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RHIC Cryogenic System Equipment Identification System and Schematic Symbols

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March 1992

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U.S. Department of Energy

USDOE Office of Science (SC)

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AD/RHIC/RD-38

RHIC PROJECT

Brookhaven National Laboratory

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This Technical Note describes the conventions which will be used to identify the components of the RHIC Cryogenic System. These conventions consist of four major groupings:

1. A valve numbering system.
2. An instrumentation numbering system.
3. A piping identification system.
4. Symbols used on schematic drawings.

As all of these conventions will finally culminate in an operating system, it is important that this uniform system be used exclusively. This will allow preparation of operating and maintenance instruction manuals in an orderly fashion.

1. Valve Numbering System

In the valve numbering system to be used for the RHIC Cryogenic System, a typical number is:

CRYO H1234A

CRYO	=	System
H	=	Fluid Controlled
1234	=	Valve Number
A	=	Type of valve

The system code for all equipment in the Cryogenic System is CRYO. This system code may be suppressed in geographic areas (Cryogenic Wing of the Service Building, Gas Storage Area and Compressor Room) where it is clear to which system a component belongs. But, in all other areas - - especially the tunnel and Experimental Areas, it must be shown on the equipment label.

The basic number is H1234. There should not be an H1234A and also an H1234M. There can, however, be an H1234A and a V1234A.

Listed below are the prefix and suffix codes to be used for valves:

Prefix - Fluid Controlled

A Air
E Hydraulic Fluid
H Helium
N Nitrogen
U Utility or miscellaneous
V Vacuum
W Water

Suffix Code - Type of Valve

A Pneumatically operated valve
C Check Valve
E Electrically operated valve - solenoid of electric motor driven
M Manual Valve
P Pressure Regulator
R Relief Valve
S Servo Valve

A "CRYO Valve Number Book" is to be maintained in the drafting room to control the issue of numbers. The book is divided in sections according to the Prefix Code. When a number is issued, an entry in the book indicates the drawing number of the schematic on which the valve appears and the drawing number of the panel or assembly on which the valve is used. If, at the time the valve number is issued, only a schematic exists, the second column will be left blank until such time as a suitable reference drawing has been prepared.

If a valve for which a number has been issued is removed from the system, a suitable entry should be made in the "Valve Number Book".

II. Instrumentation Numbering System

A typical instrument number is: CRYO TI 1234 H

CRYO = System
TI = Type of Instrument
1234 = Instrument Number
H = Fluid Measured

The basic number, in this case in TI1234. There should not be a TI1234H and a TI1234V. There can be, however, a TI1234H and a PI1234H.

Listed below are the prefix and suffix codes used for gauges:

Prefix Code - Type of Instrument

FI Flow Indicator
FS Flow Switch
PI Pressure Indicator (includes mechanical type vacuum gauges)
PS Pressure Switch
SI Speed Indicator (tachometer)
TI Temperature Indicator
TS Temperature Switch
LI Level Indicator
VI Vacuum Indicator (electrical vacuum gauges only).

Suffix Code - Fluid Measured

Same as used for Prefix Code in valve numbering system.

A "CRYO Instrumentation Number Book", similar to the "Valve Number Book" is maintained in the drafting room.

III. Piping Identification System

Ring Piping - In order to avoid conflicts with the color-coding system used on the conventional facility piping in the tunnel and experimental areas, the Cryogenic System piping in these areas will not be color-coded. A system of labels will be used to identify the Cryogenic System piping.

A typical label shall begin with the system identification, CRYO, followed by the functional description.

Ring Piping Label	Schematic Label
CRYO Magnet Helium	M
CRYO Supply Helium	S
CRYO Return Helium	R
CRYO Utility Helium	U
CRYO Shield Helium	H
CRYO Warm Helium Return	W
CRYO Vent	

When more than one cryogenic pipe is enclosed by a common vacuum jacket, the label on the vacuum jacket shall read:

CRYO VJ HELIUM PIPE

The arrow indication flow direction shall be omitted from the main runs of these multiple pipes. However, an identifying label for each individual line with flow direction indicated shall be provided near the line's entrance and exit points from the multiple line.

Cryogenic Area Piping

In geographic areas where it is clear to which system a component belongs; i.e., Cryogenic Wing of the Service Building, Compressor Room and Gas Storage Area; a system of color-coding will be used. Labels similar to those described above may also be used where they aid in piping identification.

The color-coding may be accomplished either by painting the pipes or by banding, either with tapes or painted bands.

Color-Code for Pipes and Equipment

Description	Painted Pipes	Tapes or Painted Bands
High Pressure (or Supply) Helium	Red	Red
Low Pressure (or return) Helium	Orange	Orange
Process Vacuum	Light Blue	White-Blue-White
Air	White	White
High Pressure Nitrogen	Green	Green
Low Pressure Nitrogen	Light Green	White-Green-White
Liquid Nitrogen	Green w/yellow band	Green-Yellow-Green
Hydraulic Fluid (oil)	Brown	Brown
Vent	Yellow	Yellow
Water	Blue	Blue

Rust Oleum Paint Colors

Red	H-19 Massey - Ferguson Red
Orange	723 Oil Well - Orange
Blue	721 National Blue
Yellow	659 Yellow
Light Blue	866 Marlin Blue
White	2766 High Gloss White
Green	H-12 Oliver Green
Light Green	7232 Pleasant Green
Brown	977 Chestnut Brown

Mystik Tape Colors

Tape No.	5803	Green, Blue, Brown and Red
Tape No.	5804	White and Yellow

Use a minimum tape or painted band width of 1-inch for pipes 1-inch or larger.

SCHEMATIC SYMBOLS AND NOMENCLATURE LIST

DPT	DIFFERENTIAL PRESSURE TRANSDUCER
DY	D/D – TTL TO 120 VAC OUTPUT
FI	FLOW INDICATOR
FSL	LOW FLOW SWITCH
FT	FLOW TRANSDUCER
HIC	MANUAL CONTROLLER
HS	HAND SWITCH
HTR	HEATER
HY	CURRENT TO PNEUMATIC CONVERTER
LSH	HIGH LEVEL SWITCH
LSHH	HIGH–HIGH LEVEL SWITCH
LSL	LOW LEVEL SWITCH
LT	LEVEL TRANSMITTER
MTR	MOTOR
OLS	MOTOR STARTER OVERLOADS
PI	PRESSURE INDI ATOR
PSH	HIGH PRESSURE SWITCH
PSL	LOW PRESSURE SWITCH
PT	PRESSURE TRANSDUCER
SAH	HIGH SPEED ALARM
SAHH	HIGH–HIGH SPEED ALARM
SC	SPEED CONTROLLER
SI	SPEED INDICATOR
SIC	SPEED INDICATING CONTROLLER
ST	SPEED TRANSDUCER
TI	TEMPERATURE INDICATOR
TSH	HIGH TEMPERATURE SWITCH
TT	TEMPERATURE SENSOR
VBH	HIGH VIBRATION ALARM
VBHH	HIGH–HIGH VIBRATION ALARM
VBI	VIBRATION INDICATOR
VBT	VIBRATION TRANSDUCER

SCHEMATIC SYMBOLS AND NOMENCLATURE LIST
PAGE 2 OF 3

S. P. SETPOINT SIGNAL

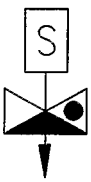
F. O. FAIL OPEN DIRECTION

F. C. FAIL CLOSED DIRECTION

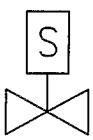

FLOW CONTROL CHECK VALVE


CONTROL VALVE


CONTROL VALVE WITH POSITIONER



3-WAY SOLENOID VALVE
(DOT INDICATES COMMON PORT)



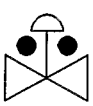
SOLENOID VALVE

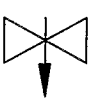

PRESSURE RELIEF VALVE

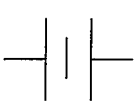

HAND VALVE

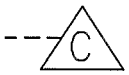

CONTROL VALVE WITH
POSITION TRANSDUCER


VALVE WITH LIMIT SWITCHES

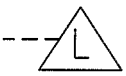

VALVE WITH LIMIT SWITCHES


NEEDLE VALVE

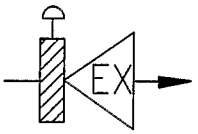

RESTRICTING ORIFICE



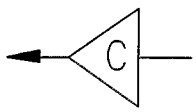
BNL COMPUTER



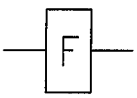
LOCAL LOGIC INTERLOCK ACTION



EXPANDER WITH ADJUSTABLE
INLET GUIDE VANES



COMPRESSOR



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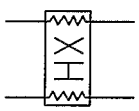

HEAT EXCHANGER

A/A ANALOG TO ANALOG CONVERSION

A/D ANALOG TO DIGITAL CONVERSION

D/A DIGITAL TO ANALOG CONVERSION

D/D DIGITAL TO DIGITAL CONVERSION

E/I VOLTAGE TO CURRENT CONVERSION

E/E VOLTAGE TO VOLTAGE CONVERSION

I/E CURRENT TO VOLTAGE CONVERSION

I/P CURRENT TO PNEUMATIC
CONVERSION

P/E PNEUMATIC TO VOLTAGE
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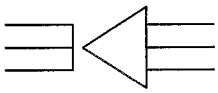
E/P VOLTAGE TO PNEUMATIC
CONVERSION

SCHEMATIC SYMBOLS AND NOMENCLATURE LIST
PAGE 3 OF 3


COOL DOWN PROCESS LINE


MAIN PROCESS LINE

ALTERNATE MAIN PROCESS LINE

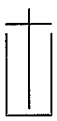
WARM UP LINE

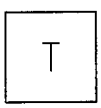
FLOW SENSOR

CAPILLARY TUBING (FILLED SYSTEM)

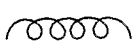
ELECTRICAL CONTROL SIGNAL

PNEUMATIC CONTROL SIGNAL


BAYONET CONNECTION



OIL TRAP


HEATER

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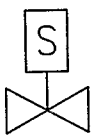


SOLENOID VALVE

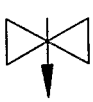

PRESSURE RELIEF VALVE

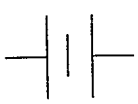

HAND VALVE

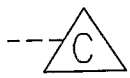

CONTROL VALVE WITH
POSITION TRANSDUCER


VALVE WITH LIMIT SWITCHES

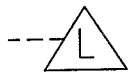

VALVE WITH LIMIT SWITCHES


NEEDLE VALVE

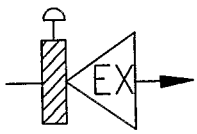

RESTRICTING ORIFICE



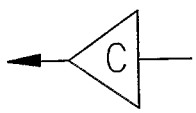
BNL COMPUTER



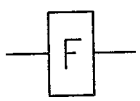
LOCAL LOGIC INTERLOCK ACTION



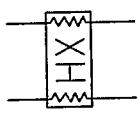
EXPANDER WITH ADJUSTABLE
INLET GUIDE VANES



COMPRESSOR



FILTER

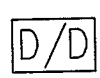


HEAT EXCHANGER

ANALOG TO ANALOG CONVERSION

ANALOG TO DIGITAL CONVERSION

DIGITAL TO ANALOG CONVERSION



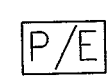
DIGITAL TO DIGITAL CONVERSION

VOLTAGE TO CURRENT CONVERSION

VOLTAGE TO VOLTAGE CONVERSION

CURRENT TO VOLTAGE CONVERSION

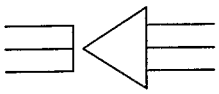
CURRENT TO PNEUMATIC
CONVERSION



PNEUMATIC TO VOLTAGE
CONVERSION

VOLTAGE TO PNEUMATIC
CONVERSION

SCHEMATIC SYMBOLS AND NOMENCLATURE LIST
PAGE 3 OF 3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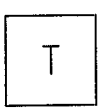

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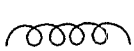
HEATER