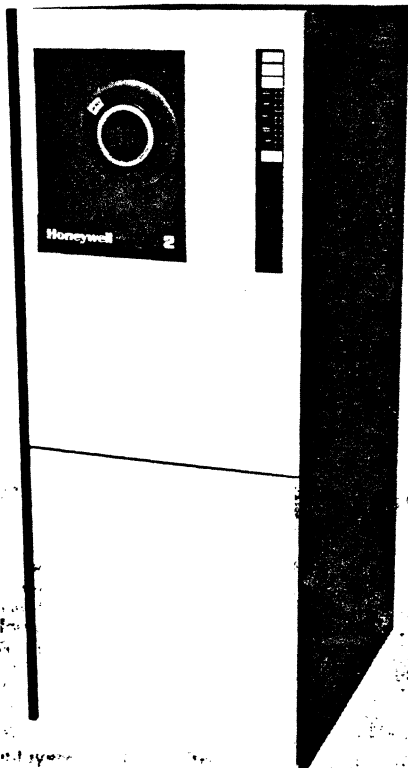


HONEYWELL

DPS 6 & LEVEL 6 GCR/PE MAGNETIC TAPE UNIT OPERATION



HARDWARE

DPS 6 & Level 6 GCR/PE Magnetic Tape Unit Operation

SUBJECT

General Description, Programming, Operation, and Maintenance Procedures for the MTS9126/MTU9126/MTU9626/MTU9627 Magnetic Tape Units

The following notice is provided in accordance with the United States Federal Communications Commission's (FCC) regulations.

Warning: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be required to correct the interference.

This equipment is subject to and will comply with the appropriate FCC Rules prior to final delivery.

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About This Manual

This manual contains hardware-oriented descriptions and instructions for operators of the GCR/PE Magnetic Tape Units for DPS 6 & Level 6 systems. Section 1 outlines the device capabilities. Section 2 describes the various controls and indicators with which an operator should become familiar before operating the unit. Section 3 explains how to operate the unit and what routine preventive maintenance procedures the operator can perform. Appendix A provides programming information for any reader who requires it. Appendix B provides detailed device specifications.

Readers are invited to use the Technical Publications Remarks Form at the end of the manual to note any publication errors or to offer any suggestions for improvement.

The information and specifications in this document are subject to change without notice. This document contains information about Honeywell products or services that may not be available outside the United States. Consult your Honeywell Marketing Representative.

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Section 1

Introduction

The Group Coded Recording/Phase-Encoded (GCR/PE) tape units (Figure 1-1), designed for DPS 6 and Level 6 systems, are 9-track, dual-density units that offer 1600-bpi PE and 6250-bpi GCR operation. The tape speed is 125 ips, allowing a maximum throughput capability of 780,000 bytes per second.

Each tape unit is located in a separate, freestanding cabinet. The initial tape unit cabinet contains a formatter/controller unit (FCU) and power supply. Up to three add-on units can be attached to a single controller. The controller requires one slot on the DPS 6 or Level 6 Megabus. (Refer to Tables 1-1 and 1-2 for marketing identifiers and descriptions.)

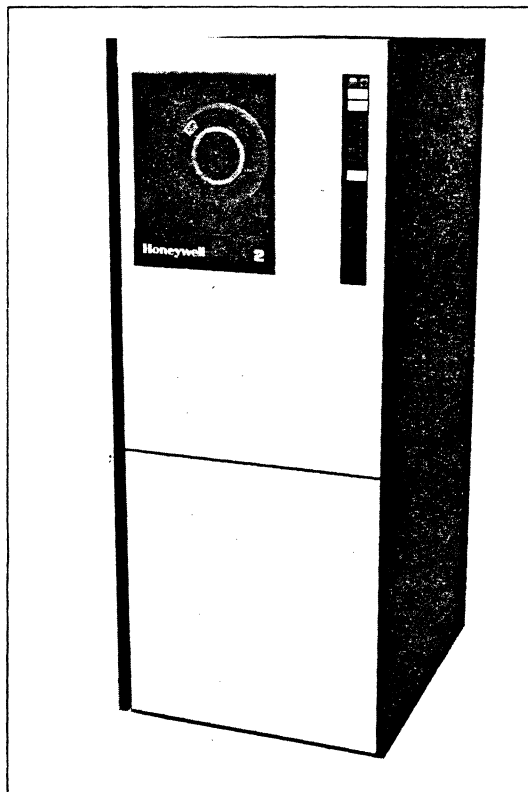


Figure 1-1. GCR/PE Tape Unit

Table 1-1. Magnetic Tape Units

DPS 6	Level 6	Description
MTC9641	---	Magnetic Tape Controller with ports for 1 to 4 tape units. Offered on DPS 6:48 and larger systems.
MTU9626	---	GCR PE tape unit with formatter controller and cabinet. Prerequisite: MTC9641
---	MTS9126	Magnetic Tape Subsystem includes Magnetic Tape Controller with ports for 1 to 4 tape units and GCR PE tape unit with formatter controller and cabinet. Offered on Model 33 and larger systems.

Table 1-2. Options

DPS 6	Level 6	Description
MTU9627	---	Add-on tape unit with cabinet. Prerequisite: MTU9626.
---	MTU9126	Add-on tape unit with cabinet. Prerequisite: MTS91126.
MTK9627	MTK9127	High-altitude option for operation between 6,000 ft and 8,448 ft (1829 m and 2575 m) above sea level.

Features

- Simple loading and operating procedures
- Automatic tape threading/loading with self-loading cartridges
- Full set of operator controls and indicators to help with major device functions
- Subsystem magnetic tape error detection
- Integrity features to help ensure accuracy of data written and retrieved from storage media
- Write-enable feature to protect files from accidental write operation
- Simultaneous reading or writing on one tape unit while rewinding or unloading other units
- Multiple host code conversions for compatibility with ANSI-standard tapes
- Test and maintenance program available to assist in fault isolation and maintenance of equipment

Supplies

Supplies for the GCR/PE tape drives and other Honeywell equipment can be ordered through the *Computer Supplies Catalog and Price List* (Order No. BY62), or contact your Honeywell Marketing Representative.

Section 2

Controls and Indicators

This section describes the various indicators and touch-sensitive controls which are necessary to operate the tape unit.

Operator Control Panel

Magnetic tape unit indicators and controls are shown in Figure 2-1 and described in Table 2-1

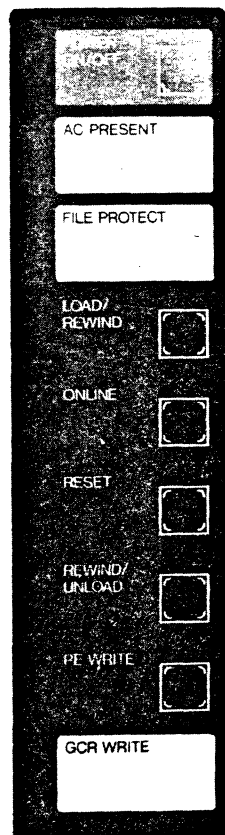


Figure 2-1. Operator Control Panel

Table 2-1. Operator Control Panel

Control/Indicator	Description/Instructions
POWER ON/OFF	Press to apply or remove ac input power to the tape unit. (The indicator will light when power is on.) AC PRESENT indicator must be lit before this control can be used.
AC PRESENT	This indicator lights when the MAIN POWER and TAPE UNIT POWER circuit breakers are switched on. These switches are located on the back panel of the tape unit cabinet.
FILE PROTECT	This indicator lights if a write-permit ring has <i>not</i> been installed on the file tape reel. The indicator remains on until a tape unload operation has been completed.
LOAD/REWIND	If tape is not loaded, press to initiate a tape load operation, which positions the tape at the beginning-of-tape (BOT) marker. (The indicator will light. Indicator will also light if tape is at or past the end-of-tape (EOT) marker.) If tape is loaded, press to rewind tape to BOT marker (indicator will light).
ONLINE	Once tape is loaded, press to place online (indicator will light). To select another operation, first press the RESET control.
RESET	Press to stop all tape motion and convert online status to offline. If pressed during high-speed rewind, the rewind option will be slowed to normal operating speed. If pressed a second time, tape motion will stop. The indicator will flash to indicate that a machine check condition exists within the tape unit.
REWIND UNLOAD	If pressed when tape is positioned at BOT, the tape unloads onto the file reel. If pressed when tape is <i>not</i> positioned at BOT marker, the tape rewinds at a high speed until the BOT marker is detected and then unloads at normal operating speed. The indicator lights when tape unit is selected by the FCU. This switch is only effective when the tape unit is not in the online mode.
PE WRITE	Press to cause the write-density selection to alternate between PE and GCR modes. This indicator will light when PE mode is selected.
GCR WRITE	This indicator lights when the GCR mode is selected via the PE WRITE control.

Window Control Button

The window control button is located above the tape unit window, on the top edge of the front door. Pushing this button will automatically lower the window if a tape load has not been activated within the tape unit. The window will close once a tape load has been completed. To close the window manually, open the front door of the tape unit and raise the window arm.

Door Latch

The door latch is located above the operator control panel, on the top edge of the front door. Pushing this button will release the door lock.

Section 3

Operation

This section describes the operation and maintenance procedures for the GCR/PE tape unit.

Applying Power

1. Switch MAIN POWER, TAPE UNIT POWER, and FCU POWER¹ circuit breakers to the on position. These circuit breakers are located on the bottom right corner of the cabinet back (see Figure 3-1). AC PRESENT indicator will light.
2. PRESS the ON/OFF control. Indicator will light when power has been applied.

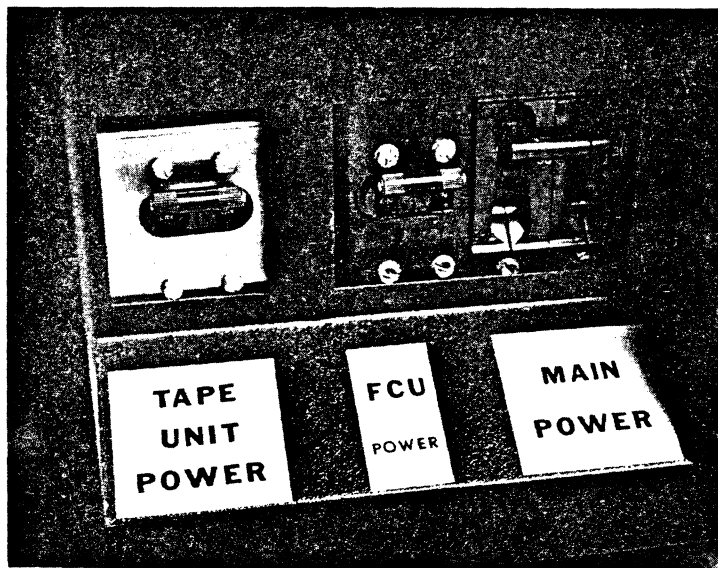


Figure 3-1. Tape Unit Circuit Brakers

¹MAIN POWER and FCU POWER circuit breakers are found only on the initial tape unit, not on the add-on units.

Removing Power

1. Switch FCU circuit breakers off.
2. Press the ON/OFF control. The ON/OFF indicator will extinguish. The AC PRESENT indicator will remain on until the tape unit's MAIN POWER circuit breaker is switched off. The MAIN POWER circuit breaker will remove all ac power.

Tape Mounting

To mount tape, follow this procedure:

1. Press the window-control button located above window, on top edge of front door. The window will lower.
2. Prior to mounting the supply reel, visually examine the condition of the tape. It should be free of kinks and creases. Check condition of the reel as well. It must not be warped or damaged in any way.

Note: If tape is to be written on, install a write-permit ring in back of the tape reel.

3. Gently press the supply reel onto the supply hub.
4. Refer to the tape threading procedures.

Automatic Tape Threading

1. Place the tape or cartridge reel on the file hub. If the cartridge reel is used, align the cartridge tabs with the corresponding slots (see Figure 3-2).
2. Press the LOAD/REWIND control.

The tape will automatically feed and thread itself onto the machine reel. If the tape does not reach the machine reel in approximately 10 seconds, the tape rewinds and a second sequence begins automatically. If this second attempt is unsuccessful, the tape will rewind and the RESET indicator will flash to signal a problem. If this should happen:

1. Examine tape leader for kinks or creases.
2. Cut off any damaged tape.
3. Press RESET.
4. Press LOAD/REWIND.

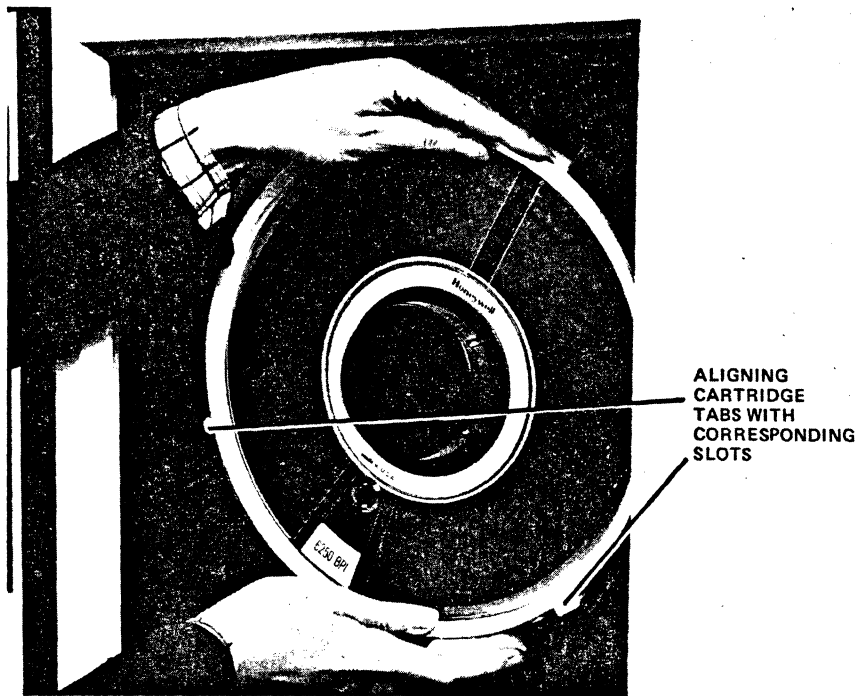


Figure 3-2. Mounting Cartridge Reel

If the tape still fails to thread, refer to "Manual Tape Threading" later in this section.

Once threaded onto the machine reel, the tape will move forward until the BOT marker is detected. Vacuum is automatically transferred to the vacuum columns and this, in conjunction with the reel's unwinding tape, loads the columns. The window automatically closes at this time.

When the columns are loaded, the tape unit automatically moves the tape forward until the BOT marker is again detected. If the BOT is not found in 1.5 seconds, the tape is searched in a backward direction. If no BOT is found, the tape unloads and the RESET indicator flashes. If this should happen:

1. Check that a BOT patch has been placed on the tape. If no BOT patch is found, place patch on tape.
2. Press RESET.
3. Press LOAD/REWIND.

If BOT is still not found, call your Customer Services Representative.

Once BOT is found, the LOAD/REWIND indicator will light and the tape unit is ready for operation. Press the ONLINE switch to place tape drive online. The indicator will light.

Manual Tape Threading

Manual threading procedures are provided to reduce downtime in the event of automatic threading problems.

1. Place the tape or cartridge reel on the file hub. If the cartridge reel is used, align the cartridge tabs with the corresponding slots (see Figure 3-2).
2. Press the LOAD/REWIND control.
3. When the file/reel begins to rotate, press the LOAD/REWIND control again. Reel motion stops, but pneumatics remain activated.
4. Manually rotate the file reel clockwise, feeding the tip of the tape into the tape path opening (see Figure 3-3).
5. Press the LOAD/REWIND control. The threading sequence will continue.

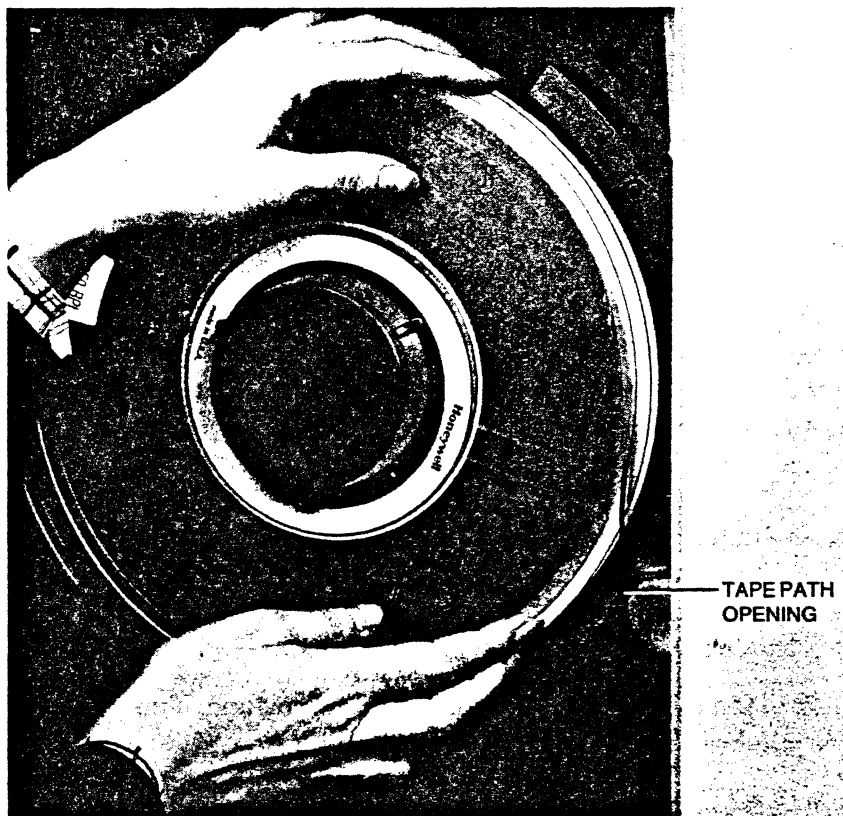


Figure 3-3. Manually Positioning Tape Leader

The tape will automatically thread itself onto the machine reel. If the tape does not reach the machine reel in approximately 10 seconds, the tape rewinds and a second sequence begins automatically. If this second attempt is unsuccessful, the tape will rewind and the RESET indicator will flash to signal a problem. If this should happen, call your Customer Service Representative.

Once threaded onto the machine reel, the tape will move forward until the BOT marker is detected. Vacuum is automatically transferred to the vacuum columns and this, in conjunction with the reel's unwinding tape, loads the columns. The window automatically closes at this time.

When the columns are loaded, the tape unit automatically moves the tape forward until the BOT marker is again detected. If the BOT is not found in 1.5 seconds, the tape is searched in a backward direction. If no BOT is found, the tape unloads and the RESET indicator flashes. If this should happen:

1. Check that a BOT patch has been placed on the tape. If no BOT patch is found, place patch on tape.
2. Press RESET.
3. Press LOAD/REWIND.

If BOT is still not found, call your Customer Service Representative.

Once BOT is found, the LOAD/REWIND indicator lights and the tape unit is ready for operation. Press ONLINE switch to place tape drive online. Indicator will light.

Tape Rewinding

1. If tape is operating online, press the RESET control. ONLINE indicator will extinguish.
2. Press the LOAD/REWIND control. The tape will rewind at high speed, then slow to normal operating speed just prior to the BOT marker. Once the BOT marker is detected, the tape will stop and the LOAD/REWIND indicator will light.

Tape Unloading

1. If tape is operating online, press the RESET control. ONLINE indicator will extinguish.
2. Press the REWIND/UNLOAD control. The tape will rewind at high speed, then slow to normal operating speed just prior to the BOT marker. Once the BOT marker is detected, the tape will stop momentarily, and then unload onto the file reel. The power window will then open automatically.

Tape Demounting

1. Follow "Tape Unloading" procedures.
2. Gently pull the supply reel from the supply hub by grasping the opposite sides of the reel with your fingers while pressing firmly with your thumbs against the reel hub.

Operator Maintenance

Proper handling of magnetic tape media is crucial for operating efficiency. The *Magnetic Tape Media Maintenance Procedures* guide (Order No. CH76) gives complete instructions in handling magnetic tape, with a section on recognizing and preventing tape damage.

Operators are required to perform a limited amount of maintenance in order to keep the tape unit(s) functioning properly. This maintenance consists of cleaning the following areas: read/write head, tape guides, capstan, tape cleaner, vacuum chamber, erase head, and tape unit surfaces. Cleaning should be performed once a day or as often as required.

Prior to cleaning the unit, remove the supply reel and then power down the unit.

Cleaning

To perform the following maintenance, first turn all power off, then open front door and interior column door. Figure 3-4 illustrates the various tape unit components.

- *Read/write head and tape cleaner block* – Clean the read/write head and the tape cleaner block using a lint-free cloth moistened with Honeywell Magnetic Tape Cleaner or equivalent solution (such as Freon "TF" solvent). Make certain the head and cleaner block are free of oxide deposits. Use foam-tipped swabs to clean the cleaner block.
- *Tape guides and air bearings* – Clean the tape guides and air bearings using a lint-free cloth moistened with Honeywell Magnetic Tape Cleaner or equivalent solution (such as Freon "TF" solvent). To reach otherwise inaccessible areas, foam-tipped swabs may be used. If necessary, the edge of a data processing card may be used to clean the flange corners of the guides.

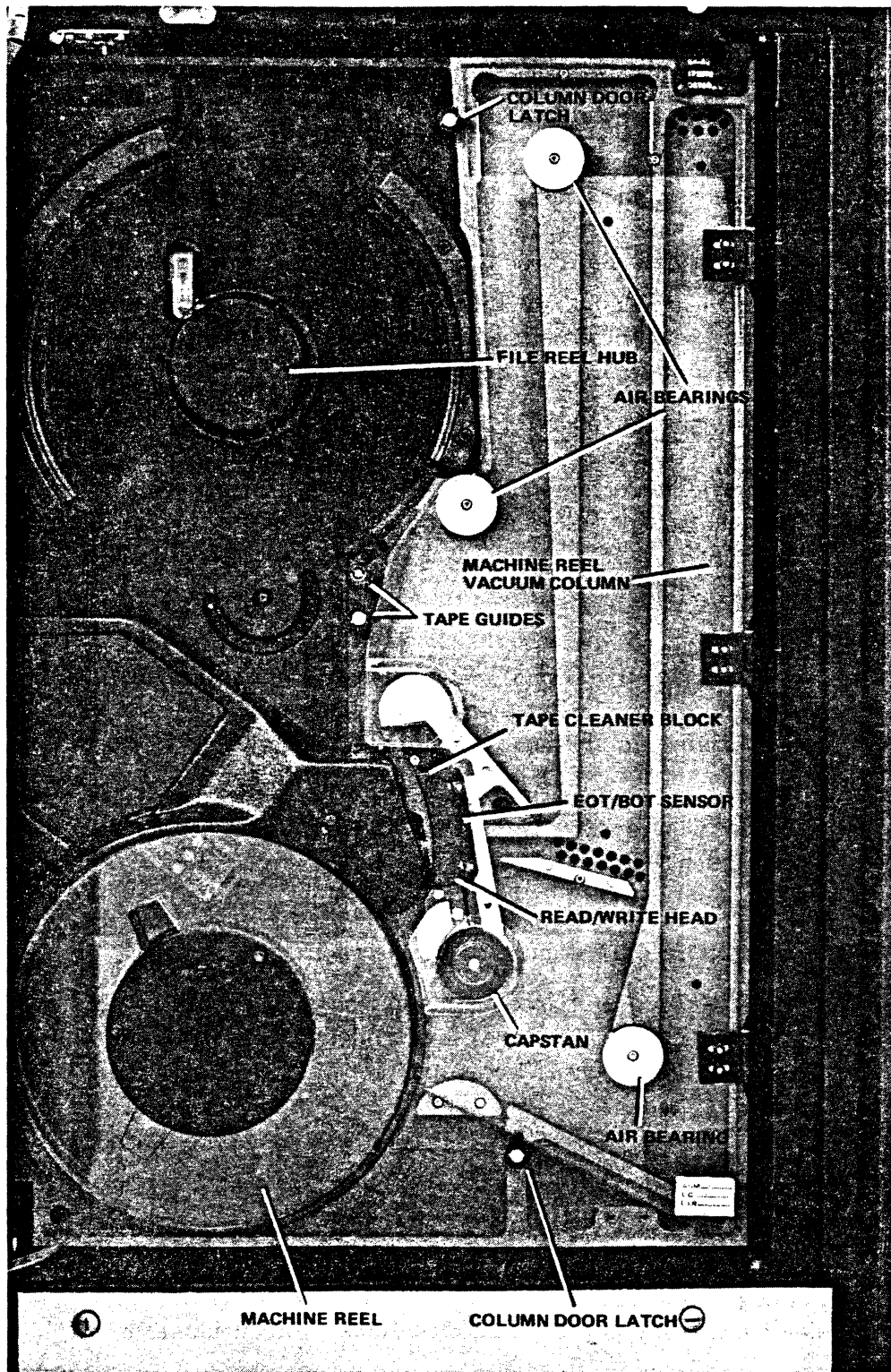


Figure 3-4. Tape Unit Components

- *Capstan* – Clean the capstan using a lint-free cloth wrapped around the index finger and moistened with Honeywell Magnetic Tape Cleaner or equivalent solution (such as Freon “TF” solvent).

CAUTION

Do NOT touch the outer, tape-contacting surface of the capstan with the bare hand as the surface is sensitive to contamination. Always use a cloth when handling the capstan and grip only the hub of the capstan. Take care as the capstan is easily dented and replacement will be required.

With the free hand, slowly rotate the capstan hub while wiping the capstan surface with the moistened cloth. Two or three revolutions is sufficient. Wipe the capstan with a dry, lint-free cloth to remove excess cleaner fluid.

- *Vacuum columns and column door* – Clean the columns and inside surface of the column door using a lint-free cloth moistened with Honeywell Magnetic Tape Cleaner or equivalent solution (such as Freon “TF” solvent). The sharp corner of a folded data processing card may be used to remove stubborn oxide buildup from the corners. Check the bottom of the columns for bits of tape and other foreign materials.

CAUTION

Do NOT use alcohol or standard hub cleaner fluid in the columns as these solvents will remove the glass-beaded tape lining the sides of the vacuum columns and also attack the urethane coating on the capstan wheel.

- *File reel hub* – Clean the expansion surface of the file reel hub using a lint-free cloth moistened with Honeywell Magnetic Tape Cleaner or equivalent solution (such as Freon “TF” solvent).

CAUTION

Do NOT use standard transport cleaner fluid.

- *EOT/BOT sensor* – Use a dry foam swab to wipe the EOT/BOT sensor window. Honeywell Magnetic Tape Cleaner or equivalent solution (such as Freon “TF” solvent) may be used if necessary.

BOT Patch Mounting

The beginning and end of the working storage area on the tape are marked by small, inch-long reflective markers. Marker dimensions are:

Length: 1.1 inch \pm 0.2 (27.94 mm \pm .5)
 Width: 0.19 inch \pm 0.02 (4.82 mm \pm .05)
 Thickness: 0.0008 inch max (.02 mm)

The BOT and the EOT markers are placed on the Mylar-base side of the tape. Take care when placing the markers. They must be within 0.03 inch (0.08 cm) of, but not protrude beyond, the reference edge of the tape and be free of wrinkles and adhesive.

The tape between BOT and physical beginning of tape is referred to as the leader. If bad spots develop on the tape toward the leading edge, the BOT marker can be moved down so that the damaged section of the tape can still be used for information storage in the normal manner. A leader length of about 16 feet (5 m) is recommended for automatic threading.

Tape Handling and Storage

The following rules should be followed in the handling and storage of magnetic tapes.

Keep tapes clean. Dust and dirt can reduce the intensity of reading or recording signals by altering the distance between the head and the tape. Therefore:

- Never touch the tape's oxide coating; body oils on tape attract dust and lint.
- Keep the tape in its dust-proof container until just prior to use on the tape drive.
- Keep tape containers clean and dust-free *inside* and *out*. Don't leave containers open when tape is in use.
- Keep the tape transport door closed when the tape drive is not in use.
- Avoid dangling the free end of the tape on the floor when changing reels.
- Don't smoke in the computer room. Smoke and ashes are dirt; hot ashes are destructive to magnetic tape. Food and drink should not be put near the tape devices.
- Identify reels with adhesive stickers, which are easily removed and leave no residue. Eraser particles are dirt. Change the label, don't erase it.

Handle and store tapes with care. Avoid damaging tapes and reels or placing tapes where temperature, dust, or magnetic fields affect them adversely. Follow these recommendations:

- Make sure that the tape leader is properly wound when tape is returned to its container. This avoids accidental crushing of the tape leader edges and possible damage to the tape itself.

- Whenever possible, store tapes in the controlled environment where they are to be used, so the tapes are not subjected to excessive variations in temperature and humidity. For short-term tape storage, the surrounding atmosphere should be controlled within the following limits:
Operating Relative Humidity: 40% to 60%
Operating Temperature: 60°F to 80°F (16°C to 27°C)
- For long-term storage, the reel of tape in its container should be hermetically sealed in a moisture-proof bag. Temperature should be constant somewhere between 60°F and 80°F (16°C to 27°C).
- When mounting or demounting tapes, handle the tape reels by the hub and not by the flanges. Squeezed or bent flanges result in damaged tape edges and eventual loss of contact with the magnetic head.
- A routine library inspection of tape reels should be made. Check for protruding tape edges. Exposed edges are vulnerable to damage and cause loss of contact with the tape drive head.
- Avoid dropping reels. If a tape is dropped, the reel may become broken or dirty, resulting in possible damage to the tape. Reel damage can be determined by a visual inspection. Never use a reel that may cause damage to the tape or to the tape drive.
- Always store tapes in containers in a dust-free cabinet. The containers should be placed on edge so that the reel is in an upright position. Do not stack tape reels one on top of the other since the bottom containers could be damaged by the weight of the stacked reels.
- Never place reels of tape on top of a tape drive as this exposes them to heat and dust from the cooling system.

Appendix A

Programming

MTC Memory and Command Interpretation

The GCR/PE Magnetic Tape Controller has a 128-word Read/Write memory that is divided into 32 registers (16 bits per register) for each of the four MTC ports (or channels). The address of each of the various registers in the MTC is a combination of two bits of the channel number and the five high-order bits of the function code used to write into or read from a particular register.

The central processor (CP) can read or write any register as long as the specific channel is not busy. To write into a register, an *I/O output* command is used; reading is done with an *I/O input* command. Addressing of the various registers relates to the I/O command as shown in Figure A-1.

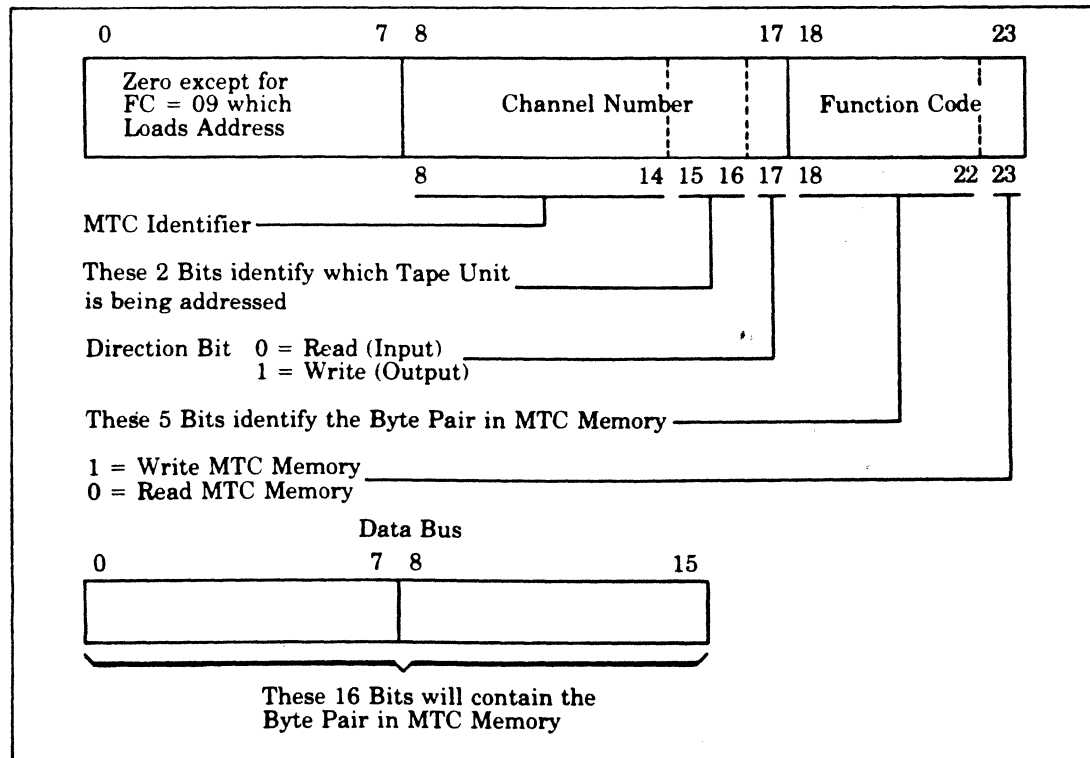


Figure A-1. Register Addressing

The format shown in Figure A-1 is for a Write cycle on the bus. For a Read cycle, the memory data will be returned from the MTC on a second bus transfer.

To perform a specific operation, software first loads the address, range, and configuration registers. The task register is loaded last and specifies the operation to be performed. The MTC begins command execution when it receives the task word.

Channel Number

Units attached to the GCR/PE Tape Unit are software-addressable via channel numbers. Each tape unit has two such channel numbers assigned, differing only in their low-order bit position called the direction bit.

The channel number for the MTC is separated into three fields:

- MTC Identifier (bits 8-14) — switch-selectable and assigned at system installation time.
- MTC Port (bits 15-16) — identifies which of the four tape units is being addressed.
- Direction Bit (bit 17) — specifies in the IOLD command whether it is an input or output data transfer. For all other commands, the direction bit is ignored by the hardware.

Simultaneity

The GCR/PE Tape Unit provides a single level of simultaneity (only one data transfer can be active in the subsystem). However, the MTC will accept a data transfer command to unit B while unit A is performing a data transfer but will not start the data transfer on B until A's data transfer is completed.

Interrupts

An interrupt will be attempted whenever a channel interrupt level is not zero, and an operation initiated by an Output Task Word or Output Control Word instruction is completed or the Attention bit is set in Status Word 1. If a negative response is received during an interrupt cycle, the MTC will store the interrupt until it can be retried. In the meantime, the MTC can receive commands and/or conduct data transfers on any of the other channels. The

channel with the pending interrupt will remain busy and the MTC will not accept any commands issued to that channel except an Output Control Word.

If an interrupt level of a channel is zero (either via initialization or loaded to zero) no interrupts will be attempted for that channel. If a condition or event occurs that would normally cause an interrupt, the appropriate bits in the Status Words will be set, but no interrupt will be attempted or accepted.

If the interrupt level is set to zero then an interrupt is pending via an Output Control Word (Initialize) or a Master Clear, the pending interrupt will be discarded.

Media Interchangeability

Tapes generated by these units are compatible with tapes generated by other units if the other tape units comply with American National Standards Institute recording standards.

Magnetic Tape

The physical layout of half-inch magnetic tape is illustrated in Figure A-2. A full reel of tape has a nominal recording length of 2400 feet (732 m). The entire length of the tape is oxide-coated. Beginning- and end-of-tape sensing is controlled by reflective markers affixed to the Mylar-base side of the tape. The beginning-of-tape (BOT) spot is attached approximately 16.0 feet (4.9 m) from the physical beginning of the tape, and the end-of-tape (EOT) spot is attached approximately 25.0 feet (7.6 m) from the physical end of the tape.

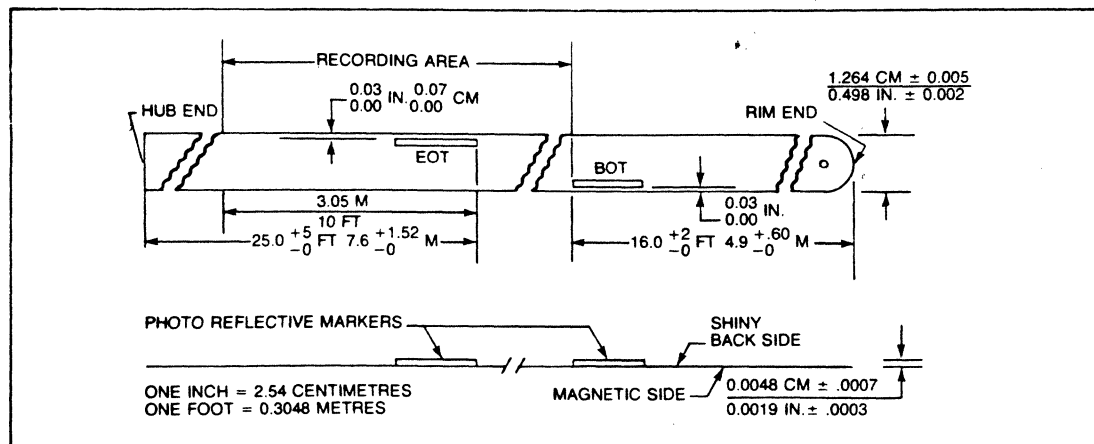


Figure A-2. Magnetic Tape Layout

Beginning and End of Tape

An erased section of tape is required surrounding the BOT marker. This serves as a defined area within which reading can start. This section begins a minimum of 1.3 in. (3.3 cm) before the hub end of the BOT marker and extends a minimum of 3.0 in. (7.6 cm) past the hub end of the BOT marker. This erased section totals about 4.3 in. (10.9 cm).

An unrecorded area must be left in the vicinity of the EOT marker affixed on the opposite edge of tape at the trailing end of a tape reel.

Data Blocks

The data is formatted and recorded on the tape in blocks. On 9-track tape, each block consists of the data, a Cyclic Redundancy Check (CRC) character, and a Longitudinal Redundancy Check (LRC) character. The CRC character is positioned four character spaces after the final data character, and the LRC character must occur four character spaces after the CRC.

Interblock Gaps

Interblock gaps are areas without data (i.e., all tracks restored to the dc-erased polarity) placed between data blocks or records. For PE, the length of the gap is 0.6 in. (1.5 cm) nominal (0.5 in./1.3 cm minimum) for 9-track subsystems. The maximum length should not exceed 25.0 feet (7.6 m). For GCR, the length of the gap is 0.3 in. (0.8 cm) nominal (0.3 in./0.8 cm minimum) for 9-track subsystems. The maximum length should not exceed 15.0 feet (4.5m).

Tape Marks

Figure A-3 shows the format of the Tape Mark for 9-track tapes. The distinguishing feature of the block is that it is a single, specific character block with a check character.

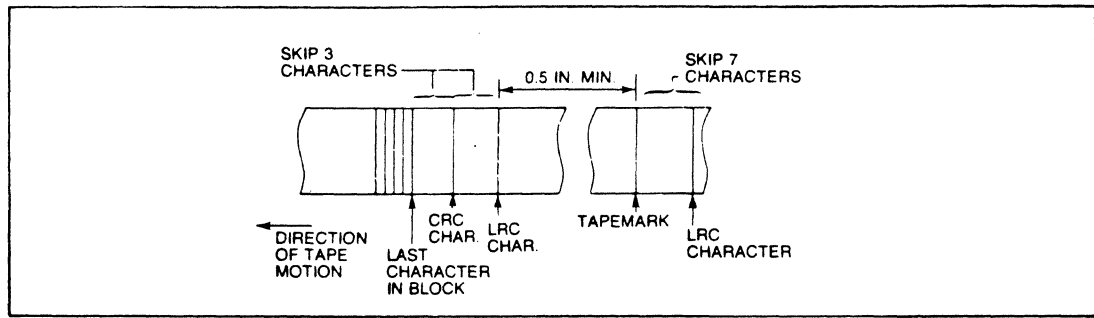


Figure A-3. Tape Mark Block Format

Phase-Encoded Recording

The PE or Phase-Encoded recording technique combines the clock and data to provide at least one flux reversal for each bit cell, thus achieving self-clocking. A "1" is a flux change to the polarity of the interrecord gap: a "0" is a flux change to the polarity opposite that of the interrecord gap, when reading in the forward direction. With PE, single-track errors are correctable.

Group Coded Recording

The GCR or Group Coded Recording technique combines the NRZI conventions for data recording along with the PE detection circuits and deskewing scheme to enable tape processing with optimum density/tape speed and error correction capabilities. GCR is similar to NRZI, but it encodes the data before recording it. The technique assembles seven bytes of data and adds an error-checking and error-correction character to form an eight-byte data group. The first four bits of each byte are then translated into five bits and then the second four bits are translated. When performing this translation, no more than two consecutive zeroes along a track on tape are allowed.

Check Characters

The PE format provides for both vertical and longitudinal parity checks. In the 9-track system an additional check called the cyclic redundancy check character is used.

- *Vertical parity*— 9-track tape subsystems use 8 tracks for recording data. The remaining track carries parity information. When performing a Write

operation, one parity bit is generated, either odd parity or even parity based on a previously stored Configuration Word, to accompany each character written on tape. The 9-track subsystems read and write odd parity only.

When performing a Read (including Read-After-Write) operation, the parity read is checked against the parity created from the data portion of the character read. A mismatch causes a Vertical Redundancy Check (VRC) error condition to be set in Status. Note, however, if an even number of bits in the data character are "dropped" or "picked," a VRC error will not be detected; thus additional checking facilities are necessary.

- *Longitudinal Parity* – A Longitudinal Redundancy Check (LRC) character is written following the data portion of each block. It is separated from the end of the data or CRC in each block. This character is made up on a per-track basis. The LRC character written is one calculated so that an even number of "one" bits, including those of the data and LRC character, is recorded in each track of the block. On reading, this is checked and an error is detected if the count is odd in any track. This possibility of detecting an erroneous block still exists if an even number of bits in a given track of a block is dropped or picked. However, when this text is combined with the vertical parity test, the probability of not detecting an error is reduced.
- *Cyclic Redundancy Character Check (CRC)* – In the 9-track system another check character is written. This character is derived with relatively complex logic and, along with the LRC character and vertical parity, minimizes the possibility of undetected errors. The CRC character bits of a Tape Mark Block are all zeros. This check character follows the last data byte of the block by four cell positions.

9-Track Data Format

Data being written on or read from tape is handled on a byte basis. All 16 bits of a data word are transferred to or from the tape as shown in Figure A-4. Odd parity (vertical redundancy check) is written on tape and is checked when read.

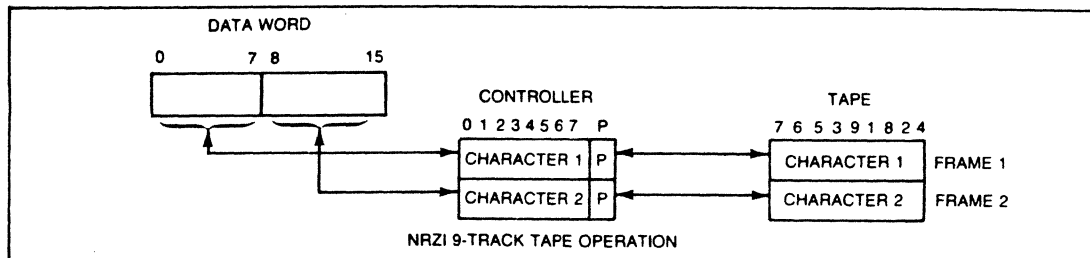


Figure A-4. 9-Track Data Format

Instructions

Table A-1 lists the I/O commands. A detailed description of each command follows this table.

Table A-1. Magnetic Tape Commands

Type	Function Code	Command
Output	09 ^a	Address
	0D	Range
	11	Configuration Word A
	13	Configuration Word B
	03	Interrupt Control
	07	Task Word
	01	Control Word
Input	0C	Range
	08	Memory Byte Address
	10	Configuration Word A
	12	Configuration Word B
	02	Interrupt Control
	26	Device ID
	06	Task Word
	18	Status Word 1
	1A	Input Status Word 2
04	Firmware Revision	

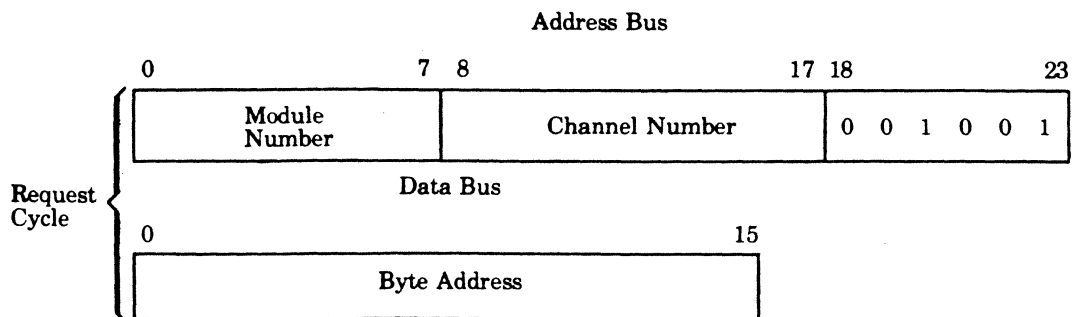
^aFunction Code 09 as executed by the CP will result in execution of functions 09 and 0D.

Output Commands

Command Output Address

Function Code 09

Format



Function

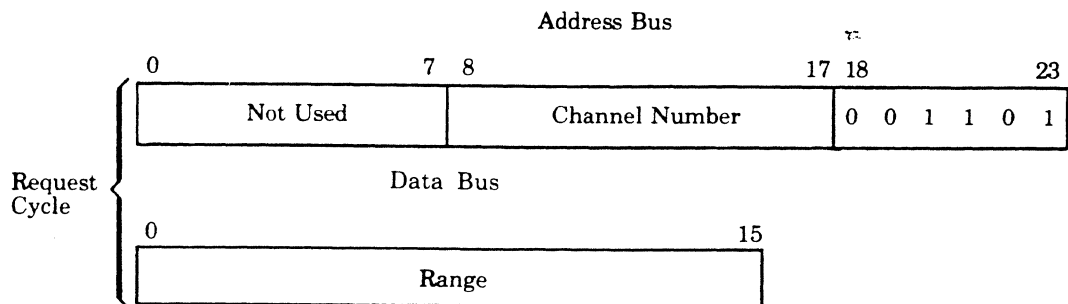
Loads a 24-bit address into the address register associated with the referenced channel (device). The address refers to the starting (byte) location in main memory where the MTC will commence input or output data transfers. Bits 0-7 of the Address Bus (Module Number) are the most significant bits of the Address. The Data Bus contains the 16 least significant bits. Data transfers to or from memory will normally be on a word basis but byte mode transfers can occur associated with the first and/or last memory cycle of a particular data transfer if the main memory buffer (identified by this instruction) begins or ends on an odd byte boundary.

Bit 17 of the address bus (direction bit of the channel number) determines the direction of any subsequent data transfer operation. A logical one specifies an output operation (writing on media) while a logical zero specifies an input operation (reading from media).

Command Output Range

Function Code OD

Format



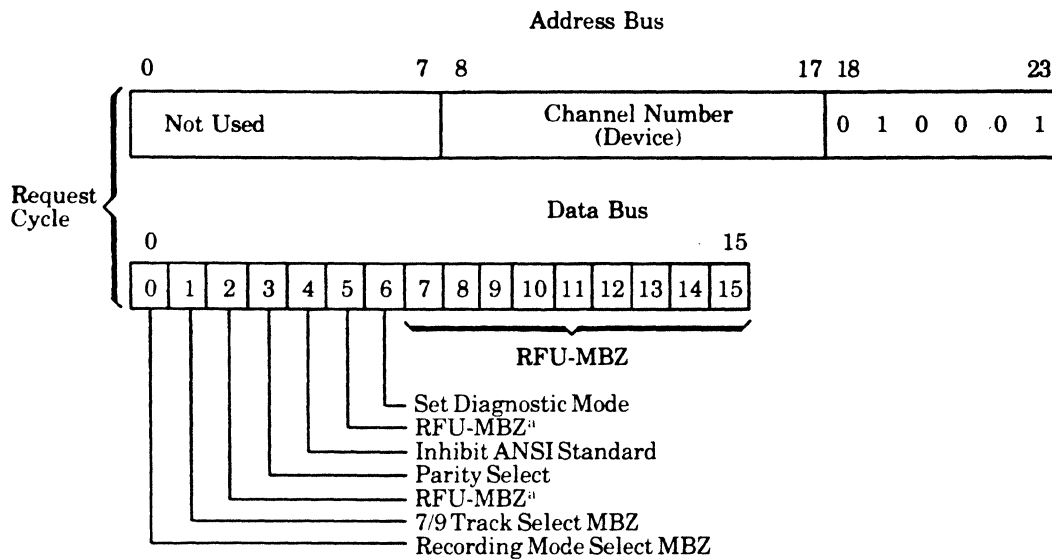
Function

Loads the Range register associated with the referenced channel. The (16-bit) quantity loaded (data bus) is the number of bytes to be transferred during the data transfer that is being set up. The number is a positive binary quantity (bit 0 must be zero) and is decremented by the MTC after each memory transfer. A range of zero results in a subsequently issued Read Forward order to perform the equivalent of a Forward Space Block order transferring no data to memory. A range of zero results in a subsequently issued Write order setting the Operation Check bit of Status Word 1, no data transfer, no tape motion initiated, and termination of the order. Any address and range register residue is applied to the next command unless reset by another Output Range instruction.

Command Output Configuration Word

Function Code 11

Format



^aReserved for future use, must be zero.

Function

Loads the Configuration Word for the device corresponding to the referenced channel. Bit descriptions follow.

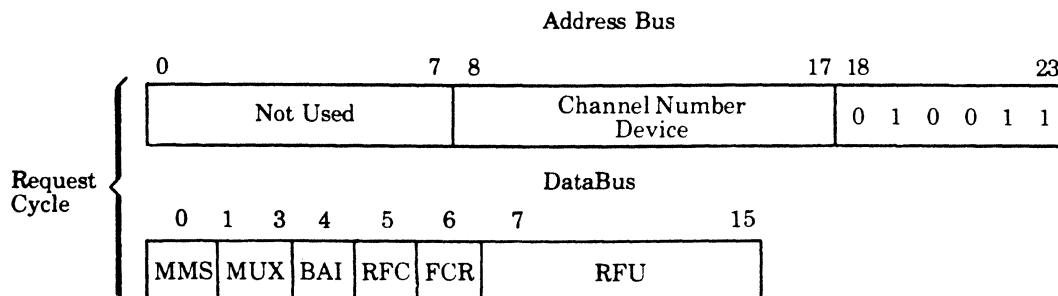
- Bit 0 — Recording Mode Select: Must be zero.
- Bit 1 — 7/9 track Select: Must be zero.
- Bit 2 — RFU, MBZ: This bit is reserved for future use and must be zero for the subsystem specified herein.
- Bit 3 — Parity Select: This bit selects either even or odd parity for the selected controller/device. The FCU interfaces only with 9-track tape drives; therefore, the normal setting of this bit is a zero selecting odd parity.
- Bit 4 — Inhibit ANSI: This mode is used for diagnostic purpose only.
- Bit 5 — RFU, MBZ: This bit is reserved for future use and must be zero for the subsystem specified.

- Bit 6 — Normal/Diagnostic Mode Select: This bit is normally set to a zero indicating that normal functionality is selected. The one state indicates that the controller selected is in a diagnostic mode. When this bit is set to a one for the FCU, the MTC issues a Set Diagnostic Mode command to the FCU prior to the execution of the Task Word that follows. This places the FCU in the diagnostic state for the Task Word that follows the Output Configuration Word instruction. Note that the FCU enters the diagnostic state for each Task Word issued where the diagnostic mode select bit (bit 6) of the Configuration Word is set to a one. The status information, available after execution of the Task Word in the diagnostic state, has specific meaning to the T&V software. Formatted tapes are not necessarily ANSI-compatible.
- Bit 7 — RFU, MBZ: Must be zero.
- Bit 8 — Density Select: This bit can be used to select one of two recording densities for the FCU operations (not implemented on MOD 400 or 600).
- Bits 9 through 15 — RFU, MBZ: These bits are reserved for future use and must be zero for the subsystem specified herein.

Command Configuration Word B

Function Code 13

Format



Function

This instruction loads the Configuration Word B for the device controller corresponding to the referenced channel. The bit significance is defined below. The command is to be used primarily for diagnostic purposes when exercising the FCU and device Test & Diagnostic (T&D) procedure.

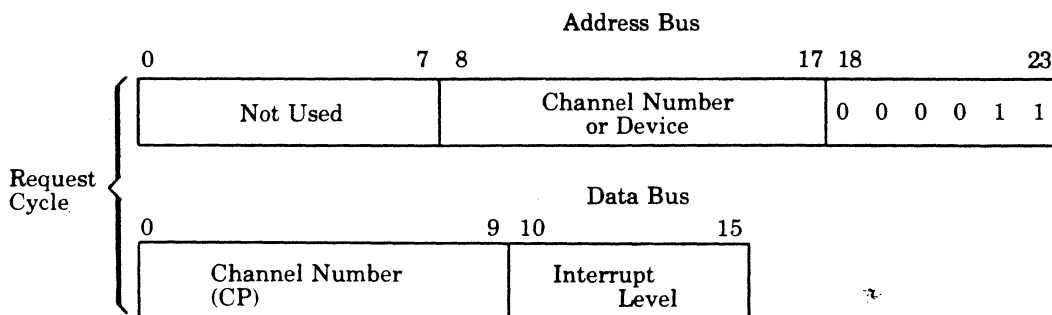
- Bit 0 — MMS (Maintenance Mode Select): This bit, in conjunction with Configuration Word A bit 6, is used by the controller firmware to set T&D maintenance mode of operation.

- Bits 1, 2, and 3 — Multiplexer control lines: These bits, which are part of the control logic, enable the error and status bus lines.
- Bit 4 — BAI, Bus Address Inhibit to the FCU.
- Bit 5 — RFC, Reset FCU.
- Bit 6 — FCR, FCU Ready.
- Bits 7 through 15 — RFU: These bits are reserved for future use.

Command Output Interrupt Control

Function Code 03

Format



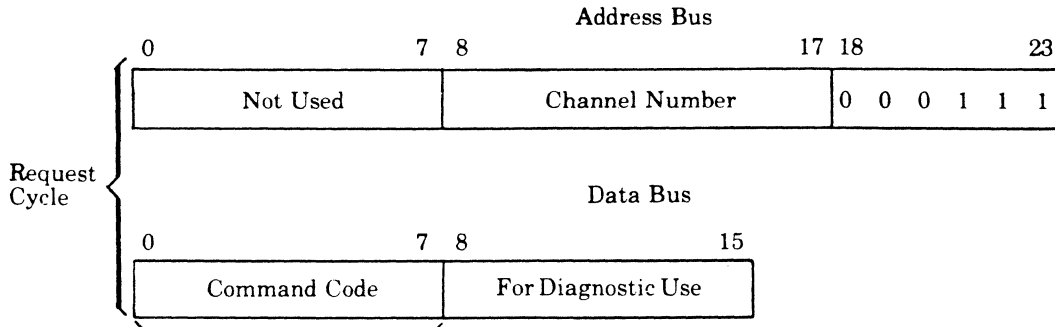
Function

Loads, for the referenced device, the interrupt level and the channel number of the CP to which subsequent interrupts should be sent. The level number is a 6-bit quantity and is positioned on the data bus as illustrated. Bits 0-9 of the data bus contain the channel number of the CP loading the interrupt level. If an interrupt level of zero is loaded, the subsystem will not generate or save interrupts for any events that occur while the interrupt level is zero. For example, if the attention bit in Status Word 1 is set to one with a stored interrupt level of zero, the subsystem will not generate an interrupt on the bus. The interrupt level is set to zero whenever the subsystem is initialized.

Command Output Task Word

Function Code 07

Format



- 10000000 — Rewind
- 11000000 — Rewind and Unload
- 00001000 — Forward-Space Block
- 00000100 — Backspace Block
- 00011000 — Forward-Space Tape Mark
- 00010100 — Backspace Tape Mark
- 00001001 — Read Forward
- 00000101 — RFU
- 00101000 — Erase
- 00111010 — Write Tape Mark
- 00101011 — Write
- 00000000 — No Operation

Function

Outputs a Task Word to the referenced channel. The coding bits 0-7, illustrated above, represent the operations that are to be performed. When this command is accepted, the channel enters the Busy state. All configuration, addresses and range information must be loaded prior to execution of this command. The direction of data transfer indicated by the low order bit of the most recent Output Address command must agree with the direction of transfer (read or write) specified by command code of the Output Task Word. If it does not, Status Word 1 bit 11 Operation Check will be set and a normal termination of the command without data transfer and tape motion will result. These commands addressed to a device not in the online state result in the setting of an Operation Check bit prior to a normal termination of the order.

- *Rewind*— This command rewinds the tape to the BOT marker. The drive remains in the busy state until the completion of the rewind operation. If the tape on the drive is at BOT when this order is issued, tape motion is not initiated and a normal termination of the order results. Note that the rewinding of a drive via the REWIND button on the drive does not put the device in the Busy state but activates rewinding (Status Word 2 bit 1), which affects the status of the Device Ready and Attention bits of Status Word 1. When the manually initiated rewind is complete, the Rewinding status condition resets, Device Ready changes state, and the Attention bit is set again.

- *Rewind and Unload* — This command causes the addressed tape unit to rewind to BOT, remove the tape from the tape path, and rewind it completely onto the file reel.

If the tape on the drive is at BOT when this order is issued, only the unload sequence is initiated prior to termination of the order. The unload sequence puts the selected tape device into the offline state and extinguishes the online indicator. Operator intervention is required to place the drive back in the online state.

- *Forward-Space Block* — This command causes the drive to space forward over the next n blocks. The order terminates when tape is positioned in the n th interblock gap. The number of blocks spaced over is a function of bits 8 through 15 of the Command Code. These bits act as a counter with a range of 0 to 255₁₀. Note that a count of zero or one results in the spacing of one block.
- *Backspace Block* — This command causes the drive to space back over the previous n blocks on tape. The order terminates when the tape is positioned in the n th previous interblock gap.

The number of blocks spaced over is a function of bits 8 through 15 of the Command code. These bits act as a counter with a range of 0 to 255₁₀. Note that a count of zero or one results in the spacing of one block. If this order is issued when the tape is positioned at BOT, tape motion is not initiated and the order is terminated; however, the tape's position beneath the read/write head will not be the same as that following the termination of a rewind operation. In order to place the tape in the proper position beneath the heads following the termination of BOT of a reverse direction command (Backspace Block Tape Mark), a Read Forward command followed by a Rewind command is necessary. This correction sequence needs to be implemented by software.

- *Forward-Space Tape Mark* — This command causes the drive to space forward over one or more blocks until a tape mark is detected. The order terminates when the tape is positioned in the interblock gap following the block containing a tape mark. If EOT is sensed while spacing, tape motion does not stop until a tape mark is detected. This can result in the drive spacing off the end of the reel if there is no tape mark after the EOT marker.
- *Backspace Tape Mark* — This command causes the drive to space back over one or more blocks until a tape mark is detected. The order terminates when the tape is positioned in the interblock gap preceding the block containing the tape mark or when the tape is positioned at BOT. If this order is issued when the tape is positioned at BOT, tape motion is not initiated and a normal termination of the order follows; however, the tape's position beneath the read/write head will not be the same as that following the termination of a rewind operation. In order to place the tape in the proper position beneath the heads following the termination of BOT of a reverse direction command (Backspace Block, Backspace Tape Mark), a Read Forward command followed by a Rewind command is necessary. This correction sequence needs to be implemented by software.

- *Read Forward* — This command causes the drive to read forward over the next block on tape. The order terminates when the tape is positioned in the next interblock gap. The format of the data transferred from tape to memory is the same as the tape formats. In addition to reading data, integrity checks are made.

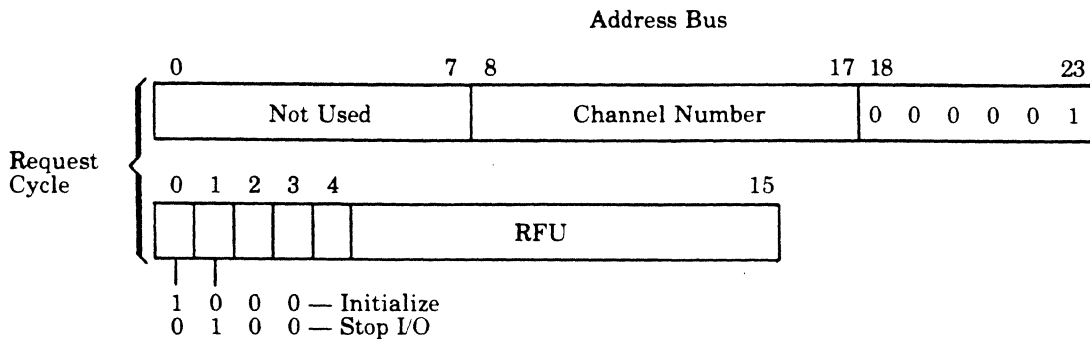
The GCR-MTS also provides for the automatic retry of records where read errors occur. The retry capability is enabled when bits 8 through 15 of the Command Code are non-zero. This field (bits 8 through 15) acts as a retry counter with a range of 0 to 255₁₀. Upon successful retry, Corrected Media Error (Status Word 1 bit 4) and Retry Attempted (Status Word 2 bit 9) are set in the terminating status. Retryable Media Error (Status Word 1 bit 2) is set if the retry mechanism was unsuccessful or a read error occurred and the retry counter was zero.

- *RFU* — Reserved for future use.
- *Erase* — This command causes the drive to erase tape in the forward direction producing a 4-inch gap on the tape. The device channel remains busy for the duration of the erase order and terminates normally.
- *Write Tape Mark* — This command causes the addressed tape unit to move tape in the forward direction, execute an Erase, and write a tape mark identifier appropriate to the recording mode in effect at the time the command is issued. No data is transferred during the write portion of the command. The channel remains busy for the duration of the command. During the entire write operation, the read detection circuitry verifies that a complete erasure has occurred and that the tape mark written is correct. The order terminates when the tape is positioned in the gap beyond the tape mark block.
- *Write* — This command causes the drive to write a data block using the selected MTU switch format most recently issued to this addressed channel.
 Nondata characters used for synchronization and error checking are recorded on tape; the generation of all such characters is an FCU function. The block that is written on tape is checked for validity as it passes under the read head. The order terminates when the tape is positioned in the gap beyond the data block written. An attempt to write a data block to a drive in the write-protect results in no data transfer, no tape motion initiated, and the activation of the Operation Check bit of Status Word 1.
- *No Operation* — This command results in no data transfer, no tape motion initiated, the normal reset of status word bits upon reception of an Output Task command, and a normal termination of the order. However, this order is NAKed if the channel is busy. It should be noted that any status information within the FCU is unaltered by this order.

Command Output Control Word

Function Code 01

Format



Function

Loads a Control Word into the referenced channel. This command will be unconditionally accepted by the channel regardless of its Busy status.

- *Initialize* – This command will cause the MTC to reset to the same state that it enters after power up. When an initialize command is received by the MTC all of its channels are initialized (regardless of which channel the command was received over).

Operations that are in progress in the MTC at the time of the Initialization will be abruptly terminated and all registers will be initialized, including control registers device select and control signals to the drives. No information about the terminated operations will be retained and no interrupts for the operations will be generated. The interrupt level for all channels will be set to zero (interrupts blocked).

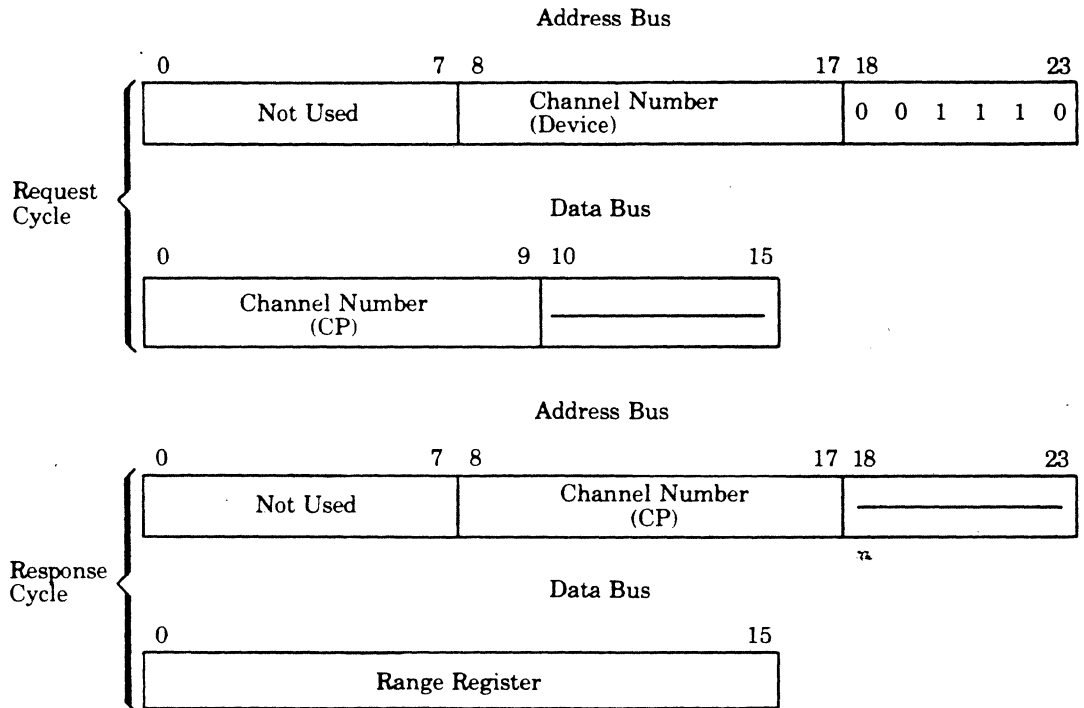
- *Stop I/O* – This command causes any operation currently active on the specified channel to be abruptly terminated. If a data transfer operation is in progress, it will not be completed. An Interrupt will be generated for the operation terminated by this command as if the operation had come to a normal ending point. Status, Address, and Range information, present in the MTC when this command is received, will be retained.

Input Commands

Command Input Range

Function Code 0C

Format



Function

Causes the current contents of the referenced channel's Range Register to be transferred to the requesting channel.

During the Response cycle (Second-Half Read), the MTC will return in bits 8-23 of the Address Bus the same data that was received in bits 0-15 of the Data Bus during the instruction cycle.

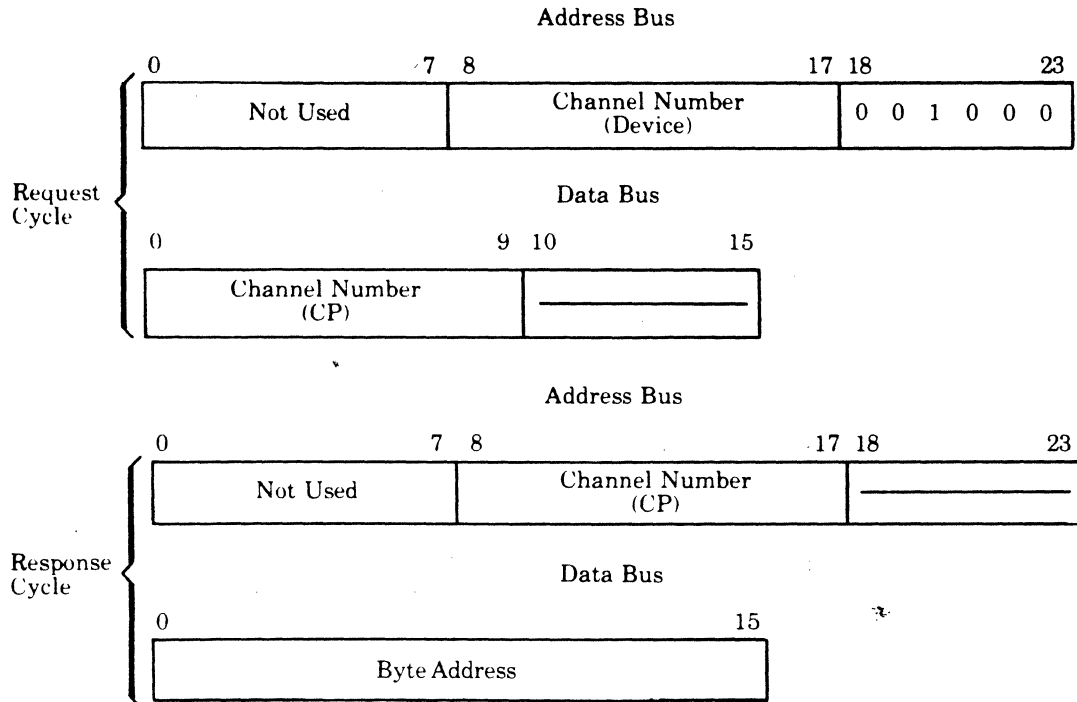
After the completion of a read operation, the contents of the Range Register reflect the status of that transfer with respect to the physical block read.

- If the contents are a positive value greater than zero and bit 8 of Status Word 1, Unequal Length Check, is set to a logical one, the length of the physical block was less than the range.
- If the contents are zero and bit 8 of Status Word 1 is equal to one, the length of the physical block was greater than the original range.
- If the contents are zero and bit 8 of Status Word 1 is equal to zero, the length of the physical block was equal to the original range.

Command Input Memory Byte Address

Function Code 08

Format



Function

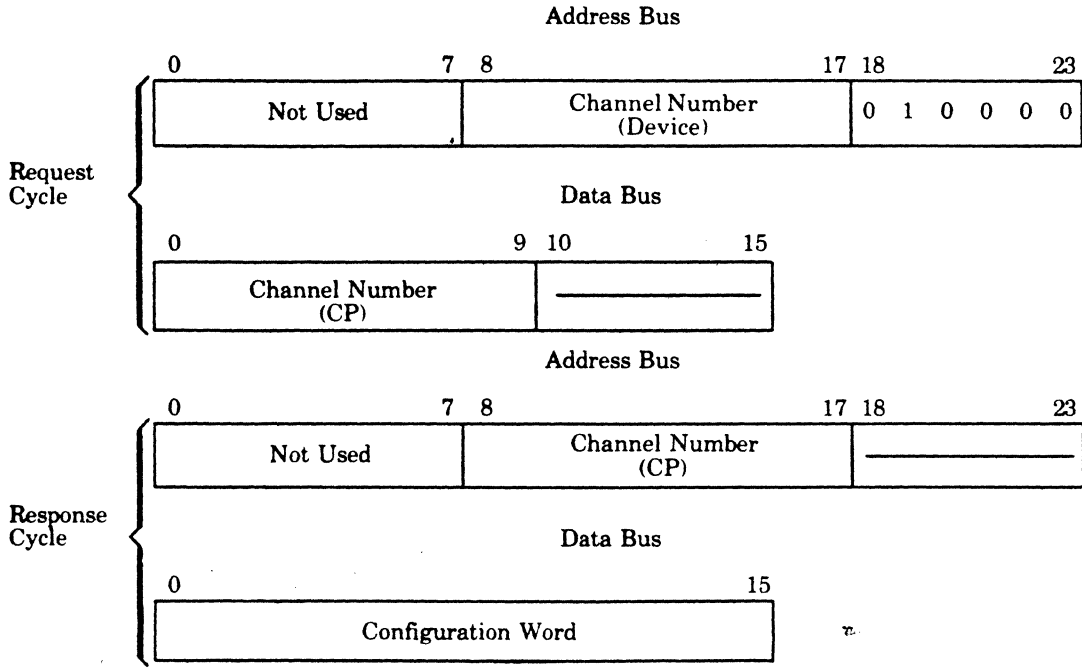
This instruction causes the current contents of the referenced channel's memory byte address to be transferred to the requesting channel.

During the Response cycle (Second-Half Read), the MTC returns in bits 8 through 23 of the Address Bus the same data that was received in bits 0 through 15 of the Data Bus during the Request cycle. The Data Bus contains the low-order 16 bits of the memory byte address currently stored for the specified channel in the MTC. Note that if a Write command ended at a byte boundary (high-order 8 bits of word), the memory address reflects the next word (not the low-order 8 bits of the previous word).

Command Input Configuration Word A

Function Code 10

Format



Function

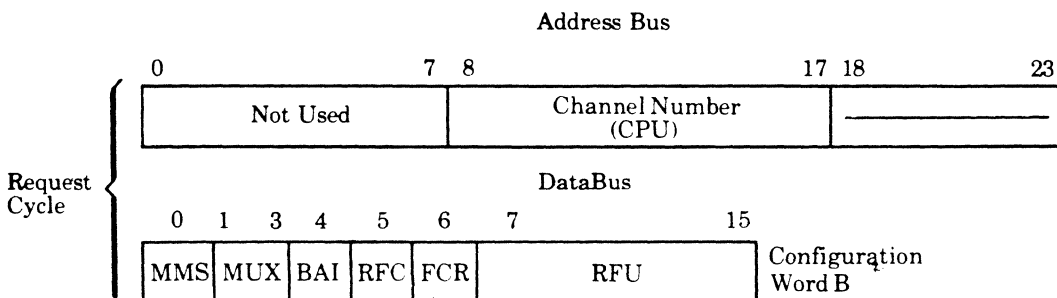
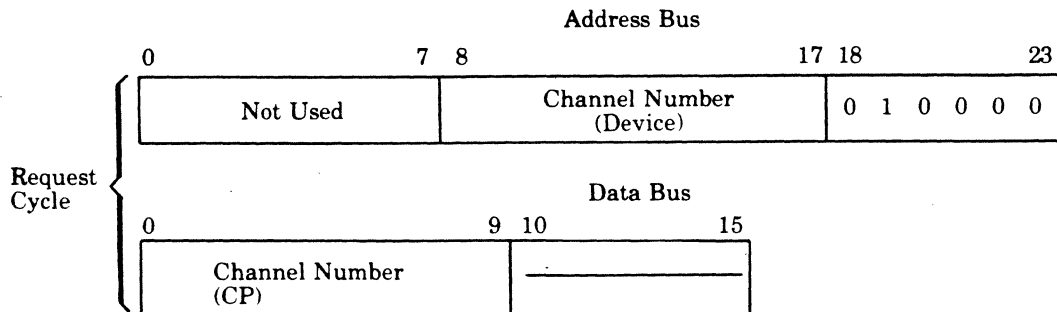
Causes the channel's Configuration Word to be transferred to the requesting channel.

During the Response cycle (Second-Half Read) the MTC will return in bits 8-23 of the Address Bus the same data that was received in bits 0-15 of the Data Bus during the Instruction cycle.

Command Input Configuration Word B

Function Code 12

Format



Function

This instruction causes the current contents of the referenced channel's configuration word B register to be transferred to the requesting channel.

During the Response cycle (Second-Half Read), the MTC returns in bits 8 through 23 of the Address Bus the same data that was received in bits 0 through 15 of the Data Bus during the Instruction cycle.

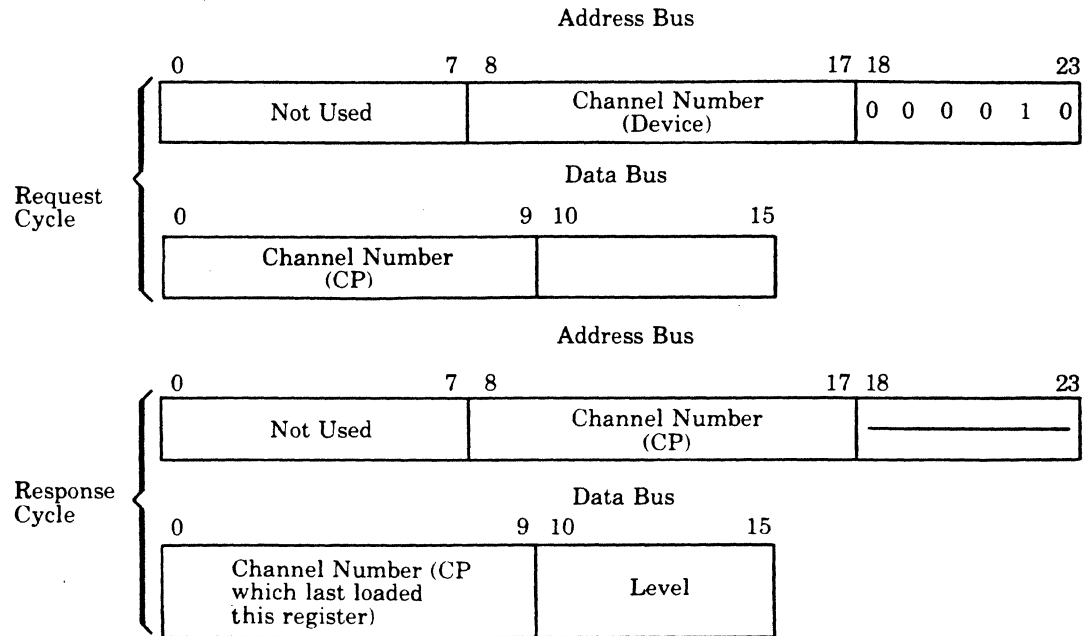
The bit significance is defined below. This command is primarily intended for diagnostic and maintenance purposes.

- Bits 0 through 3 — R, Reserved for use in Output Configuration Word B.
- Bit 4 — BAI, Bus Address Inhibit: Used for processing data in diagnostic mode only.
- Bit 5 — RFC, Reset FCU: Diagnostic mode only.
- Bit 6 — FCR, FCU Ready: Indicates that it is ready for the next command.
- Bits 7-15 — RFU, Reserved for future use.

Command Input Interrupt Control

Function Code 02

Format



Function

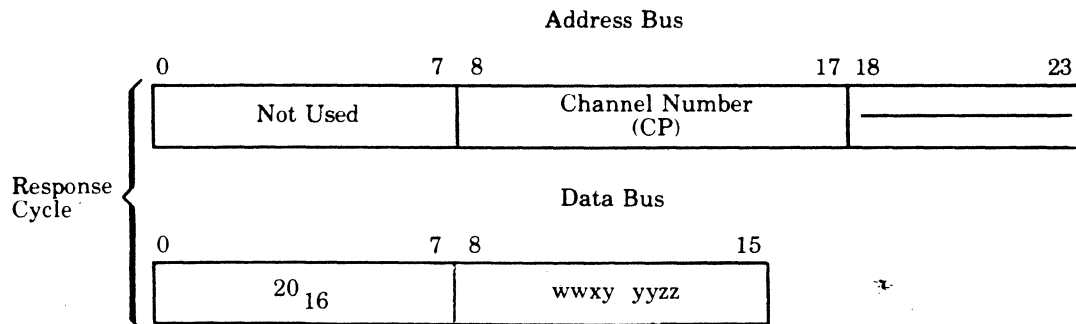
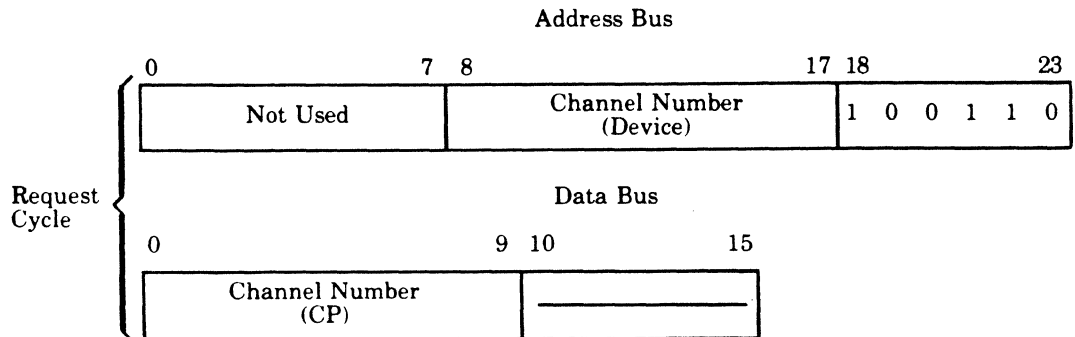
Causes the channel's interrupt level to be transferred to the requesting channel. The level value will be placed on Data Bus bits 10 through 15 with bit 15 as the least significant bit. This quantity is the value previously received in the Output Interrupt Control instruction or a default value of 00. The default value is the interrupt level assumed by the channel when initialized. Note that the channel number returned in bits 0-9 of the Data Bus might be different from the channel number of the CP executing this instruction if more than one CP is attached to the Megabus.

During the Response cycle (Second-Half Read), the MTC will return in bits 8-23 of the Address Bus the same data that was received in bits 0-15 of the Data Bus during the Request cycle.

Command Input Device ID

Function Code 26

Format



Function

Causes the referenced channel to transfer its identification code to the requesting channel. The codes for each type of tape device are defined as follows:

- Bits 0 through 7 – 2016 Identifies MTC-GCRA tape subsystem.
- Bits 8 through 9 – WW Identifies controller type attached to MTC:
 - 00 – RFU
 - 01 – FCU (GCR/PE drives)
 - 10 – RFU
 - 11 – RFU
- Bit 10 – X 0 (9-track) and 1 (7-track).
- Bits 11 through 13 – YYY Identifies tape densities which the channel can accommodate:
 - 100 – 6250 CPI (GCR)
 - 010 – 1600 CPI (PE)
 - 001 – 800 CPI (RFU)

- Bits 14 through 15 – ZZ Tape Speeds:

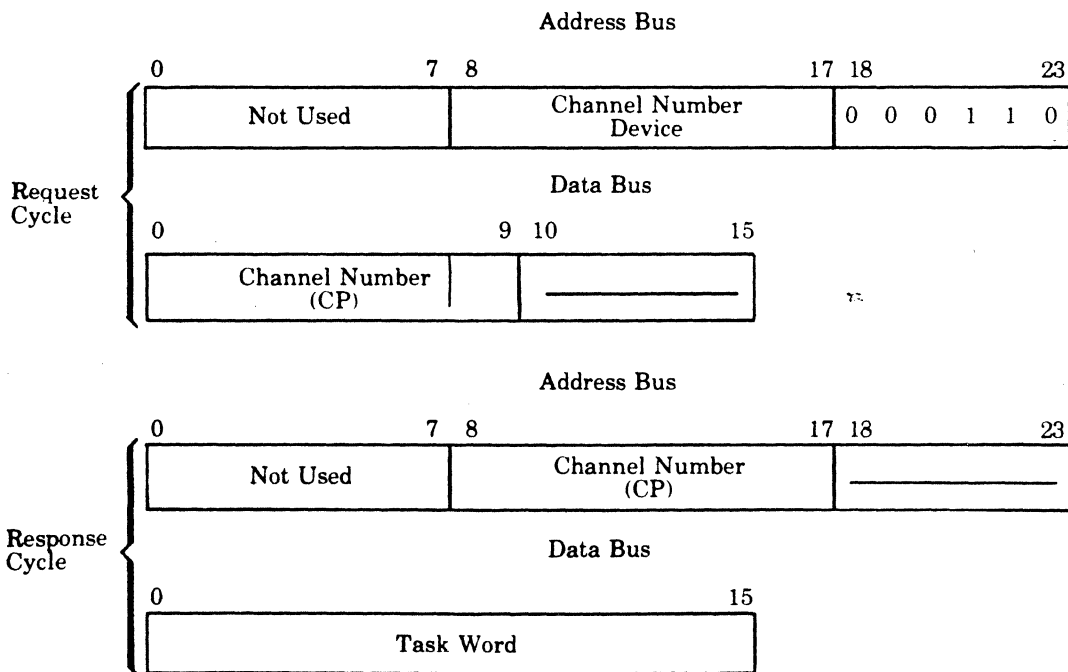
- 00 – RFU
- 01 – RFU
- 10 – RFU
- 11 – 125 ips

During the Response cycle (Second-Half Read), the MTC returns in bits 8-23 of the Address Bus, the same data that was received in bits 0-15 of the Data Bus during the Request cycle.

Command Input Task Word

Function Code 06

Format



Function

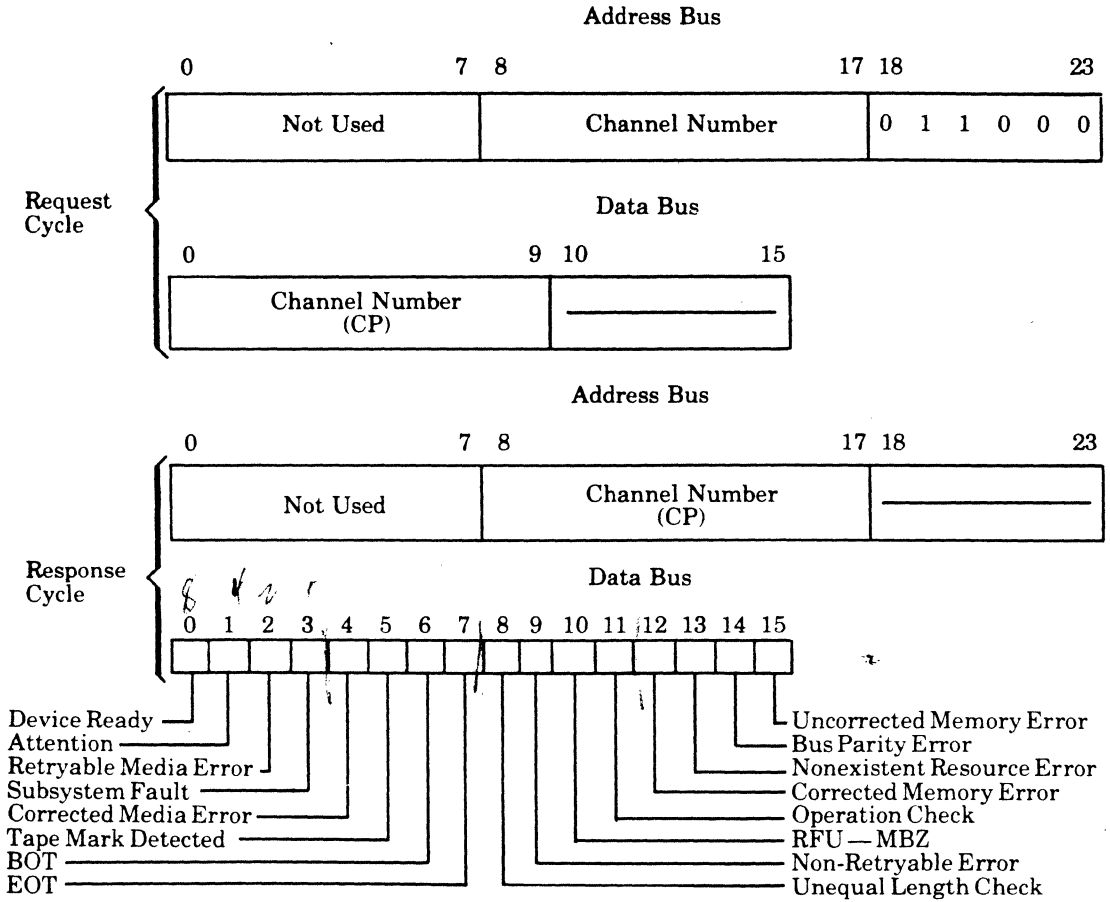
Causes the Task Word of the referenced channel to be transferred to the requesting channel. The Task Word transferred will contain the code for the last operation executed by the channel (unless an Initialize has occurred).

During the Response cycle (Second-Half Read), the MTC will return in bits 8-23 of the Address Bus the same data that was received in bits 0-15 of the Data Bus during the Request cycle.

Command Input Status Word 1

Function Code 18

Format



Function

Causes the referenced channel's Status Word 1 to be transferred to the requesting channel. During the Response cycle (Second-Half Read), the MTC will return in bits 8-23 of the Address Bus the same data that was received in bits 0-15 of the Data Bus during the Request cycle.

Table A-2. Status Bit Definitions – Word 1

Status Condition	Bit	Definition	Reset by
Device Ready	0	Unit is online with tape loaded, is not rewinding, and no further manual intervention is required to place it under program control. This bit will be zero, if either Status Word 2 bit 0 is a zero or Status Word 2 bit 1 is a one.	A change in condition
Attention	1	Indicates an event has occurred at the unit which requires software action. This event, moreover, was not related to a current task but rather was unsolicited. This bit will be set whenever the device changes its ready condition as a result of a non-software-initiated command (i.e., enter or leave the online state, rewinding state, or media loaded state). Attention status may occur following a software initiated Stop I/O or initialize command if the device was performing a Rewind or Rewind and Unload Instruction. Whenever the Attention bit is set, an interrupt is attempted (if the interrupt level is nonzero). If a previously initiated operation is in progress when a device state change is sensed, the resultant interrupt (with the Attention bit set) will serve as notification of both the end of the operation and the device state change.	Initialize or Input Status Word 1
Retryable Media Error	2	Indicates a data error has occurred and will be set whenever Status Word 2 bit 4, 5, 6 or 7 is active.	Initialize or Output Task Work Command
Subsystem Fault	3	Indicates that the MTC-GCR has detected a controller type fault (FCU or MTU) which cannot be associated with a particular tape drive. Software treats this error as if the entire subsystem (that is, FCU and its attached tape drives) is down and requires maintenance action. The cause of this fault is indicated in Status Word 2, bits 12, 13, and 14.	—
Corrected Media Error	4	Indicates that an error condition was detected on the media; however, the data read is not lost. For this subsystem, the detected condition indicates that a single-track error has been corrected during a PE operation, or that single- or double-track error correction has taken place during a GCR operation. This bit is also set when a read retry by the MTC-GCR was successful. This bit is reset by an Initialize or Output Task Word command.	Initialize or Output Task Word command
Tape Mark	5	Indicates a Tape Mark has been detected during the execution of a Write Tape Mark, Forward-space Tape Mark, or a Backspace Tape Mark order. This status bit will also be active if the block encountered during execution of a Forward-space/Backspace/Read block instruction is a Tape Mark.	Initialize or Output Task Word command
BOT (Beginning of Tape)	6	Indicates the BOT marker is positioned at the BOT sensor. A backspace or rewind order issued to a unit with tape at BOT will result in no tape motion initiated and a normal termination of the order.	—

Table A-2 (Cont). Status Bit Definitions – Word 1

Status Condition	Bit	Definition	Reset by
EOT (End of Tape)	7	Indicates the EOT marker is positioned at, or has passed beyond, the EOT sensor. This status bit will remain active until the EOT marker passes back over the sensor as a result of a Tape Backward Motion command (e.g., backspace, rewind). The state of this status bit has no effect on forward motion commands.	—
Unequal Length Check	8	Indicates that for the previous Read Operation, the physical block was either greater or less than the value in the range register, at the beginning of the Read operation. This bit, a 1 and a residue in the range register, indicates that a short block was transferred. This bit active and a range register contents of zero indicate that a long block was transferred.	Initialize or Output Task Word command
Non-Retryable Error	9	Indicates that the position of media under the tape read/write and erase heads is unknown. This bit will be set when a write order RAW ² failure occurs (i.e., the detection of magnetic transitions on tape before the start or following the completion of a recorded data block, or the failure to detect magnetic transitions in the area where a data block is being written, or the failure to detect a GCR or PE density identification area on tape when writing a GCR or PE tape). This bit will also be set when an erase order RAW failure occurs (i.e., the detection of magnetic transitions in the area on tape being erased) or when, during a read order, a split block is detected. A split block is a data block in which its beginning and end positions cannot be guaranteed detectable because of a detected unrecorded area within the block. This status bit also becomes active when Status Word 2 bits (Data Check Error) is set.	Initialize or Output Task Word command
Reserved for Future Use	10	Must be zero.	—
Operation Check	11	Indicates a write type order (Write, Write Tape Mark, Erase) was issued to a tape drive in Write Protect (see state of Status Word 2 bit 2); that upon acceptance of an Output Task Word data transfer command, the direction of data transfer is not the same as that specified by the direction bit of the channel number issued by the previous Output Address command; that upon acceptance of an Output Task Word data transfer command, the contents of the range register is zero; or that a command (other than No Operation) was issued to a channel on which the device is in the offline or Not Ready state.	—
Corrected Memory Error	12	Indicates that during execution of the previous operation, main memory detected and corrected a memory read error. The data that was delivered to the MTC was assumed to be correct.	Initialize or Output Task Word command
Nonexistent Resource Error	13	Indicates the MTC attempted a Write or Read request bus cycle and received a NAK response. Occurrence of this condition does not cause a termination of the operation in progress; however, it can result in bad data being written on the tape.	Initialize, Input Status Word 1, or Output Task Word command

Table A-2 (Cont). Status Bit Definitions – Word 1

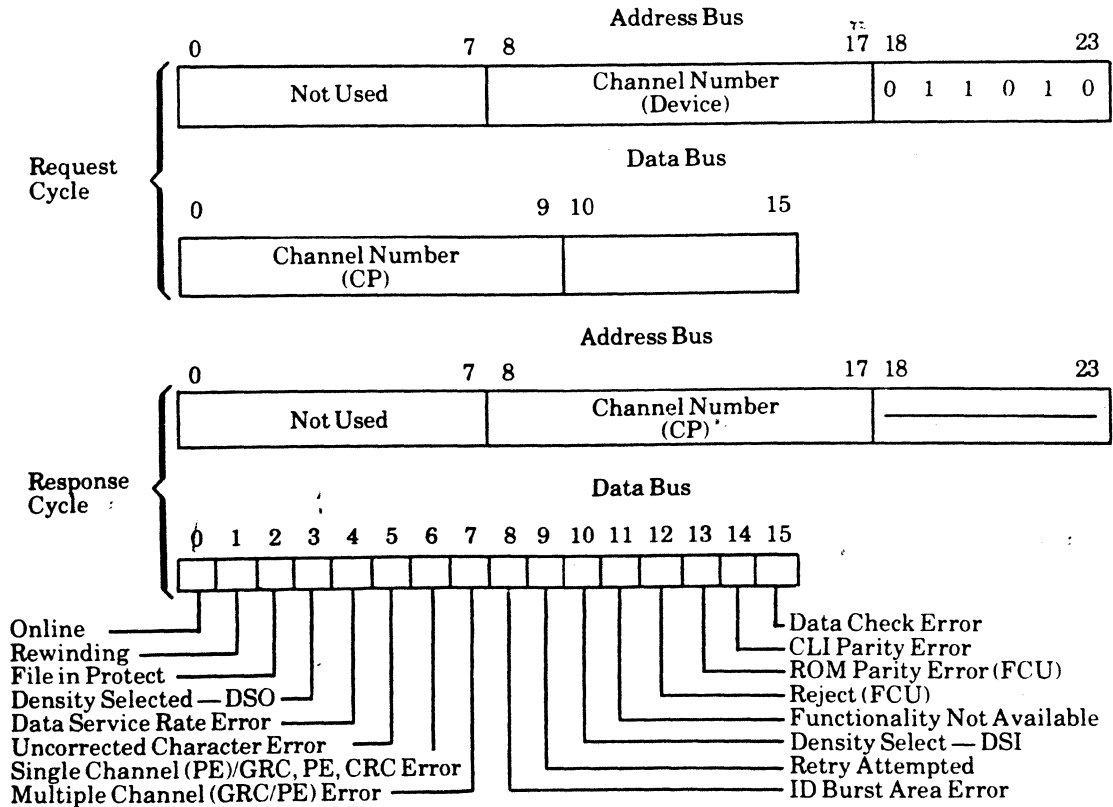
Status Condition	Bit	Definition	Reset by
Bus Parity Error	14	Indicates the MTC detected a parity error on either byte of the Data Bus during any output bus cycle (i.e., odd function code), during a second-half memory read cycle, or when a parity error is detected in bits 0-7 of the Address Bus during an Output Address command. Occurrence of this condition does not cause a termination of the operation in process; however, it can result in bad data being written on tape.	Initialize, or (error free) Input Status Word 1 command
Uncorrected Memory Error	15	Indicates that during execution of the previous operation, the main memory detected a memory read error which the EDAC algorithm could not correct. The data that was delivered to the MTC was incorrect. Occurrence of this condition does not cause a termination of the operation in progress; however, it can result in bad data being written on tape.	Initialize or Output Task Word command

*Read After Write

Command Input Status Word 2

Function Code 1A

Format



Function

Causes the referenced channel's Status Word 2 to be transferred to the requesting channel. During the Response cycle (Second-Half Read), the MTC will return in bits 8-23 of the Address Bus the same data received in bits 0-15 of the Data Bus during the Instruction cycle. Bits 0-7 of the Address Bus and the parity bit associated with these bits are the same data received during the Instruction cycle. See Table A-3.

Table A-3. Status Bit Definitions – Word 2

Status Condition	Bit	Definition	Reset by
Online	0	Indicates that the device is online to the subsystem. The device can be put into the online or offline mode via the ONLINE control. Offline status can also be activated by the REWIND and UNLOAD control.	—
Rewinding	1	Indicates that the device is processing a rewind operation, either via a command issued by the subsystem or by the rewind control. This bit is not visible to software when rewinding has been initiated by a command because I/O commands issued to a busy channel are NAKed.	—
File in Protect	2	Indicates that the device is in write protect (i.e., write permit ring is not in position on the mounted file reel).	—
High-Density Selected	3	DSO 0 PE — 1600 bpi 0 NRZI — Not Available 1 GCR — 6250 bpi 1 NRZI — Not Available	—
Data Service Rate Error	4	Indicates that during a Read or Write operation, data transfer between main memory and the device via the MTC-FCU did not maintain the rate in demand. Either data was lost on input because of failure to keep up with device demands or data was unavailable on output when required by the device. The detection of this error condition does not affect the execution of the operation in process.	Initialize or Output Task Word command
Uncorrected Character Error	5	Indicates that during a read or write operation, either a VRC ² error and/or a dropped character error was detected. Retryable Media Error is also set with this type error.	Initialize or Output Task Word command
Single Channel (PE)/CRC (GCR) Error	6	Indicates that during a write operation for PE, a single channel error was detected. During read operations, single channel errors are corrected by FCU and also set Status Word 1 bit 4. During write operations, single channel errors set bit 2 of Status Word 1 (Retryable Media Error). The detection of a single channel error does not prevent the detection of a multiple channel error in the block. Also indicates that during a read or write operation for GCR, the media CRC character failed to compare with the reconstructed value. It also causes the setting of Status Word 1 bit 2.	Initialize or Output Task Word command

Table A-3 (Cont). Status Bit Definitions – Word 2

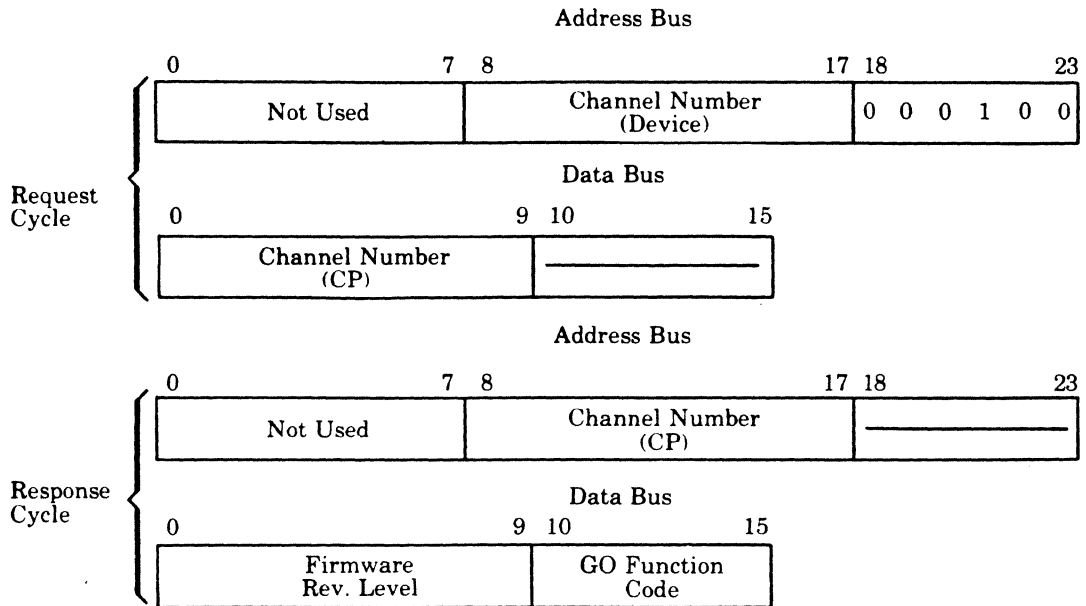
Status Condition	Bit	Definition	Reset by
Multiple Channel (GCR/PE) Error	7	Indicates that a multitrack error has occurred during a PE or GCR operation which was not correctable by the FCU ^a . The detection of these error conditions also sets Status Word 1 bit 2.	Initialize or Output Task Word command
ID Burst Area Error	8	Indicates that during a read or write (RAW) operation, an error was detected in the ID burst area; that is, the ID burst cannot be read or an incompatibility exists in the ID burst area. Nonretryable Error, Status Word 1 bit 9, is also set when this error occurs.	Initialize or Output Task Word command
Retry Attempted	9	This bit is set whenever the MTC attempts a read retry, regardless of whether or not the retry was successful.	Initialize or Output Task Word command
Density Select	10	DS1 0 PE — 1600 bpi 1 NRZI — Not Available 0 GCR — 6250 bpi 1 NRZI — Not Available	—
Functionality Not Available	11	Indicates that, for the subsystem specified herein, the Output Task Word — Read Backwards order is not available, or that an attempt was made to utilize a feature which was not available. The order terminates without tape motion.	Initialize or Output Task Word command
Reject FCU	12	Indicates that the FCU has responded to a command sequence from the MTC-GCR with the REJECT signal at the incorrect time. This indicates a serious error in the FCU and also causes the setting of Subsystem Fault Status Word 1 bit 3.	Initialize or Output Task Word command
ROM Parity Error (FCU)	13	When set, indicates that the control memory portion of the FCU detected a word having incorrect parity. This line points out a serious hardware malfunction which should be repaired before attempting to use the FCU again. Subsystem Fault, Status Word 1 bit 3, is also set when this error occurs.	Initialize or Output Word command
CLI Parity Error	14	Indicates that a parity error has been detected on the CLI interface. Occurrences of this condition does not cause a termination of the operation in progress; however, it may result in bad data being written on the medium. Subsystem Fault, Status Word 1 bit 3, is also set as a result of this error.	Initialize or Output Word command
Data Check Error	15	This line is asserted by the FCU when any of the following error conditions occur: CRC error, white tape mark check, uncorrectable error, partial record, multiple track error, end data check, velocity check, BOT reached, overrun.	—

^aVRC Error (PE, GCR) — One or more data characters were detected with incorrect vertical parity. Data character parity is odd unless bit 3 in the stored configuration word is set.

Command Input Firmware Revision

Function Code 04

Format



Function

The firmware revision level is represented by a hex number.

The GO function code indicates which instruction initiates a command cycle in the MTC.

Appendix B

Specifications

PERFORMANCE CHARACTERISTICS

Number of Tracks: 9

Interblock Gap:

PE — 0.6 in. (1.5 cm) nominal

GCR — 0.3 in. (0.8 cm) nominal

Tape Head: Dual read/write, separate erase head

Tape Density:

PE — 1600 bpi

GCR — 6250 bpi

Read/Write Speed: 125 ips

Rewind Speed: 480 ips (nominal)

Transfer Rate:

1600 bpi — 200K bytes/second

6250 bpi — 780K bytes/second

Recording Format: Compatible with ANSI standards (X3.39 — 1973, X3.54 — 1976) for recorded magnetic tape information interchange

ELECTRICAL CHARACTERISTICS

Voltage: 120 Vac, single-phase

Frequency: 60 Hz

Power Consumption: 1.4 kVa

Heat Generation: 5.4 kBtu/hr (max with FCU); 3.7 kBtu/hr (max without FCU)

PHYSICAL CHARACTERISTICS

Height: 62.0 in. (157.5 cm)

Width: 25.0 in. (63.5 cm)

Depth: 29.0 in. (73.7 cm)

Weight:

Initial Tape Unit with FCU — 620.0 lb (281.2 kg)

Add-on Tape Unit — 530.0 lb (240.4 kg)

ENVIRONMENTAL CHARACTERISTICS¹

Operating Temperature: 60°F to 90°F (16°C to 32°C)

Relative Humidity: 20% to 80% (noncondensing)

CABLES (max)

Power Cord: 15.0 ft (4.6 m)

Device to FCU: 20.0 ft (6.0 m)

¹Consideration must be given to total system configuration. Refer to either *DPS 6 System Site Preparation Manual* (Order No. CP77) or *Level 6 Site Preparation Manual* (Order No. AY52)

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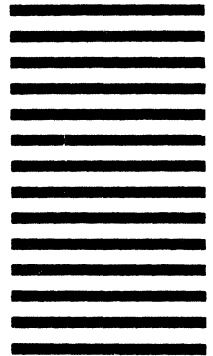
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