



Automatic Diesel Engine Shutdown System and Self Exciting Flameproof Alternator for hazardous area applications

Selection, Application and Maintenance

Series 110
Series 111

SYSTEM DESCRIPTION

The Series 110 and Series 111 Systems monitor engine speed, temperatures and oil pressure. Should any one of these fall outside of pre-set limits, power is withdrawn from the air intake shut down valve solenoid(s) thereby causing both the air intake and fuel valves to close and shut down the engine. A lever and cable arrangement also enables direct manual emergency closure of air intake shut down valve and fuel valve.

The temperature and pressure sensors are pre-set. Overspeed is set after system installation using a simple push button located under a tamper proof cover. No calculations or knowledge with respect to the drive ratio of the alternator is required.

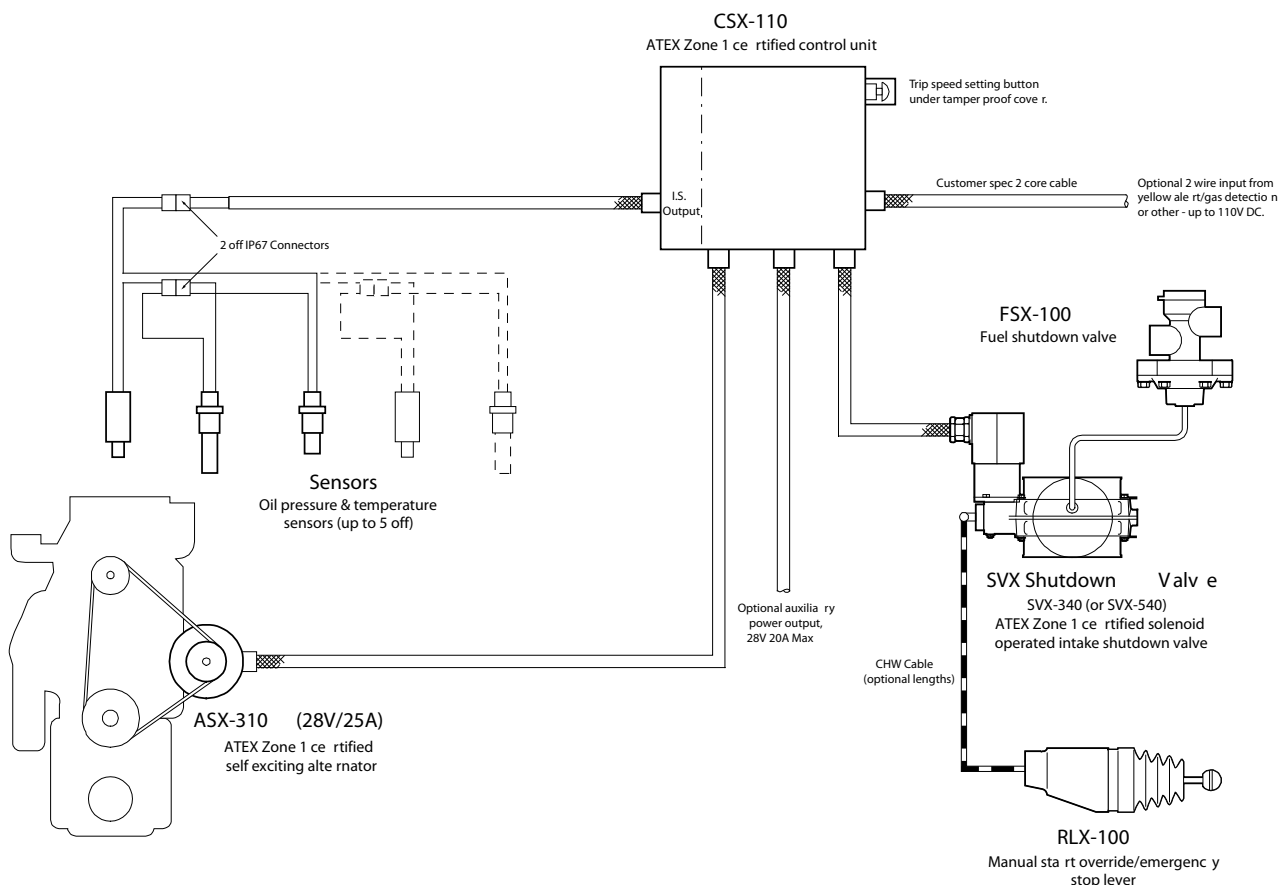
Both the Series 110 and 111 Systems have an

auxiliary power output option. Additionally the Series 110 can accept a shut down signal from an external system such as a Yellow Alert or Gas Detection System. The Series 111 has a second air intake shut down valve as may be required for example on some 'V' configuration engines.

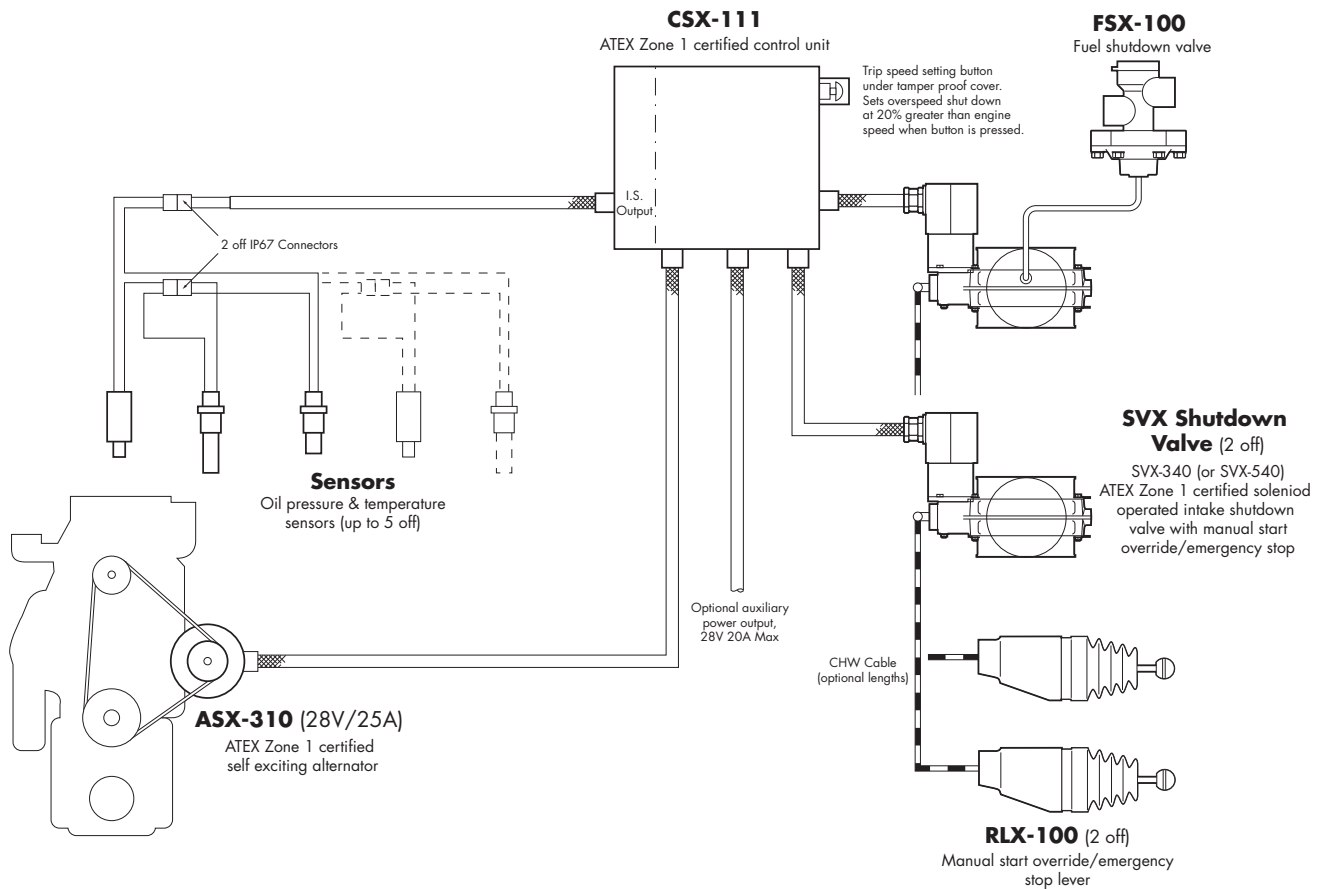
Designed for Zone1/Group IIB/T4 hazardous area application, these systems can be installed and operated completely independently from other systems on the engine and are particularly applicable where no battery or other electrical supply is available.

Series 110 and 111 systems also meet the Electromagnetic Compatibility (EMC) requirements of MIL STD 461E Clauses RE102 and RS103.

Series 110 Schematic



Series 111 Schematic



Important Notes

The Auxiliary Power Output could be used for example to charge a small battery with sufficient capacity to enable an engine management system to be powered during start up. This is applicable to both Series 110 and Series 111, but please note the battery to CSX Control Unit cable must be arranged to enable either manual or automatic disconnection when the engine is not running. If left connected the battery will slowly discharge.

To maintain full compliance with hazardous area and EMC requirements ensure:-

- a. All provided external earthing points and armoured/screened cables are properly bonded to the engine frame.
- b. Any connected electrical equipment is engineered to the requisite standard.

COMPONENT DESCRIPTION

Chalwyn CSX-110 and CSX-111 Control Units

Cast and machined aluminium enclosure and cover housing the system micro-processor, associated electronics and terminals together with the zener barrier interface with the sensor circuit. All input/outputs are via ATEX approved glands. The overspeed Trip Speed Setting Button is accessed by removal of a protective screw - see diagram below. A gasket bonded to the enclosure completes the sealing between cover and enclosure. Overall dimensions are given below.

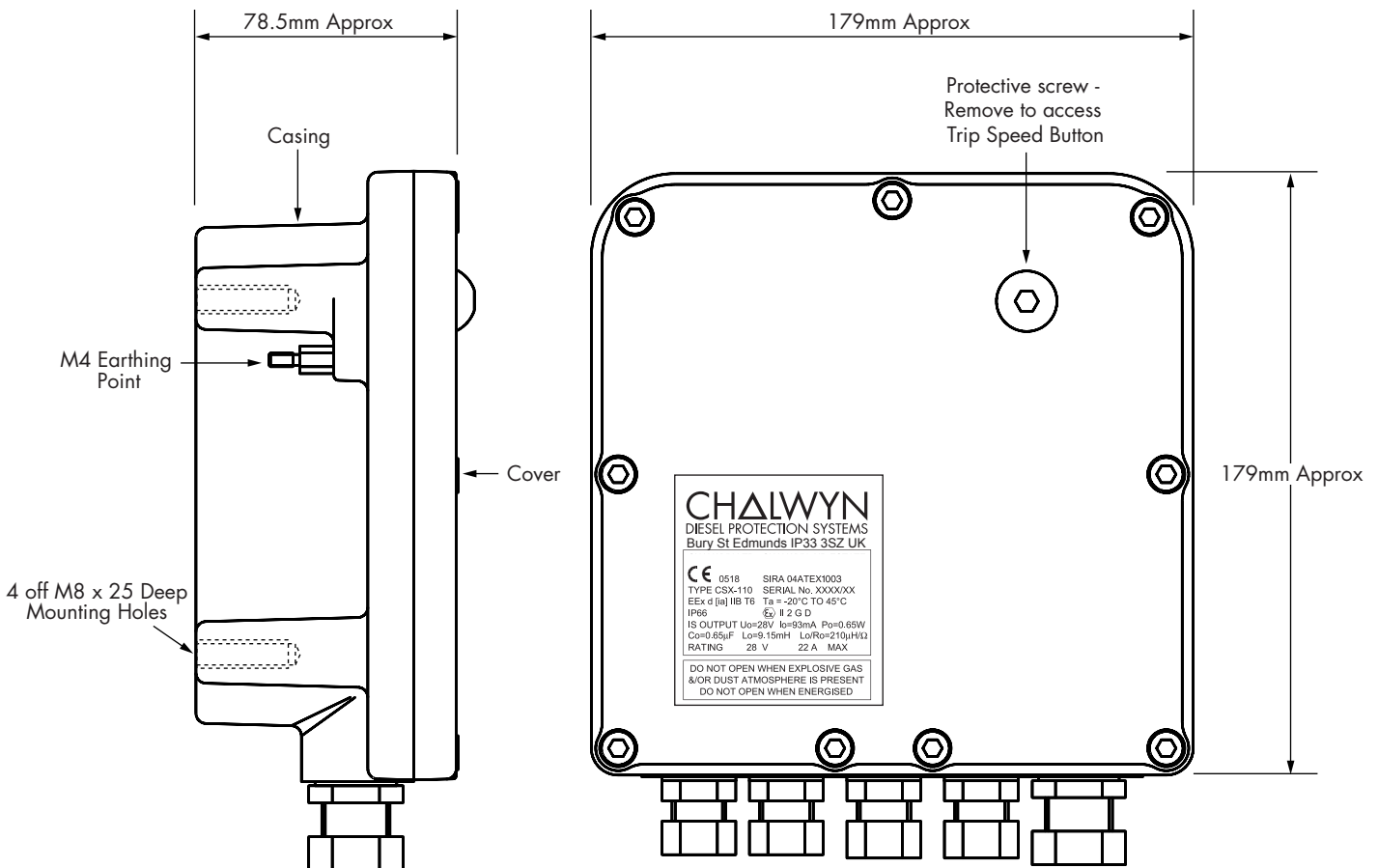
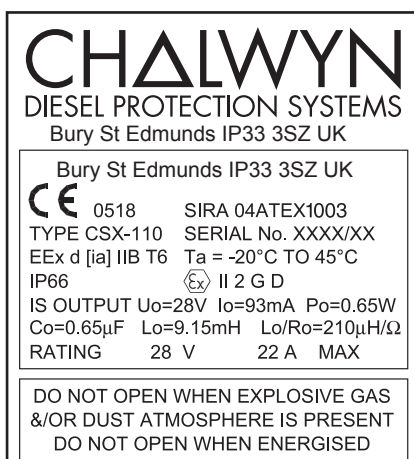
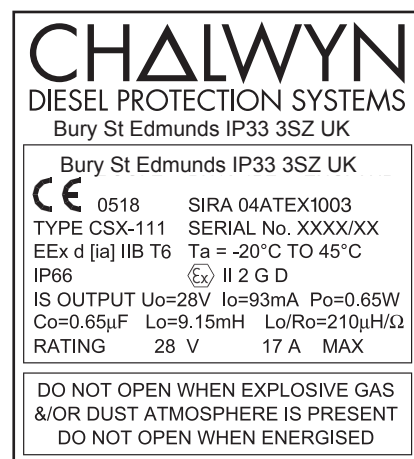


Diagram 1
Overall dimensions of CSX-110 and CSX-111 Control Boxes

Marking of CSX-110



Marking of CSX-111



• **Inputs / Outputs**

- Power and speed signal from alternator.
- Optional shut down signal (eg yellow alert, gas detector) 6V to 110V DC. Factory set to either shut down on signal detected or on loss of signal (this option is not available for the Series 111 System).
- Auxiliary power output. 28V/20A maximum (Series 110 System), 28V/15A maximum (Series 111 System).
- I.S. sensor circuit.
- Power to air intake valve solenoid (Note. One solenoid for Series 110. Two solenoids for Series 111).

• **Shut Down Speed Settings**

- Maximum set to 20% above speed at which overspeed button is released during setting.
- Minimum speed 800 rpm (alternator) - not adjustable.

• **Overspeed trip setting range**

- 1300 rpm to 15000 rpm (alternator)
- Factory setting 6000 rpm (alternator)

• **Maximum combined number of temperature and oil pressure sensors - 5**

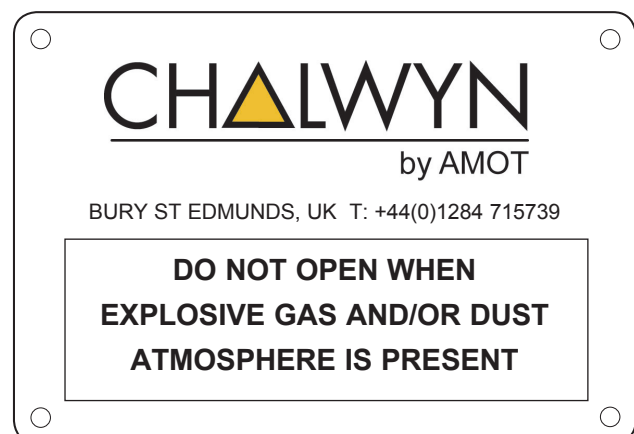
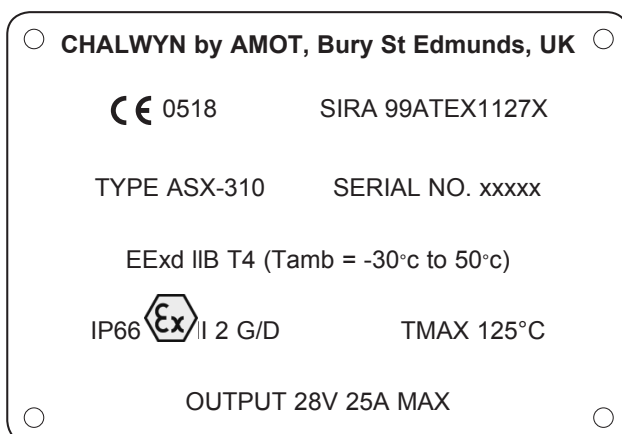
• **Timeout delay to establish oil pressure following engine start**

- 15 seconds during which time the sensor circuit is not activated. (No such time delay built into overspeed detection and shut down).

Important Note: Silicone and nitrile seals are fitted in the Control Unit and cable glands. Ethyl cyanoacrylate and Araldite 2014 epoxy adhesives are used to bond the lid seal and the product label respectively. The characteristics of these materials, together with the characteristics of the basic constructional materials of the Control Unit and the zinc plated steel fasteners, with regard to attack by aggressive substances shall be taken into account when installing or using the product in a hazardous area.

Chalwyn ASX-310 Alternator

Twelve pole, rotating field coil self exciting alternator enclosed within a machined die cast body and end covers. This alternator is marked:



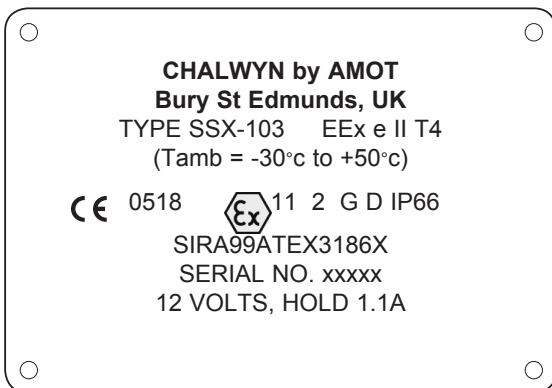
Important Note: Elastomeric cable seals are fitted to the Alternator. The characteristics of this material with regard to attack by aggressive substances shall be taken into account when installing or using the product in a hazardous area.

Full details of the ASX-310 alternator are given in Chalwyn publication CE232.

Chalwyn SVX-340/SVX-540 Air

Intake Shut down valves

12V/1.1A solenoid latched 3" or 5" bore butterfly valves suitable for mounting between flanges or supplied fitted with hose adaptors. Fitted with a cable and lever for manual start override / manual emergency stop. Valve bodies and discs manufactured in corrosion resistant hard anodised aluminium. Valve spindle made from 316 grade stainless steel. These valves are marked as follows:



IMPORTANT NOTE: SOLENOIDS FITTED TO SVX-340 and SVX-540 VALVES

Araldite epoxy adhesive and an elastomeric cable seal are used in the construction of these solenoids.

The characteristics of these materials with regard to attack by aggressive substances shall be taken into account when installing or using the product in a hazardous area.

Full details of SVX-340/SVX-540 valves are given in Chalwyn publication CE230.

Chalwyn FSX-200 Automatic Fuel Shut Down Valve and Fitting Kit FKX-300

The FSX-200 is designed to automatically close down at the same time as the SVX-340/SVX-540. A manual reset is fitted to the FSX-200. This only requires reset after an automatic shut down or after a manual emergency shut down.

Full details of FSX-200 and FKX-300 are given in Chalwyn publication CE226.

Chalwyn Temperature Switches TSX-100, TSX-135, TSX-150 and TSX-200

Immersion type temperature switches with pneumatically sealed electrically isolated cases. Designed for monitoring coolant and exhaust temperatures. Standard settings are 100°C, 135°C, 150°C and 200°C.

Full details of the Temperature Switch range are given in Chalwyn publication CE304 and CE306.

Chalwyn Pressure Switches PSX-010

Low oil pressure switch with electrically isolated body. Pre-set to 10psi (falling).

Full details of the PSX-010 are given in Chalwyn publication CE305.

SELECTION

The Series 110 and Series 111 Systems are suitable for Zone1/Group IIB/T4 hazardous area applications. These systems can be installed and operated completely independently from other systems on the engine and are particularly applicable where no battery or other electrical supply is available.

Select the air intake shut down valve(s) size. The SVX-340 has a 76mm (3") bore. The SVX-540 has a 127mm (5") bore. Determine the position at which the valve(s) is to be fitted such that the electrical and mechanical cables can be routed away without

risk of damage. See also Installation (Mechanical). Identify a suitable position for the lever assembly RLX-100 which is both convenient for operation and permits a reasonably straight run to the shut down valve for the CHW type mechanical shut down cable. Select the required length of the CHW cable from the options below. Other sizes are available on request.

Override Cable Options

Cable Identity	Cable Length
CHW-100	1.0m
CHW-200	2.0m
CHW-250	2.5m
CHW-300	3.0m

The SVX 340/540 valves can be supplied with hose adaptors fitted to one or both sides. The range of sizes available are shown below.

Hose Adaptor Options

Valve Type	Hose Adaptor	Hose Adaptor Nozzle Outside Diameter (mm)
SVX-340	HAX-3 Range	Various sizes from 51(2") to 102(4")
SVX-540	HAX-5 Range	Various sizes from 89(3.5") to 152(6")

INSTALLATION (Mechanical)

CSX-110 / CSX-111 Control Unit

Using the four M8 x 25 tapped holes in the base of the unit, mount the Control Unit to a sturdy plate.

[NOTE:The length of the fastener into tapped holes must not exceed 22mm.] Ensure the mounting plate is supported and positioned to:

- a) Minimise vibration transmitted to the Control Unit.
- b) Give good access to the Trip Speed Setting Button without causing a hazard whilst the engine is running.
- c) Enable the electrical cables to be routed away clear of hot surfaces and moving parts.
- d) Ensure that the Control Unit is not subject to an effective ambient temperature exceeding 45°C.

ASX-310 Self Exciting Alternator

1. Remove any existing non flame proof alternator from the diesel engine.
2. Check the alternator drive pulley ratio. In the case of fixed speed applications the pulley drive should be arranged to give a continuous alternator speed of between 5,000 rpm and 7,000 rpm. In the case of variable speed applications the pulley ratio should be selected to give an alternator speed of 2000 to 2,500 rpm at the engine low idle. This typically equates to a normal operating alternator speed range of about 3,500 rpm to 8,000 rpm.
3. Prepare to fit the Chalwyn ASX-310 alternator in place of the standard alternator by modifying the support bracket and belt tensioning link as necessary. Check that adequate belt adjustment is available. Ensure that with the selected cable entry position, the alternator cable can be routed away from the alternator in such a way as to avoid potential mechanical or heat damage.
4. Ensure that the alternator is not operated in an ambient temperature exceeding 50°C.

FSX-200 Automatic Fuel Shut Down Valve

1. Install the FSX-200 into the fuel line as close as possible to the fuel injection pump. Support the FSX-200 using the mounting plate supplied.
2. Locate the two 1/8" BSP holes tapped through the SVX air shut down valve body. Using thread sealant or thread locking compound:
 - a) Tighten adaptor FKX-001 into the tapped hole on the engine side of the shut down valve disc.
 - b) Tighten blanking plug FKX-002 into the tapped hole on the air cleaner side of the shut down valve disc.
3. Using the compression fittings and copper pipe supplied, connect the adaptor FKX-001 fitted in the air intake shut down valve to the fitting in the base of the FSX-200. Ensure all connections are leak free and that the copper pipe is suitably routed and clamped to avoid excessive vibration and/or damage.

Notes:

- a) After an automatic engine shut down or an emergency manual shut down via the Series 110 / Series 111, the FSX-200 reset lever (see Diagram 2) must be pressed in before restart. It is not necessary to reset the FSX-200 after a normal fuel shut down is used to stop the engine.
- b) The fuel system pressure at the point of installation of the FSX-200 must not exceed 14 bar.

SVX-340 / SVX-540 Air Intake Shut Down Valves

1. In the case of a naturally aspirated engine, the Chalwyn SVX shut down valve should generally be fitted as close to the engine air intake manifold as possible. If an intake flame trap is also fitted, the SVX valve must be installed upstream (air cleaner side) of the flame trap.
2. If the engine is turbocharged, fit the SVX downstream (engine side) of the turbocharger if space permits. Any flame trap must be installed between the SVX valve and engine.
3. SVX intake shut down valves may be installed either horizontally or vertically.
4. If hose adaptors are used, the mating hose should be of a reinforced type, provide adequate support for the valve and prevent excessive vibration. If necessary, additional support brackets mounted from the engine should be considered. Take into account loads applied to the valve by the start override/emergency stop cable when operated.
5. Particular care must be taken to ensure the integrity of the intake pipework between the Chalwyn valve and intake manifold. Ideally metal pipework should be used and any gaps kept as short as possible, taking into account any relative movement, and closed by reinforced hose. The possibility of a hose collapse on closure of the shut down valve should be avoided.
6. Any engine crankcase breather connections into the intake system between the SVX valve and engine, or any internal crankcase breather arrangement venting directly into the engine intake ports must be sealed and replaced by an external breather system venting either to atmosphere or to the intake system upstream of the shut down valve. External breather system kits for various engine types are available from Chalwyn.
7. The lever assembly RLX-100 should be mounted using the three through holes provided in the assembly. It must be positioned where convenient for operation and also to permit a reasonably straight run without tight bends for the override cable between the lever assembly and valve.
8. The lever RLX-100 is sprung towards the valve closed position. With no power applied the SVX valve is also sprung to the closed position. With both the RLX-100 and SVX valve in the closed position fit the override cable. Adjust cable and tighten the locknuts such that with the SVX valve fully closed, the outboard end of the lever RLX-100 is positioned about 5 to 10mm from its central stop (closed) position. When the RLX-100 is exercised over its operating stroke the distinct sound of the SVX valve closing should now be audible.

Note: Where two intake valves are fitted (Series 111 Systems):

- a) Fit a balance pipe between the two intake systems on the engine side of the SVX valves.
- b) Operate the two RLX-100 levers together to ensure simultaneous valve closure.

TSX Temperature Switches and PSX Pressure Switches

Fit into the exhaust, coolant and oil pressure systems as appropriate. Ensure that the flying leads can be routed to the CSX Control Box avoiding hot surfaces and moving parts.

Important Note:

Always retain/fit an engine fuel stop which is independent of the Series 110 / Series 111 System and which should be used for all normal (non-emergency) shut downs of the engine.

INSTALLATION (Electrical)

- The diagrams below show the gland position and terminal identifications for the CSX-110 and CSX-111 Control Boxes. The Control Box is supplied with approved blanking plugs fitted in place of any glands which are not required for a specific application.

CHALWYN
DIESEL PROTECTION SYSTEMS
Bury St Edmunds IP33 3SZ UK

Bury St Edmunds IP33 3SZ UK
CE 0518 SIRA 04ATEX1003
 TYPE CSX-110 SERIAL No. XXXX/XX
 EEx d [ia] IIB T6 Ta = -20°C TO 45°C
 IP66 Ex II 2 G D
 IS OUTPUT Uo=28V Io=93mA Po=0.65W
 Co=0.65µF Lo=9.15mH Lo/Ro=210µH/Ω
 RATING 28 V 22 A MAX

DO NOT OPEN WHEN EXPLOSIVE GAS
&/OR DUST ATMOSPHERE IS PRESENT
DO NOT OPEN WHEN ENERGISED

Diagram 3
CSX-110 Control Box with cover removed

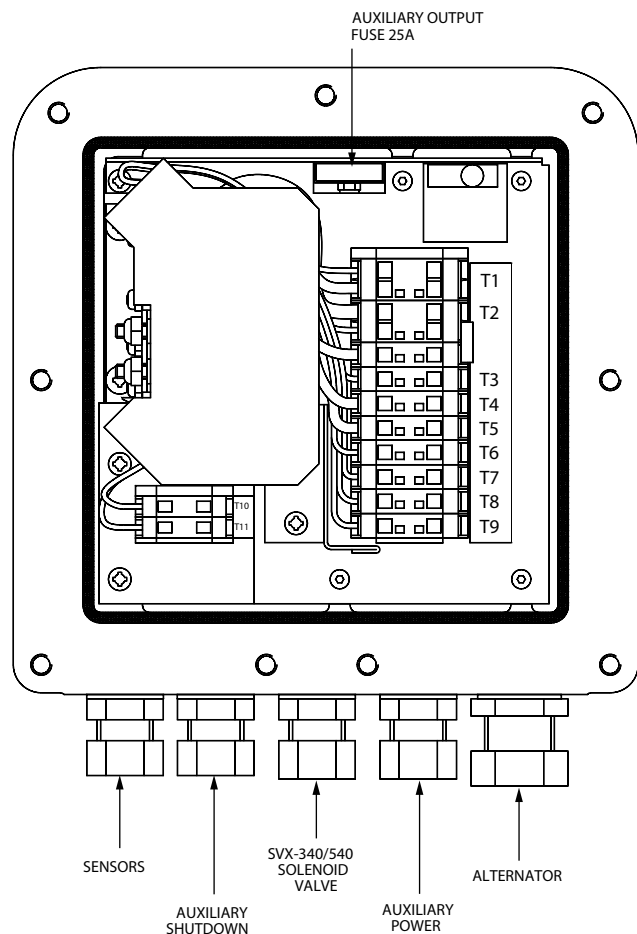


Diagram 4
CSX-111 Control Box with cover removed

Note: The Series 110 and Series 111 systems shall be installed in accordance with IEC 60079.14 or relevant local and national regulations.

Diagram 5
Series 110 Wiring

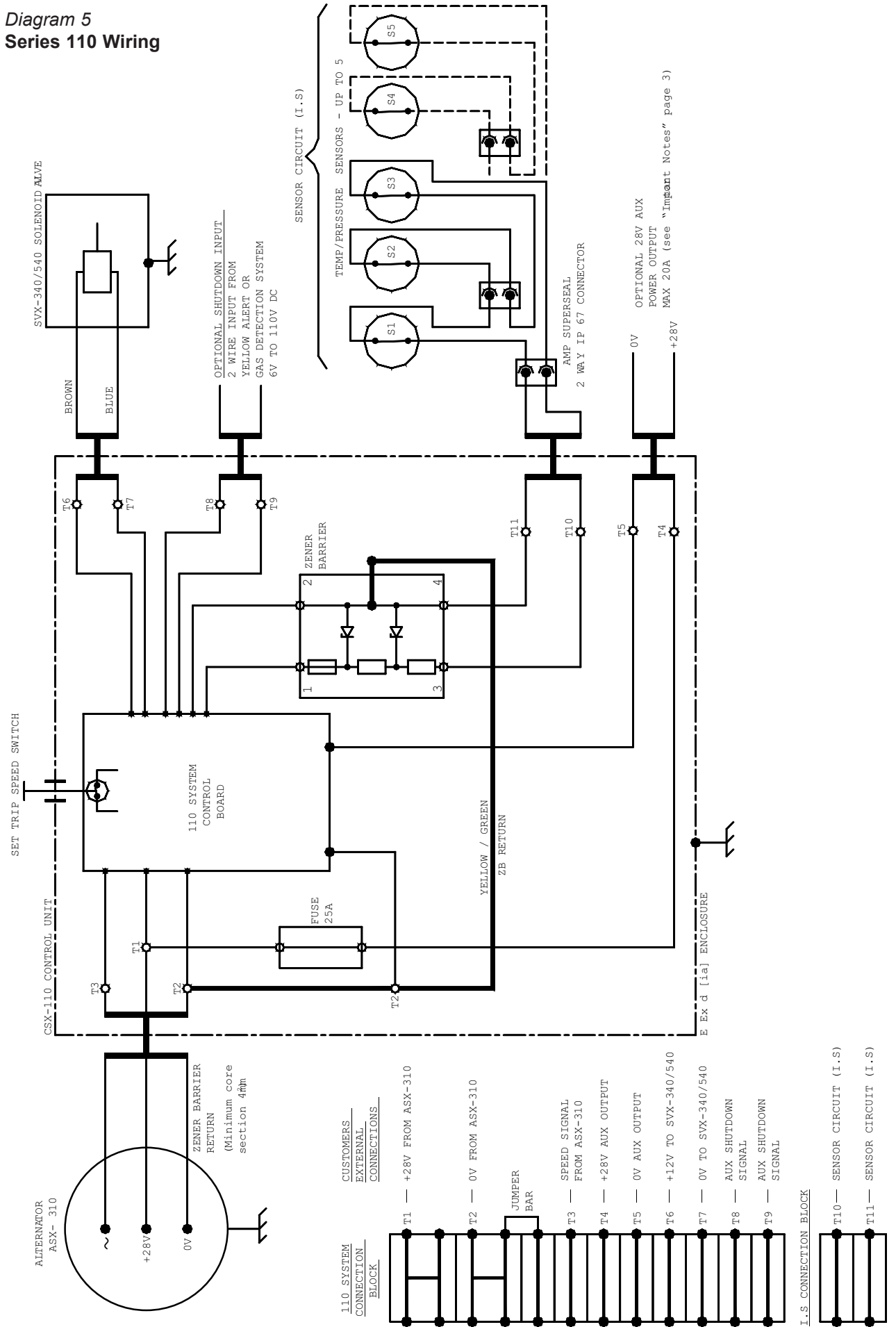
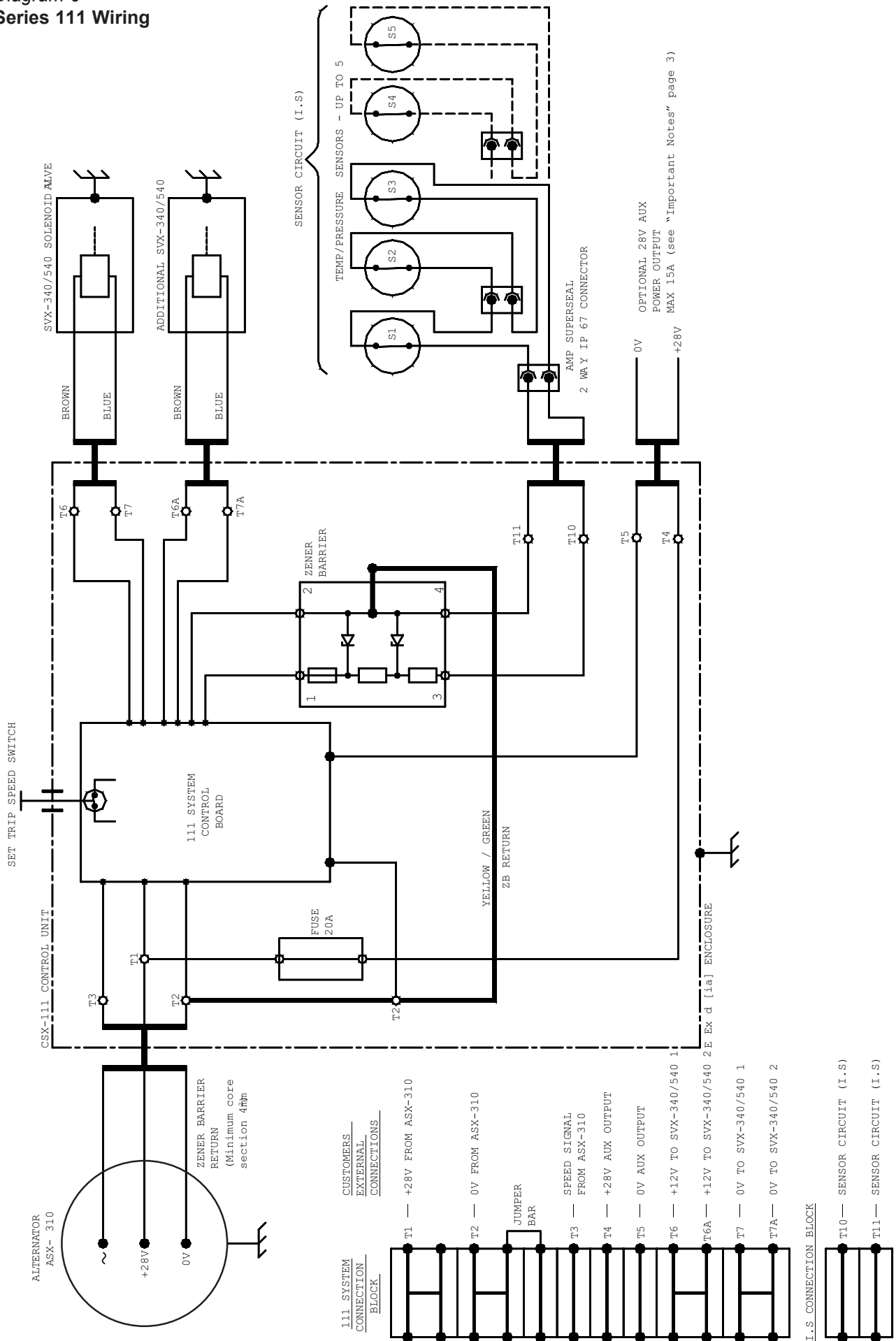
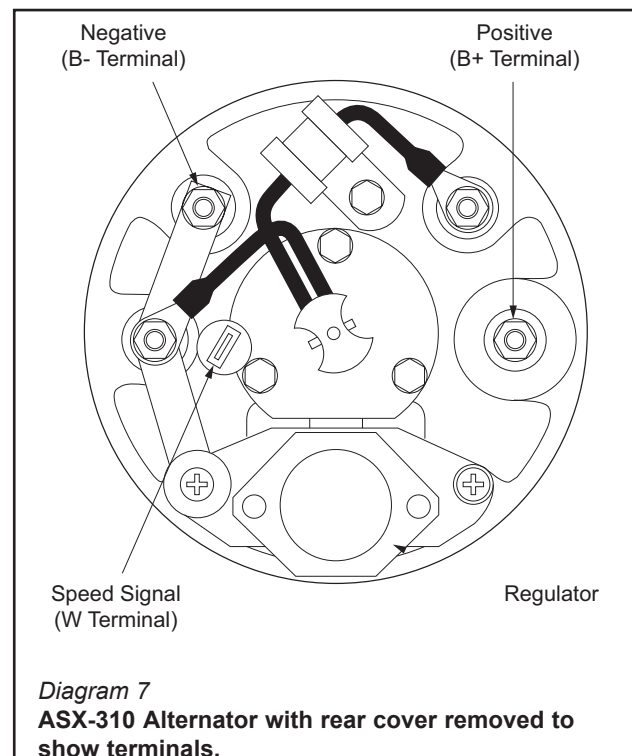


Diagram 6
Series 111 Wiring



2. After mounting the Control Unit check it is properly grounded to the engine frame. Use the M4 earth connection point provided. An M4 ring connection and a minimum cable core section of 4mm² is required.
3. Use the IP67 connectors supplied to connect the flying leads of the sensors via a twin core cable (outside sheath diameter to be between 6mm and 12mm) and the appropriate Control Unit gland to the terminals T10 and T11 of the Control Unit. Fit uninsulated boot lace ferrules to the cable ends before inserting into terminals (eg. RS stock item 211-4280). See Diagrams 5 and 6. Fit a cable clamping device as near as possible to the cable gland.
4. In the case of the Series 110 System connect any auxiliary shut down signal input via twin core cable (outside diameter 6mm to 12mm) and the appropriate Control Unit gland to the terminals T8 and T9 (see Diagram 5). Fit a cable clamping device as close as possible to the cable gland.
5. Air Intake Shut Down Valves SVX-340 or SVX-540 are supplied complete with armoured cable. Cut cable to length and prepare for fitting via the armoured cable type glands of the Control Box ensuring correct clamping and bonding onto the armour. Connect to terminals T6 and T7 in the case of the Series 110 System and also to T6A and T7A in the case of the Series 111 System. Ensure correct wire colour code for each connection (see Diagrams 5 and 6). Ensure the body of the SVX valve solenoid is grounded to the engine frame. Use the earth tag of the solenoid if necessary.
6. Use two core armoured cable with a 6mm to 12mm diameter outer sheath and a 4mm to 8.5mm inner sheath to connect the auxiliary power output using terminals T4 and T5. Again check that the armour is properly bonded to the gland (grounding is not required at the other end of this cable). Refer to Diagrams 5 and 6.
7. Select suitably rated cable (see Special Note) for connecting the ASX-310 Alternator to the Control Unit. Armoured cable with 3 off 4mm² minimum section cores is required with an inner sheath size of 8.5 to 15.5mm and an outer sheath size of 12 to 21mm diameter. Seal on the inner sheath in the alternator gland. At the Control Unit end ensure the armour is also properly bonded to the gland and the cable connected to terminals T1, T2 and T3 (see Diagram 5 and 6). Remove the rear cover of the alternator to connect the cable. Note it is possible to rotate the rear cover to give different cable entry positions. With reference to Diagram 7 across, the main positive (B+) and negative (B-) terminals are designed for M5 ring connections. When slackening or tightening the terminals nuts particular care should be taken not to loosen the M5 nuts at the base of the terminal posts. The speed signal connection should be made using a right angle spade connector to avoid bending the cable (e.g. RS part 161-2008). Use ties to restrain the cables to prevent mechanical damage.

8. Refit the rear alternator cover after checking that the 'O' ring seal is undamaged and is properly seated in the seal groove. Torque rear cover fasteners to 15Nm. Fit a cable clamping device as near as possible to the alternator cable gland.
9. To ensure good bonding of the alternator body to the engine frame a M4 tapped hole is provided in the rear cover to connect an earth lead.
10. On completion of wiring check the system isolation is maintained by completing a continuity check between each terminal point inside the Control Unit and the casing.
11. Fit cover to the CSX-110/CSX-111 Control Unit. Torque fasteners to 12Nm.



Special Notes:

The cable entry point to the alternator exceeds 70°C under rated conditions, therefore, in accordance with EN 50014:1997 clause 16.8, suitably rated cable shall be selected for installation. When preparing cable for fitting through cable glands always follow the gland manufacturers instructions.

OPERATION

1. On first start after installation the overspeed trip point must be set up as follows:
 - a) Remove the Protective Screw from the Control Unit Cover to expose the Trip Speed Setting Button. Check that the reset lever of the FSX-100 Fuel Shut Down Valve is pushed in.
 - b) Start the engine whilst holding the lever RLX-100 in the start override (valve open) position. Once the engine is running the RLX-100 lever may be released and should remain in the start override position. Allow the engine to run for a further 15 seconds to permit oil pressure to build up.

Note: If at any time during this set up procedure a problem arises the engine may be stopped by either the normal fuel stop or by pushing the RLX-100 lever to the emergency stop (valve closed) position.

- c) Initially for checking purposes set the overspeed trip to a speed in the normal operating range of the engine by slowly increasing the engine to a mid range speed and then pressing and releasing the Trip Button. The engine will shut down indicating that the trip point has been programmed.
 - d) Reset the fuel shut down valve. Re-start the engine using the RLX-100 override lever as above. After allowing 15 seconds slowly accelerate the engine and check shut down occurs at exactly 20% above the speed at which the Trip Button was released. Check also that on shut down the reset lever of the fuel shut down moves outward to expose about 4mm of the lever. To confirm the operation of the FSX-200 fuel shut down valve restart the engine without resetting the fuel shut down valve. The engine should start but will only run for a short period whilst consuming the residual fuel between the FSX-200 and the engine injectors.
 - e) Using the same procedure as above, reset the overspeed trip point to the final value required for operation in the field.

Notes: To increase the trip speed setting from a lower to a higher value, the Trip Speed Setting Button must be continuously held in from engine start up and then released at the appropriate speed as per the above setting instructions. For many applications a suitable overspeed shutdown will be 20% above the engine high idle (full throttle, zero load) speed.

- f) Refit the Protective Screw to cover the Trip Speed Setting Button. Press the reset lever of the FSX-200. The engine may now be re-started, Check the operation of the manual emergency stop (adjust mechanical cable if necessary). Check the operation of the sensor circuit by breaking at one of the connection blocks but only after leaving the engine running at least 15 seconds after start up. This should give immediate shut down.
2. Once set up, normal engine start up procedure is as follows:
 - a) If the last shut down was on automatic shut down or an emergency manual shut down via the Series 110 / Series 111 system, the FSX-200 fuel shut down valve must be reset.
 - b) Select the start override (valve open) position with the RLX-100 lever and hold whilst starting the engine. Once engine speed increases above the low idle the RLX-100 is released.
 - c) Always stop the engine using the normal fuel stop. Only use the RLX-100 lever in emergency situations.

MAINTENANCE

Carry out the following maintenance schedule. Any problems identified must be rectified prior to returning the equipment to service.

Note: *Further maintenance data can be found in the Chalwyn publications for the individual items – see “Component Description”.*

Daily:

Prior to engine start up push the RLX-100 lever to the start override (valve open) position and release. The lever should spring back to the valve closed position accompanied by the sound of the valve closing.

Monthly:

Check that the fasteners locating the SVX valve and any associated intake system or support brackets are tight.

Check that any flexible pipework between the SVX valve and engine is free from damage and suitable for further service.

Ensure all electrical and mechanical cables are properly supported and free from damage.

Check that the FSX-200 fuel shut down valve and associated pipework is leak free and the pipework suitably supported.

Check that the alternator drive belt is in a serviceable condition and correctly tensioned.

Check alternator mounting fasteners are tight.

Start engine. Run at or just above low idle speed. Carry out a manual emergency stop. The engine should stop within a few seconds and the FSX-200 reset lever should also move outwards exposing about 4mm of the lever. Restart engine without resetting the FSX-200. The engine should only run for a short period whilst consuming the residual fuel between the FSX-200 and the engine fuel injectors (Note, after this check it may be necessary to bleed the fuel system before restart).

Three Monthly:

Check all glands and cable clamping devices are tight.

Check end float of the alternator cooling fan. This must not exceed 0.2mm when the alternator is cold.

Check the alternator fan to cowl clearance. At its worst point this must be greater than 1mm.

Six Monthly:

Remove cover and carry out an internal inspection

Control Unit - Fuse Replacement

Only the approved types available from Chalwyn shall be used.

of the CSX-110/CSX-111 Control Unit. Check all visible wiring is in serviceable condition and terminations are tight. Ensure there is no sign of dust or moisture ingress and that the lid seal is in a serviceable condition. Check system isolation is maintained by completing a continuity check between each terminal point inside the Control Unit and casing. Check continuity of the zener barrier earth return back to the T2 connection to the alternator OV. Refit cover and torque fasteners to 12Nm.

Remove temperature and pressure sensors. Check operation and calibration. Refit.

Start engine. Run at or just above low idle speed. After 15 seconds break the sensor circuit at one of the connectors. The engine should immediately shut down.

Yearly:

Remove alternator rear cover. Loosen the two fasteners locating the regulator carefully noting the position of the insulating and steel washers (see Diagram 7). Replace regulator and brush assembly with a new assembly ensuring the various washers are replaced correctly. Note that particular care is required to ensure that the surfaces of the insulating washers remain clean. Clear any dust from the rear cover. Check cable condition is acceptable for further use and terminals are tight. Check rear cover ‘O’ ring seal is serviceable and properly located in the seal groove. Refit rear cover torquing fasteners to 15 Nm. Tighten cable gland. Check air passages under the fan cowl are clear of any significant build up of foreign matter.

Remove the 6 off M5 screws and washers retaining the diaphragm cover of the FSX-100 fuel shut down valve. Carefully remove the cover and spring but do not remove the centre nut retaining the diaphragm. Check diaphragm is in serviceable condition. Carefully clean the diaphragm cover and the orifice to the pipe connection. Refit spring and cover.

Important Maintenance Notes

The M6 socket head cap screws utilised for fastening the end covers of the alternator must only be replaced by cap screws with a yield strength better or equal to 830 N/mm² in accordance with EN50018:1994 clause 11.3.

Always consult Chalwyn if a defective item/system is identified or return defective parts to Chalwyn Ltd for repair.

Never open electrical enclosures when hazardous gas or dust may be present.

Only properly qualified staff are permitted to service hazardous area equipment.



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Chalwyn's Quality Management
System is approved by LRQA.

