



MANAGEMENT SYSTEM MANUAL

ARM 8.13 Plant Recovery Procedures

Originator:

Gary McGrath

Approved By:

Albert F. Suchy

1. Purpose:

The purpose of this procedure is to establish the guidelines for main engine room plant recovery from a "Dead Ship" status.

2. References:

- a. Electrical Power One-Line Diagram, 65411-320-01
- b. DC Electrical Power One Line Diagram 65411-320-03
- c. Auxiliary Systems Diagram, Fresh Water Cooling, 65411-532-02
- d. Auxiliary System Diagram, Seawater Service, 65411-524-01
- e. Auxiliary System Diagram, Fuel Oil, 65411-541-01
- f. Auxiliary System Diagram, Compressed Air, 65411-551-01
- g. R/V Armstrong Equipment Starting Procedures and Check List.

3. Responsibility:

It is the responsibility of the Chief Engineer to promulgate the instructions necessary to recover the vessel from a dead ship condition to a normal condition.

4. Procedure:

The following procedures are provided as a guide and should not be a substitute for good engineering practices. A thorough understanding of the R/V Armstrong's machinery and systems to account for all conditions is essential to safely perform these functions. It is better to take time to align and operate systems than to rush and try to operate a system without thoroughly evaluating the situation.

5. Plant Description:

The following steps define the procedures required to start a main engine/generator and supply power to the main propulsion system after a "Dead Ship" condition.

The main engines are fitted with air starters supplied with air stored in receivers. The engine and generator control electronics are battery-powered. The engine diesel oil and lube oil pumps are engine-driven. The emergency generator has a battery starter, but power to the emergency switchboard should not be required to restart a main engine/generator as long as sufficient air reserves are present in the accumulators. Feedback from the emergency switchboard to the main switchboard is not required but is possible.



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The IAS400 system monitors and displays various alarm conditions and also controls the engine remote start/stop control. There are two battery backups for the IAS400 machinery monitoring and control system (24VDC4 & 5). The port battery charger (24VDC4) is supplied from the emergency bus from EP107-3. There are two battery backups for the engine/generator control panel (24VDC6 & 7). The port battery charger (24VDC6) is supplied from the emergency bus from EP107-5.

6. Plant Start up Procedures:

The following functions are required to systematically start R/V Armstrong's power plant. A specific instruction for each function is detailed below these steps.

- ❑ Main engines require a charge of air in order to start. Starting air receivers if empty, can be filled from the No. 2 starting air compressor when energized. Run the emergency generator and put on line. (See procedure for starting the emergency diesel generator and energize the emergency switchboard).
- ❑ Check the lineup of starting air compressor No. 2 to the starting air receivers.
- ❑ With the emergency bus bar energized, run the starting air compressor and charge the starting air receivers. Air receivers are rated at 400 MAWP. The Cummins QSK38 DM main engines have a maximum operating pressure of 150 psig.

Preparations can now be made to line up and start the main engines.

❑ **Lineup the salt water to the central fresh water cooling system**

Check that the following valves are OPEN:

- Sea chest skin valves 524-VL-1 and 524-VL-2
- Central cooling salt water pumps 1 & 2 suction and discharge valves 524-VL-6, 7, 9 and 10
- CSW cooling pump discharge header crossover 524-VL-12
- CSW cooling overboard 524-VL-75
- Inlet and outlet valves for heat exchanger to be put online (note: only one heat exchanger is to be lined up at one time)
- Isolation valves for pressure gauges, sensors and transducers

Check that the following valves are CLOSED:

- CSW Cooling sea chest (pump suction) crossover 524-VL-05



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- Heat exchanger bypass to overboard 524-VL-17
- Inlet and outlet valves for offline heat exchanger

Place both CSW pumps in remote at the local switch box. Place both CSW pumps in auto using the IAS400 system.

On the IAS400 control panel press on S/D (Standby/Duty) to select which pump will be the duty and standby pump; start pump; then confirm. The duty pump will start and the standby pump will be placed in standby.

□ Lineup the salt water cooling to the Ship Service Diesel Generator (SSDG)

Check that the following valves are OPEN

- Sea chest skin valves 524-VL-3 & 4
- #1-4 SSDG suction valves 524-VL-24, 25, 26 & 27
- #1-4 SSDG overboard valves 524-VL-29, 32, 35 & 38

Check that the following valve is CLOSED

- SSDG SW cooling suction header isolation between Port/STBD sea chests 524-VL-23

□ Lineup the fresh water to the fresh water cooling system

Check that the following valves are OPEN:

- FW cooling pumps 1 & 2 suction valves CFW-VL-1, 2, 3 & 4
- FW cooling pumps 1 & 2 discharge valves CFW-VL-6, 8
- FW cooling pump discharge header crossover CFW-VL-72
- Inlet and outlet valves to heat exchanger to be put online (Note: only one heat exchanger is to be lined up at a time, valve line up should correspond with SW cooling heat exchanger valve line up)
- Generators #1-4 FW cooling inlet and outlet valves CFW-VL-19, 20, 21, 22, 23, 24, 25 & 26

Check that the following valves are CLOSED:

- Inlet and outlet valves to heat exchanger that is offline (Note: only one heat exchanger is to be lined up at a time, valve line up should correspond with SW cooling heat exchanger valve line up)



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- Locally, start central FW cooling pump to be placed online and verify operation.
 - Switch running central FW cooling pump to IAS remote control. If available, the other Central FW cooling pump should be put in standby mode in IAS.
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- ❑ Ventilation system – ensure that the engine room supply and exhaust fans are appropriately lined up. Natural combustion air damper should always be opened.
 - ❑ Lineup the fuel oil supply from the day tanks to the main engines. Sound tanks to determine appropriate level. Verify that the fuel return lines are lined up as well. Fuel supply from one tank should always be lined up to return to the same tank.
 - ❑ Blowdown the starting air receivers and the low point drain at the engine to be started. Visually inspect the engine and check vitals: Oil level, JW Level, Air filter indicators, fuel oil filter indicator.
 - ❑ With SSDG in LOCAL, start and verify operation before switching to remote IAS control.
 - ❑ At IAS control panel, verify that generator is producing correct voltage and that no alarms are present.
 - ❑ Close 690VAC ships bus supply breaker at either the IAS400 control panel in the MCS or on the PMA300 control panel located on the 690VAC switchboard panel located in the switchboard room.
 - ❑ Close the 690V Breaker to either T1 or T2 690/480VAC ship service transformer. Close the associated 480V ships service transformer breaker.

Additional information is provided in the file folder *R/V Armstrong Equipment Starting Procedures and Check List* found in the MCS.

7. Reporting, Records & Documentation

This procedure does not require any additional documentation.