NOT MEASUREMENT SENSITIVE

KSC-STD-152-2C
May 15, 1992
Supersedes
KSC-STD-152-2B
June 7, 1991

GRAPHIC SYMBOLS FOR DRAWINGS

PART 2

GROUND SUPPORT EQUIPMENT

STANDARD FOR

ENGINEERING DEVELOPMENT DIRECTORATE

National Aeronautics and
Space Administration

John F. Kennedy Space Center

NASA

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PART 2

GROUND SUPPORT EQUIPMENT

STANDARD FOR

Approved By:

Walter T. Murphy
Director of Engineering Development

JOHN F. KENNEDY SPACE CENTER, NASA

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GRAPHIC SYMBOLS FOR DRAWINGS
PART 2
GROUND SUPPORT EQUIPMENT
STANDARD FOR

1. SCOPE

This standard establishes the requirements applicable to the graphic symbols used on ground support equipment (GSE) drawings prepared by or for the John F. Kennedy Space Center (KSC), NASA. This standard applies to those symbols used on structural, mechanical, electrical, and electronic drawings used to fabricate, install, or modify GSE and on other operations and maintenance documentation (OMD) drawings required for operation, maintenance, or other use of GSE.

2. APPLICABLE DOCUMENTS

The following documents form a part of this document to the extent specified herein. When this document is used for procurement, including solicitation, or is added to an existing contract, the specific revision levels, amendments, and approval dates of said documents shall be specified in an attachment to the Solicitation/Statement of Work/Contract.

2.1 Governmental.

2.1.1 Standards

John F. Kennedy Space Center (KSC), NASA

KSC-STD-E-0011	Electrical Power Receptacles Standard for

2.1.2 Drawings

John F. Kennedy Space Center (KSC), NASA

79K05763	Tube Fitting Symbols

2.1.3 Publications

John F. Kennedy Space Center (KSC), NASA

GP-435, Volume II	Engineering Drawing Practices, Facilities

2.2 Non-Governmental

American Institute of Steel Construction (AISC)

M015	Manual of Steel Construction - Load and Resistance Factor Design
M016	Manual of Steel Construction - Allowable Stress Design

(Application for copies should be addressed to the American Institute of Steel Construction, Inc., 400 North Michigan Avenue, Chicago, IL 60611)

American National Standards Institute (ANSI)

ANSI X3.5	Flowchart Symbols and Their Usage in Information Processing.
ANSI Y10.3	Letter Symbols for Quantities Used in Mechanics of Solids
ANSI Y10.20	Mathematical Signs and Symbols for Use in Physical Sciences and Technology
ANSI Y14.36	Surface Texture Symbols
ANSI Y32.10	Graphic Symbols for Fluid Power Diagrams

(Application for copies should be addressed to the American National Standards Institute, 1430 Broadway, New York, NY 10018)

American National Standards Institute/American Society of Mechanical Engineers ANSI/ASME)

ANSI/ASME B1.7M	Nomenclature, Definitions, and Letter Symbols for Screw Threads

(Application for copies should be addressed to the American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York, NY 10017)

American National Standards Institute/American Welding Society (ANSI/AWS)

ANSI/AWS A2.4	Standard Symbols for Welding, Brazing, and Nondestructive Examination

(Application for copies should be addressed to the American Welding Society, 550 N. W. LeJeune Road, P. O. Box 351040, Miami, FL 33135)

American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)

ANSI/IEEE STD 91	Graphic Symbols for Logic Diagrams
ANSI/IEEE STD 260	Letter Symbols for Units of Measurement
ANSI/IEEE STD 280	Standard Letter Symbols for Quantities Used in Electrical Science and Electrical Engineering
ANSI/IEEE STD 315	Graphic Symbols for Electrical and Electronic Diagrams

(Application for copies should be addressed to the Institute of Electrical and Electronics Engineers, Inc., 345 East 47th, New York, NY 10017)

3. REQUIREMENTS

The graphic symbols used on GSE drawings shall be in accordance with the following requirements.

3.1 General. - The graphic symbols used on a GSE drawing shall be shown on a legend located on the drawing sheet where the symbol is used or on a legend located at the front of the drawing. However, commonly used, easily recognized symbols may be omitted from the legend. A drawing note referring to KSC-STD-152-2 for identification of symbols may be appropriate in some cases. If an item does not have a symbol in this standard, a new symbol may be created by the responsible design organization, providing that the new symbol is included in a legend on the drawing. Graphic symbols shall be drawn to the size specified in the applicable reference.

3.2 Structural. - Graphic symbols used for identifying structural steel shapes on GSE drawings shall contain the standard abbreviations and nomenclature in accordance with AISC M015 or AISC M016. General use symbols, reinforced concrete construction symbols, and symbols for combination of structural shapes, flat-rolled metals, and timber construction shall be in accordance with GP-435, Volume II.

3.3 Welding and Nondestructive Testing. - Graphic symbols used for welding and nondestructive testing shall be in accordance with ANSI/AWS A2.4.

3.4 Mechanical. - The graphic symbols depicted in appendix A are based on the requirements specified in ANSI Y32.10 and shall be used in mechanical drawings in which the internal functions of electromechanical components need to be identified. These symbols show connections, flow paths, and the function of the component. The symbols also show conditions occurring during transition from one flow path arrangement to another. The symbols do not indicate construction characteristics such as material of which the component is made, and they do not indicate pressure, flow rate, or other component settings. The symbols do not identify locations of ports, positions of actuators, or the direction of shifting internal parts in actual components. Monodirectional or bidirectional symbolic representation of a component indicates the operational flow through the component and does not imply the design of the component.

The symbols for electropneumatic components shown in appendix A shall be used in all electromechanical control diagrams, and are the preferred symbols to be used in mechanical schematics. The symbols shown in appendix B may be used as alternate symbols when the internal functions of the components are not required.

The symbols used for tube fittings shall be in accordance with drawing 79K05763.

3.5 Electrical. - The graphic symbols depicted in appendix C shall be used in GSE electrical drawings, control diagrams, wiring diagrams, and schematics. The graphic symbols specified in ANSI/IEEE STD 315 may be used for items that do not have a symbol indicated in this standard. General wiring symbols shall be in accordance with the symbols shown in appendix C. Symbols for electromechanical components used on electrical schematics shall be in accordance with appendix C. Symbols used on communications drawings and diagrams shall be in accordance with appendix D.

3.5.1 Electrical Logic and Flow. - The graphic symbols used for electrical logic and flow drawings and diagrams shall be in accordance with ANSI/IEEE STD 91.

3.5.2 Flowcharts. - Graphic symbols used on flowcharts to represent the sequence of operations, flow of data, and the flow of paperwork for information processing shall be in accordance with ANSI X3.5.

3.5.3 Electrical Power Receptacles. - Graphic symbols for electrical power receptacles shall be in accordance with KSC-STD-E-0011. When an item is used that does not have a symbol listed in KSC-STD-E-0011, a symbol for that item may be used as specified in ANSI/IEEE STD 315.

3.6 Letter Symbols. - Letter symbols used on GSE drawings shall be in accordance with ANSI Y10.3, ANSI/ASME B1.7M, ANSI/IEEE STD 260, and ANSI/IEEE STD 280.

3.7 Mathematical Signs and Symbols. - Mathematical signs and symbols used on GSE drawings shall be in accordance with ANSI Y10.20.

3.8 Surface Texture. - Surface texture symbols used on GSE drawings shall be in accordance with ANSI Y14.36.

4. QUALITY ASSURANCE PROVISIONS

Not applicable

5. PREPARATION FOR DELIVERY

Not applicable

6. NOTES

6.1 Intended Use. - This standard is intended to establish uniform engineering practices and methods for the use of graphic symbols on GSE drawings at KSC.

6.2 Definitions. - For the purpose of this standard, the following definitions shall apply.

a. Cell: an organized group of lines and/or symbols that is composed and normally stored in the library of an automated drafting system for future use on drawings. Each cell is given a specific cell name by which it is retrieved and utilized in the preparation of drawings by the automated data system, thus eliminating any redundant effort in the reconstruction of commonly used graphic presentations. Also included are any composite graphic symbols or patterns of common usage in the preparation of engineering drawings in which a master (cell) is manually drafted for utilization in the various step-and-repeat processes made available through the reproduction facilities (e.g., washoffs, etc.).

b. Component: the smallest assembled item identifiable as a complete, functioning, hardware entity that performs a distinctive function in the operation of an item of equipment or a system.

c. Graphic symbol (basic): a simple delineation of a component, which is intended to emphasize its function and operation in a circuit. Basic symbols are used in single-line diagrams or elementary schematics and are basic building blocks for complete or composite symbols.

d. Graphic symbol (complete): the basic symbol of a component plus all the component features pertinent to a circuit. Complete symbols are used in advanced schematics to emphasize the functioning and interconnections of a circuit.

e. Graphic symbol (composite): an organization of basic and/or complete symbols with circuitry and all pertinent data pertaining to connections and item identifications, which is used to indicate flow paths and methods of operation of complex components or assemblies. Composite symbols may be further combined within a solid-line enclosure to represent a standard component cell.

f. Ground Support Equipment (GSE): all equipment necessary to support the operations of receiving, handling, assembly, test, checkout, servicing, and launch of space vehicles and payloads.

NOTICE. When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any right or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

Custodian:

NASA - John F. Kennedy Space Center

Preparing Activity:

John F. Kennedy Space Center
Mechanical Engineering Division
Engineering Development Directorate

APPENDIX A

ELECTROMECHANICAL GRAPHIC SYMBOLS FOR GSE DRAWINGS (PREFERRED)

GENERAL REQUIREMENTS

The list of graphic symbols provided herein (see table A-1) shall be used in the preparation of GSE mechanical and electromechanical drawings in which the understanding of internal functions of the components is required. The symbols shown in this appendix shall not be used in conjunction with the symbols shown in appendix B.

The KSC computer-aided design (CAD) cell names are shown for the graphic symbols listed in table A-1. These CAD cell names are shown for easy reference in the preparation of computer-generated drawings. If a CAD cell does not currently exist for a symbol shown in table A-1, a dash is shown in the CAD cell name column.

The CAD cells containing the graphic symbols for CAD-prepared drawings are maintained in the KSC Standard Cell Library and are available for use in preparing KSC drawings.

Graphic symbols for regulators, switches, relief valves, transducers, gauges, and other similar components shall specify the range or setting of the components adjacent to the symbols.

The graphic symbols shown in this appendix shall be drawn at the full-scale size of the KSC CAD cell symbols.

Table A-1. Preferred GSE Electromechanical Graphic Symbols

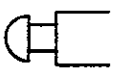
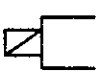
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
ACCUMULATOR	ACC	
ACCUMULATOR, GAS-CHARGED	ACCGC	
ACCUMULATOR, SPRING-LOADED	ACCSL	
ACCUMULATOR, WEIGHTED	ACCWE	
ACTUATOR, PUSHBUTTON	BUTACT	
ACTUATOR, LEVER, SPRING RETURN	LSRACT	
ACTUATOR, MANUAL	MANACT	
ACTUATOR, REVERSING-MOTOR	ACTRM	
ACTUATOR, SOLENOID	SOLACT	
ACTUATOR, SPRING	SPRACT	
ADJUSTABLE/SPRING	ADJSPR	

Table A-1. Preferred GSE Electromechanical Graphic Symbols (cont)

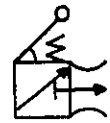
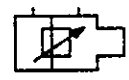
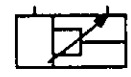
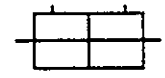
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
ADJUSTABLE/VARIABLE	ADJVAR	
BLOWGUN, PNEUMATIC	BLOGPN	
CABLE, ELECTRICAL	ELCABL	
COMPRESSOR, FIXED PLACEMENT	PMPPC1	
COOLER	COOLER	
COOLER, GASEOUS COOLING MEDIUM	CGCM	
COOLER, LIQUID COOLING MEDIUM	CLCM	
CYLINDER, FLUID, DOUBLE-ACTING, ADJUSTABLE CUSHION, ADVANCE AND RETRACT	CYLDA3	
CYLINDER, FLUID, DOUBLE-ACTING, ADJUSTABLE CUSHION, ADVANCE ONLY	CYLDA1	
CYLINDER, FLUID, DOUBLE-ACTING, ADJUSTABLE CUSHION, RETRACT ONLY	CYLDA2	
CYLINDER, FLUID, DOUBLE-ACTING, DOUBLE END ROD	CYLDA4	

Table A-1. Preferred GSE Electromechanical Graphic Symbols (cont)

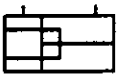
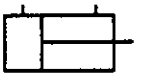
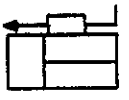
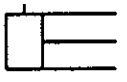
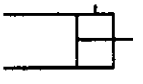
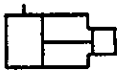
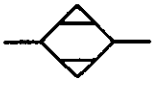
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
CYLINDER, FLUID, DOUBLE-ACTING, FIXED CUSHION, ADVANCE AND RETRACT	CYLDAF	
CYLINDER, FLUID, DOUBLE-ACTING, SINGLE END ROD	CYLDAS	
CYLINDER, FLUID, SERVO POSITIONER, HYDRAULIC	CYLSPH	
CYLINDER, FLUID, SINGLE-ACTION	CYLSA1	
CYLINDER, FLUID, SINGLE-ACTION	CYLSA2	
CYLINDER, INTENSIFIER	CYLINT	
DESSICATOR (CHEMICAL DRYER)	DESS	
DETENT	DETENT	
DIRECTION, FLOW, LIQUID, MAIN FLOW	ARLFDH	
DIRECTION, FLOW, LIQUID, SECONDARY FLOW	ARLFD	
DIRECTION, FLOW, PNEUMATIC, MAIN FLOW	ARPFDH	

Table A-1. Preferred GSE Electromechanical Graphic Symbols (cont)

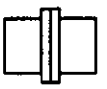
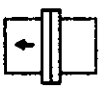
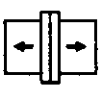
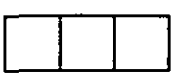
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
DIRECTION, FLOW, PNEUMATIC, SECONDARY FLOW	ARPFD	
DISC, BURST	BURDIS	
DISCONNECT, QUICK, WITHOUT CHECK VALVES, CONNECTED	DQNCC	
DISCONNECT, QUICK, WITHOUT CHECK VALVE, DISCONNECTED	DQNCV	
DISCONNECT, QUICK, WITH ONE CHECK VALVE, CONNECTED	DQ1CC2	
DISCONNECT, QUICK, WITH ONE CHECK VALVE, DISCONNECTED	DQCV	
DISCONNECT, QUICK, WITH PNEUMATIC OPERATOR	DQPO	
DISCONNECT, QUICK, WITH TWO CHECK VALVES, CONNECTED	DQCVC	
ENVELOPE, COMPONENT, BASIC	ENVCOM	
ENVELOPE, VALVE, THREE-POSITION	VENV3P	
ENVELOPE, VALVE, TWO-POSITION	VENV2P	

Table A-1. Preferred GSE Electromechanical Graphic Symbols (cont)

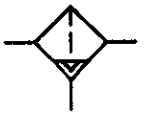
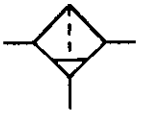
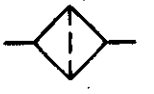
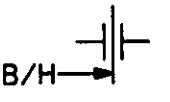
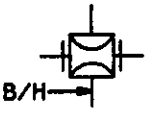
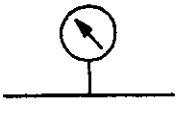
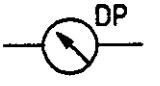
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
FAN	FAN	
FILTER-SEPARATOR, AUTOMATIC DRAIN	FSEPAD	
FILTER-SEPARATOR, MANUAL DRAIN	FSEPMD	
FILTER-STRAINER	STRF	
FITTING, BULKHEAD	BULFIT	
FITTING, BULKHEAD, ORIFICED	ORFBF	
GAUGE, FLOWMETER (DIRECT)	GFDIR	
GAUGE, LIQUID-LEVEL (DIRECT)	GLLD	
GAUGE, PRESSURE (DIRECT)	GDIRP	
GAUGE, PRESSURE, DIFFERENTIAL	GDIFP	
GAUGE, PRESSURE, DIFFERENTIAL (DIRECT)	GDDP	

Table A-1. Preferred GSE Electromechanical Graphic Symbols (cont)

TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
GAUGE, SIGHT-GLASS	GSG	
GAUGE, TEMPERATURE (DIRECT)	GDIRT	
HEATER	HTRPC	
HEATER, GASEOUS HEATING MEDIUM	HGPC	
HEATER, LIQUID HEATING MEDIUM	HTRLM	
HEATER, WITH TEMPERATURE CONTROLLER	HTRTC	
HEATER, WITH TEMPERATURE CONTROLLER, GASEOUS MEDIUM	HTRGMT	
HEATER, WITH TEMPERATURE CONTROLLER, LIQUID MEDIUM	HTRLMT	
HOSE, FLEXIBLE	HFLX1	
HOSE, FLEXIBLE, CRYO APPLICATION	HOSFCA	
HOSE, FLEXIBLE, DOUBLE LINE	HOSFDL	

Table A-1. Preferred GSE Electromechanical Graphic Symbols (cont)

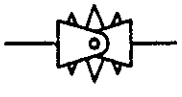
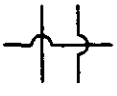
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
HOSE, FLEXIBLE, SINGLE LINE	HOSFSL	
INDICATOR, POSITION	IPOS2	
JOINT, EXPANSION, BELLOWS	JNTBEX	
JOINT, EXPANSION, GIMBALLED	JNTGEX	
JOINT, EXPANSION, HINGED	JNTHEX	
LINE, BOUNDARY, GROUPING	GBLINE	
INTERRUPTION, LINE	CUT	
LINE, PNEUMATIC OR HYDRAULIC	LINE	
LINE, VENT	GBLINE	
LINES, CROSSING	BRIDGE	

Table A-1. Preferred GSE Electromechanical Graphic Symbols (cont)

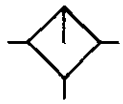
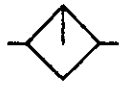
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
LINES, JOINING	DOT	
LUBRICATOR, MANUAL DRAIN	LUBMD	
LUBRICATOR, WITHOUT DRAIN	LUBND	
MOTOR, ELECTRIC	MTREL	
MOTOR, HEAT ENGINE	MTRHE	
MOTOR, LIQUID, FIXED DISPLACEMENT, BIDIRECTIONAL	MTRL2F	
MOTOR, LIQUID, FIXED DISPLACEMENT, UNIDIRECTIONAL	MTRL1F	
MOTOR, LIQUID, VARIABLE DISPLACEMENT, BIDIRECTIONAL	MTRV2L	
MOTOR, LIQUID, VARIABLE DISPLACEMENT, UNIDIRECTIONAL	MTRV1L	
MOTOR, PNEUMATIC, FIXED DISPLACEMENT, BIDIRECTIONAL	MTRP2F	
MOTOR, PNEUMATIC, FIXED DISPLACEMENT, UNIDIRECTIONAL	MTRP1F	

Table A-1. Preferred GSE Electromechanical Graphic Symbols (cont)

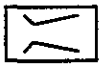
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
MOTOR, PNEUMATIC, VARIABLE DISPLACEMENT, BIDIRECTIONAL	MTRV2P	
MOTOR, PNEUMATIC, VARIABLE DISPLACEMENT, UNIDIRECTIONAL	MTRV1P	
MUFFLER	MFLR2	
NOZZLE, FLOW, CRITICAL	VENTUR	
OPERATOR, ELECTRICAL	SOLACT	
OPERATOR, FLUID, LIQUID	FLOPLI	
OPERATOR, FLUID, PNEUMATIC	FLOPPN	
OPERATOR, SERVO	OPSERV	
OPERATOR, PRESSURE-COMPENSATED	PCC	
OPERATOR, TEMPERATURE-COMPENSATED	TCC	
OPERATOR, THERMAL	THC	
ORIFICE, WITH XX MICRON RATING	ORFXXM	XXμ

Table A-1. Preferred GSE Electromechanical Graphic Symbols (cont)

TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
PAN, DRAIN	DRNPAN	
PLUG	PLUG	
PORT, CALIBRATION OR PLUGGED/CAPPED	PCALPL	
PUMP, LIQUID, FIXED DISPLACEMENT, BIDIRECTIONAL	PMPF2L	
PUMP, LIQUID, FIXED DISPLACEMENT, UNIDIRECTIONAL	PMPF1L	
PUMP, LIQUID, VARIABLE DISPLACEMENT, BIDIRECTIONAL	PMPV2L	
PUMP, LIQUID, VARIABLE DISPLACEMENT, UNIDIRECTIONAL	PMPV1L	
PUMP, LIQUID, VARIABLE DISPLACEMENT, PRESSURE-COMPENSATED, BIDIRECTIONAL	PMPPV1	
PUMP, LIQUID, VARIABLE DISPLACEMENT, PRESSURE-COMPENSATED, UNIDIRECTIONAL	PMPPVL	
PUMP, VACUUM, FIXED PLACEMENT	PMPNFV	
RECEIVER, PNEUMATIC (GAS)	RECGAS	

Table A-1. Preferred GSE Electromechanical Graphic Symbols (cont)

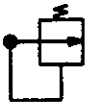
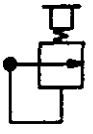
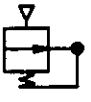
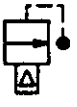
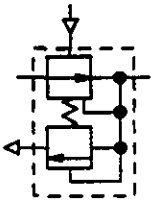
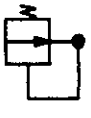
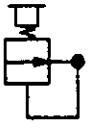
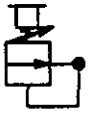
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
REGULATOR, BACK-PRESSURE, FIXED ADJUSTMENT	RGFAB	
REGULATOR, BACK-PRESSURE, MANUAL ADJUSTMENT	RGMAB	
REGULATOR, DOME, EXTERNALLY LOADED	RGEDL3	
REGULATOR, DOME, INTERNALLY LOADED	RGIDL1	
REGULATOR, DOME, INTERNALLY LOADED	RGIDL2	
REGULATOR, PRESSURE-REDUCING, EXTERNALLY DOME LOADED, WITH INTERNAL RELIEF	RGEDL1	
REGULATOR, PRESSURE-REDUCING, FIXED ADJUSTMENT	RGFAP	
REGULATOR, PRESSURE-REDUCING, MANUAL ADJUSTMENT	RGMAP	
REGULATOR, PRESSURE-REDUCING, MANUAL ADJUSTMENT	RGMPR1	

Table A-1. Preferred GSE Electromechanical Graphic Symbols (cont)

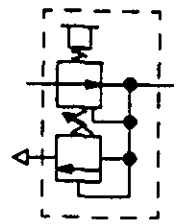
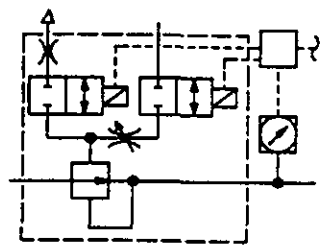
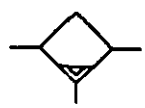
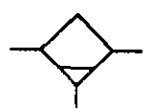
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
REGULATOR, PRESSURE-REDUCING, MOTOR-OPERATED, BIDIRECTIONAL	VLVPRM	
REGULATOR, PRESSURE-REDUCING, WITH INTERNAL RELIEF TO ATMOSPHERE, MANUAL ADJUSTMENT	RGIRA	
REGULATOR, PROGRAMMABLE	RGPRO	
SEPARATOR, AUTOMATIC DRAIN	SEPAD	
SEPARATOR, MANUAL DRAIN	SEPMD	
SWITCH, FLOW (DISCRETE)	SWDF	
SWITCH, LIQUID-LEVEL (DISCRETE)	SDLL	
SWITCH, LIQUID-SENSOR	SWLSEN	
SWITCH, POSITION	SWPOS1	
SWITCH, POSITION (DISCRETE)	SWDPOS	

Table A-1. Preferred GSE Electromechanical Graphic Symbols (cont)

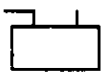
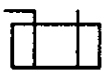
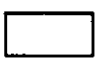
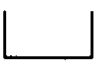
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
SWITCH, POSITION, WITH COMPONENT	SWPOS2	
SWITCH, PRESSURE (DISCRETE)	SWDPRE	
SWITCH, TEMPERATURE (DISCRETE)	SWDT	
SWITCH, VACUUM SENSOR	SWVAC	
TANK, WITH LINES ABOVE FLUID LEVEL	TANKAL	
TANK, WITH LINES BELOW FLUID LEVEL	TANKBL	
TANK/RESERVOIR, PRESSURIZED	TNKRP	
TANK/RESERVOIR, VENTED	TNKRV	
TRANSDUCER, ELECTROPNEUMATIC (ANALOG)	TRAPE	
TRANSDUCER, FLOW (ANALOG)	FLTRN	
TRANSDUCER, LIQUID-LEVEL (ANALOG)	TRLL	

Table A-1. Preferred GSE Electromechanical Graphic Symbols (cont)

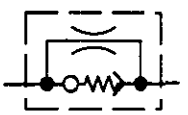
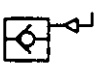
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
TRANSDUCER, MOISTURE MONITOR (ANALOG)	TRMM	
TRANSDUCER, POSITION	TRPOS	
TRANSDUCER, POSITION (ANALOG)	TRAPOS	
TRANSDUCER, PRESSURE (ANALOG)	TRAP	
TRANSDUCER, PRESSURE, DIFFERENTIAL (ANALOG)	TRADP	
TRANSDUCER, TEMPERATURE (ANALOG)	TRAT	
VALVE, CHECK	VKSING	
VALVE, CHECK, FLOW	VCFLO	
VALVE, CHECK, PILOT OPERATED TO CLOSE	VKPOTC	
VALVE, CHECK, PILOT OPERATED TO OPEN	VKPOTO	
VALVE, CHECK, PNEUMATICALLY OPERATED TO CLOSE	VKPNCL	
VALVE, CHECK, PNEUMATICALLY OPERATED TO OPEN	VKPNOP	

Table A-1. Preferred GSE Electromechanical Graphic Symbols (cont)

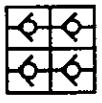
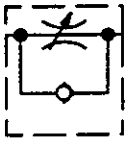
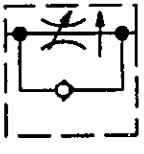
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
VALVE, CHECK, QUAD	VKQUAD	
VALVE, CHECK, WITH VENT	VCVENT	
VALVE, CONTROL, FLOW	VCFLOW	
VALVE, CONTROL, FLOW, ADJUSTABLE, WITH REVERSE FLOW BYPASS	VCAF1	
VALVE, CONTROL, FLOW, ADJUSTABLE, WITH REVERSE FLOW BYPASS, PRESSURE COMPENSATED	VCAF2	
VALVE, CONTROL, FLOW, LINE WITH FIXED RESTRICTION	VCFRF1	
VALVE, CONTROL, FLOW, MANUALLY ADJUSTED, NORMALLY OPEN	VCFMAN	
VALVE, CONTROL, FLOW, RESTRICTOR, ADJUSTABLE	VCFRF2	
VALVE, CONTROL, FLOW, RESTRICTOR, PRESSURE-COMPENSATED	VCPRF2	
VALVE, CONTROL, FLOW, RESTRICTOR, PRESSURE-COMPENSATED, ADJUSTABLE	VCPRF1	
VALVE, HAND, NORMALLY CLOSED, BIDIRECTIONAL	VHCB	

Table A-1. Preferred GSE Electromechanical Graphic Symbols (cont)

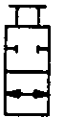
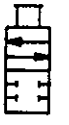
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
VALVE, HAND, NORMALLY CLOSED, MONODIRECTIONAL	VHCM	
VALVE, HAND, NORMALLY OPEN, BIDIRECTIONAL	VHOB	
VALVE, HAND, NORMALLY OPEN, MONODIRECTIONAL	VHOM	
VALVE, HAND, THREE-POSITION, FIVE-WAY, LEVER-OPERATED	VH3P5W	
VALVE, HAND, THREE-POSITION, FOUR-WAY, LEVER-OPERATED	VHQ3LO	
VALVE, HAND, TWO-POSITION, FOUR-WAY, LEVER-OPERATED	V2P4W	
VALVE, HAND, TWO-POSITION, FOUR-WAY, NORMALLY CLOSED	VHCQ2P	
VALVE, HAND, TWO-POSITION, THREE-WAY, NORMALLY CLOSED	VHCT2P	

Table A-1. Preferred GSE Electromechanical Graphic Symbols (cont)

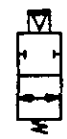
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
VALVE, HAND, TWO-POSITION, THREE-WAY, NORMALLY OPEN	VHOT2P	
VALVE, PNEUMATICALLY OPERATED, BIDIRECTIONAL, NORMALLY CLOSED	VNC2P1	
VALVE, PNEUMATICALLY OPERATED, BIDIRECTIONAL, NORMALLY CLOSED, WITH POSITION INDICATOR	VNCBPI	
VALVE, PNEUMATICALLY OPERATED, BIDIRECTIONAL, NORMALLY CLOSED, WITH POSITION SWITCH	VNCBPS	
VALVE, PNEUMATICALLY OPERATED, BIDIRECTIONAL, NORMALLY OPEN	VNOB	
VALVE, PNEUMATICALLY OPERATED, BIDIRECTIONAL, NORMALLY OPEN, SPRING RETURN	VVSA2P	
VALVE, PNEUMATICALLY OPERATED, BIDIRECTIONAL, NORMALLY OPEN, WITH POSITION INDICATOR	VNOBPI	
VALVE, PNEUMATICALLY OPERATED, BIDIRECTIONAL, NORMALLY OPEN, WITH POSITION SWITCH	VNOBPS	

Table A-1. Preferred GSE Electromechanical Graphic Symbols (cont)

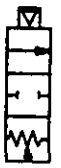
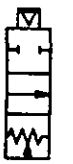
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
VALVE, PNEUMATICALLY OPERATED, MONODIRECTIONAL, NORMALLY CLOSED	VNC2P2	
VALVE, PNEUMATICALLY OPERATED, MONODIRECTIONAL, NORMALLY CLOSED, WITH POSITION INDICATOR	VNMPI2	
VALVE, PNEUMATICALLY OPERATED, MONODIRECTIONAL, NORMALLY CLOSED, WITH POSITION SWITCH	VNMPS1	
VALVE, PNEUMATICALLY OPERATED, MONODIRECTIONAL, NORMALLY CLOSED, RESTRICTED FLOW, WITH POSITION SWITCH AND POSITION INDICATOR	VNCM	
VALVE, PNEUMATICALLY OPERATED, MONODIRECTIONAL, NORMALLY OPEN	VNO2P1	
VALVE, PNEUMATICALLY OPERATED, MONODIRECTIONAL, NORMALLY OPEN, WITH POSITION INDICATOR	VNMPI1	
VALVE, PNEUMATICALLY OPERATED, MONODIRECTIONAL, NORMALLY OPEN, WITH POSITION SWITCH	VNMPS2	

Table A-1. Preferred GSE Electromechanical Graphic Symbols (cont)

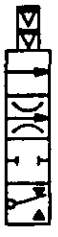
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
VALVE, PNEUMATICALLY OPERATED, THREE-POSITION, DOUBLE-ACTUATOR, NORMALLY CLOSED, WITH RESTRICTED FLOW	VN3PDA	
VALVE, PNEUMATICALLY OPERATED, THREE-POSITION, DOUBLE-ACTUATOR, NORMALLY CLOSED, RESTRICTED FLOW, WITH POSITION SWITCH	VNCTS2	
VALVE, PNEUMATICALLY OPERATED, THREE-WAY, NORMALLY CLOSED	VNC3W	
VALVE, PNEUMATICALLY OPERATED, THREE-WAY, NORMALLY CLOSED, WITH POSITION INDICATOR	VNCTPI	
VALVE, PNEUMATICALLY OPERATED, THREE-WAY, NORMALLY CLOSED, WITH POSITION SWITCH	VNCTS1	
VALVE, PNEUMATICALLY OPERATED, THREE-WAY, NORMALLY OPEN	VNOT	
VALVE, PNEUMATICALLY OPERATED, THREE-WAY, NORMALLY OPEN, WITH POSITION INDICATOR	VNOTPI	

Table A-1. Preferred GSE Electromechanical Graphic Symbols (cont)

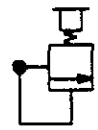
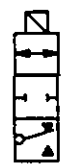
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
VALVE, PNEUMATICALLY OPERATED, THREE-WAY, NORMALLY OPEN, WITH POSITION SWITCH	VNOTPS	
VALVE, PNEUMATICALLY OPERATED, VARIABLE POSITION, NORMALLY CLOSED	VNCVP	
VALVE, RELIEF, MANUAL ADJUSTMENT	VLVMAR	
VALVE, RELIEF, PRESSURE, FIXED ADJUSTMENT	VPRFA	
VALVE, RELIEF, PRESSURE, MANUAL ADJUSTMENT	VPRMAN	
VALVE, SOLENOID, BIDIRECTIONAL, NORMALLY CLOSED	VSCB22	
VALVE, SOLENOID, BIDIRECTIONAL, NORMALLY CLOSED, SPRING RETURN	VSB2S2	
VALVE, SOLENOID, BIDIRECTIONAL, NORMALLY CLOSED, WITH POSITION SWITCH	VSCBPS	

Table A-1. Preferred GSE Electromechanical Graphic Symbols (cont)

TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
VALVE, SOLENOID, BIDIRECTIONAL, NORMALLY OPEN	VSOB22	
VALVE, SOLENOID, BIDIRECTIONAL, NORMALLY OPEN, WITH POSITION SWITCH	VSOBPS	
VALVE, SOLENOID, DOUBLE-SPRING, DUAL DETENT, NORMALLY CLOSED	VSDSDS	
VALVE, SOLENOID, DOUBLE-SPRING, DUAL DETENT, NORMALLY CLOSED, WITH POSITION SWITCH	VSCDNS	
VALVE, SOLENOID, MONODIRECTIONAL, NORMALLY CLOSED	VSCB21	
VALVE, SOLENOID, MONODIRECTIONAL, NORMALLY CLOSED, SPRING RETURN	VSB2S1	
VALVE, SOLENOID, MONODIRECTIONAL, NORMALLY CLOSED, WITH POSITION SWITCH	VSCMPS	

Table A-1. Preferred GSE Electromechanical Graphic Symbols (cont)

TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
VALVE, SOLENOID, MONODIRECTIONAL, NORMALLY OPEN	VSOB21	
VALVE, SOLENOID, MONODIRECTIONAL, NORMALLY OPEN, WITH POSITION SWITCH	VSOMPS	
VALVE, SOLENOID, THREE-WAY, NORMALLY CLOSED	VSCT	
VALVE, SOLENOID, THREE-WAY, NORMALLY CLOSED, SPRING RETURN	VS2PSA	
VALVE, SOLENOID, THREE-WAY, NORMALLY CLOSED, WITH POSITION SWITCH	VSCTPS	
VALVE, SOLENOID, THREE-WAY, NORMALLY OPEN	VSOT21 VSOT22 VSOT23	
VALVE, SOLENOID, THREE-WAY, NORMALLY OPEN, WITH POSITION SWITCH	VSOTPS	
VALVE, SOLENOID, THREE-WAY, TWO-POSITION, SPRING RETURN	VST2P	

Table A-1. Preferred GSE Electromechanical Graphic Symbols (cont)

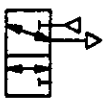
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
VALVE, THERMALLY OPERATED, ONE-WAY, NORMALLY CLOSED, RESTRICTED FLOW	VTCMRT	
VALVE, THERMALLY OPERATED, ONE-WAY, NORMALLY CLOSED, RESTRICTED FLOW, WITH POSITION SWITCH	VTCMPS	
VALVE, THERMALLY OPERATED, ONE-WAY, NORMALLY OPEN, RESTRICTED FLOW	VTOMRF	
VALVE, THERMALLY OPERATED, ONE-WAY, NORMALLY OPEN, RESTRICTED FLOW, WITH POSITION SWITCH	VTOMPS	
VALVE, TWO-POSITION, FOUR-WAY	V2P4W	
VALVE, TWO-POSITION, THREE-WAY	VLVCT2	
VALVE, TWO-POSITION, THREE-WAY	VLVO23	
VALVE, TWO-POSITION, TWO-WAY	VLVCB2	
VALVE, TWO-POSITION, TWO-WAY	VLVO22	

Table A-1. Preferred GSE Electromechanical Graphic Symbols (cont)

TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
VENT (1)	VENT1	
VENT (2)	VENT2	
VENT, TO ATMOSPHERE	VENTAT	
VENTURI	VNTURI	
VENTURI, SENSING	VTUR	

APPENDIX B

ELECTROMECHANICAL GRAPHIC SYMBOLS FOR GSE DRAWINGS (ALTERNATE)

GENERAL REQUIREMENTS

The list of graphic symbols provided herein (see table B-1) may be used in the preparation of GSE mechanical schematics in which the integral functions of the components are not required to be shown. Although the symbols listed in table B-1 may be used as alternate symbols, the symbols listed in appendix A are preferred. The symbols listed in appendix A should be used for all electromechanical control diagrams, and should never be used in conjunction with the symbols shown in appendix B.

The KSC computer-aided design (CAD) cell names are shown for the graphic symbols listed in table B-1. These CAD cell names are shown for easy reference in the preparation of computer-generated drawings. If a CAD cell does not currently exist for a symbol shown in table B-1, a dash is shown in the CAD cell name column.

The CAD cells containing the graphic symbols for CAD-prepared drawings are maintained in the KSC Standard Cell Library and are available for use in preparing KSC drawings.

Graphic symbols for regulators, switches, relief valves, transducers, gauges, and other similar components shall specify the range or setting of the components adjacent to the symbols.

The graphic symbols shown in this appendix shall be drawn at the full-scale size of the CAD cell symbols.

Table B-1. Alternate GSE Electromechanical Graphic Symbols

GENERAL SYMBOLS

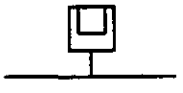
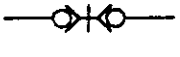
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
ACTUATOR, HYDRAULIC	ACTHYD	
ARRESTER, SHOCK	SHARR	
BLOWER	BLOWER	
BLOWER, VANE-AXIAL	BLOVAX	
CALORIMETER	CALMET	
CONNECTION, GAUGE	GCONN	
DAMPER (ASSEMBLY), BALL VALVE	DAMPAS	
DAMPER, MANUALLY OPERATED	DAMPER	
DIAPHRAGM, BURST	BURDIA	
DISCONNECT, QUICK, WITH CHECK VALVES, DISCONNECTED	DQCD	
DISCONNECT, QUICK, WITH CHECK VALVES, CONNECTED	DQCC	

Table B-1. Alternate GSE Electromechanical Graphic Symbols (cont)

GENERAL SYMBOLS (CONT)

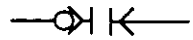
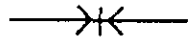
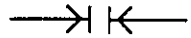
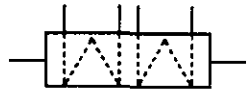
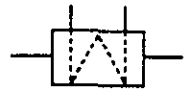
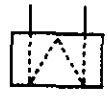
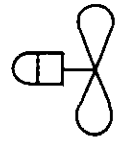
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
DISCONNECT, QUICK, WITH ONE CHECK VALVE, CONNECTED	DQ1CC1	
DISCONNECT, QUICK, WITH ONE CHECK VALVE, DISCONNECTED	DQCD DQNCD	
DISCONNECT, QUICK, WITHOUT CHECK VALVES, CONNECTED	DQNC	
DISCONNECT, QUICK, WITHOUT CHECK VALVE, DISCONNECTED	DQNCD	
DUCT, FLEXIBLE	DUCFLX	
EDUCTOR, JET	JETEDU	
EXCHANGER, HEAT, DOUBLE COIL (FLUID TO FLUID)	HTXFF2	
EXCHANGER, HEAT, SINGLE COIL (FLUID TO FLUID)	HTXFF1	
EXCHANGER, HEAT, (VAPORIZER) (FLUID TO AIR)	HTXFA	
FAN AND MOTOR	FANMO	
FILTER	FLTR	

Table B-1. Alternate GSE Electromechanical Graphic Symbols (cont)

GENERAL SYMBOLS (CONT)

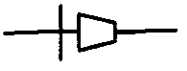
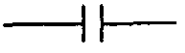
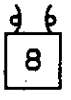
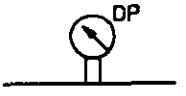
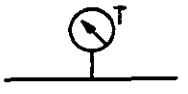
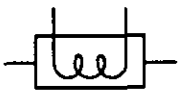
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
FLANGE, REDUCING	REDFL	
FLANGE, REDUCING (ALTERNATE)	REDFLA	
FLOWMETER	FLOMET	
GAUGE, PRESSURE	GDIRP	
GAUGE, PRESSURE, DIFFERENTIAL	GDIFP	
GAUGE, TEMPERATURE	GTEMP	
GAUGE, VACUUM	GVAC	
GLASS, SIGHT	STGL	
HEATER	HTR	
HEATER, ELECTRIC	HTREL	
HOSE, FLEXIBLE	HOSFLX	

Table B-1. Alternate GSE Electromechanical Graphic Symbols (cont)

GENERAL SYMBOLS (CONT)

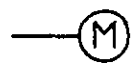
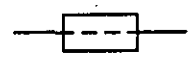
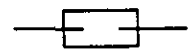
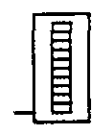
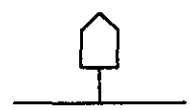
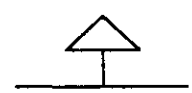
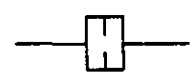
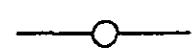
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
INDICATOR, MOISTURE	MOIST	
JOINT, EXPANSION, SLEEVE	JNTSEX	
JOINT, EXPANSION, SLIDING	JNTEXS	
MANIFOLD	MANFOL	
MANOMETER	MANMTR	
MECHANISM, QUICK-RELEASE	QRMECH	
MOTOR	MTR	
MUFFLER	MFLR1	
NIPPLE AND CAP	NIPCAP	
ORIFICE	ORF	
PLUG, DRAIN	DPLUG	

Table B-1. Alternate GSE Electromechanical Graphic Symbols (cont)

GENERAL SYMBOLS (CONT)

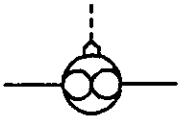
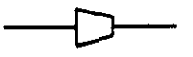
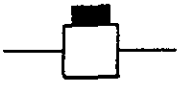
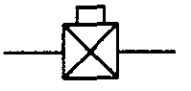
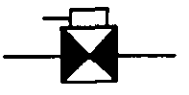
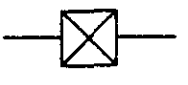
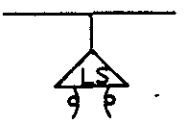
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
PUMP	PMP	
REDUCER	RED	
REGULATOR, BACK-PRESSURE	RGBP	
REGULATOR, DOME-LOADED	RGDL	
REGULATOR, FLOW	RGFLOW	
REGULATOR, FLOW, PNEUMATICALLY ACTUATED	RGFPA	
REGULATOR, INTERNALLY LOADED	RGIL	
SCREEN	SCREEN	
SENSOR, LIQUID	SENLIQ	
SENSOR, LIQUID-LEVEL	LLSEN	

Table B-1. Alternate GSE Electromechanical Graphic Symbols (cont)

GENERAL SYMBOLS (CONT)

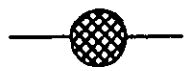
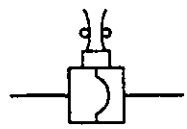
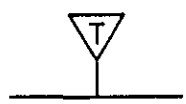
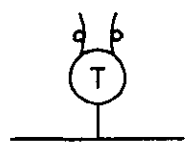
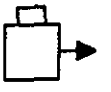
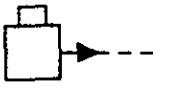
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
STRAINER	STR	
STRAINER/FILTER	STRF	
SWITCH (ASSEMBLY), LEVEL-CONTROL	SWFLC	
SWITCH, PRESSURE	SWPR1	
SWITCH, PRESSURE	SWPR2	
SWITCH, SENSITIVE	SWSEN	
SWITCH, STEP, PRESSURE	SWSTEP	
THERMOMETER	THMTR	
THERMOSTAT	THSTAT	
TRANSDUCER, PRESSURE	TRPRES	

Table B-1. Alternate GSE Electromechanical Graphic Symbols (cont)

GENERAL SYMBOLS (CONT)

TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
UNLOADER	UNLOAD	
VENT, TO ATMOSPHERE	VLVTA	
VENT, TO LINE	VTLV	

VALVE SYMBOLS

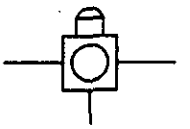
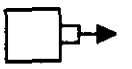
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
VALVE, BALL	VBALL	
VALVE, BALL, MANUAL	VBMAN	
VALVE, BALL, THREE-WAY, MOTOR-ACTUATED	VBTMA	
VALVE, BLADE	VBLADE	
VALVE, BUTTERFLY	VBFLY	
VALVE, CALIBRATION	VLVCAL	

Table B-1. Alternate GSE Electromechanical Graphic Symbols (cont)

VALVE SYMBOLS (CONT)

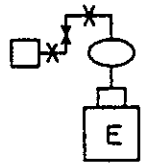
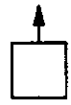
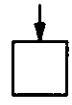
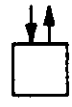
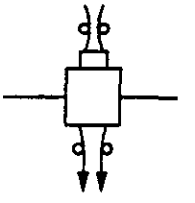
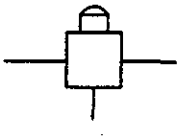
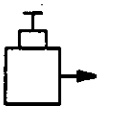
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
VALVE, DIAPHRAGM	VDIAPH	
VALVE, EXPANSION	VLVEXP	
VALVE, GATE	VGATE2	
VALVE, GLOBE	VGLOB2	
VALVE, IRIS	VIRIS	
VALVE, RELIEF, PRESSURE	VPREL1	
VALVE, RELIEF, PRESSURE	VPREL2	
VALVE, RELIEF, PRESSURE	VPREL3	
VALVE, RELIEF, VACUUM	VVACR	
VALVE, RELIEF, VACUUM AND PRESSURE	VPVREL	

Table B-1. Alternate GSE Electromechanical Graphic Symbols (cont)

VALVE SYMBOLS (CONT)

TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
VALVE, SHUTOFF	VREGSO	
VALVE, SOLENOID, WITH POSITIVE FEEDBACK SWITCH	VSFBSS	
VALVE, THREE-WAY, MOTOR ACTUATED	V3WMA	
VALVE, VENT, MANUAL	VVENTM	

VALVE INDICATOR SYMBOLS

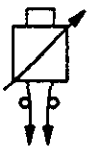
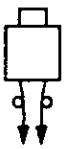
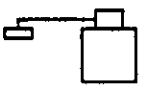
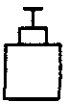
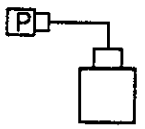
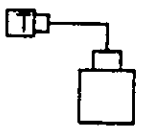
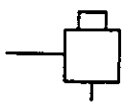
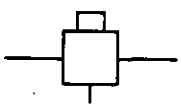
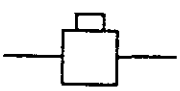
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
POTENTIOMETER, FEEDBACK	SWPOTF	
SWITCH, FEEDBACK	SWFEED	
OPERATOR, FLOAT	VFLOAT	
OPERATOR, MANUAL	VMANO	

Table B-1. Alternate GSE Electromechanical Graphic Symbols (cont)

VALVE OPERATOR SYMBOLS (CONT)

TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
OPERATOR, MOTOR	VLVMTR	
OPERATOR, PNEUMATIC	VNOPR	
OPERATOR, PRESSURE	VPRES	
OPERATOR, SELF-ACTUATING	VLVOSA	
OPERATOR, SOLENOID	VSOPR	
OPERATOR, TEMPERATURE	VTEMP	

VALVE PORTING ARRANGEMENT SYMBOLS

TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
PORTING, ANGLE	VPRTAN	
PORTING, THREE-WAY	VPRT3W	
PORTING, TWO-WAY	VPRT2W	

APPENDIX C

ELECTRICAL GRAPHIC SYMBOLS FOR GSE DRAWINGS

GENERAL REQUIREMENTS

The graphic symbols provided herein shall be used in the preparation of GSE electrical drawings, control diagrams, wiring diagrams, and schematics where graphic symbols are required.

The KSC computer-aided design (CAD) cell names are shown for the graphic symbols listed in the tables in this appendix. These CAD cell names are shown for easy reference in the preparation of computer-generated drawings. If a CAD cell does not currently exist for a symbol shown in the applicable table, a dash is shown in the CAD cell name column.

The CAD cells containing the graphic symbols for CAD-prepared drawings are maintained in the KSC Standard Cell Library and are available for use in preparing KSC drawings.

The graphic symbols shown in this appendix shall be drawn at the full-scale size of the KSC CAD cell symbols.

The graphic symbols shown in this appendix shall be drawn at the full-scale size of the KSC CAD cell symbols.

Table	Title	Page
C-1	Basic Electrical Graphic Symbols for GSE	C-2
C-2	Complete Graphic Symbols for Electrical Cable and Harness Assembly Drawings	C-11
C-3	Composite Electrical Graphic Symbols for GSE	C-14

Table C-1. Basic Electrical Graphic Symbols for GSE

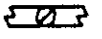
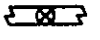
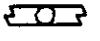
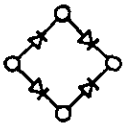
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
AMPLIFIER	AMP	
BATTERY	BAT	
BUS, PATCH, PLUG-IN	BUSPPI	
BUS, SCREW, STUD	BUSSS	
BUS, SOLDER	BUSSOL	
BREAKER, CIRCUIT	CB3	
BREAKER, CIRCUIT, RESETTING, AUTOMATIC	CBAR	
BREAKER, CIRCUIT, SWITCH-TYPE	CBST	
BRIDGE, DIODE, FULL-WAVE	DFWBR	
CAPACITOR	CAP	
CAPACITOR, DIODE (VARACTOR)	CAPDV	
CAPACITOR, POLARIZED	CAPPOL	

Table C-1. Basic Electrical Graphic Symbols for GSE (cont)

TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
CAPACITOR, VARIABLE	CAPVAR	
COIL, RELAY	KRPC2	
COIL, RELAY (COMPONENT BOARD)	KR5	
COIL, RELAY, POWER-CONTACTOR	KRPC2	
CONNECTOR, BULKHEAD, FEEDTHRU (FEMALE TO MALE)	CONBF	
CONNECTOR, BULKHEAD, FEEDTHRU MATED (FEMALE TO MALE)	CONMBF	
CONNECTOR, BULKHEAD, FEEDTHRU MATED (FEMALE TO FEMALE)	CBFMFF	
CONNECTOR, BULKHEAD, FEEDTHRU MATED (FEMALE TO HARDWARE)	CBFMFH	
CONNECTOR, MATED	CONM	
CONNECTOR, MATED, PIN FIXED	CONMPF	
CONNECTOR, MATED, SOCKET FIXED	CONMSF	
CONNECTOR, PIN OR SOCKET	CONPOS	

Table C-1. Basic Electrical Graphic Symbols for GSE (cont)

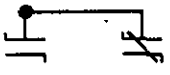
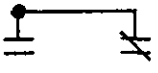
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
CONDUCTORS, CONNECTING	CONC	
CONDUCTORS, CROSSING	BRIDGE	
CONTACT, MOMENTARY	CONTA2	
CONTACT, NONMOMENTARY	CONTA1	
CONTACT, RELAY, MAGNETIC LATCH	KCMLR	
CONTACT, RELAY, MAGNETIC LATCHING	KCML	
CONTACT, RELAY, NORMALLY CLOSED	KCC	
CONTACT, RELAY, NORMALLY OPEN	KCO	
CONTACT, RELAY, TRANSFER	KCTR	
DIODE	D	
DIODE, FUSED, PLUG-IN OR PATCH	DFPIP1	
	DFPIP2	

Table C-1. Basic Electrical Graphic Symbols for GSE (cont)

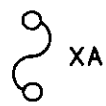
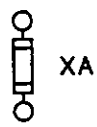
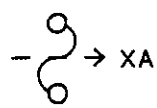
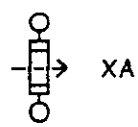
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
DIODE, LIGHT-EMITTING	DLE	
DIODE, ZENER	DZ	
DIODE, ZENER, BACK-TO-BACK	DZBTB2	
FILTER, AC-POWER	FILACP	
FUSE, WITH X AMPERAGE RATING	FUSE1	
	FUSE2	
FUSE, MECHANICAL, POP-OUT, WITH X AMPERAGE RATING	FMPO1	
	FMPO2	
GROUND, ANALOG	GNDANL	
GROUND, CHASIS, EQUIPMENT	GNDEQ	
GROUND, EARTH, STRUCTURE	GNDES	

Table C-1. Basic Electrical Graphic Symbols for GSE (cont)

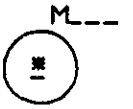
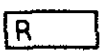
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
GROUND, SIGNAL	GNDSIG	
LAMP, DUAL-ELEMENT *COLOR CODE A - AMBER B - BLUE C - CLEAR G - GREEN O - ORANGE P - PURPLE R - RED W - WHITE Y - YELLOW	LP1	
LAMP, SINGLE-ELEMENT *COLOR CODE A - AMBER B - BLUE C - CLEAR G - GREEN O - ORANGE P - PURPLE R - RED W - WHITE Y - YELLOW	LP3	
METER, INSTRUMENT *METER TYPE A - AMMETER ET - ELAPSE TIME F - FREQUENCY V - VOLTMETER W - WATT METER	MTRINS	
POINT, TEST	TP1	
RESISTOR, FIXED	RFIX1	
RESISTOR, FIXED (COMPONENT BOARD)	RFIX4	

Table C-1. Basic Electrical Graphic Symbols for GSE (cont)

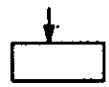
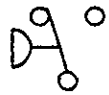
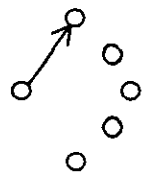
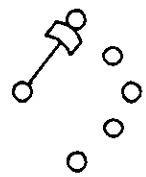
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
RESISTOR, VARIABLE	RV2	
RESISTOR, VARIABLE (COMPONENT BOARD)	RV5	
SWITCH, PRESSURE	SPRES1	
SWITCH, PUSHBUTTON, CIRCUIT-CLOSING, PUSH-ON, PUSH-OFF	SOOP	
SWITCH, PUSHBUTTON, CIRCUIT-OPENING, PUSH-OFF, PUSH-ON	SCOP	
SWITCH, PUSHBUTTON, MOMENTARY, NORMALLY OPEN	SMP	
SWITCH, PUSHBUTTON, TWO-CIRCUIT, MOMENTARY	S2CMP	
SWITCH, PUSHBUTTON, TWO-CIRCUIT, PUSH-ON, PUSH-OFF	S2CMP	
SWITCH, ROTARY, BREAK-BEFORE-MAKE (TYPICAL)	SBBMR	
SWITCH, ROTARY, MAKE-BEFORE-BREAK (TYPICAL)	SMBBR	
SWITCH, TOGGLE, CENTER-OFF, SINGLE-POLE, DOUBLE-THROW	SCOT	

Table C-1. Basic Electrical Graphic Symbols for GSE (cont)

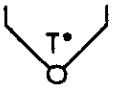
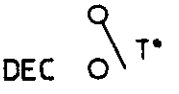
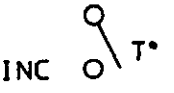
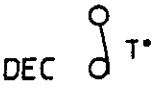
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
SWITCH, TOGGLE, MOMENTARY, CENTER-OFF, SINGLE-POLE, DOUBLE-THROW	SMCOT	
SWITCH, TOGGLE, MOMENTARY, SINGLE-POLE, DOUBLE-THROW	SMTOG2	
SWITCH, TOGGLE, SINGLE-POLE, DOUBLE-THROW	STOG1 STOG2	
SWITCH, TOGGLE, SINGLE-POLE, SINGLE-THROW	STOG3	
TERMINAL, CIRCUIT, SOLDER	TERCS	
TERMINAL, PLUG-IN, PATCH	TERPIP	
TERMINAL, SCREW, STUD	TERSS	
THERMISTOR	THERMI	
THERMOCOUPLE	THCPL	
THERMOSTAT, CLOSES WITH DECREASE IN TEMPERATURE	THCWD	
THERMOSTAT, CLOSES WITH INCREASE IN TEMPERATURE	THCWI	
THERMOSTAT, OPENS WITH DECREASE IN TEMPERATURE	TCOWD	

Table C-1. Basic Electrical Graphic Symbols for GSE (cont)

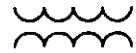
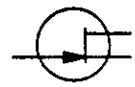
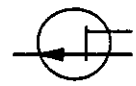
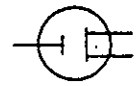
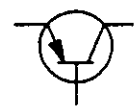
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
THERMOSTAT, OPENS WITH INCREASE IN TEMPERATURE	THOWI	
THYRISTOR, SCR, N-TYPE GATE	THYSNG	
THYRISTOR, SCR, P-TYPE GATE	THYSPG	
TRANSFORMER, CURRENT-TO-AIR	TCTA	
TRANSFORMER, IRON-CORE	TIC	
TRANSFORMER, IRON-CORE, VARIABLE	TICV	
TRANSISTOR, FET, N-CHANNEL GATE	TRFNG	
TRANSISTOR, FET, P-CHANNEL GATE	TRFPG	
TRANSISTOR, MOS (METAL OXIDE SEMICONDUCTOR)	TRNMOS	
TRANSISTOR, NPN	TRAN2 TRAN3	
TRANSISTOR, PNP	TRAN4 TRAN5	

Table C-1. Basic Electrical Graphic Symbols for GSE (cont)

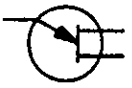
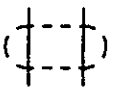
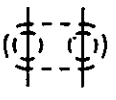
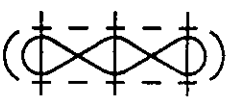
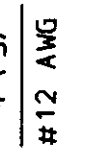
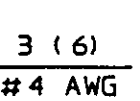
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
TRANSISTOR, UNIJUNCTION N-TYPE BASE	TRUNIN	
TRANSISTOR, UNIJUNCTION P-TYPE BASE	TRUNIP	
WIRE, SHIELDED, SINGLE CONDUCTOR	WS1C	
WIRE, SHIELDED (TWO OR MORE CONDUCTORS)	WS2ORC	
WIRE, SHIELDED, (TWO OR MORE CONDUCTORS), SINGLE AND OVERALL	WS2OR	
WIRE, TWISTED (ONE PAIR TWISTED, SHIELD OVER TWISTED CONDUCTORS)	WSTOC1 WSTOC2 WSCOT3	
WIRE, TWISTED (THREE CONDUCTORS TWISTED, SHIELD OVER TWISTED CONDUCTORS)	WSTOC4	
WIRE, STANDARD PLACE WIRE NUMBERS TO THE LEFT AND PARALLEL WITH VERTICAL LINES: ABOVE AND PARALLEL WITH HORIZONTAL LINES. IF COLOR CODING IS REQUIRED, THE NUMBER USED TO INDICATE COLOR CODING SHALL BE SHOWN IN PARENTHESES.	WSTD1	
IF WIRE SIZE IS SHOWN, IT SHALL BE PLACED TO THE RIGHT AND PARALLEL WITH VERTICAL LINES: BELOW AND PARALLEL WITH HORIZONTAL LINES. NUMBER SYMBOL (#) SHALL BE SHOWN WITH SIZE.	WSTD2	

Table C-2. Complete Graphic Symbols for Electrical Cable and Harness Assembly Drawings

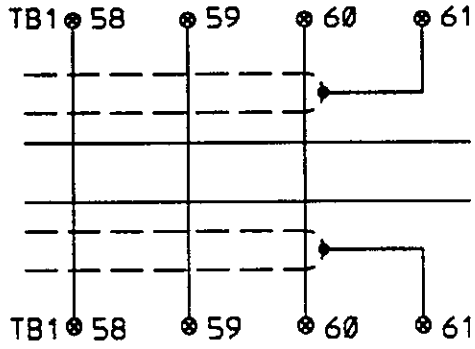
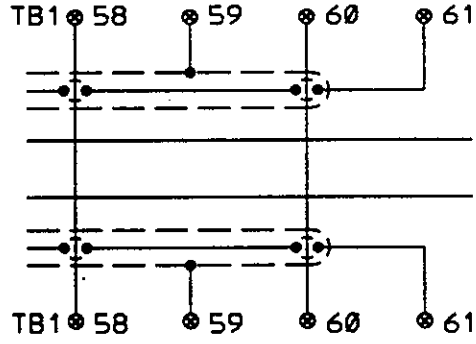
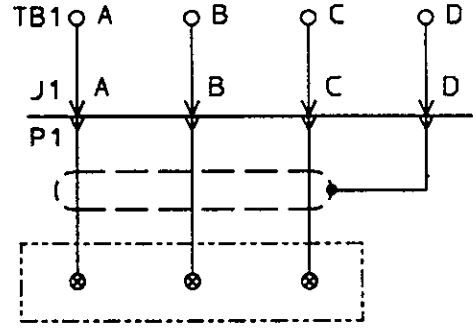
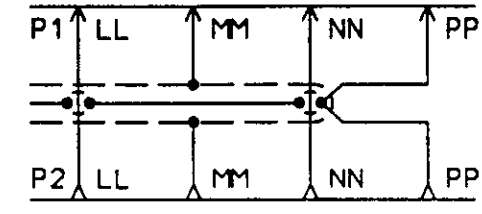
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
CABLE BETWEEN TWO DISTRIBUTORS. OVERALL SHIELD	SC2DOV	
CABLE BETWEEN TWO DISTRIBUTORS. SINGLE AND OVERALL SHIELD	SC2DSI	
CABLE. OVERALL SHIELD. END FLOATING	SCOVEF	
CABLE. SINGLE AND OVERALL SHIELD	SCSIOV	

Table C-2. Complete Graphic Symbols for Electrical Cable and Harness Assembly Drawings (cont)

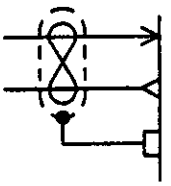
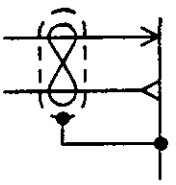
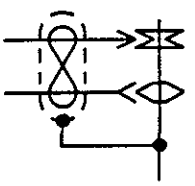
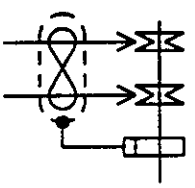
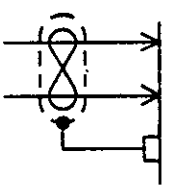
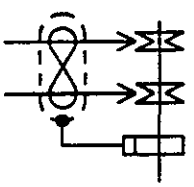
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
CONNECTOR, CONCENTRIC	CCNCTR	
CONNECTOR, CONCENTRIC, METAL PANEL	CCNCMP	
CONNECTOR, CONCENTRIC, TWINAX, THRU, MOUNTED IN A METAL PANEL	CCTWMP	
CONNECTOR, CONCENTRIC, TWINAX, THRU, MOUNTED IN A PHENOLIC PANEL. GROUND CONTINUITY IS MAINTAINED THROUGH THE CONNECTOR SHELL	CCTPHS	
CONNECTOR, TWIN	CCTWIN	
CONNECTOR, TWIN, THRU MOUNTED IN A PHENOLIC PANEL. GROUND CONTINUITY IS MAINTAINED THROUGH THE CONNECTOR SHELL	CTWPHS	

Table C-2. Complete Graphic Symbols for Electrical Cable and Harness Assembly Drawings (cont)

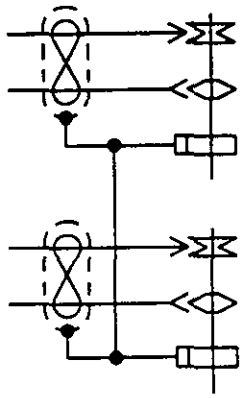
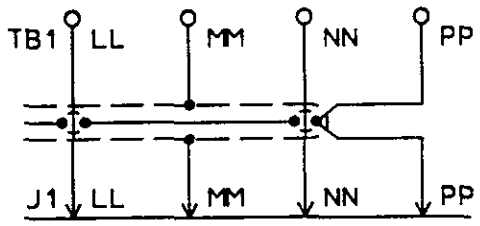
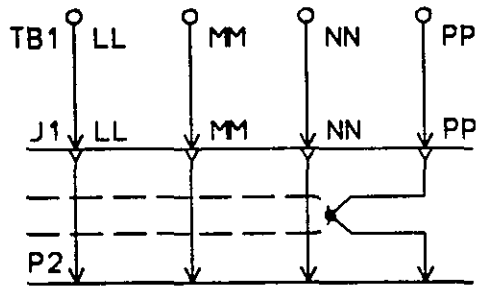
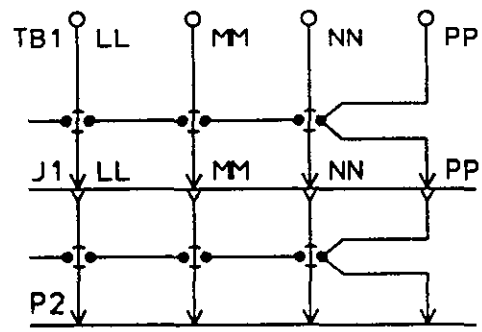
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
CONNECTOR, CONCENTRIC, TWINAX, THRU, MOUNTED IN INSULATED PANEL. SHIELDS DAISY CHAINED TOGETHER	CTDASY	
HARNESS, SINGLE AND *OVERALL SHIELD*	SHSIOV	
HARNESS AND CABLE, OVERALL SHIELD	SHCOV	
HARNESS AND CABLE, SINGLE SHIELD	SHCSNG	

Table C-3. Composite Electrical Graphic Symbols for GSE

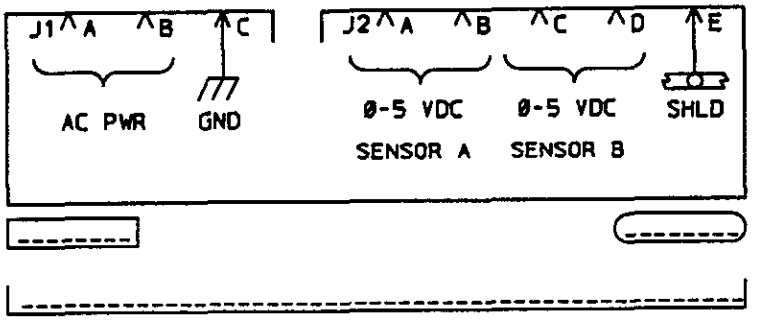
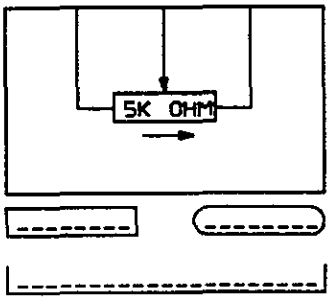
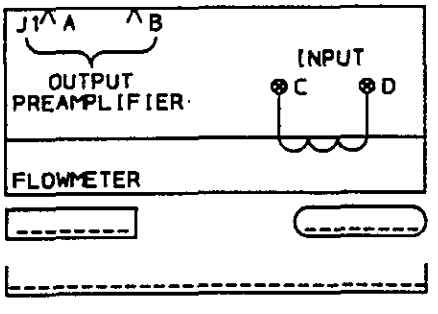
SYMBOL/DESCRIPTION	KSC CAD CELL NAME
DETECTOR, VAPOR, HYPERGOL 	ADETVH
POTENTIOMETER, 5K OHMS (VALUE POSITION INDICATION), WITH PIGTAIL CONNECTIONS 	APOT35 APOT45
PREAMPLIFIER-FLOWMETER 	AAP3FL AAP4FL

Table C-3. Composite Electrical Graphic Symbols for GSE (cont)

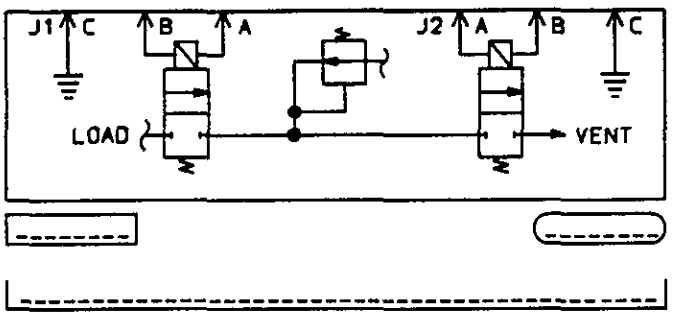
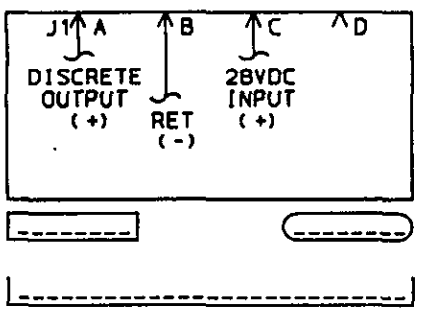
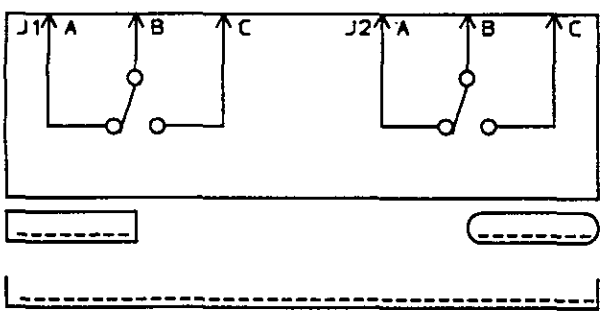
SYMBOL/DESCRIPTION	KSC CAD CELL NAME
REGULATOR, PRESSURE-REDUCTION, WITH INTERNAL RELIEF TO ATMOSPHERE 	ARG31R ARG41R
SENSOR, LIQUID 	ALS3 ALS4
SWITCH, DUAL, POSITION INDICATION 	ASDPOS

Table C-3. Composite Electrical Graphic Symbols for GSE (cont)

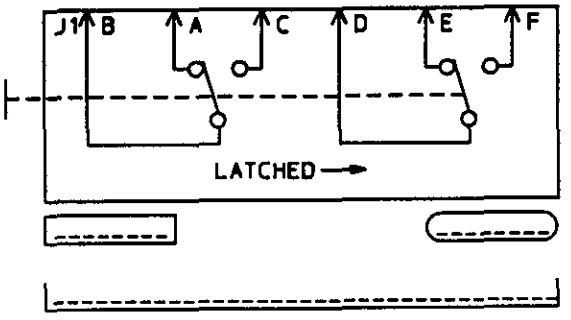
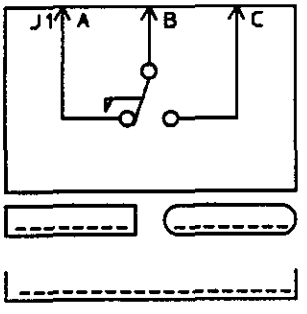
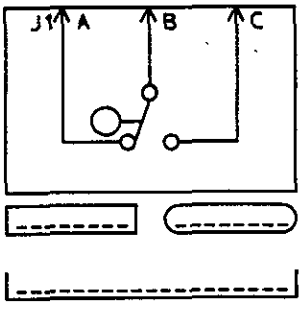
SYMBOL/DESCRIPTION	KSC CAD CELL NAME
SWITCH, DUAL, ROLLER PLUNGER-ACTUATED 	ASDRPA
SWITCH, FLOW-ACTUATED 	AS3FA AS4FA
SWITCH, LIQUID-LEVEL-ACTUATED 	AS3LLA AS4LLA

Table C-3. Composite Electrical Graphic Symbols for GSE (cont)

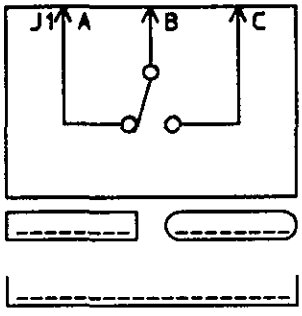
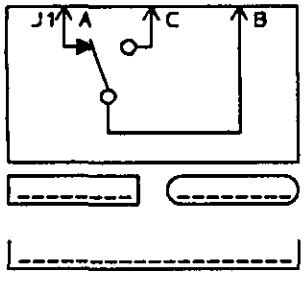
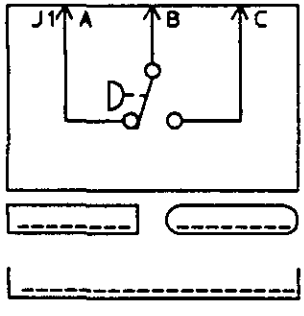
SYMBOL/DESCRIPTION	KSC CAD CELL NAME
SWITCH, POSITION INDICATION 	AS3PI AS4PI
SWITCH, POSITION MOMENTARY 	AS3MMP AS4MMP
SWITCH, PRESSURE- OR VACUUM-ACTUATED 	AS3PV AS4PV

Table C-3. Composite Electrical Graphic Symbols for GSE (cont)

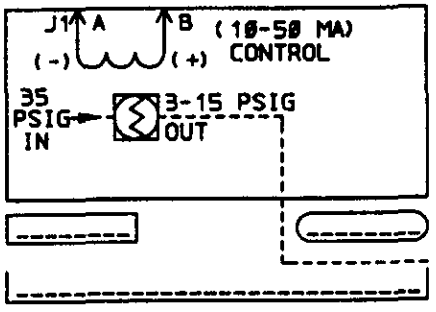
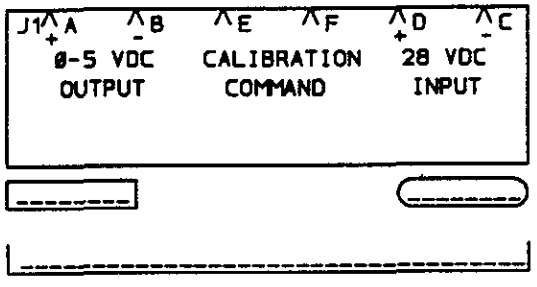
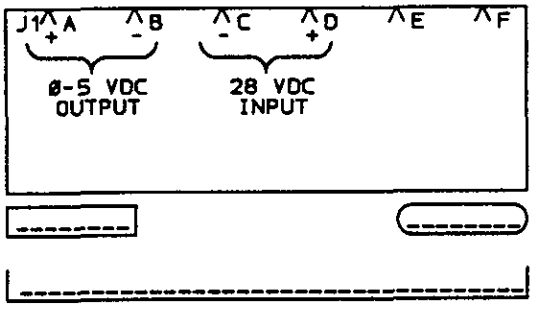
SYMBOL/DESCRIPTION	KSC CAD CELL NAME
TRANSDUCER, ELECTROPNEUMATIC (I TO P) 	ATR3EN ATR4EN
TRANSDUCER, PRESSURE, WITH CALIBATION 	ATR3CP ATR4CP
TRANSDUCER, PRESSURE/TEMPERATURE 	ATR3T1 ATR4T1

Table C-3. Composite Electrical Graphic Symbols for GSE (cont)

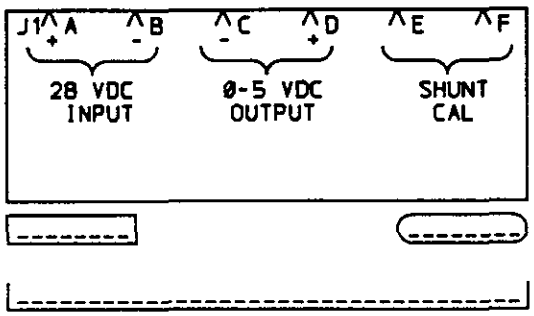
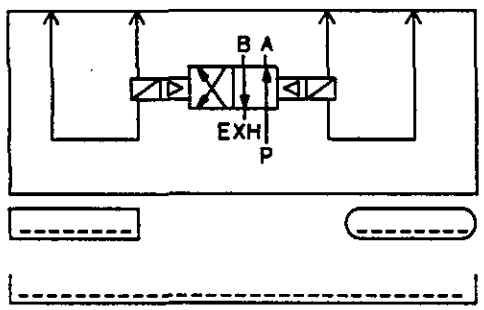
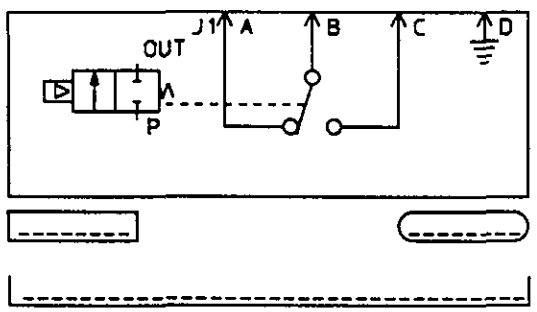
SYMBOL/DESCRIPTION	KSC CAD CELL NAME
TRANSDUCER, ΔP 	ATR3PN ATR4PN
VALVE, DOUBLE-SOLENOID, PILOT-CONTROLLED, TWO-POSITION, FOUR-WAY, WITH PIGTAIL CONNECTIONS 	AVSPPC
VALVE, PNEUMATICALLY OPERATED, NORMALLY CLOSED, TWO-POSITION, TWO-WAY, WITH POSITION FEEDBACK SWITCH 	AVN3CF AVN4CF

Table C-3. Composite Electrical Graphic Symbols for GSE (cont)

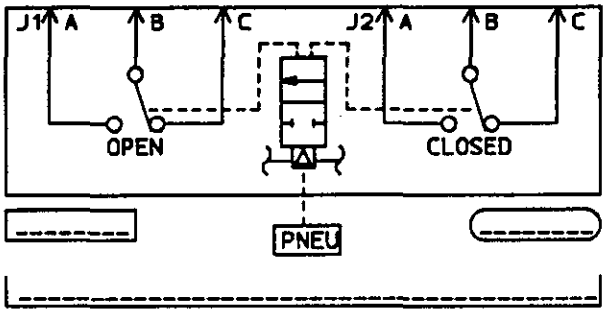
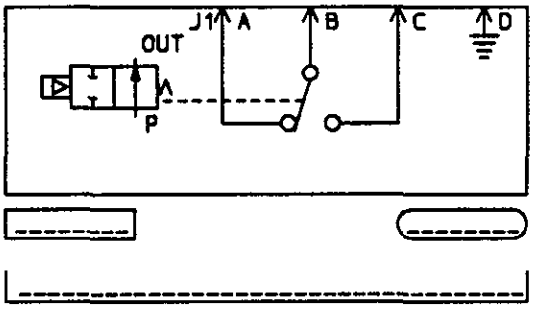
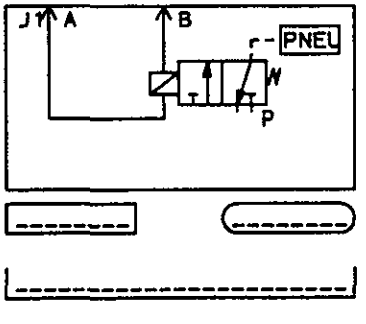
SYMBOL/DESCRIPTION	KSC CAD CELL NAME
VALVE, PNEUMATICALLY OPERATED, NORMALLY OPEN, MONODIRECTIONAL 	AVN3CM AVN4CM
VALVE, PNEUMATICALLY OPERATED, NORMALLY OPEN, TWO-POSITION, TWO-WAY, WITH POSITION FEEDBACK SWITCH 	AVN3OF AVN4OF
VALVE, SOLENOID, NORMALLY CLOSED, TWO-POSITION, THREE-WAY 	AVS4C2

Table C-3. Composite Electrical Graphic Symbols for GSE (cont)

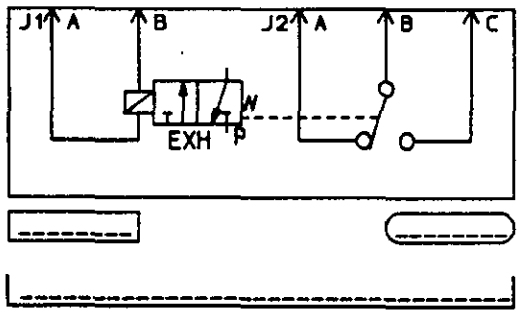
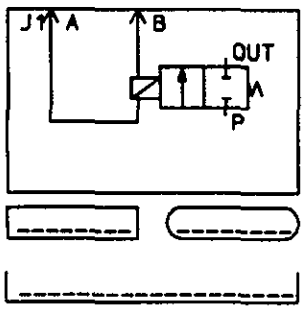
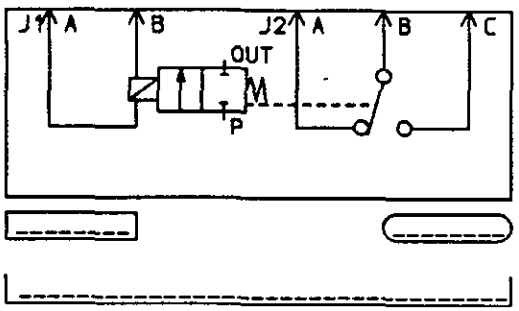
SYMBOL/DESCRIPTION	KSC CAD CELL NAME
VALVE, SOLENOID, NORMALLY CLOSED, TWO-POSITION, THREE-WAY, WITH POSITION FEEDBACK SWITCH 	AVS3C1 AVS4C1
VALVE, SOLENOID, NORMALLY CLOSED, TWO-POSITION TWO-WAY 	AVS3C AVS4C
VALVE, SOLENOID, NORMALLY CLOSED, TWO-POSITION, TWO-WAY, WITH POSITION FEEDBACK SWITCH 	AVS3CF AVS4CF

Table C-3. Composite Electrical Graphic Symbols for GSE (cont)

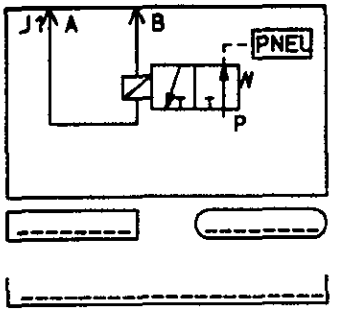
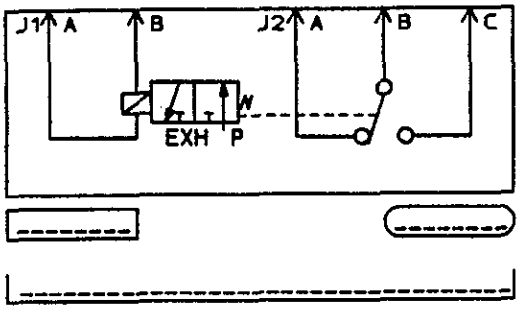
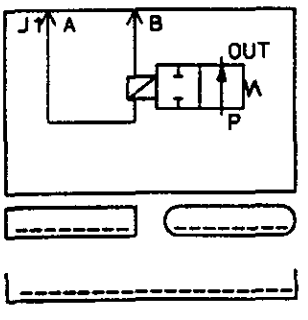
SYMBOL/DESCRIPTION	KSC CAD CELL NAME
VALVE, SOLENOID, NORMALLY OPEN, TWO-POSITION, THREE-WAY 	AVS3O1 AVS4O2
VALVE, SOLENOID, NORMALLY OPEN, TWO-POSITION, THREE-WAY, WITH POSITION FEEDBACK SWITCH 	AVS3O2 AVS4O1
VALVE, SOLENOID, NORMALLY OPEN, TWO-POSITION, TWO-WAY 	AVS3O AVS4O

Table C-3. Composite Electrical Graphic Symbols for GSE (cont)

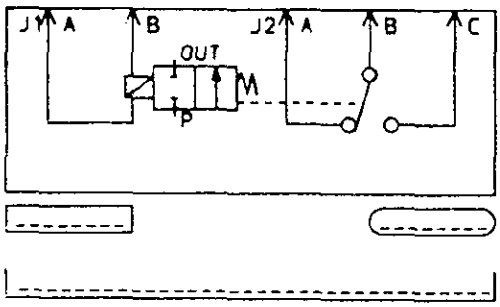
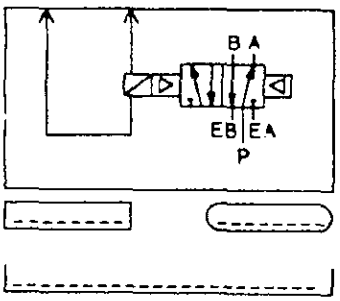
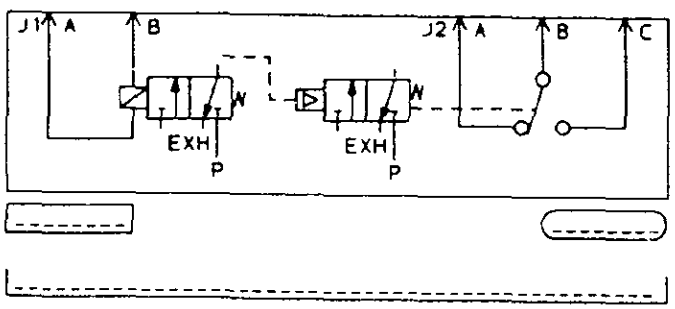
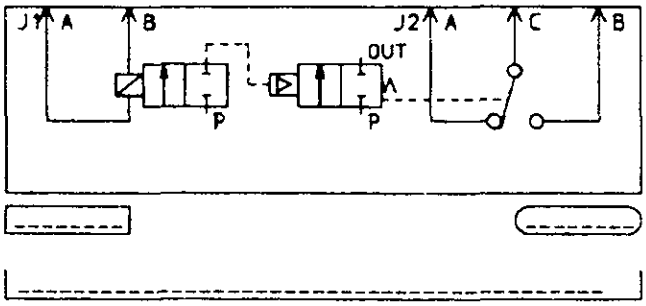
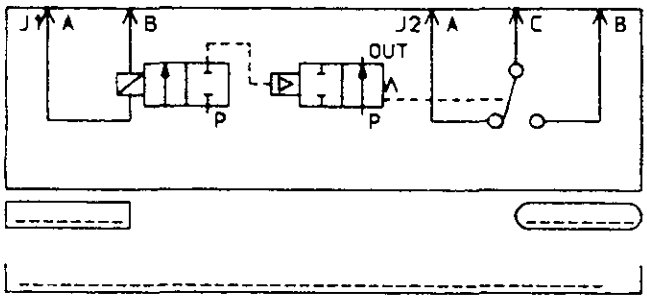
SYMBOL/DESCRIPTION	KSC CAD CELL NAME
VALVE, SOLENOID, NORMALLY OPEN, TWO-POSITION, TWO-WAY, WITH POSITION FEEDBACK SWITCH 	AVS3OF AVS4OF
VALVE, SOLENOID, PILOT-CONTROLLED, AIR RETURN, TWO-POSITION, FOUR-WAY, WITH PIGTAIL CONNECTIONS 	AVSPAP
VALVE, SOLENOID, PILOT-CONTROLLED, NORMALLY CLOSED, TWO-POSITION, THREE-WAY, WITH POSITION FEEDBACK SWITCH 	AVSPOF

Table C-3. Composite Electrical Graphic Symbols for GSE (cont)

TITLE/DESCRIPTION	KSC CAD CELL NAME
VALVE, SOLENOID, PILOT-CONTROLLED, NORMALLY CLOSED, TWO-POSITION, TWO-WAY, WITH POSITION FEEDBACK SWITCH 	AVNS31 AVNS41
VALVE, SOLENOID, PILOT-CONTROLLED, NORMALLY OPEN, TWO-POSITION, TWO-WAY, WITH POSITION FEEDBACK SWITCH 	AVNS30 AVNS41

APPENDIX D

COMMUNICATIONS GRAPHIC SYMBOLS FOR GSE DRAWINGS

GENERAL REQUIREMENTS

The list of graphic symbols provided herein (see table D-1) shall be used in the preparation of GSE communications diagrams and drawings where graphic symbols are required.

The KSC computer-aided design (CAD) cell names are shown for the graphic symbols listed in table D-1. These CAD cell names are shown for easy reference in the preparation of computer-generated drawings. If a CAD cell does not currently exist for a symbol shown in table D-1, a dash is shown in the CAD cell name column.

The CAD cells containing the graphic symbols for CAD-prepared drawings are maintained in the KSC standard Cell Library and are available for use in preparing KSC drawings.

The graphic symbols shown in this appendix shall be drawn at the full-scale size of the CAD cell symbols.

Table D-1. Communications Graphic Symbols for GSE

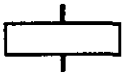
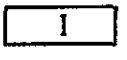
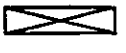
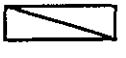
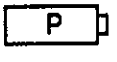
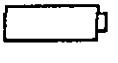
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
AMPLIFIER, GENERAL	AMP AMP1	
AMPLIFIER, NETWORKING	AMPNET	
AMPLIFIER, PAGING (INSTALLATION)	PAGAMP	
ANTENNA	ANT	
BELL (DESIGNATE SIZE AND TYPE)	BELL	
BRIDGE	BRDGE	
CABINET, INTERCOM, ADMISTRATIVE, AGENCY, USING	UAAICA	
CABINET, TERMINAL, PAGING, HOUSE	CABHPT	
CABINET, TERMINAL, PAGING, MAIN	CABMPT	
CABINET, TERMINAL, TELEPHONE, HOUSE	CABHTT	
CABINET, TERMINAL, TELEPHONE, MAIN	CABMTT	
CAMERA, PHOTOGRAPHIC	PHOTOC	
CAMERA, TELEVISION (FIXED)	TVCAMF	

Table D-1. Communications Graphic Symbols for GSE (cont)

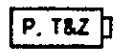
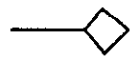
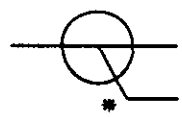
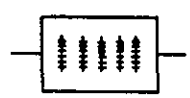
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
CAMERA, TELEVISION (PAN AND TILT)	TVCAPT	
CAMERA, TELEVISION (PAN, TILT AND ZOOM)	TVCPTZ	
CAMERA, VIDEO, PERSONAL	VDCAMR	
CONNECTION, FIBER OPTIC	FBRCON	
CONTROLLER, STAR	STAR	
COUPLER, DIRECTIONAL	DIRCOP	
DISTRIBUTOR BOX	DISTBX	
DISTRIBUTOR, CLOCK, COUNTDOWN	CDCDIS	
DISTRIBUTOR, SYSTEM, INTERCOM, OPERATIONAL	OISDIS	
DISTRIBUTOR, TELEVISION	TVDIST	
DISH, MICROWAVE	MWDISH	
EQUALIZER	EQUAL	

Table D-1. Communications Graphic Symbols for GSE (cont)

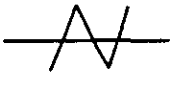
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
FAST PATH	FASTPT	
FAX	FAX	
GATEWAY	GATWAY	
HEADSET	HDSET	
HOST	HOST	
INDICATOR, DOWN	DWNIND	
INDICATOR, RISER	RISER	
LINE EXTENDER	LINEEX	
LINE, FIBER OPTIC	FBRLIN	
LOUDSPEAKER, HORN-TYPE, INTERIOR	PAIH	
LOUDSPEAKER, HORN-TYPE, WEATHERPROOF, EXPLOSIONPROOF, EXTERIOR	PAWP2	

Table D-1. Communications Graphic Symbols for GSE (cont)

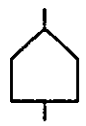
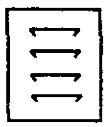
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
LOUDSPEAKER, HORN-TYPE, WEATHER-PROOF, EXTERIOR	PAWP1	
MAIL, QUICK	QKMAIL	
MODEM	MODEM	
MONITOR, TELEVISION	TVMON	
MUX, HIGH SPEED	HSMUX	
MUX, LOW SPEED	LSMUX	
OUTLET, MICROPHONE, SINGLE-GANG, SYSTEM, PAGING, WITH CANNON XL-SERIES RECEPTACLE AND PLATE	PAMICO	
PAD	PAD	
PRINTER	PRINTR	
RACK	RACK	
RACKTOP	RACKTP	

Table D-1. Communications Graphic Symbols for GSE (cont)

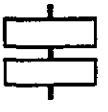
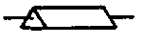
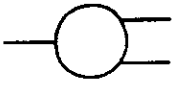
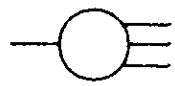
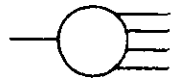
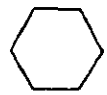
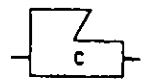
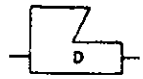
TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
REPEATER, MULTIPORT	MULRPT	
REPEATERS, REMOTE, LEFT AND RIGHT	LRREPT	
ROUTER	ROUTER	
ROUTER, BRIDGE	BROUTE	
SERVER	SERVER	
SERVER, FILE	FILESR	
SERVER, MAIL	MAILSR	
SERVER, NAME	NAMESR	
SPEAKER, CONE-TYPE, WALL-MOUNTED, SURFACE, INTERIOR AND BAFFLE	PAIC	
SPEAKER, CONE-TYPE, WALL-MOUNTED, SURFACE, INTERIOR AND BAFFLE BIDIRECTIONAL	PAICB	
SPLITTER, 2-WAY	2WAYS	

Table D-1. Communications Graphic Symbols for GSE (cont)

TITLE/DESCRIPTION	KSC CAD CELL NAME	SYMBOL
SPLITTER, 3-WAY	3WAYS	
SPLITTER, 4-WAY	4WAYS	
TAP, 8-PORT	8PORT	
TELEPHONE	PHONE	
TELEVISION	TV	
TERMINAL	TRMNL	
TERMINATOR	TERMIN	
TRANSCEIVER	TRNSCV	
TRANSCEIVER, MULTIPORT	MULTCV	
UNIT, SERVICE, CHANNEL	CSU	
UNIT, SERVICE, DATA	DSU