

Service Bulletin

RTA-28

Technical Information to all the Owners
of Sulzer RTA – Type Diesel Engines equipped with
DENIS-1 and DENIS-5 ENGINE CONTROL SYSTEMS

31.05.96

Improvement of the Engine Control System

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INTRODUCTION

Since the introduction of the DENIS Control Concept approximately 160 engine control systems were installed (DENIS=Diesel Engine Interface Specification).

The DENIS-1 and Denis-5 control systems comprise the engine control system as well as the interface for the remote control, safety and alarm system.

It is always possible, that with such a complex system some minor faults or shortcomings are detected during the course of its service life and we have found that the engine control system can be improved with some small modifications to the pneumatic and electrical control system.

This Service Bulletin informs you about the necessary steps which must be taken to improve the engine control system of engines equipped with the above mentioned control systems.

Modification:	Ref.	Applicable to	Effect:
Removal of valve 49HH	1.1.2	All engines	Increased safety. Engine internal fuel interlock always remains active.
Addition of valve 130HF	1.1.3	Plants with engine driven generators	Increased availability of electric power generation. Avoids fuel cut-off (blackout) in case of failure of main bearing oil pump.
Removal of valve 49HG	1.2.3	Engines with electric actuators only	Improved local control. Stop lever remains active also in "manual fuel control" by the actuator.
Control of reversing system (software)	2.2	All engines, especially when equipped with PGA200 or PGA-EG200	Improved reversing manoeuvre. Not relevant for safety considerations.

1. MODIFICATION ON VALVE GROUP "G" ON THE ENGINE CONTROL SYSTEM

Below we have listed the engine types as well as the relevant control diagram drawing numbers which are involved in this modification.

DENIS-1 : RTA 52, 62, 72, 84C, 84M, RTA 52U, 62U and 72U Type Engines

0-107.268.581 with Woodward governor PGA 200	}	With electrical VIT
0-107.268.580 with Woodward governor PGA EG 200		
0-107.268.582 with electrical fuel pump actuator		

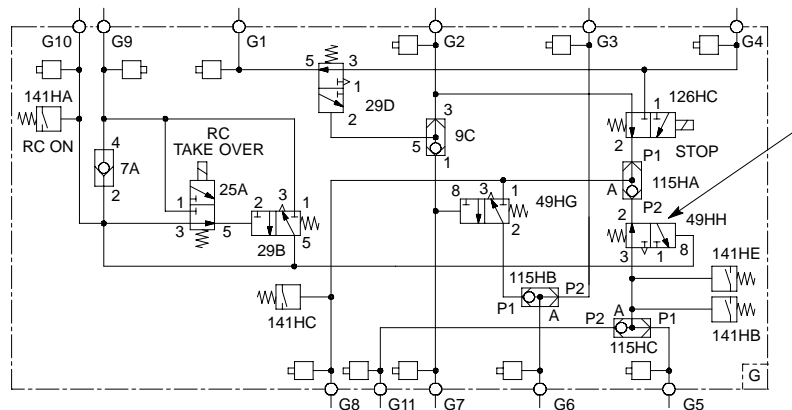
0-107.094.195 with Woodward governor PGA 200	}	With mechanical VIT
0-107.094.168 with Woodward governor PGA EG 200		
0-107.094.196 with electrical fuel pump actuator		

DENIS-5 : RTA 84T Type Engines

0-107.094.464 with Woodward governor PGA 200
 0-107.094.542 with Woodward governor PGA EG 200
 0-107.094.543 with electrical fuel pump actuator

1.1. Modification Valve 49HH

1.1.1. Existing Execution with Valve 49HH in Valve Group "G"



Function of Valve 49HH (please refer to diagram on enclosure RTA-28 / 1)

When running the engine from the "Local Control" stand there is **no pressure on port No. 8 of valve 49HH** as shown on the diagram of valve group "G" above.

If the engine is running in the wrong direction connecting point G11 is under pressure. In case one or more of the reversing servomotors are not in the correct endposition the connection G5 is under pressure. The pressure signal either from G5 or G11 is transmitted through to ports 3-2 of valve 49HH which in turn influences the fuel interlock.

The engine internal fuel interlock for the direction of rotation safeguard is not active if the engine is in "Remote Control" mode (valve 49HH is activated). Under certain circumstances, such as defective control valves in combination with a failure of the crosshead oil pump, an undesired reversing of the engine may result.

To ensure that the fuel is cut-off in all necessary cases the fuel interlock should remain activated at all times, i.e. with the engine in "Local Control", "Control Room Control" and "Bridge Control" mode. This can be achieved with the modification shown in Paragraph 1.1.2. or 1.1.3.

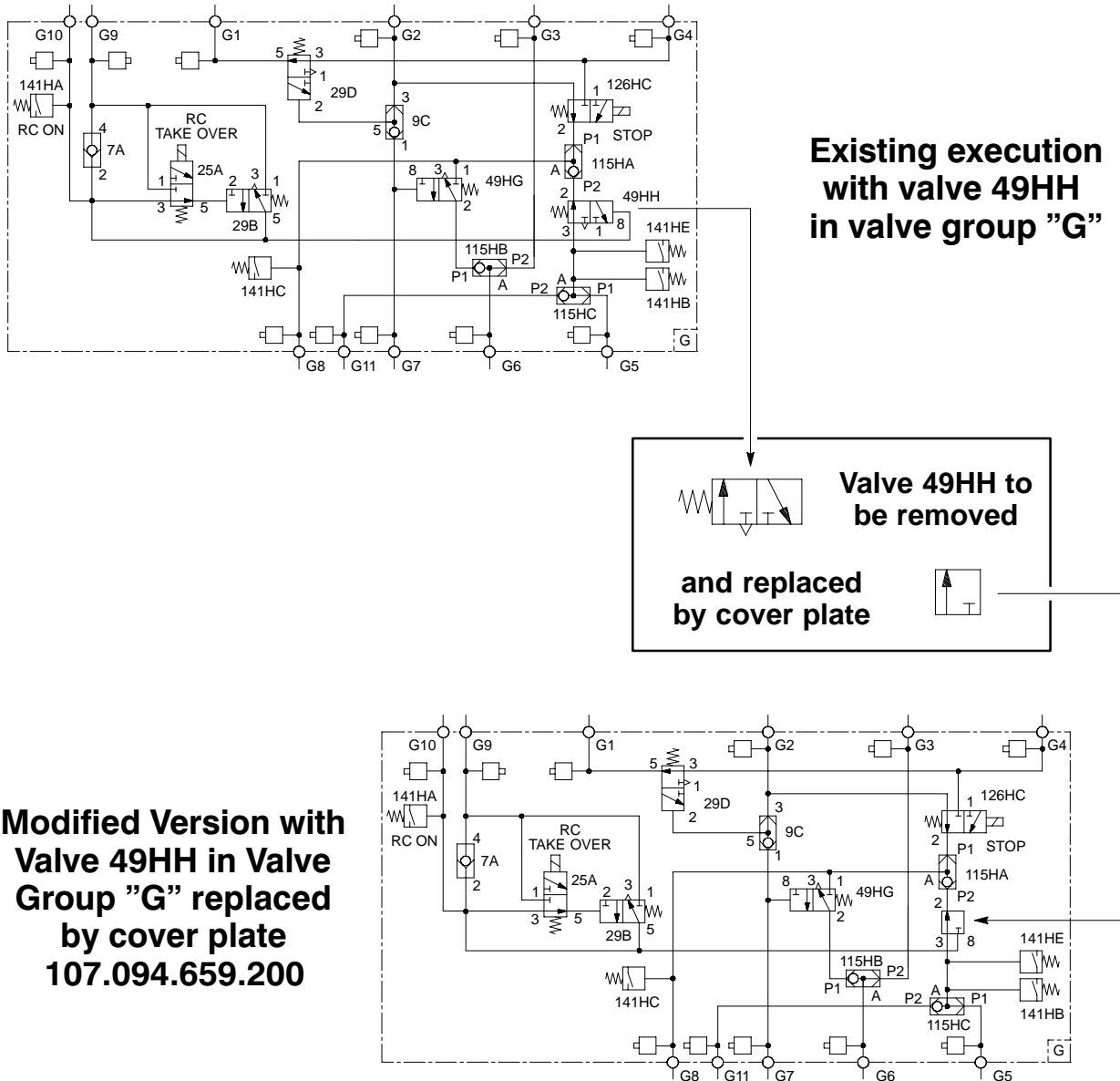
In case of a main bearing oil pump failure a fuel cut-off of very short duration can occur until the stand-by pump has built up pressure. This leads to a drop of the engine speed for a few seconds which can be easily accepted on engines without engine driven generators.

For engines driving generators a separate solution has been developed, so that in case of a bearing oil failure no blackout will occur. This system modification is described in Paragraph 1.1.3.

1.1.2. Modification for Engines WITHOUT Engine Driven Generators

For engines **without engine driven generators** the modification is a simple one.

Remove valve 49HH and fit cover plate 107.094.659.200 instead. The cover plate will now blind-off connection No. 8 and will join the connection No. 3 with connection No. 2.



The cover plate 107.094.659.200 can be ordered from New Sulzer Diesel Ltd.

On the modified version where the valve 49HH is omitted and the cover plate fitted instead the direction of rotation safeguard and the monitoring of the reversing servomotor end-position remain activated at all times, regardless whether the engine is operated from the bridge, the control room or from the local control stand.

1.1.3. Modification for Engines WITH Engine Driven Generator

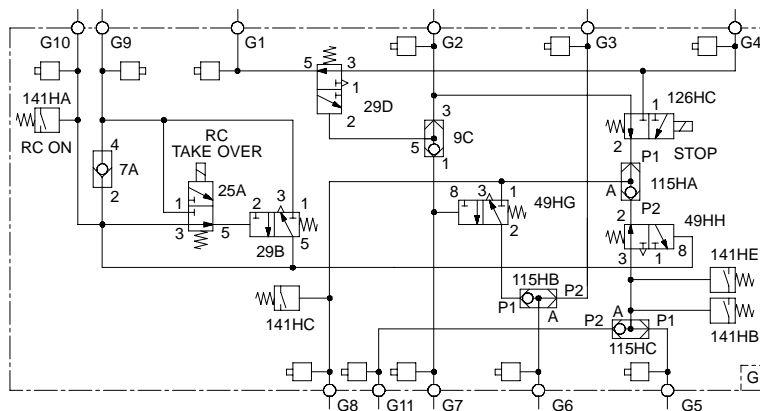
For plants with engine driven generators it is possible to carry out the modification in two steps:

- a) In principle the same modification as mentioned in Paragraph 1.1.2. can be carried out as a first step. In this case the rotation direction safeguard will remain actuated at all times, also in the remote control mode, and in this way there is a better safety margin against wrong manoeuvring. However, if the main lubricating oil pump fails, a black-out can occur until the stand-by pump has built-up oil pressure again, which may take a few seconds.

We therefore recommend to modify the system according to paragraph b) directly, or as soon as possible if the system was previously modified according to paragraph a), in order to benefit from the additional safety measures against black-outs:

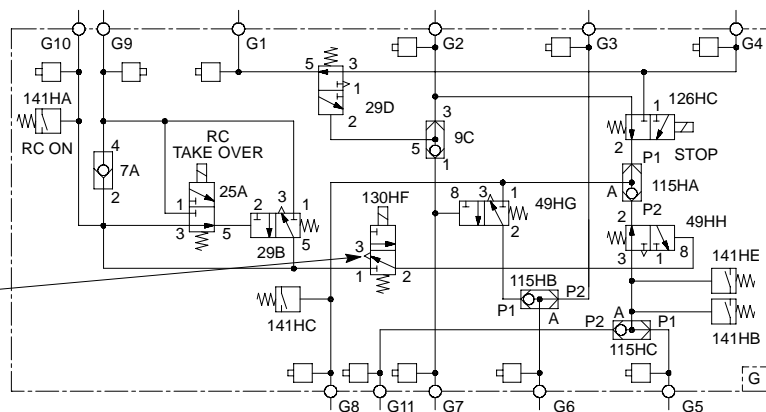
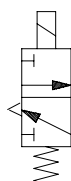
- b) For plants with an engine driven generator the solution is to fit an additional solenoid valve 130HF (please refer to the sketch below and the fitting instructions on next page).

The valve 130HF prevents a blackout, which could occur in case of a pressure drop in the main bearing oil system until the stand-by oil pump is automatically put in service. In case the normal bearing oil pressure is not built up again within a few seconds the engine will be stopped by the safety system.



**Existing execution
with valve 49HH
in valve group "G"**

**Modified version with
additional 3/2-way-
solenoid valve 130HF
fitted in valve group "G"**



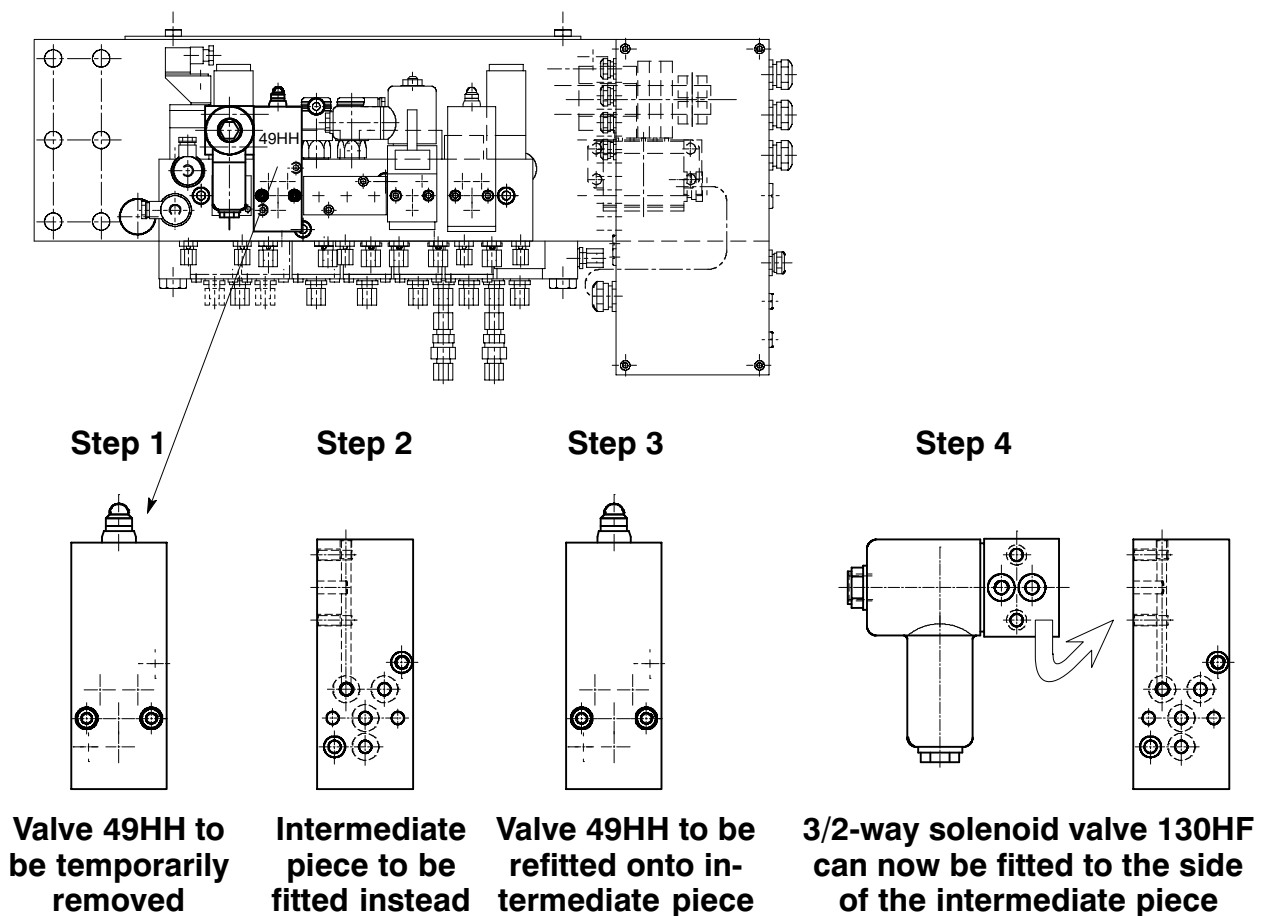
Modification Kit for Valve Group "G" of Engines with Engine Driven Generators

The modification kit consists of:

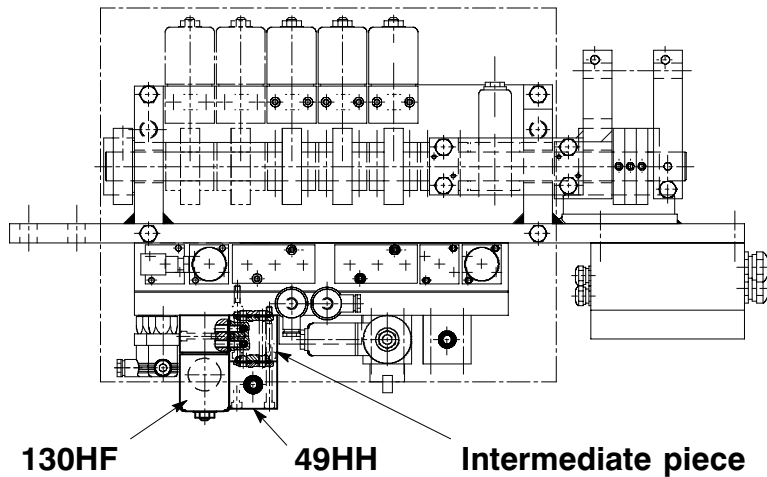
1 off	3/2 Directional Control Valve	existing valve 49HH
1 off	3/2-Way-Solenoid Valve	Article No. 107.084.304.001
1 off	Intermediate Piece	Article No. 107.094.655.200
2 off	Hexagon Socket Head Screw (6x100)	Article No. 015.251.403.501
2 off	Hexagon Socket Head Screw (6x70)	Article No. 015.251.403.381
2 off	Hexagon Socket Head Screw (6x55)	Article No. 015.251.403.321
10 off	Round Rubber Ring	Article No. 021.505.001.001
1 off	Cable	Article No. 107.122.488.001

The above kit can be obtained from **New Sulzer Diesel** or through their **Representatives**.

Fitting Instruction for 3/2-Way-Solenoid-Valve 130HF



Please refer to the next page for further information.



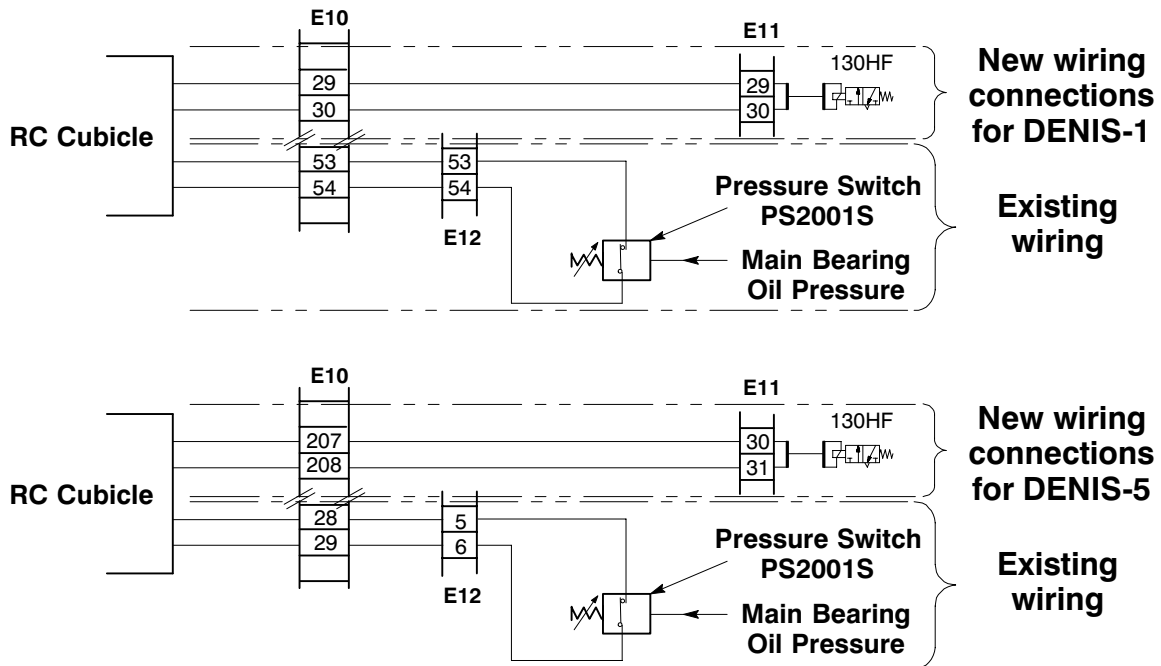
Function:

The solenoid valve 130HF will be energized as soon as the pressure switch PS2001S indicates a low main bearing oil pressure.

Please note:

The 3/2-way solenoid valve is only required on engines which drive a generator.

Electrical wiring Instruction for 3/2-Way-Solenoid-Valve 130HF

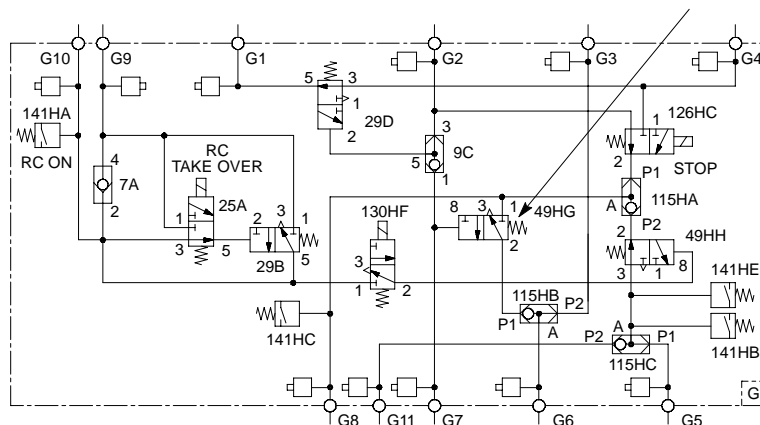


As preparatory work the solenoid valve 130HF can already be wired with the junction box E11 and E10. Since the junction box E10 is the interface between DENIS and the Remote Control, the supplier of the remote control system should be contacted for further information regarding the connection between E10 and the remote control system.

Please note: The remote control system has to be **prepared** and **adapted** for the connection of the solenoid valve 130HF by the **supplier of the remote control system**.

1.2. Modification Valve 49HG (please refer to diagram on enclosure RTA-28 / 1)

1.2.1. Existing Execution with Valve 49HG in Valve Group "G"



Function of Valve 49HG

When running the engine from the bridge, from the control room or from the local control stand there is no control air pressure on port No. 8 of valve 49HG and the valve is in the same mode as drawn on the above diagram i.e. there is no connection between port No. 1 and port No. 2. When the engine is stopped and during reversing the fuel is cut-off by the Woodward governor or the electrical actuator (with electronic governor) via the fuel linkage.

In case the engine speed governor fails, the operation of engine can be continued in the so called "Emergency Control" mode and the fuel linkage is operated from the fuel control lever 3.12 on the local control stand (please refer to enclosure RTA-28 / 1).

If the engine is to be run in "Emergency Control" mode the fuel lever 3.12 on the local control stand is moved from the remote control position to the manual position. The air-cylinder 3.10 is vented and the Woodward governor or the electrical actuator is no longer active. Simultaneously the air pressure supplied to connection G7 switches off the remote control system. The control air pressure is also supplied to port No. 8 of valve 49HG with the consequence that the fuel cut-off function during reversing and stopping of the engine is now induced by the safety cut-out device 6.04.

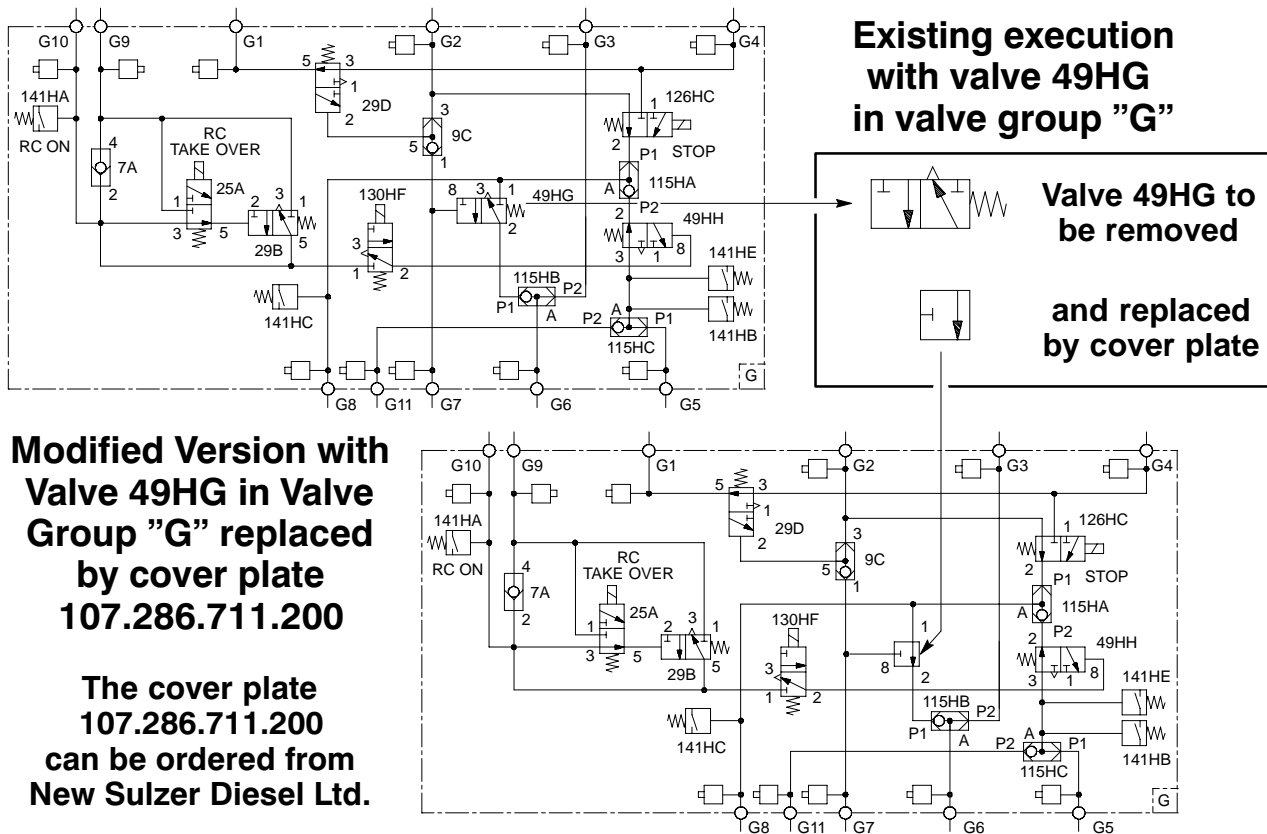
1.2.2. Engines with Woodward Governors

On engines which are equipped with Woodward PGA 200 or PGA EG 200 governors there is no change required i.e. valve 49HG remains in its position.

1.2.3. Engines with Electronic Speed Controls

On engines with electronic speed controls, using electrical actuators to adjust the fuel linkage, valve 49HG **must** be removed and the cover plate 107.286.711.200 must be fitted instead.

The cover plate will now blind-off connection No. 8 and will join the connection No. 1 with connection No. 2 (please refer to the sketch below).



On engine side with electrical actuators there are two possibilities of fuel setting. In so called "emergency control" direct by the fuel lever 3.12 (please refer to enclosure RTA-28 / 3) or in "local control" via the push buttons "Fuel Control" / "Increase" and "Decrease" by the actuator (lever 3.12 in "remote" position).

However, it was found that under the latter condition the stop lever 5.07 becomes inoperative and therefore it is necessary to carry out the above modification in order to be sure that the engine can also be stopped at any time with the stop lever.

Modification Kit for Valve Group "G" of Engines with Electronic Speed Controls

The modification kit consists of:

- | | | |
|-------|--------------|-----------------------------|
| 1 off | Cover Plate | Article No. 107.286.711.200 |
| 3 off | O-Rings 10x2 | Article No. 021.505.001.001 |
| 2 off | Screws M6x25 | Article No. 015.251.433.161 |

2. MODIFICATIONS TO THE REMOTE CONTROL SYSTEM

2.1. Hard Knocking during Reversing Manoeuvres

It is possible that, especially on engines equipped with Woodward governors PGA 200 or PGA EG 200, heavy firing thumps can occur during the reversing of the engine.

These heavy firing thumps occur because the above-mentioned governors do not pull the fuel linkage back to "0" position quick enough and under some conditions the reversing servomotors have already moved from their respective end position before the linkage has returned completely to "0".

Fuel is injected too early before TDC (Top Dead Centre), thus causing high firing pressure which manifests itself in heavy firing thumps. As a consequence piston ring collapse and even broken piston rings may occur.

In this connection it is suggested also to check whether the settings of start fuel limit, torque limit and scavenge air fuel limit are correct i.e. as per shop or sea trial records.

2.2. Countermeasures to avoid Heavy Firing Thumps

To avoid heavy firing knocks during the reversing of the engine at least one of the following conditions must be fulfilled:

- ✓ Load indicator < Position 1 (only valid when the reversing manoeuvre is induced whilst the engine is still turning)
- ✓ Actual direction to correspond with selected direction
- ✓ Standstill of the engine

The three above-mentioned points are already monitored in the "Remote Control System" and can be inter-linked in the software in such a way that the reversing of the engine will not be started unless at least one of the three conditions is fulfilled.

The adaptation of the software is carried out by the supplier of the remote control system and does not entail any modification to the hardware of the engine control system.

The remote control suppliers were already informed about the necessary requirements by New Sulzer Diesel Ltd.

3. CONCLUSION

For safety reasons we strongly recommend to implement these modifications at the next suitable opportunity.

The necessary hardware for the modifications according to paragraphs 1.1.2. / 1.1.3. and 1.2.3. can be ordered from our spare parts department.

For the modification of the software according to paragraph 2.2., please contact your remote control supplier.

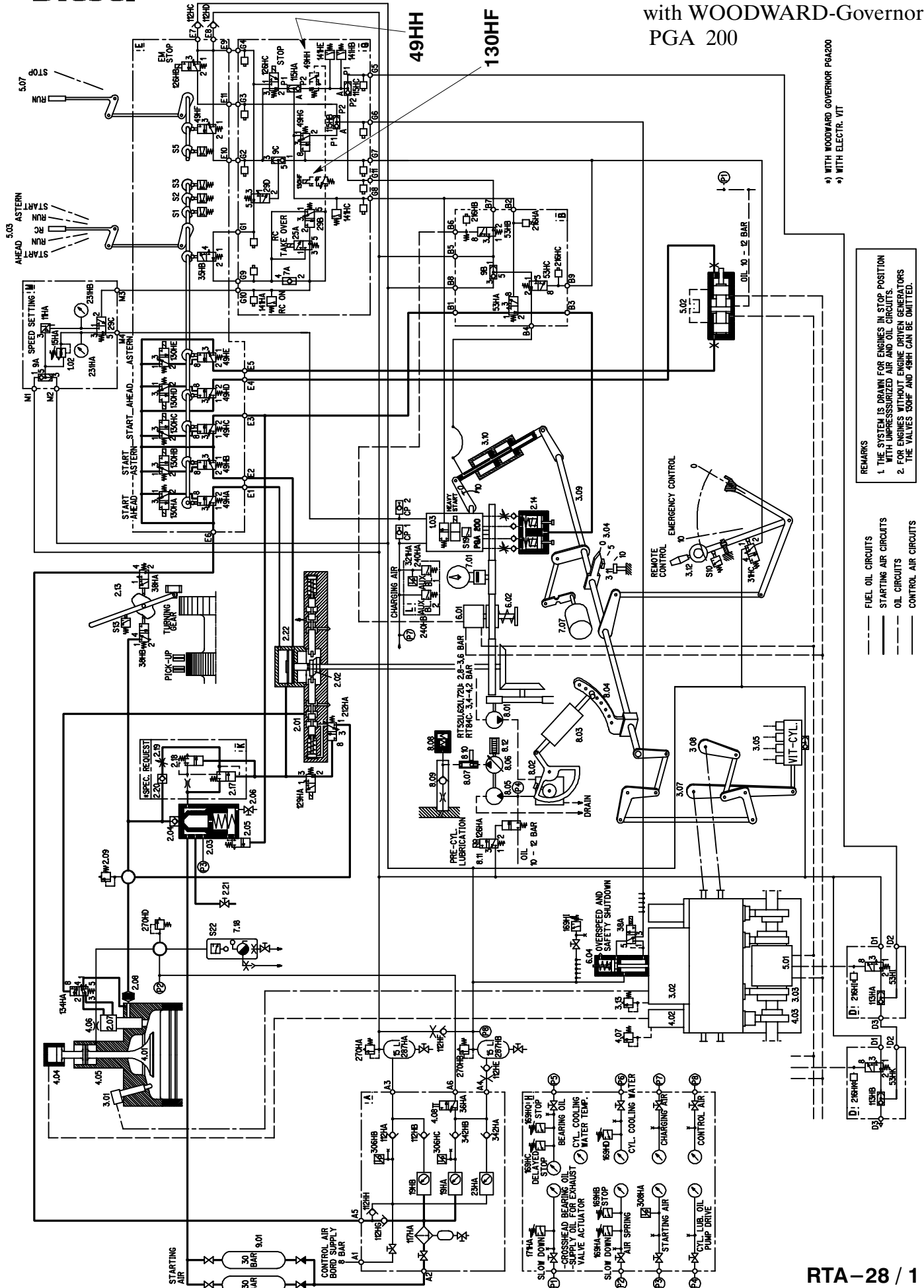
4. SERVICE BULLETINS PUBLISHED FOR LARGE BORE RTA–TYPE ENGINES

We have so far published the following Service Bulletins which are valid for Large Bore RTA–Type Engines (RTA 52 to RTA 84):

R–1	dated 31.10.89	Fitting / Replacement of Waisted Studs
RTA–2	dated 05.10.88	Water Drain from Charge Air Receiver and Charge Air Temperature
RTA–3.3	dated 25.04.94	Fuel Injection Nozzles
RTA–4	dated 20.11.89	Oil Damping for Short Tie Rods
RTA–8	dated 15.06.92	RTA–Cylinder Liners and Reinforced Water Guide Jackets
RTA–9	dated 20.07.92	Cylinder Cover with Erosion / Corrosion Resistant Cladding
RTA–10	dated 28.10.92	RTA ”–8 Series” Engines / Piston Skirt in Two Parts
RTA–11	dated 31.03.93	Fuel Injection Pump Regulating Linkage
RTA–14	dated 30.11.93	System Oil Care and Maintenance
RTA–15	dated 10.02.94	Elastic Studs on RTA-Type Engines
RTA–16	dated 15.03.94	Piston Rod Gland for RTA ”-8 Series” Engines
RTA–17.1	dated 28.02.95	Circulation Valve to Fuel Injection Valve
RTA–18	dated 15.09.94	Running-in of Piston Rings and Cylinder Liners
RTA–19	dated 28.10.94	Oil Supply Monitoring for Geislinger Torsional Vibration Damper
RTA–20	dated 30.11.94	Rotational Safety Studs for Roller Guide of Fuel Pump and Exhaust Valve Actuator
RTA–21	dated 10.04.95	Improvement of Starting Behaviour (For engines with DENIS–1 and DENIS–5 Control Systems only!)
RTA–22	dated 10.07.95	Waisted Bolts for Piston Crown Spraying Plate of RTA 84C, 84CU, 84M and 84T Type Engines
RTA–24	dated 03.11.95	ABB-Turbochargers Type VTR ..4 Introduction of Advanced Types of Bearings and Centrifuges
RTA–26	dated 03.01.96	Loss of Material on Piston Crowns due to High Temperature Corrosion and Erosion (Watercooled Pistons)
RTA–27	dated 26.04.96	Plastic Water Separator

Should you not be in possession of the above mentioned documentation suitable for your plant, kindly contact your local New Sulzer Diesel representative for your copy.

ENCLOSURES: as mentioned in the text



*) WITH WOODWARD GOVERNOR PGA200
*) WITH ELECTR. VIT

New Sulzer Diesel

with WOODWARD-Governor
PGA - EG 200

