

Standard Modular System Component Circuits

Advanced IBM technology has developed several programs to standardize and expedite the design and manufacturing of new data processing equipment. Notable among these are component circuit cards using solid state circuitry, automation of design, and the standard modular system (SMS) of packaging. This manual deals mainly with the component circuit cards but also includes sections on automation of design and the standard module system of packaging.

Organization and Purpose

This manual describes in text and chart form all SMS component cards now available for use in IBM equipment. Its purpose is to give the customer engineer sufficient understanding of circuits to service the IBM 7000 systems and all other IBM equipment that uses the cards. The description of each card also relates the circuit to its automated logic block configuration.

The component circuit descriptions are arranged alphabetically by card code and cap connection. This dictionary arrangement permits quick reference to the general information for any pluggable circuit cards now available. In addition, the Appendix gives several cross reference charts that make it possible to locate card descriptions by part number or function.

SMS Card Description Format

At the top of each SMS card description is the logic block (or blocks) used to represent the circuit in the automated logic diagrams. In most cases one block configuration is shown for each circuit on a card; however, one circuit could be used in several ways and would then be represented by more than one logic block. To assist in circuit understanding, typical logic applications are also included near the top of the schematic. Dashed lines around the input or output loading blocks distinguish these blocks from the logic block being described. In like manner, additional circuitry is also illustrated in dashed lines.

Logic flow through the blocks and the circuit is always from left to right across the page. The circuits are drawn so that the most positive voltages are at the top of the schematic and most negative voltages are at the bottom of the drawing. Electron flow is then from the bottom to the top of the schematic for both PNP and NPN transistor circuits. In fact in this manual all references to the flow of current are from minus to plus. The shading of a transistor symbol indicates that the transistor is in a conducting status.

Waveforms are included to aid in circuit explanations. Pulses are usually shown as square waves, even though a perfect square wave does not exist. The actual rise and fall times are a function of the transistors used and the loading conditions. Waveforms are shown on the logic block as well as on the circuit diagram, and show the phase relationship between the input and output signals. Nominal (nom) voltage levels are shown for most circuits.

At the bottom of the schematic is found additional information pertaining to the circuit. It may include:

1. Card code, cap connection and the part number of the SMS card.
2. Minimum and maximum voltage swings for the input and output signals.
3. Delay timings, or rise and fall times of the signals.
4. Functional symbols used in line 1 of the ALD block to indicate that the card is capable of performing several logical functions. For example, both positive and negative logic are used in solid-state switching circuits. That is, a +AND circuit may also be used to perform a -OR function and a +OR circuit can also perform a -AND function. Several circuits can share a common load and provide a second level of logic in the output circuit. These DOT OR or DOT AND functions are also indicated by the symbol on line 1. Finally, cards are connected together to form triggers (or latch circuits) and are so indicated by appropriate functional symbols.
5. Types of outputs and loading conditions. Whenever possible, the SMS cards using the same basic card, but having different loading conditions, are grouped and treated as a family of cards. For example, in the CG - family, four cards are listed with different cap connections. Circuit operation for each card is similar, but internal collector loading of the circuits on the card is determined by the particular cap connection.

Below the diagram is the card title followed by a brief description of:

1. The purpose or use of the circuit
2. Circuit operation
3. Particular or special applications

Indexing Arrangement

The SMS card descriptions are arranged in alphabetical order according to the card code and cap connections assigned each card. This alphabetical code is found in the upper right corner of the SMS card description page. Cross reference charts are provided for quickly locating or identifying a card as to part number, usage, or card code and cap connection.

Modes of Operation

Card descriptions that follow pertain to the following modes of operation: current mode transistor circuits, diffused junction transistor circuits, complemented transistor diode logic (CTDL) circuits, magnetic core logic circuits, or special purpose circuits.

Current Mode Transistor Circuits

Current mode transistor logic is characterized by the use of small-signal swings that switch well-defined currents from one part of a circuit to another. The collectors of the transistors used in these circuits are reverse-biased by approximately 6 volts to avoid saturation operation, and