

ENVIRONMENTAL SYSTEMS SCHEMATIC SYMBOLS

TABLE OF CONTENTS

	Page
1. PURPOSE	2
2. SCOPE	2
3. SYMBOL USE	2
3.1 General Schematic Organization	2
3.2 General Symbol Features	3
4. SYMBOLS	3
4.1 Heat Exchangers	4
4.2 Rotating Components	5
4.3 Plumbing and Lines	7
4.4 Valves	9
4.5 Controls and Sensors	11
4.6 Miscellaneous	12
5. COMBINED OR SPECIAL SYMBOLS	14
6. EXAMPLE SCHEMATIC	17
7. BIBLIOGRAPHY	18

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1. PURPOSE:

This Aerospace Recommended Practice (ARP) establishes graphical symbols for use on schematic flow diagrams of aerospace vehicle environmental systems. Use of this ARP is recommended for systems integration purposes. It is not intended to show detailed component functional information.

2. SCOPE:

This ARP provides symbols to schematically represent aerospace vehicle environmental system components on functional flow schematic drawings and graphical computerized output. The symbols are for use on simplified diagrams that provide basic information about an environmental system.

Symbols are provided to represent basic types of components used in environmental systems. Simple variations of basic symbol types are provided. Words on the schematic diagram, special symbol codes, or symbols that combine basic symbol types (Section 5) can be used to augment the basic symbols when appropriate. Special or combined symbols not contained in this document should be defined on the schematic diagram.

An example of a complete schematic is given in Section 6.

A bibliography of other documents on environmental system symbols is found in Section 7.

3. SYMBOLS USE:

Environmental system symbols are used on a schematic diagram to indicate functional relationships between actual parts of the system. The schematic diagram facilitates tracing the operation of the system. The diagram does not indicate actual physical size, shape, or location of a system component, device, or part. The symbols are a shorthand method to relate graphically the function of a part of the system.

3.1 General Schematic Organization: Recommendations for organizing component symbols on a schematic diagram, and general recommendations on schematic symbols for system plumbing and lines are provided.

3.1.1 Symbols should be located on the schematic diagram so that components located towards the forward part of the vehicle are located on the left side of a schematic diagram, and symbols for components located towards the aft part of the vehicle are on the right side of a schematic diagram. This does not apply if general component location in a vehicle is unknown.

3.1.2 Heavy, medium, and light lines may be used on a schematic diagram to emphasize elements of the system diagram.

3.1.3 Fluid flow directions should be indicated with arrowheads on the schematic flow diagram.

3.1.4 Fluid types should be written near symbols for ducting or plumbing lines, particularly if several different fluids are used.

3.2 General Symbol Features: Several general features applicable to all symbols are recommended.

3.2.1 Circles, rectangles, squares, triangles, and lines (curved and straight) are basic symbol shapes. Rotation of a symbol shape on a schematic diagram does not change the meaning of the symbol.

3.2.2 Alphabetical (letter) codes, related to the component name, are used to identify symbols having the same or similar shape. Complete component names or identifications on a schematic diagram should be located in approximately the same location relative to the symbol to which they apply.

3.2.3 The inlet and outlet flow locations should be indicated clearly for each symbol. Flow lines through a symbol should be used to prevent confusion if two or more different fluids enter or exit a component at two different locations (e.g., heat exchanger flow lines).

3.2.4 Lines representing sensor signals or intelligence data for controls should be drawn lightly. The number of wires or lines actually used does not need to be indicated - a single line can be used. The type of sensor signal or intelligence data should be identified by words or alphanumeric codes.

4. SYMBOLS:

Symbols are presented in five general groupings, plus miscellaneous. The five groups are Heat Exchangers, Rotating Components, Plumbing and Lines, Valves, and Controls and Sensors. Generally, symbol types are alphabetized within each group.

Asterisks are used on some symbols in this report, but are not intended for actual use. Instead, an identifier or code letter or letters should be used, as noted on the following pages. The asterisk can be omitted when appropriate.

Arrowheads are not included on most symbols in this report. They should be used on the schematic flow diagrams to indicate fluid flow direction between component symbols. Arrowheads are found on some symbols in this report for clarity.

4.1 Heat Exchangers:

NAME

SYMBOL

BASIC HEAT EXCHANGER

* [IDENTIFIER NAME]

BOILER

CONDENSER or COND

DEFOG

EVAPORATOR or EVAP

INTERCOOLER

LOAD

PRECOOLER or PRE

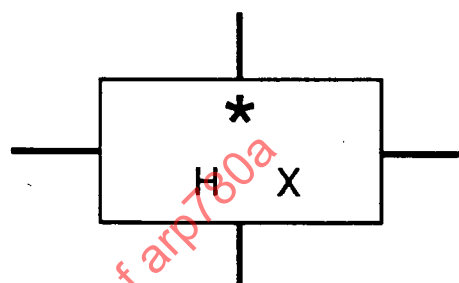
PRIMARY or PRI

REGENERATIVE or REGEN

REHEATER

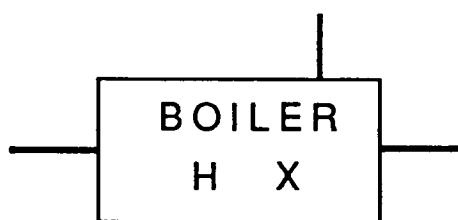
SECONDARY or SEC

SUBCOOLER or SUBC

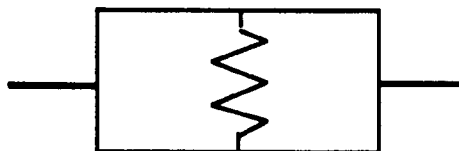


HEAT EXCHANGER VARIATIONS

BOILER



ELECTRIC HEATER

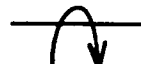


4.2 Rotating Components:

NAME

SYMBOL

SHAFT

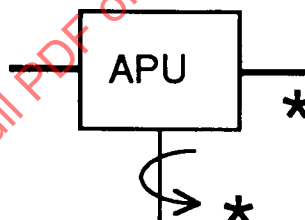


AIR CYCLE MACHINE (ACM)

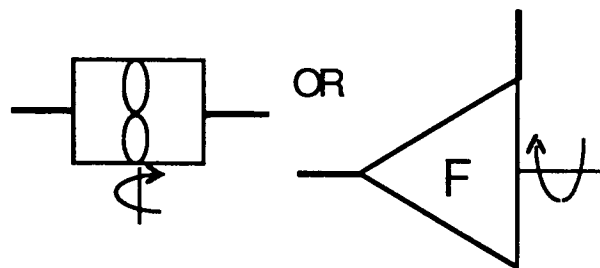
(See COMPRESSOR, FAN, and
TURBINE)

AUXILIARY POWER UNIT (APU)

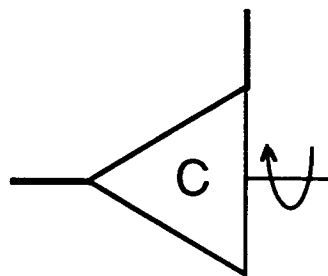
* Power Extraction Shaft, or
Bleed, or
Both, as appropriate



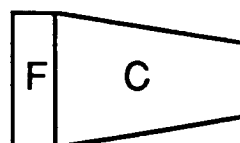
BLOWER, or FAN
with EXTERNAL POWER



COMPRESSOR



ENGINE



4.2 Rotating Components (Continued):

NAME

SYMBOL

GEAR DRIVE



POWER DRIVE (MOTOR)

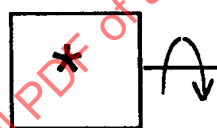
* [IDENTIFIER CODE]

AIR MOTOR P
(OR SEE TURBINE)

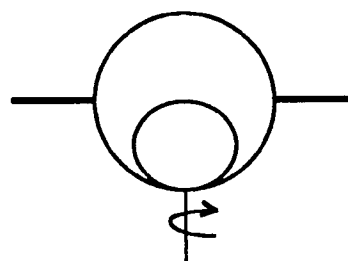
AC MOTOR AC

DC MOTOR DC

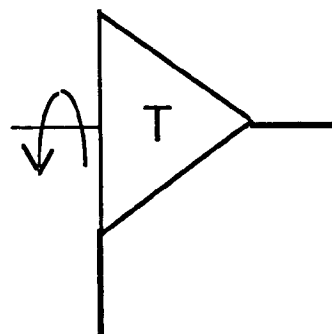
HYDRAULIC MOTOR . . . H



PUMP



TURBINE



4.3 Plumbing and Lines:

NAME

SYMBOL

LINES

AIR



REFRIGERANT



LIQUID COOLANT



ELECTRIC



CONTROL or SENSE



CONNECTION or JUNCTION

DISCONNECT, QUICK
(without CHECK VALVE)
CONNECTED

DISCONNECTED

(with CHECK VALVE)
CONNECTED

DISCONNECTED



4.3 Plumbing and Lines (Continued):

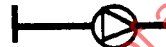
NAME

SYMBOL

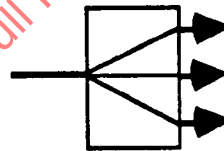
EXPANSION JOINT



GROUND SERVICING



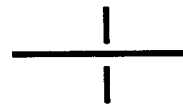
MANIFOLD



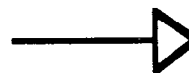
NOZZLE



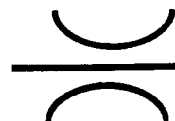
ORIFICE



OUTLET



VENTURI



4.4 Valves:

NAME

SYMBOL

ACTUATION AND CONTROL

** [TWO LETTER CODE:
1st: ACTUATION METHOD
2nd: CONTROL METHOD]

ELECTRICAL E
FLUID F
HYDRAULIC H
MECHANICAL M
PNEUMATIC P
SQUIB S
THERMAL T

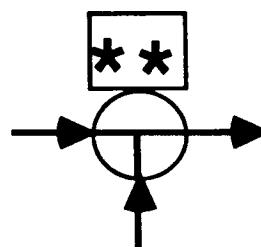
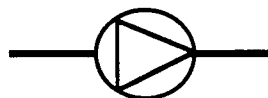
BILEVEL

CHECK

COMPARTMENT PRESSURE
REGULATOR

COMPARTMENT SAFETY
VALVE

FLOW MIXING

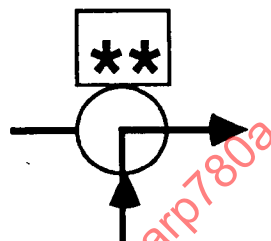
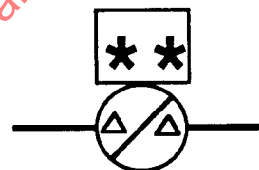


4.4 Valves (Continued):

NAME

SYMBOL

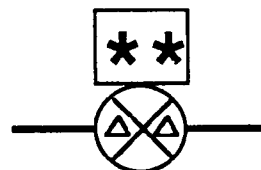
FLOW SELECTOR

MODULATING
ΔΔ [TWO LETTER CODE]SPRING LOADED CLOSED... NC
SPRING LOADED OPEN.... NO

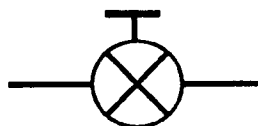
PRESSURE RELIEF



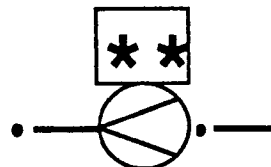
SHUTOFF

SPRING LOADED CLOSED... NC
SPRING LOADED OPEN.... NO

SHUTOFF, MANUAL



THERMAL EXPANSION



4.5 Controls and Sensors:

NAME

SYMBOL

COCKPIT SWITCH

SW

CONTROLLER


 CTRL

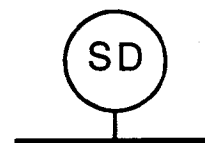
SENSOR

* [TYPE CODE]

COOLING EFFECT CE
 FLOW RATE F
 PRESSURE (ABSOLUTE) AP
 PRESSURE(DIFFERENTIAL) DP
 PRESSURE (GAGE) P
 TEMPERATURE T



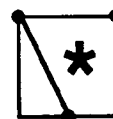
SMOKE DETECTOR



SWITCH

* [TYPE CODE]

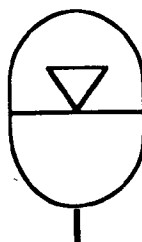
ALTITUDE A
 PRESSURE (ABSOLUTE) AP
 PRESSURE(DIFFERENTIAL) DP
 PRESSURE (GAGE) P
 TEMPERATURE T



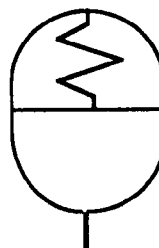
4.6 Miscellaneous:

NAME

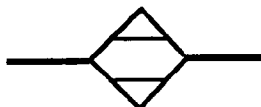
SYMBOL

ACCUMULATOR
HYDROPNEUMATIC

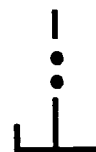
SPRING-LOADED



DESICCANT

DRAIN (LIQUID)
OVERBOARD

TO RESERVOIR



DUST SEPARATOR

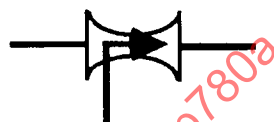


4.6 Miscellaneous (Continued):

NAME

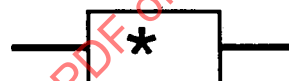
SYMBOL

EJECTOR

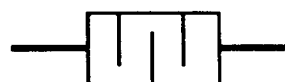


FILTER

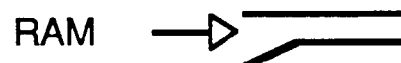
*[IDENTIFIER CODE]
NUCLEAR, BIOLOGICAL,
CHEMICAL.....NBC
PARTICULATE.....DUST



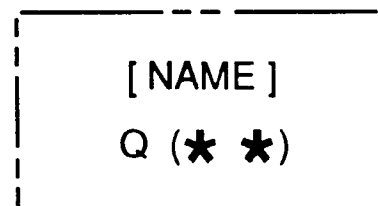
MUFFLER



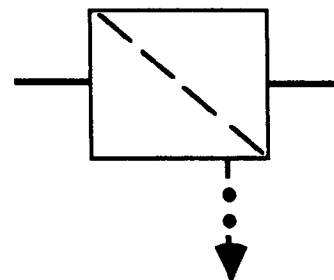
RAM SCOOP



THERMAL LOAD
(COMPARTMENT)
** HEAT LOAD, KW



WATER COLLECTOR or
SEPARATOR
(or OTHER LIQUIDS)



5. COMBINED OR SPECIAL SYMBOLS:

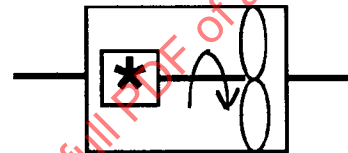
NAME

SYMBOL

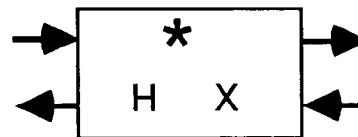
CONTROLLER,
ELECTRO-PNEUMATIC

FAN

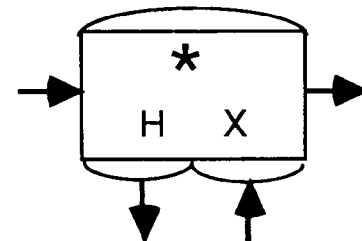
* AIR MOTOR P
 AC MOTOR AC
 DC MOTOR DC
 HYDRAULIC MOTOR... H



HEAT EXCHANGER,
 (* - see HEAT EXCHANGERS, p. 4)
 COUNTERFLOW



MULTI-PASS



MULTIPLE

