013	M8 x 25 HEX HEAD SET SCREW	6

ITEM	DWG No.	PART No.	DESCRIPTION	QTY
F10		01-0007	M8 NYLOC NUT	2
F11		01-0091	M12 x 25 HEX HEAD SET SCREW	3
F12		01-0148	M6 x 50 HEX SET SCREW ST/ST	1
F13		01-0149	M6 FULL NUT ST/ST	2
F14		02-0037	M6 WASHER ST/ST	2
F15		02-0021	M12 WASHER	3

7.11 Engine Service Kit SA-1928-02



ITEM	DRG No.	PART No.	DESCRIPTION	QTY
1		10-0005	AIR CLEANER ELEMENT	1
2		10-0006	FUEL FILTER ASSY	1
3		10-0007	RE-USABLE OIL FILTER	1
4		12-0005	STOP SOLENOID COIL	1
5	1522	10-0011	AIR FILTER GASKET	2
6		10-0249	BOWL FILTER ELEMENT	1

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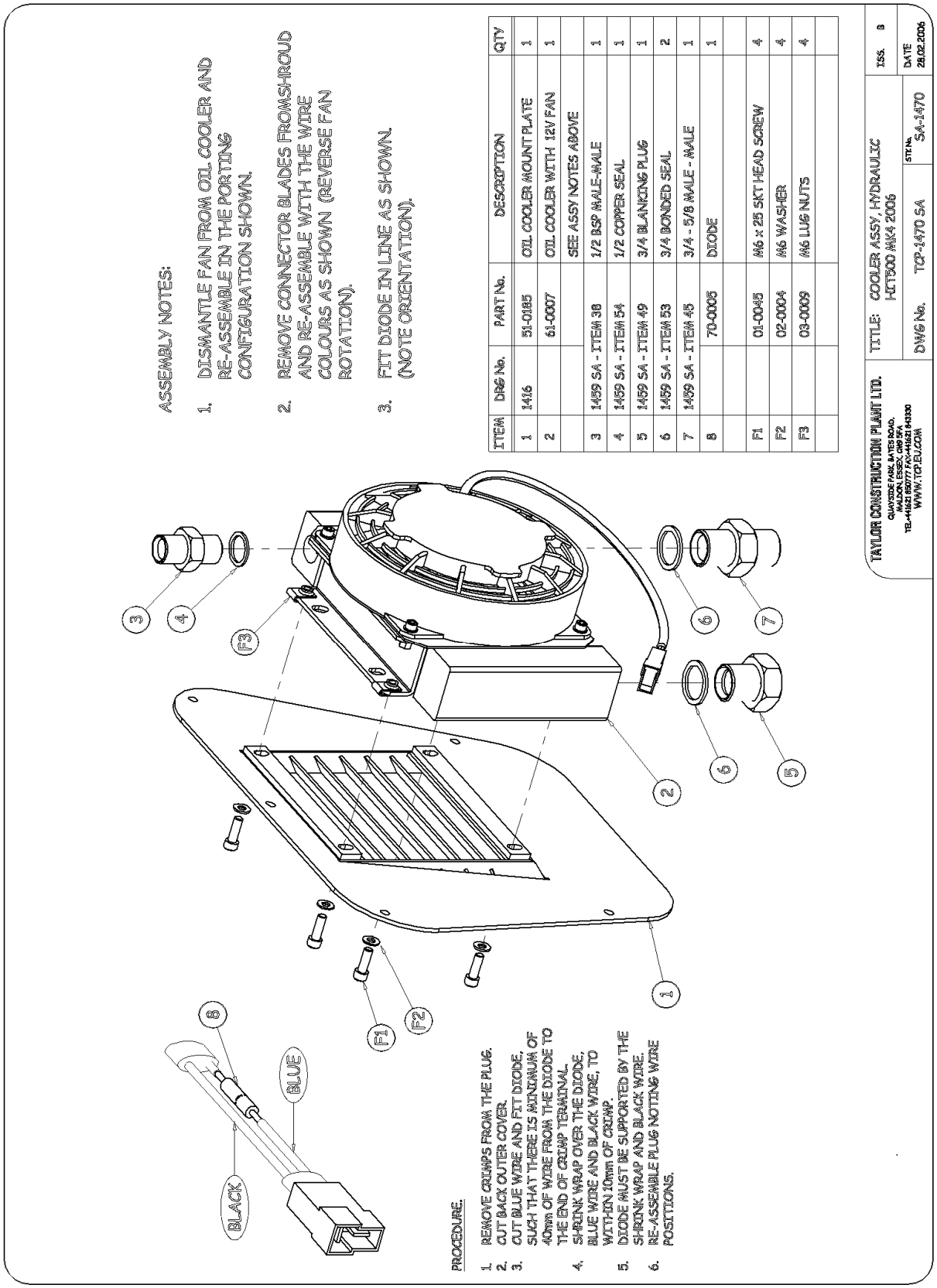
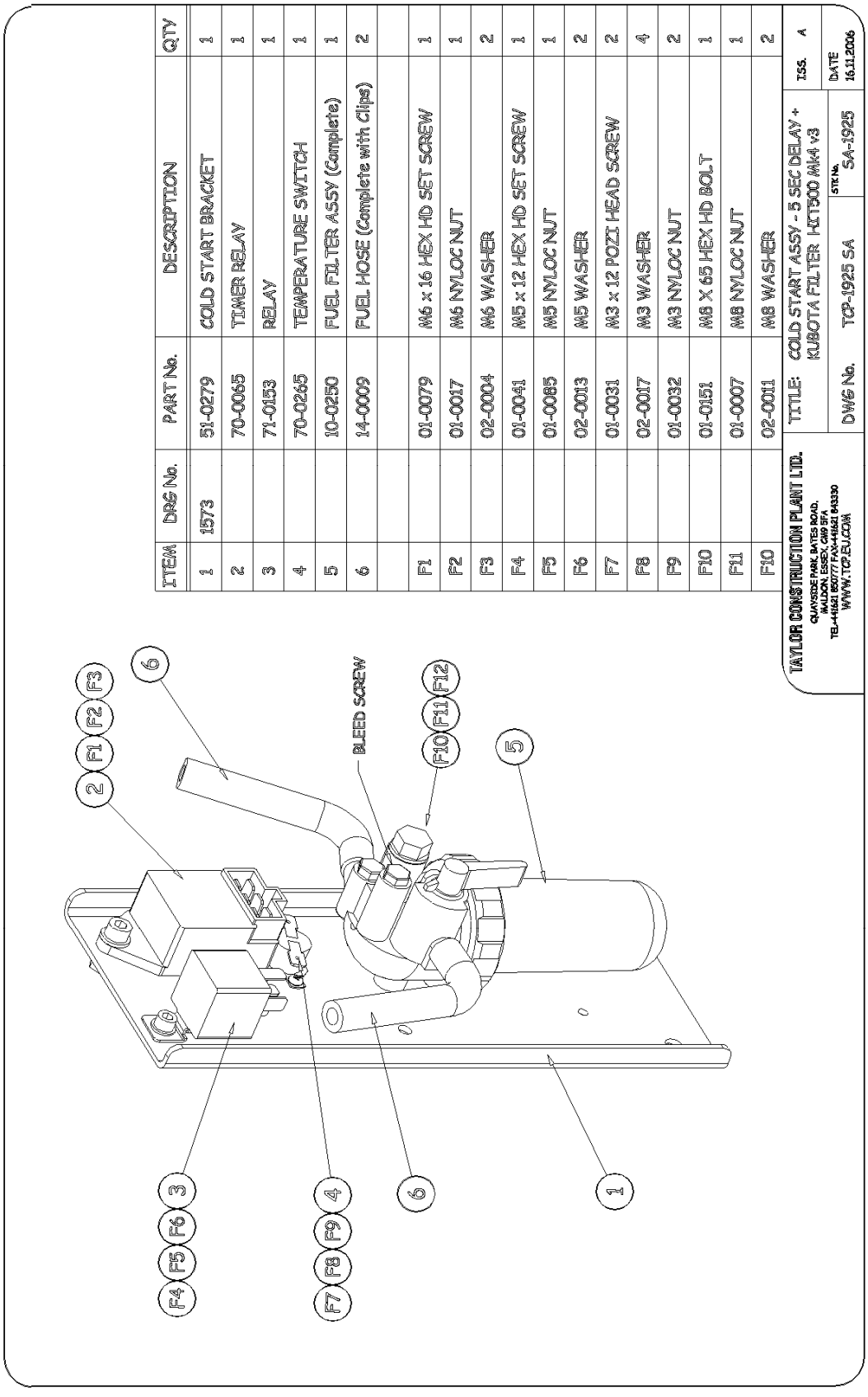
TITLE: ENGINE SERVICE KIT HITSOO MK4 v3 - 2006
DWG No. TCP-1928-02 SA
STK No.
ISS. A
DATE 20.11.2006

7.12 Cooler Assy, Hydraulic SA-1470



ITEM	DRG No.	PART No.	DESCRIPTION	QTY
1	1416	51-0185	OIL COOLER MOUNT PLATE	1
2		61-0007	OIL COOLER WITH 12V FAN	1
			SEE ASSY NOTES ABOVE	
3	1459 SA - ITEM 38		1/2 BSP MALE-MALE	1
4	1459 SA - ITEM 54		1/2 COPPER SEAL	1
5	1459 SA - ITEM 49		3/4 BLANKING PLUG	1
6	1459 SA - ITEM 53		3/4 BONDED SEAL	2
7	1459 SA - ITEM 45		3/4 - 5/8 MALE - MALE	1
8		70-0005	DIODE	1
F1		01-0045	M6 x 25 SKT HEAD SCREW	4
F2		02-0004	M6 WASHER	4
F3		03-0009	M6 LUG NUTS	4

7.13 Cold Start Assy Kubota Filter SA-1925



ITEM	DRG No.	PART No.	DESCRIPTION	QTY
1	1573	51-0279	COLD START BRACKET	1
2		70-0065	TIMER RELAY	1
3		71-0153	RELAY	1
4		70-0265	TEMPERATURE SWITCH	1
5		10-0250	FUEL FILTER ASSY (Complete)	1
6		14-0009	FUEL HOSE (Complete with clips)	2
F1		01-0079	M6 x 16 HEX HD SET SCREW	1
F2		01-0017	M6 NYLOC NUT	1
F3		02-0004	M6 WASHER	2
F4		01-0041	M5 x 12 HEX HD SET SCREW	1
F5		01-0085	M5 NYLOC NUT	1
F6		02-0013	M5 WASHER	2
F7		01-0031	M3 x 12 POZI HEAD SCREW	2
F8		02-0017	M3 WASHER	4
F9		01-0032	M3 NYLOC NUT	2
F10		01-0151	M8 X 65 HEX HD BOLT	1
F11		01-0007	M8 NYLOC NUT	1
F10		02-0011	M8 WASHER	2

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TITLE: COLD START ASSY - 5 SEC DELAY + KUBOTA FILTER HOT900 Mk4 v3

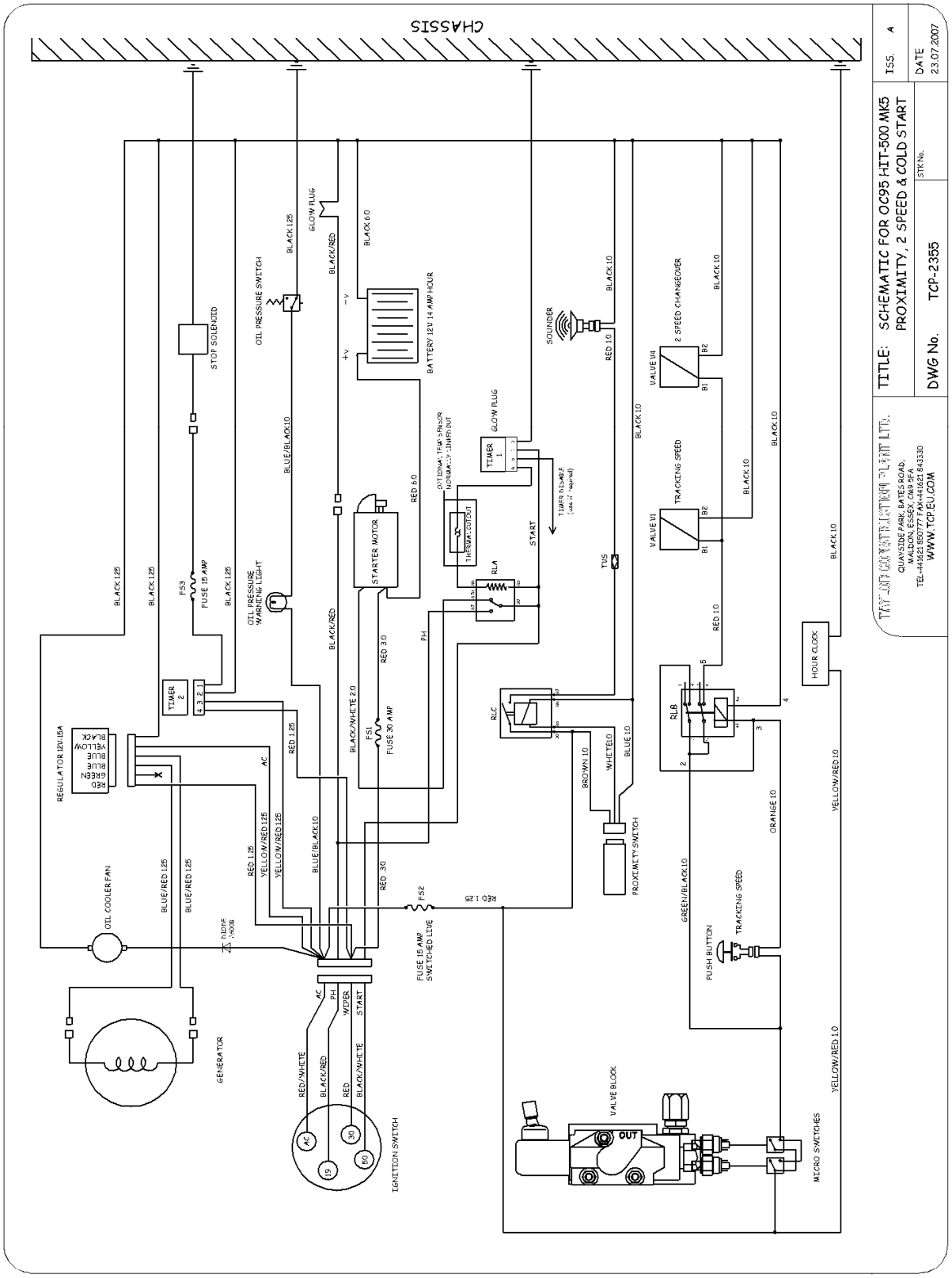
DWG No. TCP-1925 SA

STK No. SA-1925

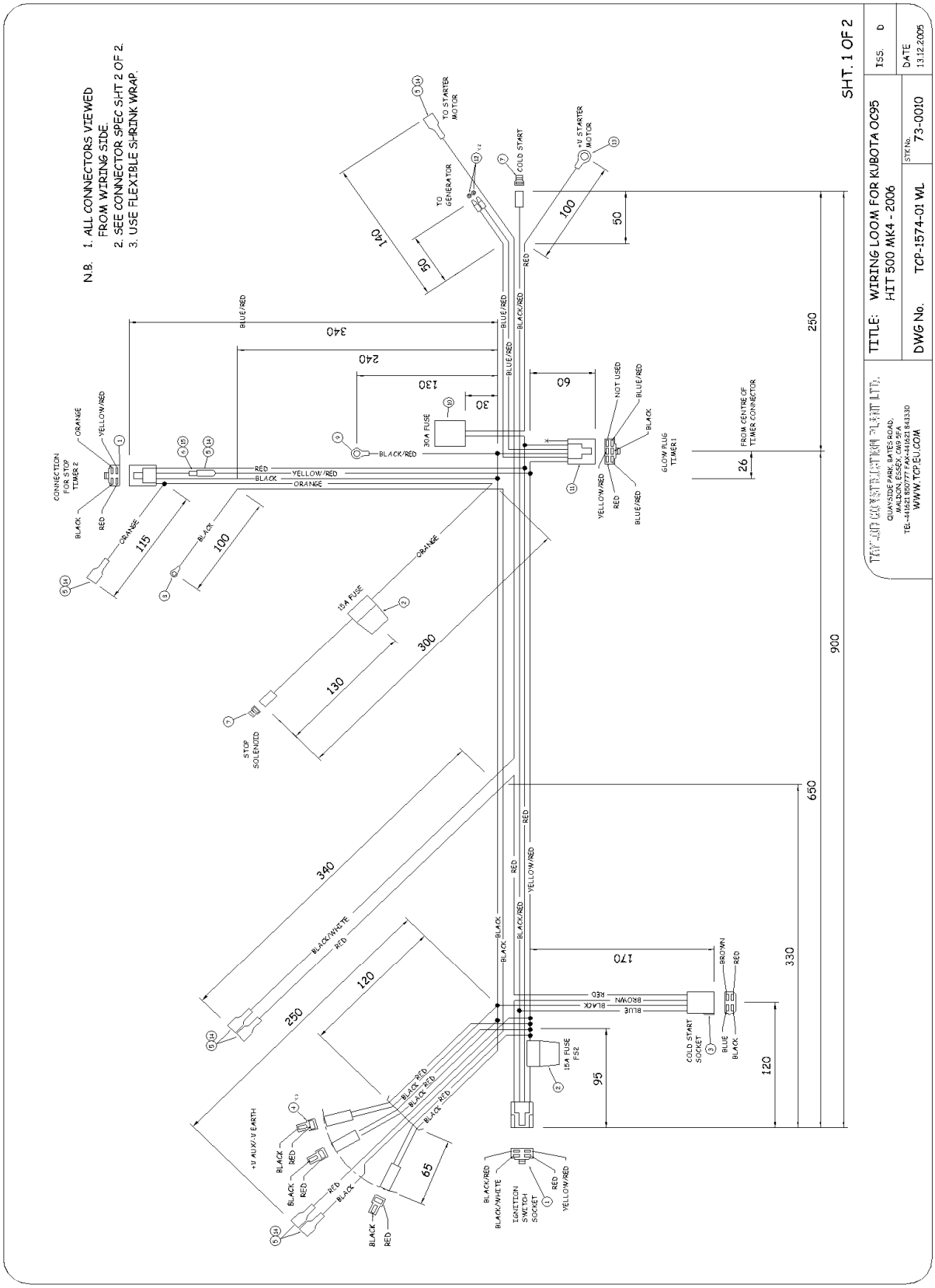
ISS. A

DATE 16.11.2006

7.14 Electrical Schematic OC95 2355



7.15 Loom for Kubota OC95 1574-01



Sh 1 of 2

ITEM	STK. No.	DESCRIPTION	MANUFACTURER	PART No.	QTY
1	———	RECEPTACLE HOUSING 4 WAY (S)	SUPPLIED WITH ENGINE		2
2	70-0149	IN-LINE FUSE HOLDER	DURITE	0-376-90	2
3	70-0054	RECEPTACLE HOUSING 4 WAY	TYCO ELECTRONICS	180900-0	1
4	70-0050	RECEPTACLE HOUSING 2 WAY 'T'	TYCO ELECTRONICS	180907-0	3
5	70-0060	6.3 IN-LINE RECEPTACLE	RS	503LT	7
6	70-0062	6.3 BLADE	RS	DOM6.3-2.5 LT	1
7	———	RECEPTACLE HOUSING 1 WAY (S)	SUPPLIED WITH ENGINE		2
8	———	M5 RING CRIMP TERMINAL	DURITE	0-001-02	1
9	———	M6 RING CRIMP TERMINAL	SUPPLIED WITH ENGINE		1
10	———	FUSE HOLDER (S)	SUPPLIED WITH ENGINE		1
11	———	RECEPTACLE HOUSING 6 WAY (S)	SUPPLIED WITH ENGINE		1
12	———	Ø4 CRIMP MALE BULLET	SUPPLIED WITH ENGINE		2
13	———	M8 RING CRIMP TERMINAL	SUPPLIED WITH ENGINE		1
14	70-0061	RECEPTACLE COVER	RS	1505PVC	7
15	70-0063	BLADE COVER	RS	1504PVC	1
16	70-0058	RECEPTACLE 0.8-2.1mm	TYCO ELECTRONICS	42282-2	10
17	70-0193	BLADE FUSE 15A	DURITE	0-375-15	1

SHT. 2 OF 2

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MALDON, ESSEX, CM9 5FA
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WWW.TCP.EU.COM

TITLE: WIRING LOOM FOR KUBOTA OC95 HIT 500 MK4 - 2006

ISS. D

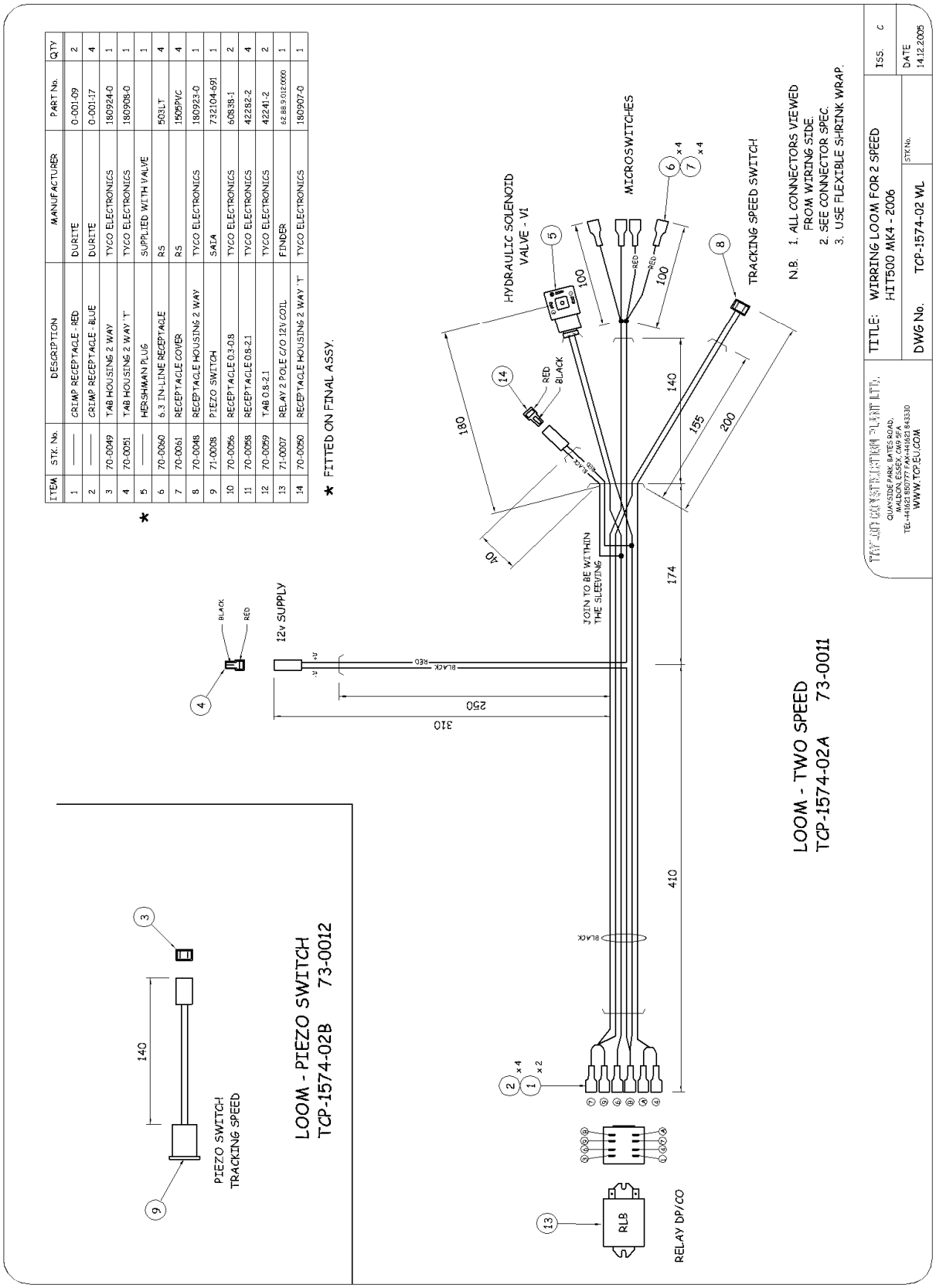
DWG No. TCP-1574-01 WL

STK No. 73-0010

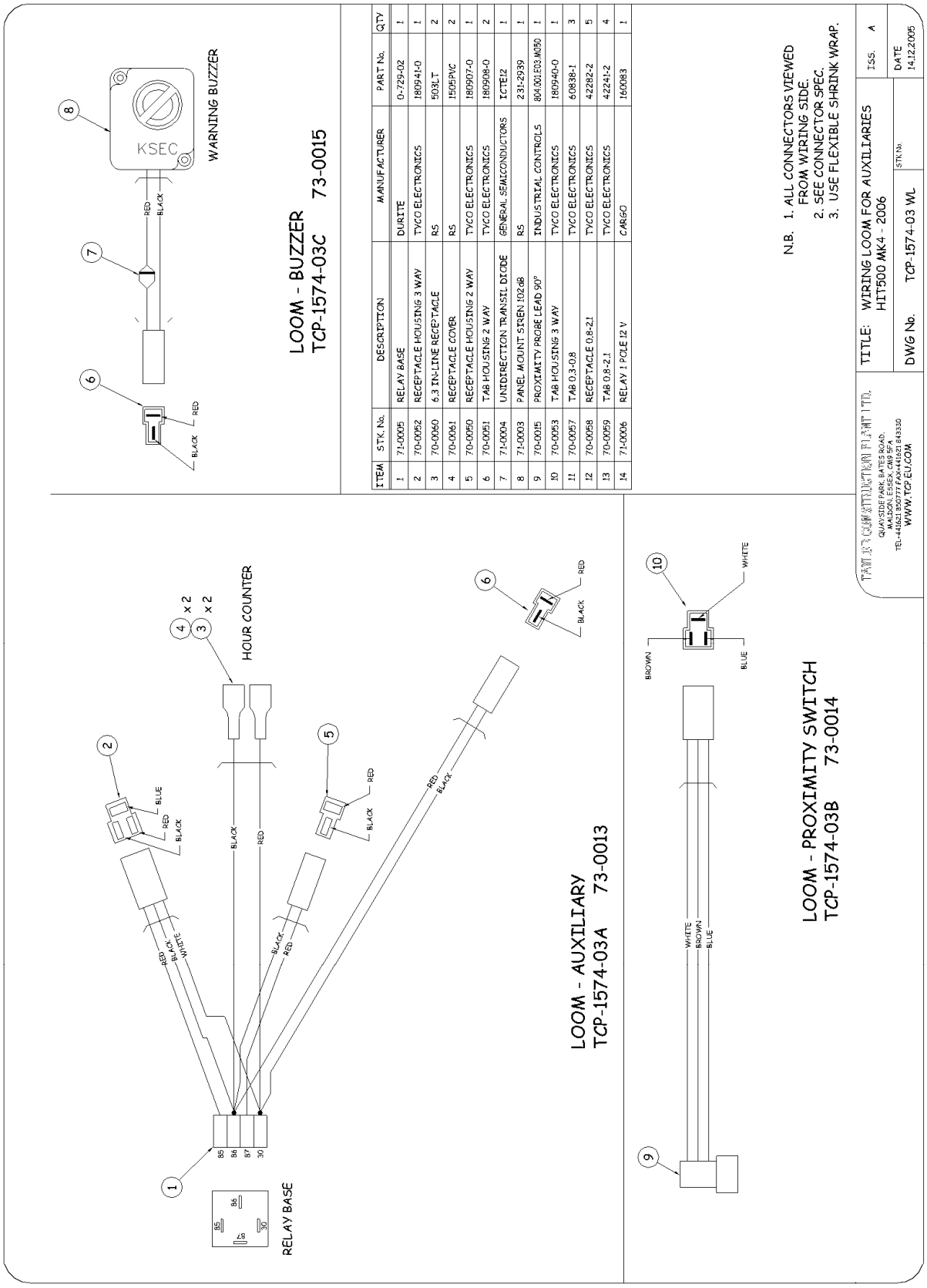
DATE 13.12.2005

Loom for Kubota OC95 1574-01 Sh 2 of 2

7.16 Two Speed Loom WL-1574-02

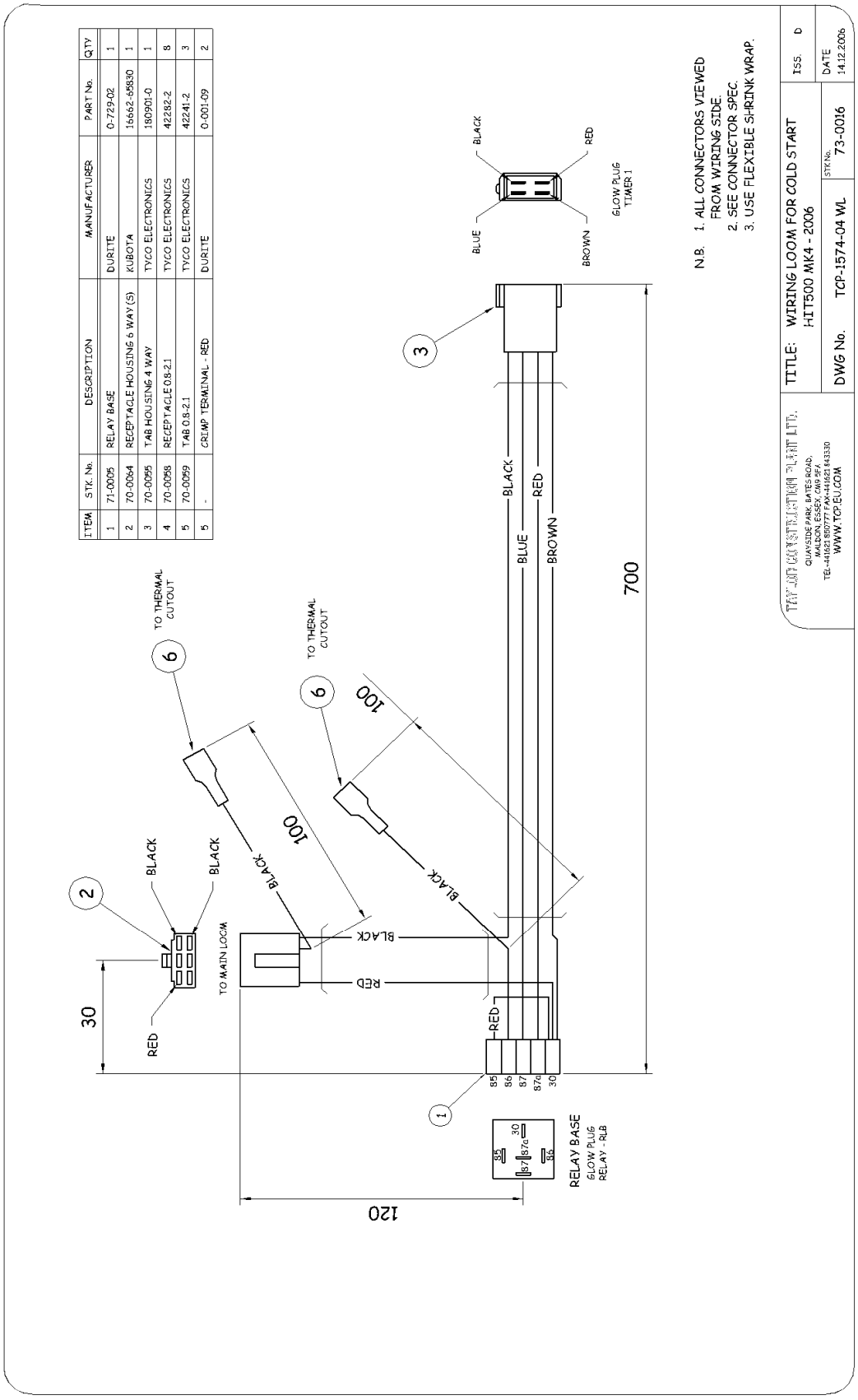


7.17 Wiring For Auxiliaries WL-1574-03

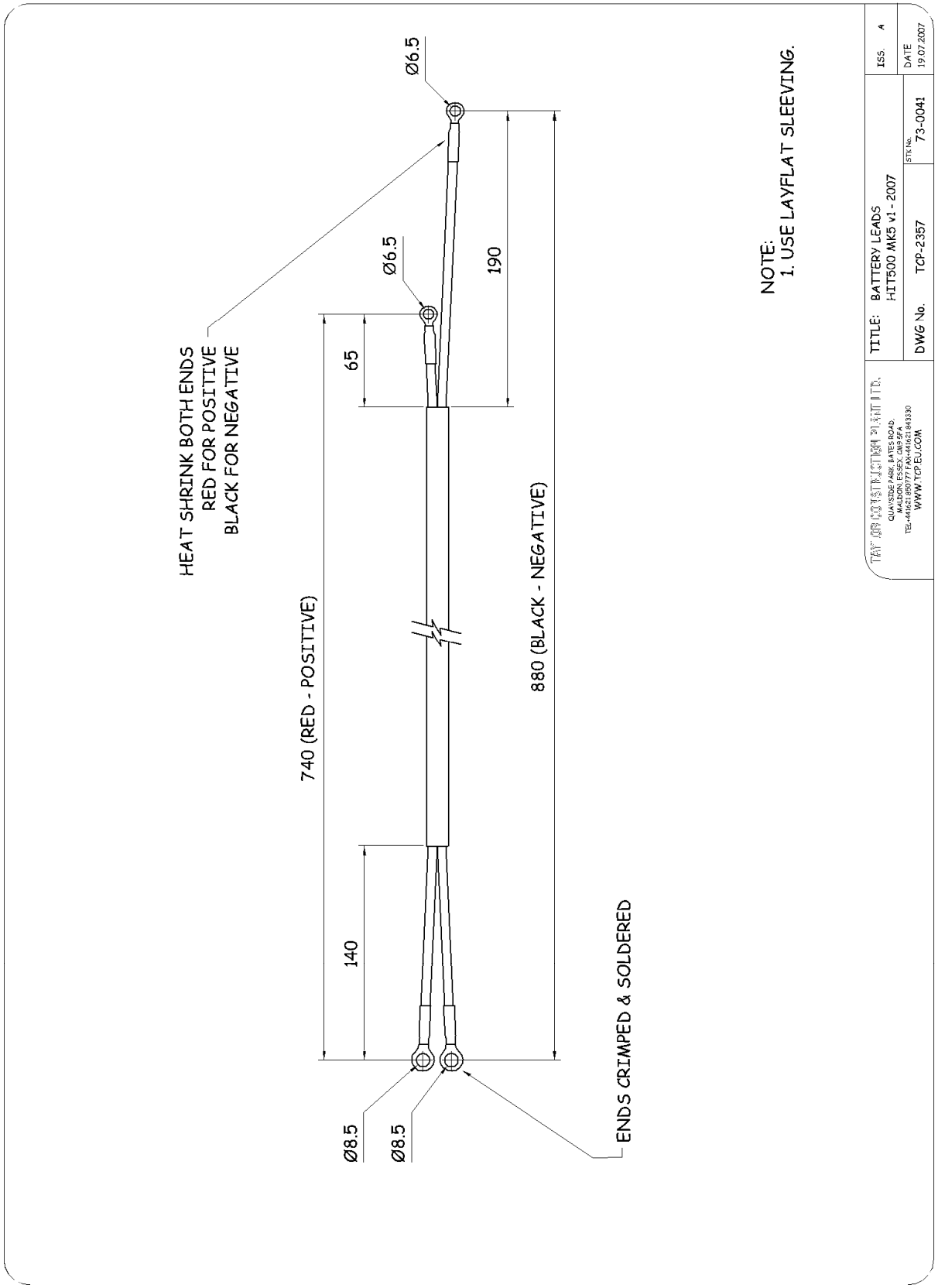


ITEM	STK. No.	DESCRIPTION	MANUFACTURER	PART No.	QTY
1	71-0005	RELAY BASE	DURITE	0-729-02	1
2	70-0052	RECEPTACLE HOUSING 3 WAY	TYCO ELECTRONICS	180941-0	1
3	70-0060	6.3 IN-LINE RECEPTACLE	RS	503LT	2
4	70-0061	RECEPTACLE COVER	RS	150SPVC	2
5	70-0050	RECEPTACLE HOUSING 2 WAY	TYCO ELECTRONICS	180907-0	1
6	70-0051	TAB HOUSING 2 WAY	TYCO ELECTRONICS	180908-0	2
7	71-0004	UNIDIRECTION TRANSIL DIODE	GENERAL SEMICONDUCTORS	TGTEI2	1
8	71-0003	PANEL MOUNT SIREN 102dB	RS	231-2939	1
9	70-0015	PROXIMITY PROBE LEAD 90°	INDUSTRIAL CONTROLS	8040001E03.M050	1
10	70-0053	TAB HOUSING 3 WAY	TYCO ELECTRONICS	180940-0	1
11	70-0057	TAB 0.3-0.8	TYCO ELECTRONICS	60838-1	3
12	70-0058	RECEPTACLE 0.8-2.1	TYCO ELECTRONICS	42282-2	5
13	70-0059	TAB 0.8-2.1	TYCO ELECTRONICS	42241-2	4
14	71-0006	RELAY 1 POLE 12 V	CARGO	160083	1

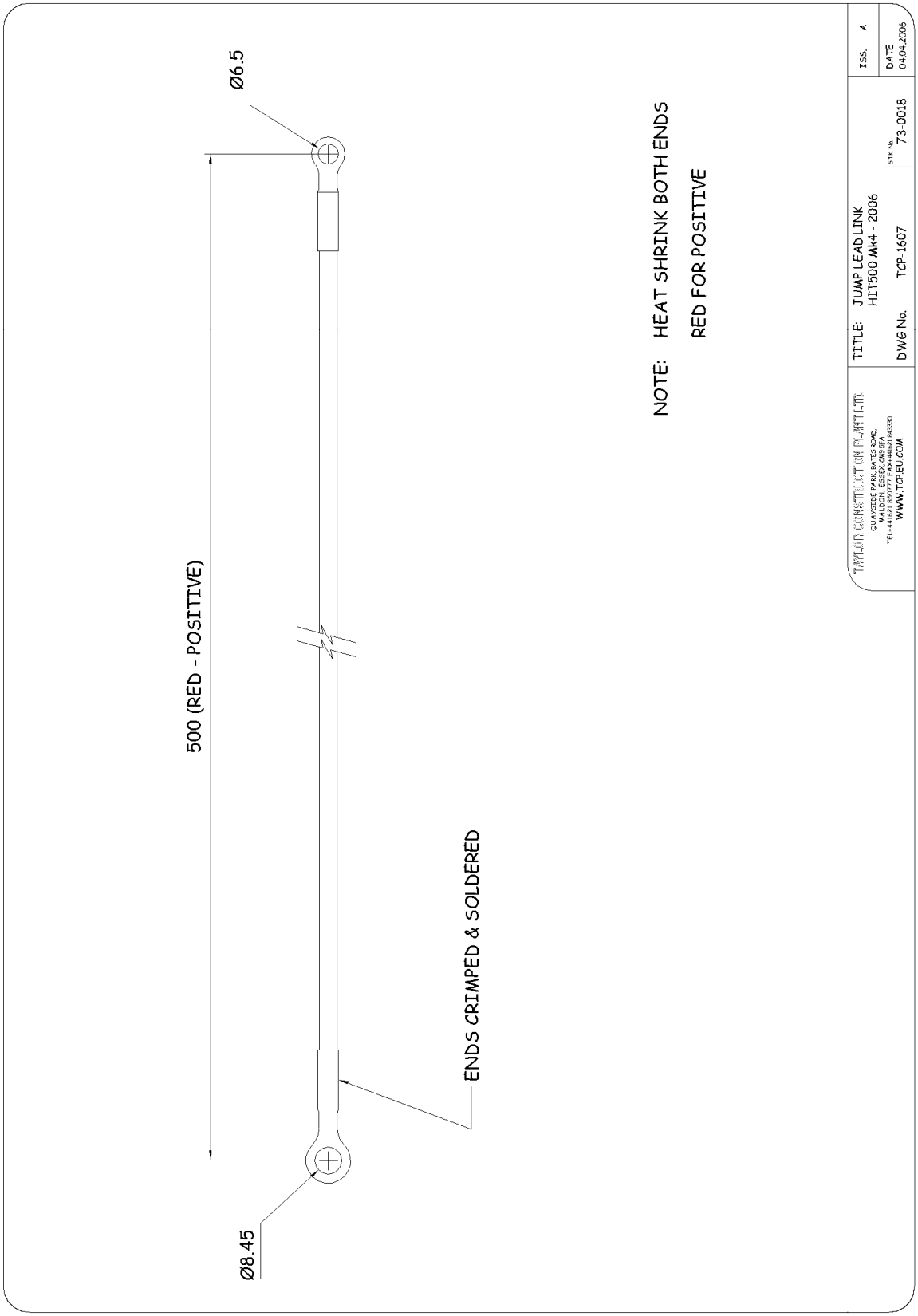
7.18 Loom for Cold Start WL-1574-04



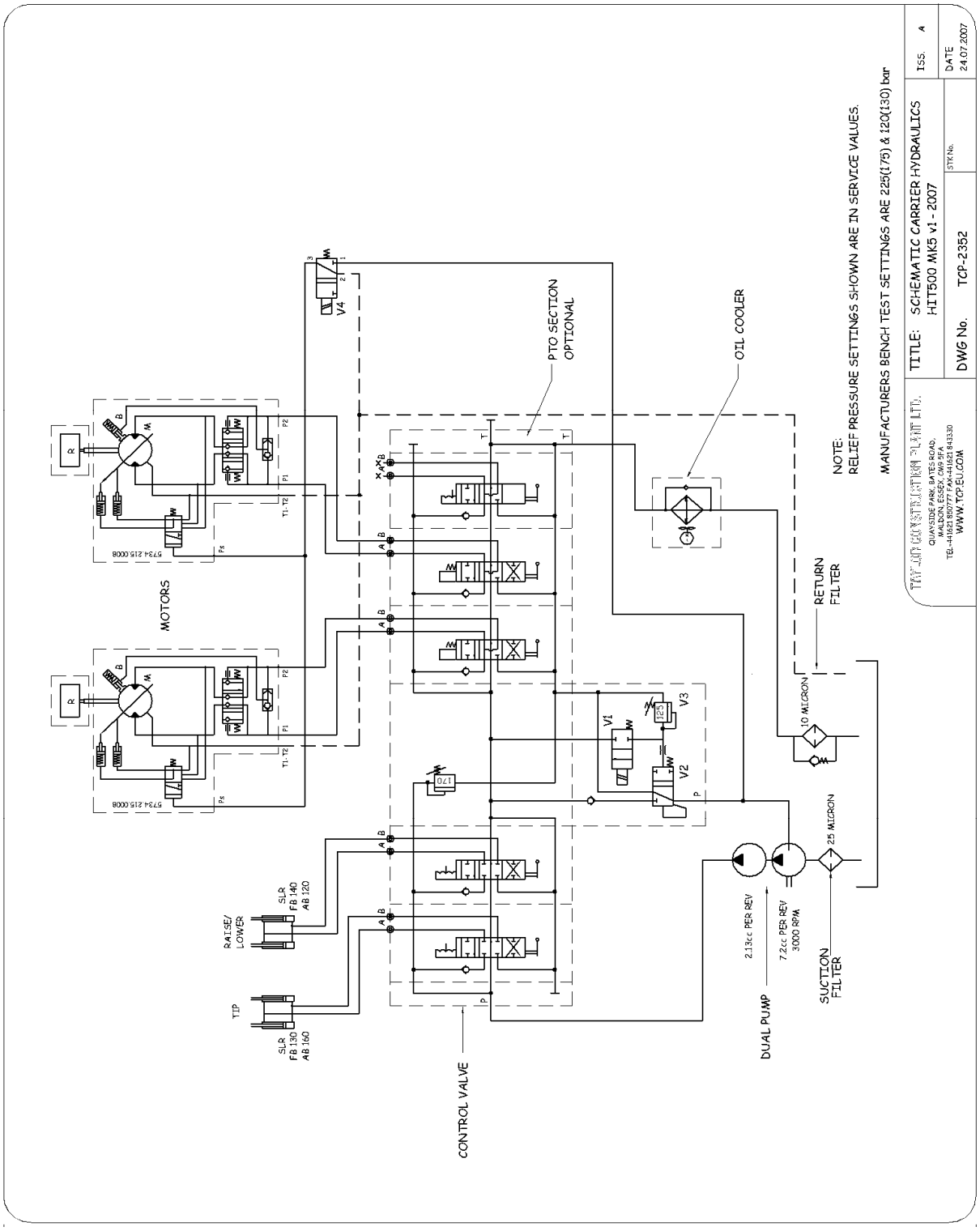
7.19 Battery Leads.2357



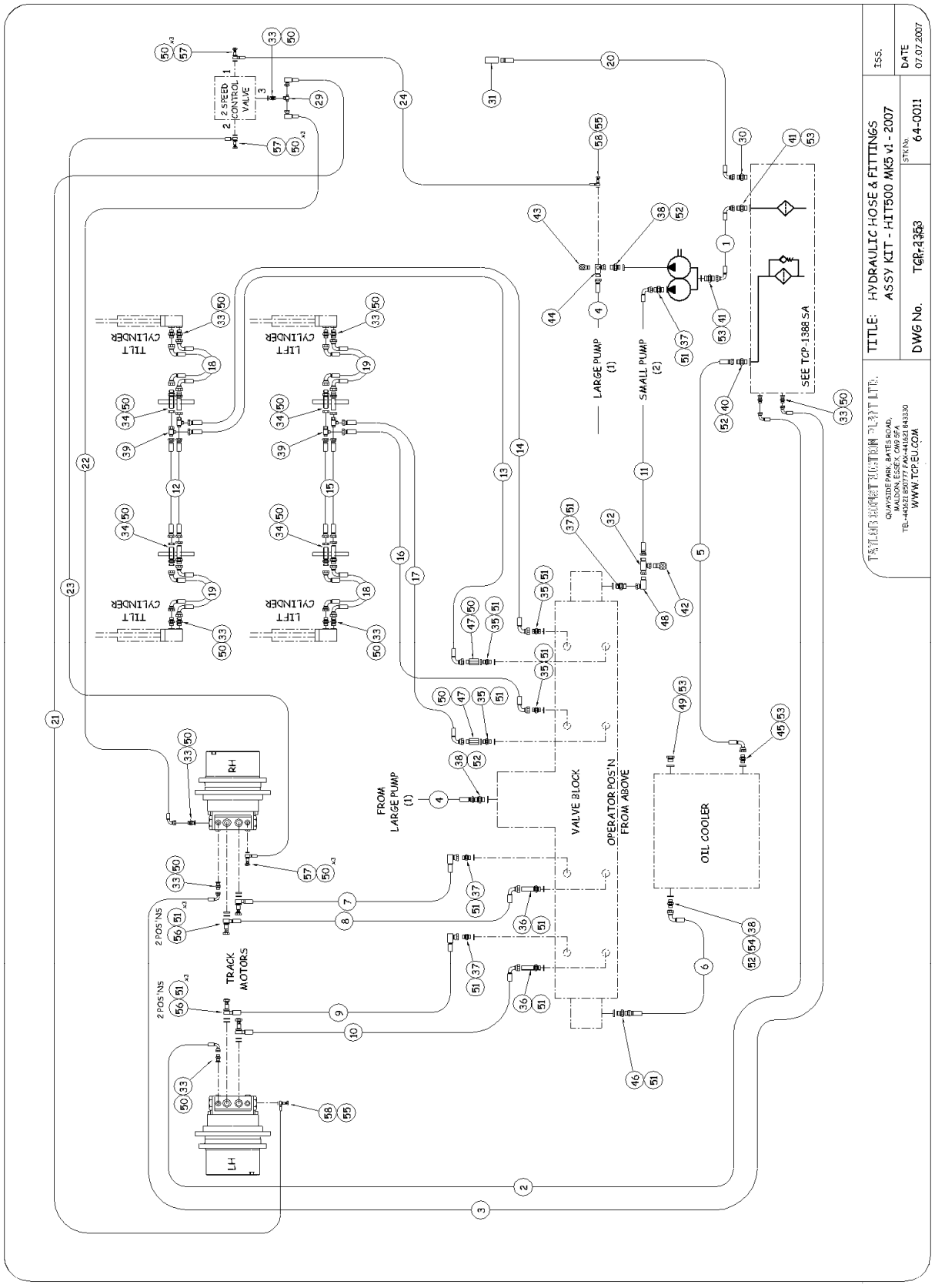
7.20 Jump Lead Link 1607



7.21 Carrier Hydraulics 2352



7.22 Hydraulic Hose Assy SA-2353



ITEM	DESCRIPTION	WHERE USED	STK No	QTY
1	¾ 1w 380 Cut Length 90°C-90°S @ 60°	Tank Suction To Pump	62-0090	1
2	¼ 1w 320 Cut Length 90°S-90°C @ 350° (Lefthand Motor)	Drains From Track Motors	62-0091	1
3	¼ 1w 320 Cut Length 90°S-90°C @ 270° (Righthand Motor)	Drains From Track Motors	62-0092	1
4	½ 2w 640 Cut Length FM-FM	Large Pump To Valve Block	62-0034	1
5	5/8 1w 540 Cut Length 90°C-ST Female	Oil cooler to Return Filter	62-0093	1
6	½ 1w 460 Cut Length 90°S-90°C @ 180°	Valve to Oil cooler	62-0094	1
7	3/8 2w 1325 Cut Length 90°C-3/8 Banjo @ 270°	Righthand Track Motor	62-0190	1
8	3/8 2w 1295 Cut Length 90°S-3/8 Banjo @ 270°	Righthand Track Motor	62-0191	1
9	3/8 2w 1325 Cut Length 90°C-3/8 Banjo @ 270°	Lefthand Track Motor	62-0190	1
10	3/8 2w 1295 Cut Length 90°S-3/8 Banjo @ 270°	Lefthand Track Motor	62-0191	1
11	3/8 2w 680 Cut Length 90°S-Fm	Small Pump To valve	62-0035	1
12	¼ 1w 430 Cut Length 45° B/E @ 0°	Cross Over Top Cylinders	62-0018	2
13	¼ 1w 450 Cut Length 45°–90°S @ 90°	Valve To Cylinder	62-0099	1
14	¼ 1w 450 Cut Length 45°–90°C @ 135°	Valve To Cylinder	62-0120	1
15	¼ 1w 450 Cut Length 45° B/E @ 0°	Cross Over Bottom Cylinders	62-0018	2
16	¼ 1w 740 Cut Length 45°–90°S @ 180°	Valve To Cylinder	62-0121	1
17	¼ 1w 740 Cut Length 45°–90°C @ 180°	Valve To Cylinder	62-0122	1
18	¼ 1w 550 Cut Length 90°C-90°S Opposite To Lay @ 270° Sleeved In Pairs	Chassis To Cylinder	62-0123	2 Prs
19	¼ 1w 550 Cut Length 90°C-90°S Opposite To Lay @ 90° Sleeved In Pairs	Chassis To Cylinder	62-0124	2 Prs
20	½ 1w 550 Cut Length 90°S-Male	Air Breather Extension	62-0125	1
21	3/16 R7 420 Cut Length 1/4 BSP 90°C-1/8 Banjo @ 335°	Lefthand Track Motor	62-0192	1
22	3/16 R7 350 Cut Length 1/4 BSP 90°C-90°S @ 225°	Righthand Track Motor	62-0193	1
23	1/4 1w 580 Cut Length 1/4 BSP Banjo-1/4 Banjo @ 0°	C/O Valve to Tank	62-0194	1
24	1/4 1w 660 Cut Length 1/4 BSP Banjo-1/8 Banjo @ 0°	Pump to C/O Valve	62-0195	1
29	1/4 BSP Male-Male-Female Swivel Tee		62-0196	1
30	1/2 - M22 Male-Male		62-0080	1
31	1/2 - 5/8 Barrel		62-0081	1
32	3/8 Male-Female-Female Tee		62-0082	1
33	1/4 BSP Male-Male		62-0001	11
34	1/4 Extended Bulkhead C/W Nuts		62-0005	8
35	3/8 -1/4 Male-Male		62-0031	4
36	3/8 BSP Male-Male Bulkhead (No Nuts)		62-0083	2
37	3/8 BSP Male-Male		62-0007	4
38	1/2 BSP Male-Male		62-0009	3
39	1/4 BSP Male-Female-Male Swivel Tee		62-0003	4
40	1/2 - 5/8 BSP Male-Male		62-0010	N/R
41	3/4 BSP Male-Male		62-0013	1
42	3/8 BSP Test point		62-0015	1
43	1/8 BSP Test point		62-0084	1
44	1/2 Male-Female Block Elbow (Modified - See TCP-2344)		62-00??	1
45	3/4 - 5/8 BSP Male-Male		62-0086	1
46	3/8 - 1/2 BSP Male-Male		62-0087	1
47	1/4 BSPP - 1/4 BSPP Male-Female Extended		62-0088	2
48	3/8 BSP Male-Female Block Elbow		62-0113	1
49	3/4 Blanking plug		62-0118	1
50	1/4 Bonded Seal		62-0002	27
51	3/8 Bonded Seal		62-0008	24
52	1/2 Bonded Seal		62-0011	3
53	3/4 Bonded Seal		62-0014	3
54	1/2 Copper Seal		62-0089	1
55	1/8 Bonded Seal		62-0197	4
56	3/8 Banjo Bolt		62-0198	4
57	1/4 Banjo Bolt		62-0199	3
58	1/8 Banjo Bolt		62-0200	2
	Denotes Items new or changed from Mk4			

ISS. A
DATE 07.07.2007
TITLE: HYDRAULIC HOSE & FITTINGS ASSY KIT - HIT500 MK5 v1 - 2007
STK No. 64-0011
DWG No. TCP-2353 Sht. 2 of 2
TCP (UK) LTD. QUAYSIDE PARK, BATESROAD, MALDON, ESSEX, CM9 5FA. TEL: +44(0)1621 850777 FAX: +44(0)1621 843330 WWW.TCPEU.COM

7.23 Hydraulic Tank Assy SA-1388

ITEM	DRG No.	PART No.	DESCRIPTION	QTY
1	008	50-0001	TANK	1
2	037	50-0002	COVER, TANK	1
3a		62-0013	3/4" x 3/4" MALE - MALE	1
3b	1459 SA - ITEM 53		3/4" x 3/4" MALE - MALE	1
4		63-0005	SUCTION FILTER	1
5		63-0001	FILTER ASSY C/W CAP	1
6		63-0002	REPLACEMENT CARTRIDGE	-
7		63-0003	DIPSTICK	1
8		63-0004	BREATHER, PRESSURISED	1
9	1459 SA - ITEM 40		1/2 - 5/8 MALE MALE	1
10	1459 SA - ITEM 53		1/2 BONDED WASHER	1
11		62-0001	1/4 - 1/4 MALE MALE	2
12		62-0002	1/4 BONDED WASHER	3
13		62-0004	DRAIN PLUG	1
14		62-0014	3/4 BONDED WASHER	1
15	1459 SA - ITEM 30		1/2 - M22 MALE MALE	1
F1		01-0001	M10 x 35 HEX HD SET SCREW	1
F2		02-0002	M10 WASHER	2
F3		01-0002	M6 x 20 HEX HD SET SCREW	8
F4		02-0003	M6 SPRING WASHHER	8
F5		02-0004	M6 WASHER	8

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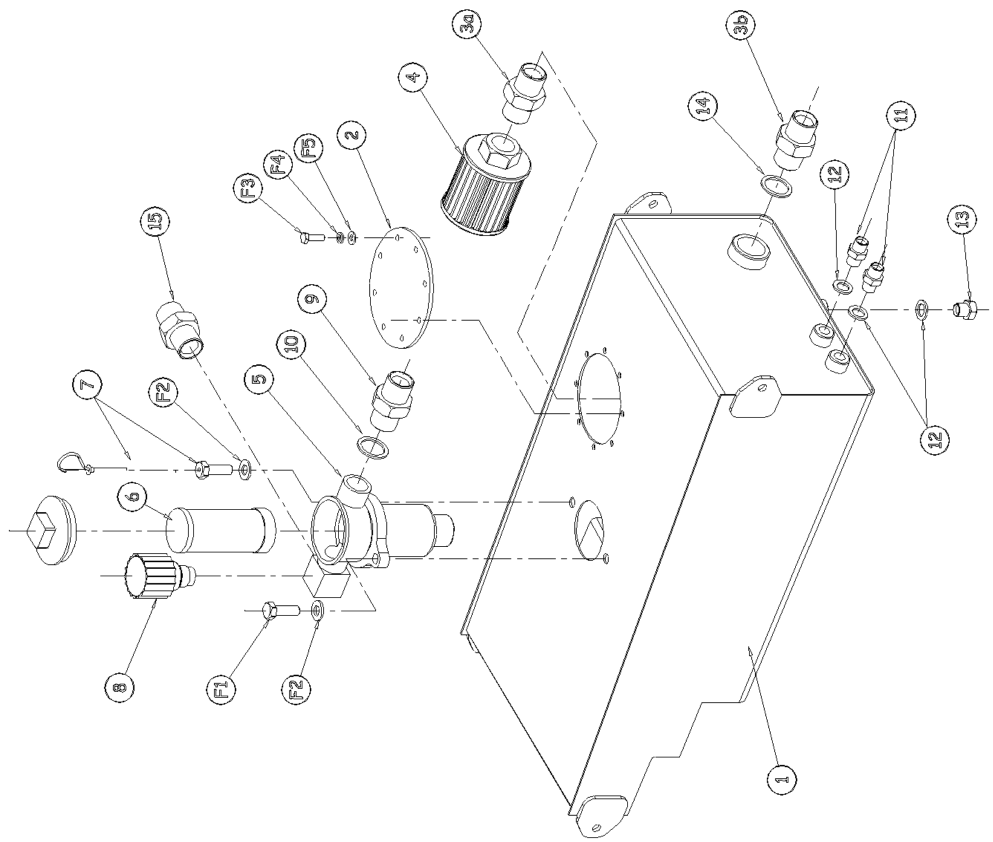
TITLE: HYDRAULIC TANK ASSY HIT500 MK3 & MK4

ISS. A

DWG No. TCP-1388 SA

STK No. 63-0007

DATE 30.01.2006



7.24 Control Valve SA-1598

ITEM	DRG No.	PART No.	DESCRIPTION	QTY
1		60-0035	VALVE MODULE COMPLETE - RAMS	2
2		60-0034	VALVE MODULE COMPLETE - TRACKS	2
3		60-0137	END CAP RH	1
4		60-0138	END CAP LH	1
5		60-0012	RELIEF CARTRIDGE	1
6		60-0011	FLOW DIVIDER	1
7		60-0128	COIL MODULE 12V COMPLETE	1
8		72-0003	SWITCH MODULE COMPLETE	2
9		70-0203	MICRO-SWITCH ONLY PER MODULE	1
10		60-0021	CONTROL LEVER - BLACK	2
11		60-0020	CONTROL LEVER - GREEN	1
12		60-0023	CONTROL LEVER - YELLOW	1
13		60-0046	SEAL KIT PER MODULE	1

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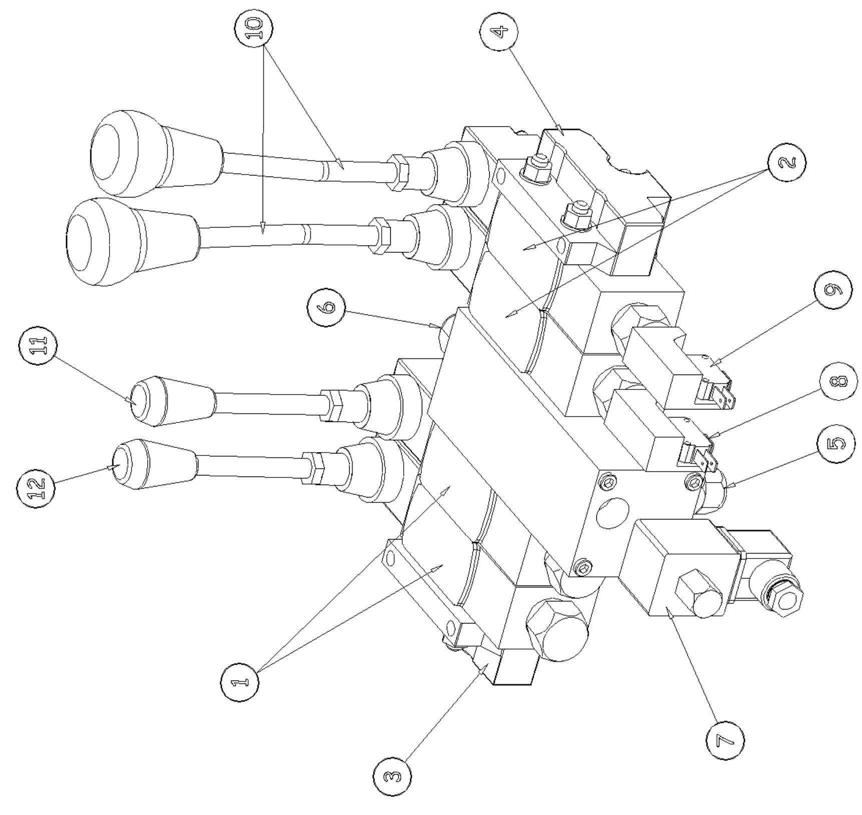
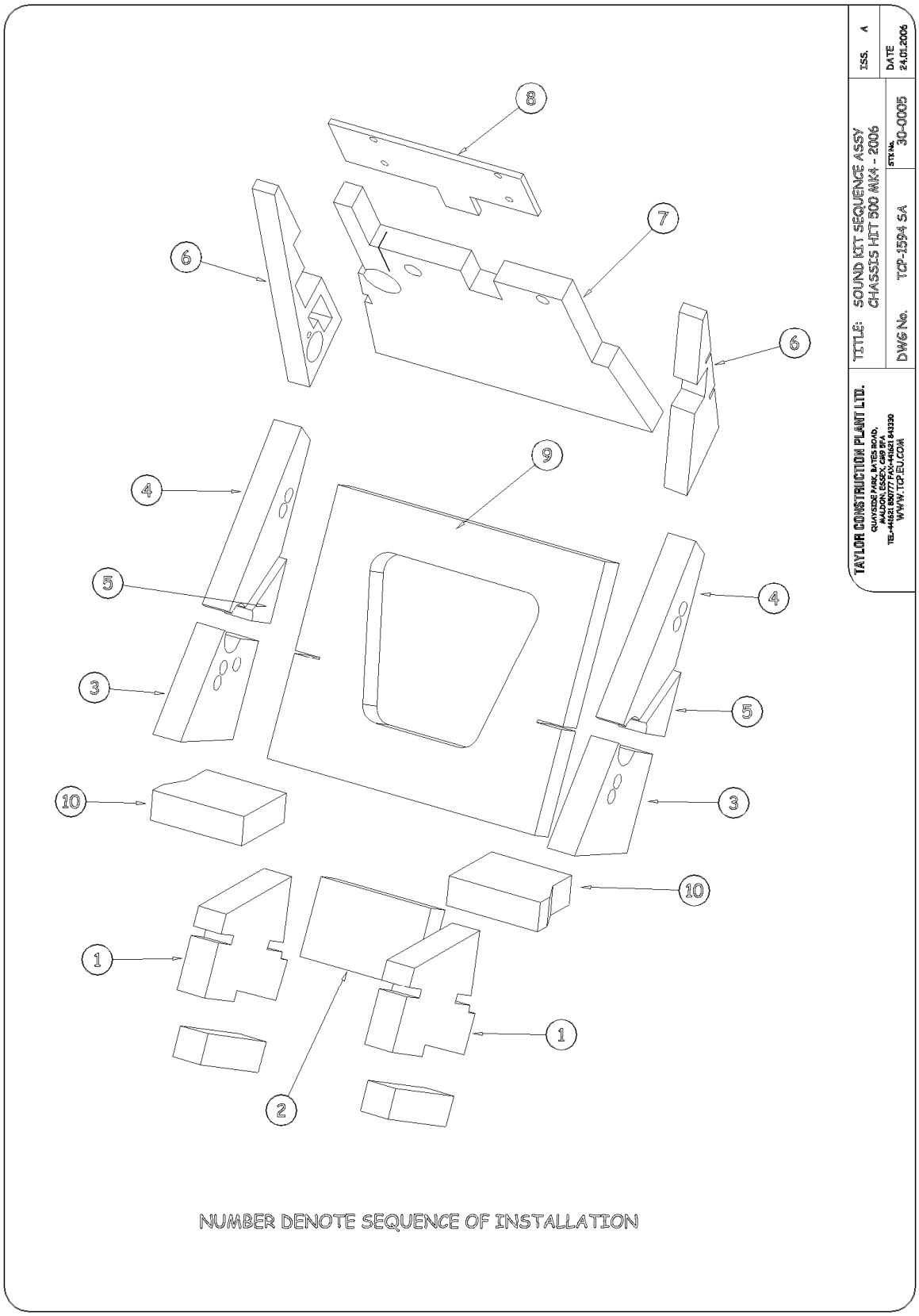
TITLE: CONTROL VALVE ASSY MK4
HIT500 MK4 - 2006

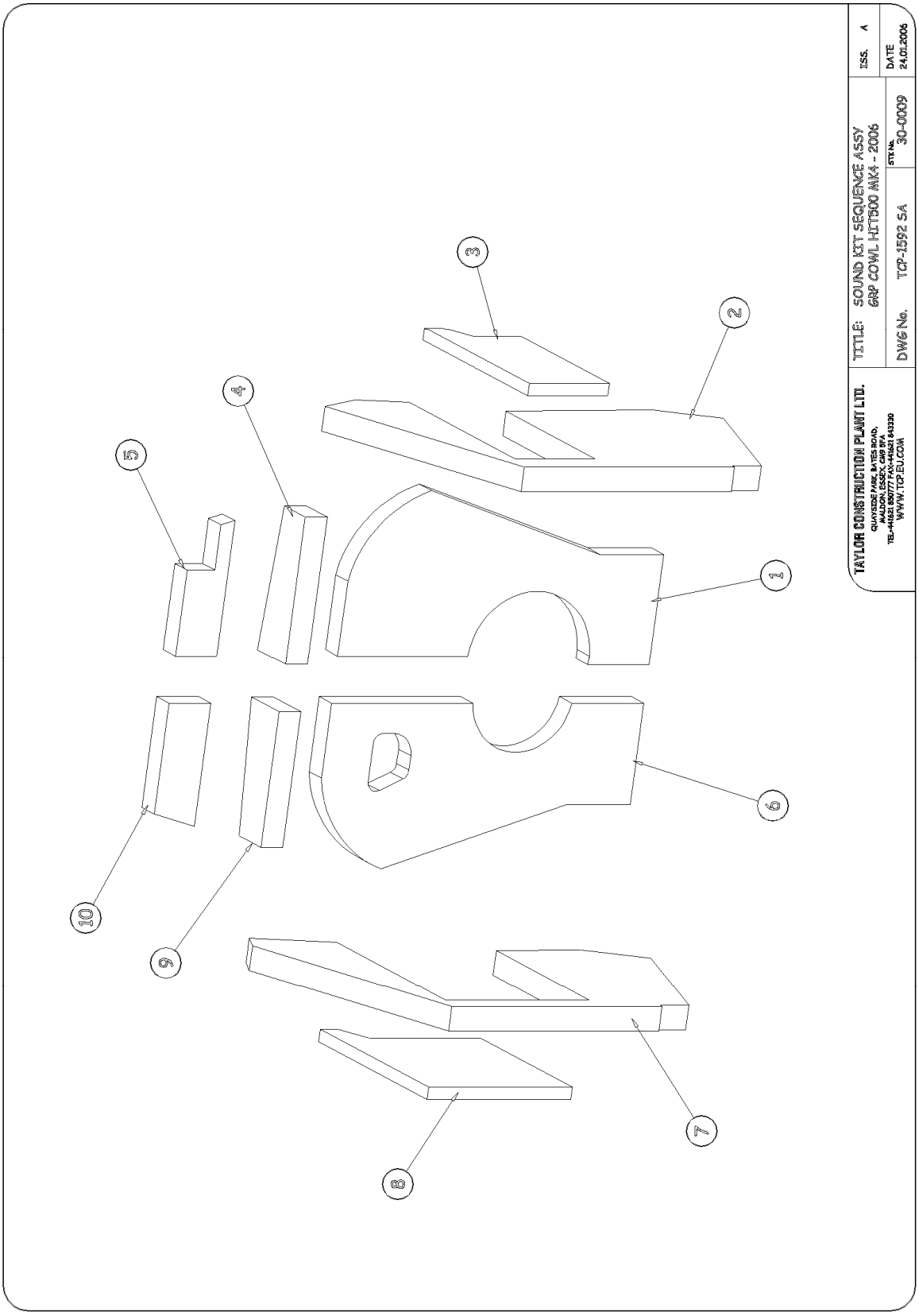
DWG No. TCP-1598 SA
STK No. 60-0003
ISS. A
DATE 15.02.2006



7.25 Sound Kit Seq. Assy Chassis 1591 SA



7.26 Sound Kit Seq. Assy 1592 SA



Appendix A Nut & Bolt Torque Specification

1. Specific Torque Settings

Track motor to chassis	70 Nm
Sprocket to track motor	70 Nm
Rams to chassis/body	120 Nm
Lifting eye to chassis	85 Nm
Fuel filler hose clip	10 Nm
Hydraulic tank drain plug	34 Nm
Idler and bottom rollers	49 Nm

2. Generic Torque Settings

Bolts not defined above should be tightened to the torque settings listed in Table A-1.

Friction coefficient total 0.14 for screws and nuts without after treatment as well as for phosphate nuts.

Tighten by hand.

If nothing special is indicated, select correct torque limits from the following tabulations:

Size	6.9 Some Engine Bolts		8.8 Standard Hex Bolt		10.9 Some Engine Bolt		12.9 Standard Cap head	
	Nm	(lbfft)	Nm	(lbfft)	Nm	(lbfft)	Nm	(lbfft)
M6	8.5	(6.3)	10	(7.4)	14	(10.3)	17	(12.5)
M8	21	(15.5)	25	(18.4)	35	(25.8)	41	(30.2)
M10	41	(30.2)	49	(36.1)	69	(50.9)	83	(61.2)
M12	72	(53.1)	86	(63.4)	120	(88.5)	145	(106.9)
M14	115	(85)	135	(100)	190	(140)	230	(170)
M16	180	(133)	210	(155)	295	(218)	355	(262)
M18	245	(181)	290	(214)	400	(295)	485	(358)
M20	345	(255)	410	(302)	580	(428)	690	(509)
M22	465	(343)	550	(406)	780	(575)	930	(686)
M24	600	(443)	710	(524)	1000	(738)	1200	(885)
M27	890	(656)	1050	(774)	1500	(1106)	1800	(1328)
M30	1200	(885)	1450	(1070)	2000	(1475)	2400	(1770)

Table A-1 Torque settings for Metric ISO Thread DIN 13