

**AUTOMATIC COMBUSTION CONTROL MAINTENANCE TRAINER-HAGAN, DEVICE 19E23****TRAINING CATEGORY:**

PROPULSION ENGINEERING (Damage Equipment Maintenance)

ORIGINATING AGENCY:

CNET

SECURITY CLASSIFICATION:

Device 19E23 is unclassified.

INTENDED USE:

The ACC maintenance training simulators are designed to provide "hands on" system training and repair and calibration experience for students in the Hagan ACC system maintenance courses at the NAVSCOL BT and the Naval Training and Development Center. These units are also provided to selected Naval shipyards for use in apprentice training programs and for dynamic shop testing of shipboard ACC system components.

FUNCTIONAL DESCRIPTION:

The ACC Maintenance Training Simulators are intended to represent typical combustion and feedwater control systems of the ships. The simulators are pneumatically operated in all respects with the exception of electric solenoid valves and pilot lights. The systems consist of two (2) console units; one unit is provided for a trainee and a second unit for his instructor. The Instructor Console contains provision for establishing boiler steam demand and for initiating simulated casualties to selected plant and control system components. The Trainee Console generally duplicates a shipboard ACC console of a type installed in an enclosed operating station. One complete set of boiler combustion controls, a boiler feedwater regulator, and a main feed pump control system are included in the simulation. Selector switches, corresponding to a burner ordering system, are provided on the Trainee Console to permit the system operator to simulate lighting off and securing of fuel oil burners. Instrumentation is provided to display all pertinent boiler and control system variables.

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The following specific training capabilities are designed into the system:

1. Boiler light-off
2. Raising steam pressure
3. Transfer of control loops from REMOTE MANUAL to AUTOMATIC control
4. Underway maneuvering under AUTOMATIC control
5. Underway maneuvering under REMOTE MANUAL control
6. Steady steaming under REMOTE MANUAL control
7. Response to plant or control system component casualties while under either REMOTE MANUAL or AUTOMATIC control
8. Transfer of control loops from AUTOMATIC to REMOTE MANUAL mode
9. Securing the boiler

Performance of the trainee may be continuously monitored and evaluated by the instructor. The location of the Instructor's Console with respect to the trainee will permit the instructor to view the trainee's response to simulated conditions and emergency situations imposed. The trainee, on the other hand, will be unable to see the instructor's operations which initiate emergency sequences, thus the trainee is forced to respond to casualty conditions on the basis of information observed directly from his console instrumentation. The boiler system provided in the simulator includes the steady state and dynamic characteristics of a modern navy type boiler designed for operation at 1275 psig steam drum pressure. Four (4) fuel oil burners of the atomizing steam type are provided. The external configuration of the combustion control consoles duplicate a standard Hagan console.

Instrumentation provided at the Trainee Console permits the console operator to monitor the following plant and control system variables:

1. Boiler steam flow
2. Superheater outlet pressure
3. Steam drum pressure
4. Boiler water level
5. Boiler feedwater flow
6. Combustion air flow
7. Forced draft blower speeds
8. Total fuel flow
9. Supply and header fuel oil pressures
10. Atomizing steam pressure
11. Boiler windbox pressure
12. Main feed pump discharge pressure
13. Control air supply pressure

These data are displayed on gages and vertical indicators on the face of the console. Operating instrumentation displayed on the upper sloped face of the console includes:

1. Superheater outlet steam pressure
2. Boiler drum pressure
3. Boiler water level
4. Boiler smoke density
5. Casing inlet windbox air pressure
6. Engine order telegraph commands

The operator interface equipment includes the following:

1. Boiler master transfer station
2. Fuel oil transfer station
3. Forced draft blower transfer stations
4. Boiler feedwater regulator transfer station
5. Main boiler feed pump transfer station
6. Remote operator for main steam stop valve
7. Remote operator for fuel oil quick-closing valve
8. Fuel/air ratio relay
9. Fuel/air ratio indicator

Alarm or pilot lights are provided for the following conditions:

- 1.a. Smoke indicator (normal)
- 1.b. Smoke indicator (smoke)
2. Flame failure indicator
- 3.a. High water level indicator
- 3.b. Low water level indicator
- 4.a. 1A1 forced draft blower non-return shutter
- 4.b. 1A2 forced draft blower non-return shutter
5. Control air supply pressure indicator

The maintenance trainers feature a bread-board display of the actual steam generating plant component control mechanisms. The control mechanisms are connected directly to the control console. They respond appropriately to console commands and react to simulated steam plant responses and/or abnormal conditions. The simulators provide the following maintenance training capabilities:

1. Dynamic visual display of control mechanism functions
2. Casualty diagnosis and fault isolation scenarios
3. Control mechanism displays can be detached for repair calibration, replacement and system checkout

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PHYSICAL INFORMATION:

Estimated weight of trainee console is 2300 lbs., instructor's console is 1800 lbs. and the display panel is approximately 2500 lbs. The consoles require an entrance way of 40" but the panel requires an entrance way of 12'.

Instructor's Console: 32" W x 53" H x 50" L

Trainee Console: 38" W x 54" H x 60" L

Display Panel: 42" W x 96" H x 144" L

ENVIRONMENTAL CHARACTERISTICS:

Space in which consoles are installed should be provided with a compressed air supply and electrical service. Lighting should be ample to permit viewing of training operations. Air conditioning is desirable but not necessary.

EQUIPMENT REQUIRED (NOT SUPPLIED):

1. Poly-Flo Makeup Kit - Imperial Eastman #115-P
2. Wallace & Tierman, Dual Scale Model 65B5A0031, 3.6 PSI to 30.6 PSI scale
3. Pressure Regulator, Moore Product Type 40-30 or equal
4. 50" "U" Tube Water Manometer

INSTALLATION AREA:

The equipment should be located in a large classroom or similar space of sufficient size to accommodate the consoles, display panel and number of personnel involved with the training.

POWER REQUIREMENTS:

Compressed Air - 75-100 psig

Power 115V, 60 Hz, 10, 15A

PUBLICATIONS FURNISHED:

NAVTRADEV P-4099

CONTRACT IDENTIFICATION:

Manufactured by Naval Ships Engineer Center, Philadelphia, PA.

LOCAL STOCK NUMBER:

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