

IBM 9333 SCSI MAPPING

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1.0 Serial link messages

Control Messages are packets on the serial link whose destination address is the receiver's microprocessor. They interrupt the microprocessor which then accesses the packet in the packet buffer.

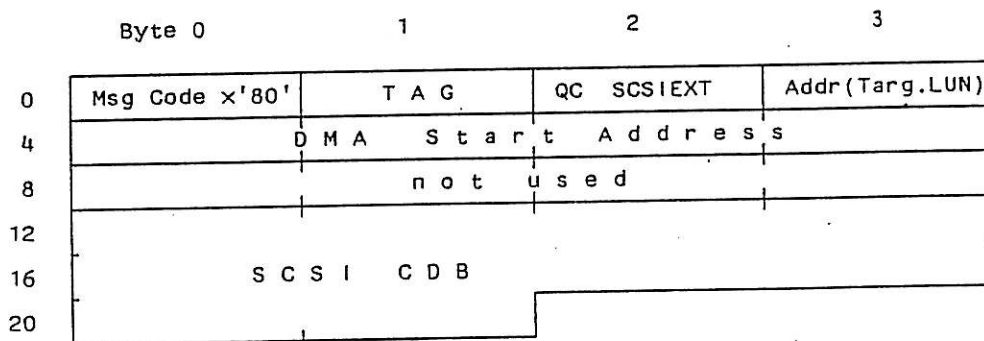
The first data byte in the packet identifies the message. The subsequent data bytes are the parameters.

Most messages carry a tag as a parameter. This allows the messages to be associated with the corresponding command. The tag is that originally specified by the host in the mailbox containing the Command Descriptor Block.

The adapter-controller messages are described below.

1.1.1 Adapter to Controller Messages

1.1.1.1 SCSI_COMMAND Message



This message transfers a SCSI Command Descriptor Block (CDB) to the controller queue.

Address This is the target and logical unit that is to execute the command.

QC is the Queue Control value stored in bits 0,1 of the byte.

00 - None (unqueued)

01 - Invalid

10 - Ordered

11 - Unordered

SCSIEXT (Bits 2-7) SCSI Extension. These six bits are used for extensions or modifications to the command beyond the function provided within SCSI.

bit 2 Split Write to DASD is enabled

bit 3 Split Read enabled on Adapter to Controller link

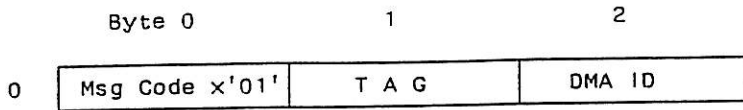
DMA address

This is the start address in system memory of the data area for the SCSI command. This can be an odd or even address.

SCSI CDB

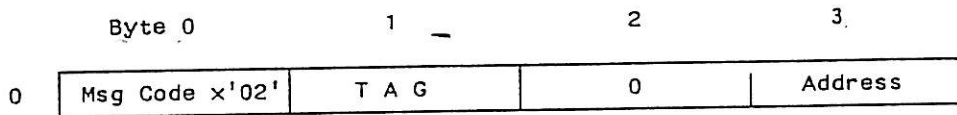
This is the command descriptor block for the SCSI command. This can be either 6 or 10 bytes in length.

1.1.1.2 *READY_FOR_READ Message.*



This message is sent by the Adapter to the Controller in response to a DATA_READY message (see below). It informs the controller of the DMA register number allocated in the Adapter to the DMA transfer for this tag.

1.1.1.3 *QUERY_DEVICE Message.*



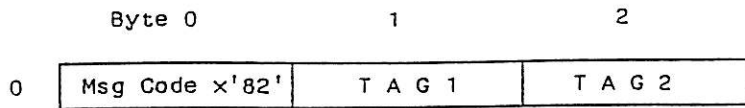
This message is generated by the adapter when executing the Query Device operation to inquire if there has been any valid reason for delaying the completion of a command.

If there has been a valid reason for a delay since the last status was sent to this adapter, a SCSI Status message x'00' (Good) is sent to the adapter. The following are valid reasons for delay:

- Long command executed (e.g. Format Unit, Reassign Block)
- Command executed from other adapter
- Error recovery procedures have been started.

If there is no valid reason for delay, a Special Status message x'8A' (No valid delay) is sent to the adapter.

1.1.1.4 ABORT Message.

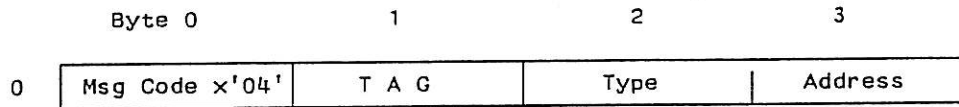


This message is generated by the Adapter when executing the Abort SCSI Command operation. 'TAG1' identifies the mailbox containing the Abort SCSI Command operation; 'TAG2' identifies the command to be aborted. The message causes the controller to terminate execution of the command if it is in progress or to remove the command from its queue if execution has not begun.

If the command is neither executing nor queued, (probably because ABORT crossed with the command's status), the command to be aborted returns the same SCSI status as if the abort had not been attempted.

In either case, the Abort Message is acknowledged with a Good SCSI Status message (see below).

1.1.1.5 RESET Message.



This message is sent by the Adapter to the Controller to reset selected resources within the Controller or DASD. A Special Status message (Reset Acknowledge) is returned by the controller.

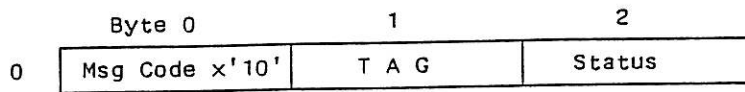
Address. This byte contains the Target.LUN address. As in other messages, the target component of the address is redundant. The LUN component of the address is used only for DASD resets.

Type. This identifies the scope of the reset:

| | |
|-------------------------------|--|
| Quiesce DASD (x'02') | This causes the controller to terminate any active operation and any in the queue for this DASD from this adapter. |
| Reset DASD (x'03') | This causes a total (short) reset to be issued to the specified DASD on the controller to DASD link. |
| Quiesce Cntrlr (x'04') | This causes the controller to terminate all active operations and any in the queue from this adapter. |

1.1.2 Controller to Adapter Messages.

1.1.2.1 SCSI_STATUS Message.



This message carries the SCSI status generated on completion of the command identified by the tag. Note that Busy Status is never generated.

| SCSI Status. | |
|--------------|----------------------|
| 0000 0000 | Good |
| 0000 0010 | Check |
| 0001 1000 | Reservation conflict |
| 0010 1000 | Queue full |

Figure 1. SCSI Status

1.1.2.2 SPECIAL_STATUS Message.

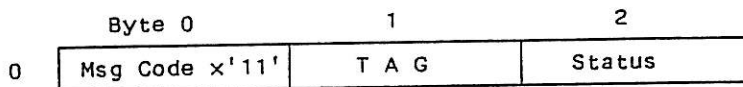


Figure 2. SPECIAL_STATUS Message.

This message carries the Special status generated on completion of the command or message identified by the tag.

| Special status. | |
|-----------------|--------------------------------|
| 1000 0000 | not used |
| 1000 0001 | Aborted Command |
| 1000 0010 | Invalid queue control |
| 1000 0011 | Purged after Outstanding Sense |
| 1000 0100 | Purged after EPOW |
| 1000 0101 | not used |
| 1000 0110 | Reset Acknowledge |
| 1000 0111 | Write Buffer in progress |
| 1000 1000 | Invalid message |
| 1000 1001 | Invalid mailbox |
| 1000 1010 | No valid delay |

Figure 3. Special Status

Bit 0 is chosen to have value one to distinguish it from SCSI status (redundantly).

1.1.2.3 *READY_FOR_WRITE* Message

| | Byte 0 | 1 | 2 | 3 |
|---|----------------|-------|---------------------|---------------|
| 0 | Msg Code x'12' | T A G | DMA id. | |
| 4 | | D M A | S t a r t | A d d r e s s |
| 8 | | D M A | L e n g t h (bytes) | |

This message instructs the adapter to transfer data from the host at the DMA Start Address for the DMA length. 'DMA id' identifies the DMA channel in the controller to which the data packets are to be addressed. The tag identifies the command with which the data is associated.

1.1.2.4 *DATA_READY* Message

| | Byte 0 | 1 | 2 | 3 |
|---|----------------|-------|---------------------|---------------|
| 0 | Msg Code x'13' | T A G | | |
| 4 | | D M A | S t a r t | A d d r e s s |
| 8 | | D M A | L e n g t h (bytes) | |

This message instructs the adapter to allocate a DMA channel to this tag, if it has not already done so, and prime it for a transfer into host memory at the specified address and for the specified length. The adapter responds with a 'Ready_for_read' message telling the controller which DMA channel the data packets should be addressed to.

1.1.2.5 DATA_RETRY Message

| | Byte 0 | 1 | 2 | 3 |
|---|-------------------------------|-------|--------------|---|
| 0 | Msg Code x'14' | T A G | Retry length | |
| 4 | D M A S t a r t A d d r e s s | | | |
| 8 | D M A Length (bytes) | | | |

This message is used by the Controller after it discovers that the data transferred from the DASD to the host contained an error. It tells the Adapter that the previous DMA for the tag has finished, even if its count has not expired, and instructs the Adapter to set up a new DMA. The Adapter responds with a READY_FOR_READ message.

The Retry length field (bytes 2 and 3) indicate the number of bytes which are being retried.

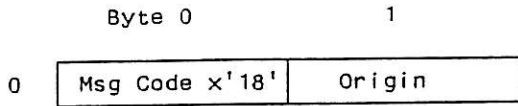
The DMA length field is the count of the number of bytes that are about to be sent.

1.1.2.6 PACK_STATUS_CHANGE Message.

| | Byte 0 | 1 |
|---|----------------|-----|
| 0 | Msg Code x'15' | LUN |

This message is not related to any particular SCSI command. It informs the host that a Unit Attention condition is in effect for this LUN following a Power on or Reset of the LUN. The usual implications of Unit Attention apply - the next command will be checked unless it is Inquiry or Request Sense. The sense data will reflect 'Pack Change'.

1.1.2.7 *READY_ASYNC Message.*

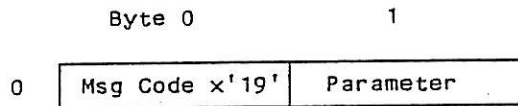


This unsolicited, asynchronous message is sent by the Controller to the Adapter when the Controller comes Ready after a reset. It informs the Adapter of the cause of the reset. This is used by the Adapter to set adapter status to inform the system that outstanding operations have been purged.

| Origin | |
|-----------|--------------------------|
| 0000 0000 | Power on Reset |
| 0000 0001 | Type 1 Check without IML |
| 0000 0010 | Type 1 Check with IML |

Figure 4. Origin of Reset

1.1.2.8 *DOWNLOADING_CODE Message*



This message is sent by the controller to an adapter when its code is being downloaded from the other adapter via the Write Buffer command. The parameter value is zero.

2.0 SCSI command set

The following is a summary of the SCSI commands supported by the controller. Where there are differences from the SCSI specification these are noted against each command.

TEST UNIT READY

REQUEST SENSE

The definition of the sense data returned has some differences in order to report controller errors.

FORMAT UNIT

REASSIGN BLOCKS

READ (6)

WRITE (6)

INQUIRY

Extended to report controller VPD

MODE SELECT (6)

Page 2 parameter (buffer full/empty ratio) is not supported

Some SCSI unique page 1 parameters are not supported

RESERVE

Third party Reservation is not supported.

RELEASE

MODE SENSE (6)

Differences described under Mode Select

START STOP UNIT

SEND DIAGNOSTIC

This is extended to allow the command to specify controller diagnostics, Trace and Write DASD enclosure VPD.

RECEIVE DIAG RESULTS

Used to return Trace data to the host.

READ CAPACITY

READ (10)

WRITE (10)

WRITE AND VERIFY

VERIFY

WRITE BUFFER

Only the Download and Save option is supported.

WRITE SAME

Flag and Link bits The Flag and Link bits are not supported. If either flag or link bits are set to one, the controller will return CHECK CONDITION status with the sense key set to ILLEGAL REQUEST.

3.0 SCSI Status Byte

A SCSI Status byte will be sent to the Host Adapter at the termination of each SCSI command unless the command is cleared by an Abort or a Reset. The SCSI Status Byte is defined in Figure 5.

| | | | | | | | |
|----------|---|---|---|-------------|---|---|------|
| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Reserved | | | | Status Code | | | Rsrv |

Bits of Status Byte

| 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | Status Represented |
|---|---|---|---|---|---|---|---|----------------------|
| R | R | 0 | 0 | 0 | 0 | 0 | R | GOOD |
| R | R | 0 | 0 | 0 | 0 | 1 | R | CHECK CONDITION |
| R | R | 0 | 1 | 1 | 0 | 0 | R | RESERVATION CONFLICT |
| R | R | 1 | 0 | 1 | 0 | 0 | R | QUEUE FULL |

Note: All Reserved fields (R) will be set to zero.

Figure 5. SCSI Status Byte

A description of the Status represented by each Status Byte is given below.

00h GOOD

This status indicates that command has been successfully completed without error.

02h CHECK CONDITION

This Status indicates that an error, exception, or abnormal condition has caused sense data to be set. The Host Adapter should issue a REQUEST SENSE command to obtain the sense data and determine the cause of the CHECK CONDITION Status.

18h RESERVATION CONFLICT

This Status indicates that the LUN is reserved (Refer to Reserve and Release commands) to the other Host Adapter and is unable to execute the command received from the currently connected Host Adapter. The Host Adapter should issue the command again at a later time. This status is also returned when the target is in 'trace reservation' state with the other Host Adapter (see -- Heading id 'tdump' unknown --).

28h QUEUE FULL

This Status indicates that an UNORDERED QUEUE TAG, or ORDERED QUEUE TAG message has been received and the command cannot be accepted because the queue is full. The command is not executed.

Note: SCSI BUSY status is never reported. If a command with a queue tag of NONE is received for a LUN while a command is being executed on that LUN for the other Host Adapter, the execution of this new command may be delayed.

Heading ID's

| <u>id</u> | <u>File</u> | <u>Page</u> | <u>Heading References</u> |
|-----------|-------------|-------------|---------------------------|
| spstat | SCSIMAP | 5 | SPECIAL_STATUS Message. |
| tdump | ? | ? | ? |
| | | | 10 |

Figure ID's

| <u>id</u> | <u>File</u> | <u>Page</u> | <u>Figure References</u> |
|-----------|-------------|-------------|--------------------------|
| status | SCSIMAP | 10 | 5: 10 |

Imbed Trace

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Page 0

MACDEF SCRIPT
GLIBIMBD SCRIPT