

The EXOGAM Auto-Fill System

Instruction Manual and Specification for the 160l Dewar Level Controllers

Type 1 (Supplied by York)

(EDOC418)

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Version 1, June 1999

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IMPORTANT NOTE

The level controllers supplied by York are commercial units (QAR2080's supplied by Quantum Production Ltd) modified for their application on EXOGAM. They are identifiable by labels stating that they are modified units. These installation and operating instructions refer only to their use on EXOGAM.

Any queries regarding the units should be directed to Bob Hide at the University of York.

INTRODUCTION

The DEWAR LEVEL CONTROLLER automatically maintains the level of nitrogen in the 160l dewar, between two set points. The operation of the DEWAR LEVEL CONTROLLER is independent of the main AUTOFILL system, except when the AUTOFILL system requests a detector fill, for the reasons described below.

When the 160l dewar is filling, two solenoid valves open, one to let nitrogen in and one to release the pressure in the dewar.

The reason for releasing the pressure is as follows.

The nitrogen supply line in the lab is at a low pressure (1.5bar) and is similar to the pressure in the 160l dewar. This means that the length of time needed for the dewar to fill from the supply line would be unacceptably long. To overcome this problem a solenoid valve releases the dewar pressure during filling. However this does mean that during or immediately after the fill, no pressure is available for decanting.

If the AUTOFILL system requested a detector fill during the time that the 160l dewar was filling, it would not take place until the 160l dewar was full and the pressure had built up.

In order to overcome this problem, the AUTOFILL system inhibits, or suspends the automatic filling of the 160l dewar when it requests a detector fill.

This method still has a drawback, in that extra time has to be allowed for the detector fill because of the possibility of low pressure in the 160l dewar due to a current or recent fill.

(If this becomes a problem it should be possible to alter the control system, using spare control lines in the AUTOFILL system.)

DESCRIPTION

The level controller consists of a tubular stainless steel level sensor unit connected by a low voltage cable to the control unit. The level sensor is fitted vertically into the 160l dewar

A low voltage cable (12 V. DC.) connects the level sensor to the control unit.

At the control unit the detected level of liquid is displayed both by five vertically mounted lights (LED's) and also by a meter which reads 0 - 100 % full.

Should the level of liquid, for any reason, continue to fall below the 'LOW level to a lower pre-set 'LOW ALARM' level, or rise above the 'HIGH' level to a per-set 'HIGH ALARM' level, an internal 'Alarm' relay is activated the appropriate alarm light is lit and an audible alarm bleeps.

When the indicated liquid level is below the pre-set Low' level, the fill and vent valve on the dewar are opened

When the indicated liquid level is above the pre-set 'High' level, the fill and vent valve on the dewar are closed.

The table below summarises the visual and audible indications and the states of the control valves which correspond to various detected levels of liquid nitrogen within the 160l dewar

Level of liquid in vessel L.E.Ds	Illuminated and Audible	State of fill and vent Valves
Below the Low Alarm level	Low Level (Amber) Low Alarm (Red) Audible Alarm Bleeping	Open
Between the Low Alarm and Low Level levels	Low Level (Amber) No Audible Alarm	Open
Between the Low Level and High Level levels	Normal (Green) No Audible Alarm	see note 1 below
Between the High Level and High Alarm Levels	High Level (Amber) No Audible Alarm	Closed
Above the High Alarm level	High Level (Amber) High Alarm (Red) Audible Alarm Bleeping	Closed

Note 1.

When the indicated level of liquid lies between the Low Level and High Level pre-set point. the valves will be closed f the previous level has been Low Level or below (i.e. the dewar in the process of being filled) but the valves will be open if the previous level has been High Level or above (i.e. the dewar has just been filled and the level of liquid is falling).

Note 2. The Remote Alarm Relay contacts parallel the operation of the Audible Alarm. When the Audible Alarm is bleeping the Remote Alarm Relay will be in the Alarm state (pins 2 and: **closed**; pin 4 open circuit). When there is no Audible Alarm, pins 2 and 4 are close **together** and pin **3 is isolated** (open circuit).

ADJUSTMENT OF LEVEL SETTINGS

Six multiturn potentiometers are accessible through labelled holes on underside of unit which may be adjusted using a trim tool.

There are four potentiometers for High Alarm, High Level, Low Level and Low Alarm. One potentiometer for meter zero set and one for meter 100% set.

FRONT PANEL CONTROLS AND INDICATORS

PANEL METER

The panel meter fitted on the front panel of the control unit has been pre-calibrated so that it gives a reading of 0 (%) when there is no liquid nitrogen in the probe and 100 (%) when liquid nitrogen fills the stainless steel tube up to the height of the breather hole. The reading is linear with the height of liquid in the dewar between these points.

LED INDICATIONS (AND ALARMS)

CONDITION	L.E.D. COLOUR	AUDIBLE ALARM STATE
High Alarm	RED	BLEEPING
High Level	YELLOW	NONE
Normal	GREEN	NONE
Low Level	YELLOW	NONE
Low Alarm	RED	BLEEPING
Filling	GREEN	
Power	AMBER	

MANUAL FILL SWITCH

This centre biased switch enables a fill to be initiated (if the liquid level is falling between full and empty) or the fill to be stopped.

REAR PANEL CONNECTORS

Socket A - Output to Solenoid valves.

Socket B - Inhibit input from Manifold Control Unit.

Sensor input - From sensor mounted in dewar.

Remote Alarm - Connection of remote alarm, see section on next page.

SPECIFICATION

The level controllers are QAR2080's supplied by Quantum Production Ltd. These units have been modified for their application on EXOGAM by the University of York, Physics Department.

The modification allows the autofill system to inhibit the automatic filling of the 160l dewar, and enable the unit to supply power to operate the fill and vent valves on the 160l dewar.

The only visible modifications are the addition of a miniature 3 way connector (for the inhibit function) and a 4 way mains rated connector (to control the valves)

The units are clearly marked as modified, both externally and internally.

The unit has two mains fuses, one for the electronics and one for the supply to the solenoid valves.

The fuse mounted on the pcb supplies the mains transformer. (Type T 20mm 63mA)

The fuse mounted on the chassis supplies the solenoid valves (Type T 20mm 1A)

Warning - Disconnect the mains supply and alarm socket (if used) before opening the unit

Warning - The printed circuit board has mains supplied to it from both fuses.

Warning - The printed circuit board may have hazardous voltages supplied to it via the alarm socket.

The Remote Alarm Facility

The control unit contains an internal Alarm' relay which is energised whenever the unit is not in an 'Alarm' state (i.e. High or Low Alarm) and is de-energised in an Alarm' state. Hence if the power to the unit is switched off the 'Alarm' relay connections will indicate an 'Alarm' state.

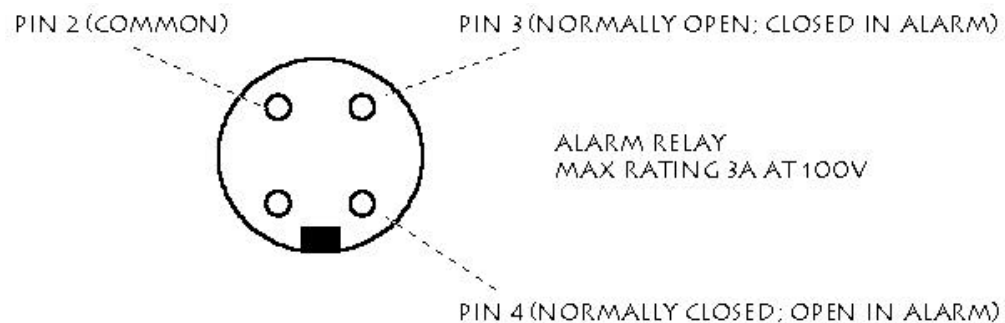
Connections to the contacts of the 'alarm' relay are available at the 4-pin DIN socket labelled 'Remote Alarm Relay' on the rear panel of the electronic control unit.

These contacts are described as volt free changeover contacts'. This means that the 'alarm' relay does not supply power to its output contacts but that its contacts act as a switch for an external circuit with its own power supply.

When IN the 'Alarm' state (either 'Low Alarm' or 'High Alarm' lights lit), current can pass between pins 3 (Normally Open; Closed in Alarm) and 2 (Common) but pin 4 (Normally Closed; Open in Alarm) is electrically isolated (open circuit).

When NOT IN the 'Alarm' state, there is an electrical pathway between pin 2 (Common) and pin 4 (Normally Closed) - i.e. current can pass between pins 2 and 4 - but pin 3 is electrically isolated (open circuit).

Remote Alarm Panel Socket (viewed from rear of unit)



THE 'ALARM' RELAY IS RATED FOR A MAXIMUM CURRENT OF 3 AMPS AND FOR A MAXIMUM VOLTAGE OF 100 VOLTS AC OR 24 VOLTS DC