Technical Manual

1771-OFE1 Analog Output Module

This is an intelligent output module with a built in microprocessor. The module is configured to have four analog outputs in the range of ±10 volts DC. The voltages correspond to 12 bit signed binary signals sent by the PLC by means of backplane block transfer communication. The module has 10 configuration plugs that must be set.

Two LED indicators on the module perform the following functions:

RUN — On (green) indicates that the module is operating correctly without faults.

FAULT — On (red) indicates that the module has a hardware failure and should be replaced.

The 1771-OFE1 module drives regulator functions such as the buck-boost exciter for walk shoe synchronization. The module output is controlled by the walk shoe synchronization regulator in the PLC. Similarly, the PLC produces modified motion reference signals, anti tightlining signals, etc. OFE1 modules are also used to modify reference signals that are originated at the operator's motion master switch. These signals are modified by reaching machine limits, by faults, etc.

1771-IAD Input Module

This input module monitors the on-off status of 120 volt AC devices such as control switches, pushbutton switches, limit switches, and pressure switches. The PLC processor uses this information in conjunction with its program to control outputs.

The 120 volt AC input signals are optically isolated, filtered, and converted into low voltage backplane signals that are fed to the processor module. The filtering minimizes the effects of contact bounce and electrical noise. The delays due to filtering are 26 milliseconds for on signals and 28 milliseconds for off signals.

The IAD input module can handle sixteen inputs which are wired into the module through a hinged and removable wiring arm. The terminals on this arm are labeled in the octal numbering system. The first eight inputs are numbered 00 through 07, and the last eight inputs are numbered 10 through 17.

Type F files are used by instructions that perform floating point math. These files are addressed to element level only. Two words are required per element to handle the number range.

Type B bit files are addressed to bit level using a / bit number after the element number or by specifying only a bit number. If the latter approach is taken (as it is on the 2570-WS), the file is treated as a file of consecutively numbered bits rather than elements. Address B3/21 is therefore the same as B3:1/5. The dragline ladder logic uses the B3/21 form of bit file addressing.

When the processor performs its I/O scan, it updates the type I input file and the type O output file in the data table. These files are called image files since the status of their bits is identical to the status of inputs and outputs in the rack modules. Type I and O files use addresses that have rack and module slot location significance. Two types of I/O addressing are used; two slot and single slot addressing.

The dragline PLC normally uses a two slot rack I/O addressing scheme for most racks. In this scheme the sixteen slot rack has eight I/O module groups of two adjacent slots each. Each module group can accommodate one input module and one output module. The I/O module groups are numbered 0 through 7 from left to right.

PLC I/O racks are numbers 0 through 7 and 10 through 17. The local rack contains the main processor module and is rack zero. The 2570W-S dragline uses racks 1 and 10 for the Panelview terminal which behave like remote I/O. Racks 1 and 10 do not physically exist as racks in hardware but look like two racks to the main processor as far as the software logic is concerned (they are, therefore, logical racks).

Following is an example of two slot I/O addressing. A contactor coil is connected to the twelfth terminal of an output module in the fourth slot of local rack 0. This module is in module group 1. The twelfth terminal corresponds to output image table bit 07. Module terminals and their corresponding image table bits are numbered in octal, 0 through 7 and then 10 through 17. The full address for the output is 00:01/07. This specifies file type 0, number 0, rack 0, module group 01, and bit 07.

In two slot addressing, the 16 slots are addressed in combinations of input and output cards (i.e. group 1 may have a digital input, IAD, and a digital output OAD card). This method allows each rack to support 128 digital inputs and 128 digital outputs (i.e. 8 input cards and 8 output cards).

vi) Use the up-down arrows to position the cursor for the opposite end stop limit. Enter this limit setting in feet of rope from the sheave. Press the ENTER key.

vii) Use the up-down arrows to position the cursor for the slowdown limit. Enter this limit setting in feet of rope from the sheave. Press the ENTER key.

viii) Press CANCEL to disable the cursor before leaving the screen.

Note: If installing new ropes on both hoist and drag, calibrate 1 can be performed on both hoist and drag before performing calibrate 2 on either motion. Both calibrate 1 and calibrate 2 must be performed on a motion before its limits can be set.

Procedure for hoist and drag encoder calibration and limit setting if ropes are shortened due to wear.

i) With the maximum number of wraps of rope on the drum, use the up-down arrows to position the cursor for the calibrate 2 function for the motion being calibrated. Press the CAL ~~F6~~ F1 function key.

ii) Move the bucket to the desired stop limit position on the sheave end of travel. Use the up-down arrows to position the cursor for the stop limit for the motion being set. Press the LIMIT ~~F6~~ F1 function key.

iii) Move the bucket to the desired slowdown limit position on the sheave end of travel. Use the up-down arrows to position the cursor for the slowdown limit for the motion being set. Press the LIMIT ~~F6~~ F1 function key.

iv) Use the up-down arrows to position the cursor for the opposite end stop limit. Enter this limit setting in feet of rope from the sheave. Press the ENTER key.

v) Use the up-down arrows to position the cursor for the slowdown limit. Enter this limit setting in feet of rope from the sheave. Press the ENTER key.

vi) Press CANCEL to disable the cursor before leaving the screen.

1) An electric tank heater sized to maintain 60°F oil temperature within the tank. Maintaining a 60°F minimum oil temperature permits ample flow rate from this reservoir through the gearbox bearings to satisfy bearing lubrication requirements during the gravity drain period following the termination of pump operation.

2) Supply line splitter valve located at the tank inlet controls the oil flowrate into the reservoir during filling simultaneous with adequate flowrate to the gearbox to satisfy bearing requirements.

3) A hydraulic fuse, located on the top of the reservoir allows for air escape through the breather during the filling operation. This fuse will close once hydraulic pressure hits it (when the tank is full). During drainback, the fuse responds to the suction pressure initiated in the first moments of drainback by opening to atmospheric pressure, the valve will remain in this position until hydraulic pressure again causes it to close.

iv. Breather Tank - This approximately 20 gallon tank, fitted to the gearbox just below the motor mounts, serves as the temporary storage tank for displaced oil due to gearing speed (with the pumping system off and gearbox full of oil, gearing RPM can cause a significant oil displacement). This tank will fill anytime the air void at the top of the case has been eliminated. Drainage will be by gravity. This tank also serves as a common vent vehicle for the gearbox, primary reservoir, and level sensing reservoir.

v. Level Sensing Tank - This approximately 1 gallon reservoir, located adjacent to the gearbox, provides an oil level of the gearbox unaffected by oil splash created by gearing. This reservoir is filled with two electronic level sensing probes. The elevation of the reservoir must be adjusted to provide electronic sensing of the "full" and "standard running", oil levels. A sight tube is provided for visual verification of oil level. Note that the only time truly accurate oil levels can be established is with the gearing at zero speed and the pump running (standard level) and secondly, with the gearing at zero speed and pump off long enough for the primary tank to have emptied (elevated oil level).

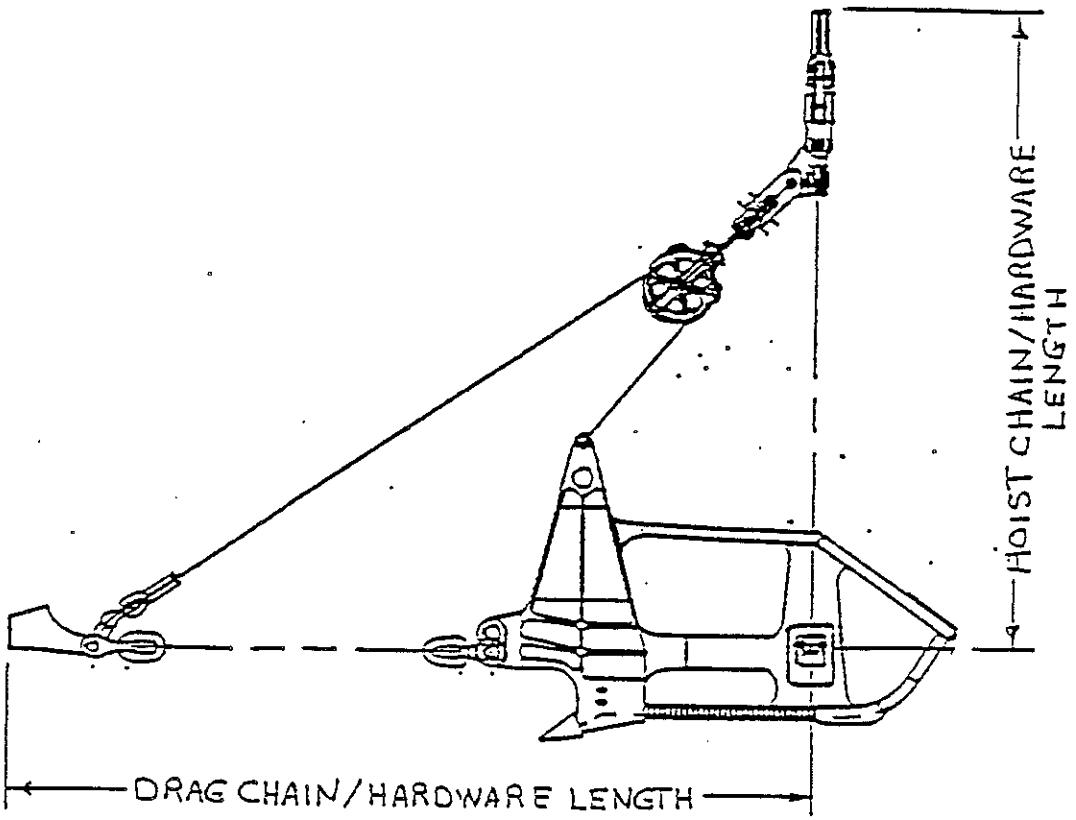

Figure I.C.6.2

Manual pushbuttons are provided for each system. LSAS1 for the left side and LSAS2 for the right side.

Red alarm lights are provided for each system. Unlike the other groups, each of these systems is provided with its own pump and will not, therefore, affect any other system. The procedure to clear an alarm is similar to that for all other systems except that the horn silence pushbuttons are located on each console, LSHSL for the left console horn and LSHSR for the right console horn.

4. Miscellaneous Control Stations

Several other control stations exist at various places around the machine (such as boom winch control, main crane control, various hoist controls, rear door opening and closing control, etc.). These controls are self-explanatory and require little comment.

A brief description, however, is required for swing lube pump motor pushbutton station which is located at the bottom of the stairs near swing gear case number 1. This set of pushbuttons serves two purposes. The first is to provide a way to operate the swing gear case pumps for maintenance purposes. The second is to provide a means to reset a swing gear case lubrication fault. The pushbutton is located where it is because it is always very desirable to determine what type of fault exists. The oil cooling pump for these systems is quite large and even though automatic protection exists, these pump could empty a gear case quickly in case of hose or pipe breakage.

The start and stop pushbuttons are used under normal running conditions to reset swing gear case pump faults. If a pump drive motor has a control fault or the pump has a pressure loss, or if a gear case oil level drops too low, that swing gear case will become faulted. The pump motor will shut down and the gear case should fill up to the top (unless there is oil leak). When this happens, the operator will be told via his CRT what has happened. Because of the possibility of a severe leak, the fault should be investigated at once (particularly if it is a low oil level fault). The swing motion top speed will be limited to about 80%. Provided the problem is not caused by a low oil level, the operator may continue to operate at reduced speed until maintenance corrects the problem. Once the problem has been corrected, it is necessary to reset the fault in order to allow full speed operation again. To do this, the swing motion should be brought to a normal stop. The gear case pump maintenance stop

Remote rack 5 in machinery house. 2 Slot Addressing

		Group 0		Group 1		Group 2		Group 3		Group 4		Group 5		Group 6		Group 7	
Ps	Proc	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7	Slot 8	Slot 9	Slot10	Slot11	Slot12	Slot13	Slot14	Slot15	Slot16
1771 P7	1771 ASB	1771 IAD		1771 IAD		1771 IAD		1771 IR	1771 IR	1771 IXE	1771 IXE	1771 IXE	1771 IXE	1771 IXE			
		auxil		auxil		h&d oil p.		dc mtr temp	dc mtr temp	amb. temp	ls pro brg te	m-g 3 brg te	m-g 4 brg te	sw oil temp			

Remote rack 6 MCC AREA located in the lower control room. 2 slot addressing.

		Group 0		Group 1		Group 2		Group 3		Group 4		Group 5		Group 6		Group 7	
Ps	Proc	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7	Slot 8	Slot 9	Slot10	Slot11	Slot12	Slot13	Slot14	Slot15	Slot16
1771 P7	1771 ASB	1771 IAD		1771 IAD	1771 OAD	1771 IAD	1771 OAD	1771 IAD	1771 OAD	1771 IAD	1771 OAD	1771 IAD	1771 OAD	1771 IAD	1771 OAD	1771 IAD	
		sw oil pump		blower	blower	fans	fans	fire alarms	fans & htrs	fans	fans	sw oil level	heater	swing oil p	swing oil p	swing press	

Remote rack 7 located in the inverter room.

		Group 0		Group 1		Group 2		Group 3		Group 4		Group 5		Group 6		Group 7	
Ps	Proc	Slot 1	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6	Slot 7	Slot 8	Slot 9	Slot10	Slot11	Slot12	Slot13	Slot14	Slot15	Slot16
1771 P7	1771 ASB	1771 DB	1771 OFE1	1771 IFE		1771 IK		1771 IFE			1771 OAD	1771 IAD					
		swing comm	swing ms sw	sw mtr temp		swing position		swing param			swing comm	swing comm					

Rack 0 Group 5 Slot 12
1771-OGD

Address	Symbol	Description
O:05/00	HCO	hoist motion control on (on=0)
O:05/01	DCO	drag motion control on (on=0)
O:05/02		
O:05/03	DPS	G.E. drag propel selection (propel=1)
O:05/04		
O:05/05		
O:05/06		
O:05/07		
O:05/10		
O:05/11		
O:05/12		
O:05/13		
O:05/14		
O:05/15		
O:05/16		
O:05/17		

Rack 0 Group 6 Slot 13
1771-IGD

I:06/00	SME1CIL	sync motor field exc. 1 cur. isolator (CI) loss
I:06/01	MCPSL	motion control power supply loss (fault=0)
I:06/02	HFECIL	hoist gen fld exciter current isolator loss
I:06/03	H1ACIL	hoist loop no. 1 armature CI loss (fault=1)
I:06/04	H2ACIL	hoist loop no. 2 armature CI loss (fault=1)
I:06/05	H3ACIL	hoist loop no. 3 armature CI loss (fault=1)
I:06/06	H4ACIL	hoist loop no. 4 armature CI loss
I:06/07	HMFECIL	hoist mtr. fld. exc. CI loss
I:06/10	DFECIL	drag gen fld exciter current isolator loss
I:06/11	D1ACIL	drag loop no. 1 armature CI loss (fault=1)
I:06/12	D2ACIL	drag loop no. 2 armature CI loss (fault=1)
I:06/13	D3ACIL	drag loop no. 3 armature CI loss (fault=1)
I:06/14	D4ACIL	drag loop no. 4 armature CI loss (fault=1)
I:06/15	DMFECIL	drag mtr. fld. exc. current isolator loss
I:06/16	PMFECIL	propel mtr. fld. exc. CI loss
I:06/17	SME2CIL	sync mtr. fld exc. 2 cur. isolator loss (fault=1)

Rack 0 Group 6 Slot 14
1771-OFE

N45:0	hoist plc reference volts
N45:1	drag plc reference volts
N45:2	hoist plc motor field reference volts
N45:3	walk plc sync regulator error volts

Rack 0 Group 7 Slot 15
1771-IGD

I:07/00	HGFBL1	hoist loop no. 1 ground fault
I:07/01	HGFBL2	hoist loop no. 2 ground fault
I:07/02	HGFBL3	hoist loop 3 ground fault
I:07/03	HGFBL4	hoist loop 4 ground fault
I:07/04	DGFBL1	drag loop no. 1 ground fault
I:07/05	DGFBL2	drag loop no. 2 ground fault
I:07/06	DGFBL3	drag loop 3 ground fault
I:07/07	DGFBL4	drag loop 4 ground fault

Rack 2 Group 6 Slot 12
1771-IAD

Address	Symbol	Description
I:26/00	AWB1I	aux. winch no. 1 breaker interlock
I:26/01	AWS1RF	aux. winch no. 1 raise pb. fast
I:26/02	AWS1RS	aux. winch no. 1 raise pb slow
I:26/03	AWS1L	aux. winch no. 1 lower pb.
I:26/04	AWS2RF	aux. winch no. 2 raise pb. fast
I:26/05	AWS2RS	aux. winch no. 2 raise pb. slow
I:26/06	AWS2L	aux. winch no. 2 lower pb.
I:26/07	AWB2I	aux. winch no. 2 breaker interlock
I:26/10	BRDU	bottom rear door up pushbutton
I:26/11	BRDD	bottom rear door down pushbutton
I:26/12	TRDO	top rear door open pushbutton
I:26/13	TRDC	top rear door close pushbutton
I:26/14	BRDUP	bottom rear door up limit
I:26/15	BRDDL	bottom rear door down limit
I:26/16	TRDOL	top rear door open limit
I:26/17	TRDCL	top rear door close limit

Rack 2 Group 6 Slot 14
1771-OD

O:26/10	AWC1F	aux. winch no. 1 forward contactor
O:26/11	AWC1R	aux. winch no. 1 reverse contactor
O:26/12	AWCIL	aux. winch no. 1 low speed contactor
O:26/13	AWC1H	aux. winch no. 1 high speed contactor
O:26/14	AWC2F	aux. winch no. 2 forward contactor
O:26/15	AWC2R	aux. winch no. 2 reverse contactor

Rack 2 Group 7 Slot 15
1771-IAD

I:27/00	MGC-1	m-g set no. 1 starter aux. contact
I:27/01	MGC-2	m-g set no. 2 starter aux. interlock
I:27/02	MGC-3	m-g set no. 3 starter aux. interlock
I:27/03	MGC-4	m-g set no. 4 starter aux. interlock
I:27/04		
I:27/05	GFDB1	drive bus 1 ground fault
I:27/06	GFDB2	drive bus 2 ground fault
I:27/07	GFFB1	fan bus 1 ground fault
I:27/10	GFFB2	fan bus 2 ground fault
I:27/11	GFMB	maintenance bus ground fault
I:27/12	BDBI	bottom door circuit breaker interlock
I:27/13	TDBI	top door circuit breaker
I:27/14	IOCX	system on
I:27/15	PLCRT	PLC power supply running timer
I:27/16		
I:27/17		