To: T10 Technical Committee
From: Rob Elliott, HP (elliott@hp.com)
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Subject: 07-067r0 SAM-4 SAS-2 FCP-4 QUERY UNIT ATTENTION task management function

Revision history
Revision 0 (13 February 2007) First revision

Related documents
sam4r08 - SCSI Architecture Model - 4 (SAM-4) revision 8
sas2r08 - Serial Attached SCSI - 2 (SAS-2) revision 8
fcp4r00 - Fibre Channel Protocol - 4 (FCP-4) revision 0
07-066 - SAM-4 SAS-2 FCP-4 QUERY TASK SET task management function (Rob Elliott, HP)
07-072 - FCP-4 QUERY TASK task management function (Rob Elliott, HP)

Overview
After a logical unit establishes a unit attention condition, commands that report the unit attention condition like TEST UNIT READY also clear the unit attention condition (unless the unit attention interlock feature is enabled). It is desirable to have a way to determine if a unit attention condition exists without clearing it. Although a command could be defined to do this, a task management function is a better fit. A new QUERY UNIT ATTENTION task management function is proposed, returning:

a) FUNCTION SUCCEEDED if there is a unit attention condition pending; and
b) FUNCTION COMPLETED if there is not a unit attention condition pending.

QUERY UNIT ATTENTION is useful for layered software stacks in initiators when the lower layer needs to determine if a unit attention condition exists (e.g., in SAS, after receiving a Broadcast (Asynchronous Event) or Broadcast (SES)). If the lower layer sends a full-fledged SCSI command which draws out the unit attention condition, the automatic clearing nature prevents the upper layer software from learning about the unit attention condition. There is no way for the lower layer to pass along that knowledge - each command that the upper layer has outstanding will receive its own status, and the unit attention cannot be returned on top of another status value.

Since SAS-2 and FCP-4 both have 3 reserved bytes in their RESPONSE frames, the additional sense code (ASC/ASCQ) of the highest priority unit attention condition is also returned along with the response code. This consumes 2 bytes, leaving one more still reserved.

Changes are proposed for SAM-4, SAS-2, and FCP-4. iSCSI could adopt this change when it is upgraded to SAM-4 from SAM-2.

Suggested changes to SAM-4

4.5.8 SCSI task router class

The SCSI task router class routes information (e.g., commands and task management functions) between a logical unit and a service delivery subsystem using the route task operation.

The task router routes commands and task management functions as follows:

a) Commands addressed to a valid logical unit are routed to the task manager in the specified logical unit;
b) Commands addressed to an incorrect logical unit are handled as described in 5.8.4;
c) Task management functions with I_T_L nexus scope (e.g., ABORT TASK SET, CLEAR TASK SET, QUERY UNIT ATTENTION, CLEAR ACA, and LOGICAL UNIT RESET) or I_T_L_Q nexus scope (e.g., ABORT TASK and QUERY TASK) addressed to a valid logical unit are routed to the task manager in the specified logical unit;
d) Task management functions with an I_T nexus scope (e.g., I_T NEXUS RESET) are routed to the task manager in each logical unit about which the task router knows; and
e) Task management functions with I_T_L nexus scope or I_T_L_Q nexus scope addressed to an incorrect logical unit are handled as described in 7.10.

In some transport protocols, the task router may check for overlapped task tags on commands (see 5.8.3).

7.1 Introduction

An application client requests the processing of a task management function by invoking the SCSI transport protocol services described in 7.10, the collective operation of which is modeled in the following procedure call:

Service Response = Function name (IN (nexus))

The task management function names are summarized in table 34.

Table 34 — Task Management Functions

Task Management Function	Nexus	Reference
ABORT TASK	I_T_L_Q	7.2
ABORT TASK SET	I_T_L	7.3
CLEAR ACA	I_T_L	7.4
CLEAR TASK SET	I_T_L	7.5
I_T NEXUS RESET	I_T_L	7.6
LOGICAL UNIT RESET	I_T_L	7.7
QUERY TASK	I_T_L_Q	7.8
QUERY UNIT ATTENTION	I_T_L	7.xx

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One of the following SCSI transport protocol specific service responses shall be returned:

FUNCTION COMPLETE: A task manager response indicating that the requested function is complete. Unless another response is required, the task manager shall return this response upon completion of a task management request supported by the logical unit or SCSI target device to which the request was directed.

FUNCTION SUCCEEDED: An optional task manager response indicating that the requested function is supported and completed successfully. This task manager response shall only be used by functions that require notification of success (e.g., QUERY TASK or QUERY UNIT ATTENTION). The task manager response may be accompanied by three bytes of additional response information as defined for that task management function.

FUNCTION REJECTED: An task manager response indicating that the requested function is not supported by the logical unit or SCSI target device to which the function was directed.

INCORRECT LOGICAL UNIT NUMBER: An optional task router response indicating that the function requested processing for an incorrect logical unit number.

SERVICE DELIVERY OR TARGET FAILURE: The request was terminated due to a service delivery failure (see 3.1.120) or SCSI target device malfunction. The task manager may or may not have successfully performed the specified function.

Each SCSI transport protocol standard shall define the events comprising each of these service responses.

The task manager response to task management requests is subject to the presence of access restrictions, as managed by ACCESS CONTROL OUT and ACCESS CONTROL IN commands (see SPC-3), as follows:

a) A task management request of ABORT TASK, ABORT TASK SET, CLEAR ACA, I_T NEXUS RESET, ~~or~~ QUERY TASK, or QUERY UNIT ATTENTION shall not be affected by the presence of access restrictions;

b) A task management request of CLEAR TASK SET or LOGICAL UNIT RESET received from a SCSI initiator port that is denied access to the logical unit, either because it has no access rights or because it is in the pending-enrolled state, shall not cause any changes to the logical unit; and
c) The task management function service response shall not be affected by the presence of access restrictions.

7.8 QUERY TASK

Request:

Service Response = QUERY TASK (IN (I_T_L_Q Nexus))

Description:

SCSI transport protocols may or may not support QUERY TASK and may or may not require logical units accessible through SCSI target ports using such transport protocols to support QUERY TASK.

~~The task manager shall return a response of FUNCTION SUCCEEDED if the specified task is present in the task set, or FUNCTION COMPLETE if the specified task is not present in the task set.~~

The task manager in the specified logical unit shall return a response as follows:

a) FUNCTION SUCCEEDED if the specified task is present in the task set; and
b) FUNCTION COMPLETE if the specified task is not present in the task set.

The additional response information shall be set to 000000h.

7.xx QUERY UNIT ATTENTION

Request:

Service Response = QUERY UNIT ATTENTION (IN (I_T_L Nexus))

Description:

SCSI transport protocols may or may not support QUERY UNIT ATTENTION and may or may not require logical units accessible through SCSI target ports using such transport protocols to support QUERY UNIT ATTENTION.

The task manager in the specified logical unit shall return a response as follows:

a) FUNCTION SUCCEEDED if there is a unit attention condition pending for the specified I_T nexus; and
b) FUNCTION COMPLETE if there is no unit attention condition pending for the specified I_T nexus.

If the response is FUNCTION SUCCEEDED, the task manager shall set the additional response information to the additional sense code of the highest priority unit attention condition as specified in table 35.

Table 35 — Additional response information

Byte\Bit	7	6	5	4	3	2	1	0
0	Reserved							
1	ADDITIONAL SENSE CODE							
2	ADDITIONAL SENSE CODE QUALIFIER							

The ADDITIONAL SENSE CODE field indicates the value of the ADDITIONAL SENSE CODE field that would be returned in the sense data for the unit attention condition (see SPC-4).

The ADDITIONAL SENSE CODE QUALIFIER field indicates the value of the ADDITIONAL SENSE CODE QUALIFIER field that would be returned in the sense data for the unit attention condition (see SPC-4).

Editor's Note 1: Byte 0 could indicate the number of pending unit attentions

Suggested changes to SAS-2

8.2.2.3.6 PL_OC2:Overall_Control state frame transmission

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This state shall not send a Tx Frame message containing a TASK frame for a task that only affects an I_T_L_Q nexus (e.g., an ABORT TASK or QUERY TASK task management function (see SAM-4)) to any PL_PM state machine until this state has received one of the following messages for each Tx Frame message with the same I_T_L_Q nexus:

a) Transmission Status (ACK Received);
b) Transmission Status (NAK Received);
c) Transmission Status (ACK/NAK Timeout); or
d) Transmission Status (Connection Lost Without ACK/NAK).

This state shall not send a Tx Frame message containing a TASK frame for a task that only affects an I_T_L nexus (e.g., an ABORT TASK SET, CLEAR TASK SET, QUERY UNIT ATTENTION, CLEAR ACA, or LOGICAL UNIT RESET task management function (see SAM-4)) to any PL_PM state machine until this state has received one of the following messages for each Tx Frame message with the same I_T_L nexus:

a) Transmission Status (ACK Received);
b) Transmission Status (NAK Received);
c) Transmission Status (ACK/NAK Timeout); or
d) Transmission Status (Connection Lost Without ACK/NAK).

This state shall not send a Tx Frame message containing a TASK frame for a task that only affects an I_T nexus (e.g., an I_T NEXUS RESET task management function (see SAM-4)) to any PL_PM state machine until this state has received one of the following messages for each Tx Frame message with the same I_T nexus:

a) Transmission Status (ACK Received);
b) Transmission Status (NAK Received);
c) Transmission Status (ACK/NAK Timeout); or
d) Transmission Status (Connection Lost Without ACK/NAK).

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9.2.2.2 TASK frame - Task Management Function information unit

Table 152 defines the TASK MANAGEMENT FUNCTION field.

Table 152 — TASK MANAGEMENT FUNCTION **field**

Code	Task management function	Uses LOGICAL UNIT NUMBER field	Uses TAG OF TASK TO BE MANAGED field	Description
01h	ABORT TASK	yes	yes	The task manager shall perform the ABORT TASK task management function with L set to the value of the LOGICAL UNIT NUMBER field and Q set to the value of the TAG OF TASK TO BE MANAGED field (see SAM-4). [a]
02h	ABORT TASK SET	yes	no	The task manager shall perform the ABORT TASK SET task management function with L set to the value of the LOGICAL UNIT NUMBER field (see SAM-4). [a]
04h	CLEAR TASK SET	yes	no	The task manager shall perform the CLEAR TASK SET task management function with L set to the value of the LOGICAL UNIT NUMBER field (see SAM-4). [a]
08h	LOGICAL UNIT RESET	yes	no	The task manager shall perform the LOGICAL UNIT RESET task management function with L set to the value of the LOGICAL UNIT NUMBER field (see SAM-4). [a]
10h	I_T NEXUS RESET	no	no	The task manager shall perform the I_T NEXUS RESET task management function (see SAM-4). [a]
20h	Reserved			
40h	CLEAR ACA	yes	no	The task manager shall perform the CLEAR ACA task management function with L set to the value of the LOGICAL UNIT NUMBER field (see SAM-4). [a]
80h	QUERY TASK	yes	yes	The task manager shall perform the QUERY TASK task management function with L set to the value of the LOGICAL UNIT NUMBER field and Q set to the value of the TAG OF TASK TO BE MANAGED field (see SAM-4). [a]
81h	*QUERY TASK SET (proposed in 07-xxx)*			
82h	QUERY UNIT ATTENTION	yes	yes	The task manager shall perform the QUERY UNIT ATTENTION task management function with L set to the value of the LOGICAL UNIT NUMBER field (see SAM-4). [a]
All others	Reserved			

[a] The task manager shall perform the specified task management function with the I and T arguments set to the initiator port and target port involved in the connection used to deliver the TASK frame.

If the TASK MANAGEMENT FUNCTION field contains a reserved or unsupported value, the task manager shall return a RESPONSE frame with the DATAPRES field set to RESPONSE_DATA and its RESPONSE CODE field set to TASK MANAGEMENT FUNCTION NOT SUPPORTED.

If the TASK MANAGEMENT FUNCTION field is set to ABORT TASK or QUERY TASK, the TAG OF TASK TO BE MANAGED field specifies the TAG value from the COMMAND frame that contained the task to be aborted or checked. For all other task management functions, the TAG OF TASK TO BE MANAGED field shall be ignored.

9.2.2.5.3 Response information unit - RESPONSE_DATA format

If the DATAPRES field is set to RESPONSE_DATA, then:

a) the SSP target port shall set the STATUS field to zero and the SENSE DATA LENGTH field to zero;
b) the SSP initiator port shall ignore the STATUS field and the SENSE DATA LENGTH field;
c) the SSP target port shall not include the SENSE DATA field;
d) the SSP target port shall set the RESPONSE DATA LENGTH field to 00000004h; and
e) the SSP target port shall include the RESPONSE DATA field.

Table 153 defines the RESPONSE DATA field. The RESPONSE DATA field shall be present if the SSP target port detects any of the conditions described by a non-zero value in the RESPONSE CODE field and shall be present for a RESPONSE frame sent in response to a TASK frame.

Table 153 — RESPONSE DATA field

Byte\Bit	7	6	5	4	3	2	1	0
0	~~Reserved~~ ADDITIONAL RESPONSE INFORMATION							
2								
3	RESPONSE CODE							

The ADDITIONAL RESPONSE INFORMATION field contains additional response information defined in SAM-4 for certain response code values as specified in table 158.

Table 158 defines the RESPONSE CODE field, which specifies the error condition or the completion status of a task management function. See 10.2.1.5 and 10.2.1.15 for the mapping of these response codes to SCSI service responses.

Table 158 — RESPONSE CODE field

Code	Description	Additional response information
00h	TASK MANAGEMENT FUNCTION COMPLETE [a]	No
02h	INVALID FRAME	No
04h	TASK MANAGEMENT FUNCTION NOT SUPPORTED [a]	No
05h	TASK MANAGEMENT FUNCTION FAILED [a]	No
08h	TASK MANAGEMENT FUNCTION SUCCEEDED [a]	Yes
09h	INCORRECT LOGICAL UNIT NUMBER [a]	No
0Ah	OVERLAPPED TAG ATTEMPTED [b]	No
All others	Reserved	

[a] Only valid when responding to a TASK frame
[b] Returned in case of command/task management function or task management function/task management function tag conflicts.

10.2.1.1 SCSI transport protocol services overview

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An application client requests the processing of a SCSI command by invoking SCSI transport protocol services, the collective operation of which is conceptually modeled in the following remote procedure call (see SAM-4):

Service response = Execute Command (IN (I_T_L_Q Nexus, CDB, Task Attribute, [Data-In Buffer Size], [Data-Out Buffer], [Data-Out Buffer Size], [Task Priority]), OUT ([Data-In Buffer], [Sense Data], [Sense Data Length], Status))

An application client requests the processing of a SCSI task management function by invoking SCSI transport protocol services, the collective operation of which is conceptually modeled in the following remote procedure calls (see SAM-4):

a) Service Response = ABORT TASK (IN (Nexus));
b) Service Response = ABORT TASK SET (IN (Nexus));
c) Service Response = CLEAR ACA (IN (Nexus));
d) Service Response = CLEAR TASK SET (IN (Nexus));
e) Service Response = I_T NEXUS RESET (IN (Nexus));
f) Service Response = LOGICAL UNIT RESET (IN (Nexus)); ~~and~~
g) Service Response = QUERY TASK (IN (Nexus))~~.~~; and
h) Service Response = QUERY UNIT ATTENTION (IN (Nexus)).

SSP defines the transport protocol services required by SAM-4 in support of the these remote procedure calls.

Table 180 describes the mapping of the remote procedure calls to transport protocol services and the SSP implementation of each transport protocol service.

Table 180 — SCSI architecture mapping

Remote procedure call	Type of transport protocol service	Transport protocol service interaction	Transport protocol service	I/T [a]	SSP implementation
Execute Command	Request/ Confirmation	Request	Send SCSI Command	I	COMMAND frame
		Indication	SCSI Command Received	T	Receipt of the COMMAND frame
		Response	Send Command Complete	T	RESPONSE frame
		Confirmation	Command Complete Received	I	Receipt of the RESPONSE frame or problem transmitting the COMMAND frame
	Data-In Transfer [b]	Request	Send Data-In	T	Read DATA frames
		Confirmation	Data-In Delivered	T	Receipt of ACKs for the read DATA frames
	Data-Out Transfer [b]	Request	Receive Data-Out	T	XFER_RDY frame
		Confirmation	Data-Out Received	T	Receipt of write DATA frames
	Terminate Data Transfer [b]	Request	Terminate Data Transfer	T	
		Confirmation	Data Transfer Terminated	T	
ABORT TASK, ABORT TASK SET, CLEAR ACA, CLEAR TASK SET, I_T NEXUS RESET, LOGICAL UNIT RESET, ~~and~~ QUERY TASK, and QUERY UNIT ATTENTION	Request/ Confirmation	Request	Send Task Management Request	I	TASK frame
		Indication	Task Management Request Received	T	Receipt of the TASK frame
		Response	Task Management Function Executed	T	RESPONSE frame
		Confirmation	Received Task Management Function Executed	I	Receipt of the RESPONSE frame or problem transmitting the TASK frame

[a] I/T indicates whether the SSP initiator port (I) or the SSP target port (T) implements the transport protocol service.
[b] Data transfer transport protocol services for SCSI initiator ports are not specified by SAM-4.

10.2.1.12 Send Task Management Request transport protocol service

An application client uses the Send Task Management Request transport protocol service request to request that an SSP initiator port transmit a TASK frame.

Send Task Management Request (IN (Nexus, Function Identifier, [Association]))

Table 191 shows how the arguments to the Send Task Management Request transport protocol service are used.

Table 191 — Send Task Management Request transport protocol service arguments

Argument	SAS SSP implementation
Nexus	I_T_L nexus or I_T_L_Q nexus (depending on the Function Identifier), where: a) I specifies the initiator port to send the TASK frame; b) T specifies the target port to which the TASK frame is sent; c) L specifies the LOGICAL UNIT NUMBER field in the TASK frame header; and d) Q (for an I_T_L_Q nexus) specifies the TAG OF TASK TO BE MANAGED field in the TASK frame header.
Function Identifier	Specifies the TASK MANAGEMENT FUNCTION field in the TASK frame. Only these task management functions are supported: a) ABORT TASK (Nexus argument specifies an I_T_L_Q Nexus); b) ABORT TASK SET (Nexus argument specifies an I_T_L Nexus); c) CLEAR ACA (Nexus argument specifies an I_T_L Nexus); d) CLEAR TASK SET (Nexus argument specifies an I_T_L Nexus); e) I_T NEXUS RESET (Nexus argument specifies an I_T Nexus); f) LOGICAL UNIT RESET (Nexus argument specifies an I_T_L Nexus); ~~and~~ g) QUERY TASK (Nexus argument specifies an I_T_L_Q Nexus)~~.~~; and h) QUERY UNIT ATTENTION (Nexus argument specifies an I_T_L Nexus).
[Association]	Specifies the TAG field in the TASK frame header.

10.2.1.13 Task Management Request Received transport protocol service

An SSP target port uses the Task Management Request Received transport protocol service indication to notify a task manager that it has received a TASK frame.

Task Management Request Received (IN (Nexus, Function Identifier, [Association]))

Table 192 shows how the arguments to the Task Management Request Received transport protocol service are determined.

Table 192 — Task Management Request Received transport protocol service arguments

Argument	SAS SSP implementation
Nexus	I_T_L nexus or I_T_L_Q nexus (depending on the Function Identifier), where: a) I indicates the initiator port that sent the TASK frame; b) T indicates the target port that received the TASK frame; c) L indicated by the LOGICAL UNIT NUMBER field in the TASK frame header; and d) Q (for an I_T_L_Q nexus) indicated by the TAG OF TASK TO BE MANAGED field in the TASK frame header.
Function Identifier	Indicates the TASK MANAGEMENT FUNCTION field in the TASK frame. Only these task management functions are supported: a) ABORT TASK (Nexus argument ~~specifies~~indicates an I_T_L_Q Nexus); b) ABORT TASK SET (Nexus argument ~~specifies~~indicates an I_T_L Nexus); c) CLEAR ACA (Nexus argument ~~specifies~~indicates an I_T_L Nexus); d) CLEAR TASK SET (Nexus argument ~~specifies~~indicates an I_T_L Nexus); e) I_T NEXUS RESET (Nexus argument ~~specifies~~indicates an I_T Nexus); f) LOGICAL UNIT RESET (Nexus argument ~~specifies~~indicates an I_T_L Nexus); ~~and~~ g) QUERY TASK (Nexus argument ~~specifies~~indicates an I_T_L_Q Nexus)~~.~~; and h) QUERY UNIT ATTENTION (Nexus argument indicates an I_T_L Nexus).
[Association]	Indicates the TAG field in the TASK frame header.

Suggested changes to FCP-4 (base text assumes 07-066r0 has been incorporated)

4.9 Task management

An application client requests a task management function to control explicitly the processing of one or more FCP I/O operations (see 9.2.2.5).

The ABORT TASK task management function is mapped to the FC-FS-2 ABTS basic link service while the other task managment functions are mapped into control bits (see table 20) in the FCP_CMND IU. Task management functions that use the FCP_CMND IU are transmitted as the first IU in a new Exchange. A task management function that uses the FCP_CMND IU ends with an FCP_RSP IU that indicates the completion status of the function. If the addressed logical unit is not supported or is not available (e.g., not connected or not configured) the FCP_CMND IU:

a) should end with an FCP_RSP IU completion status of 09h (i.e., Task Management function incorrect logical unit number) (see table 24); and
b) may end with an FCP_RSP IU completion status of 00h (i.e., Task Management function complete) (see table 24).

The FCP_CDB field in FCP_CMND IUs that perform task management functions is ignored.

The QUERY TASK task management function is not supported.

The task management function mappings are specified in table 3.

Table 3 — Task management functions, SAM-3 to FCP-4

SAM-3 function	FCP-4 equivalent
ABORT TASK	FCP recovery abort [a]
ABORT TASK SET	FCP_CMND ABORT TASK SET
CLEAR TASK SET	FCP_CMND CLEAR TASK SET
CLEAR ACA	FCP_CMND CLEAR ACA
LOGICAL UNIT RESET	FCP_CMND LOGICAL UNIT RESET
QUERY UNIT ATTENTION	FCP_CMND QUERY UNIT ATTENTION
[a] FC-FS-2 basic link services are used to perform the ABORT TASK function.	

FC-FS-2 basic link services and FC-LS extended link services are used to perform the ABORT TASK task management function, to recover Exchange resources, and to re-establish other initial conditions.

The ABORT TASK task management function causes the device server to abort the specified task using the recovery abort protocol, if the task exists. The action is defined in SAM-3. The ABORT TASK task management function is performed by the initiator FCP_Port (i.e., Exchange Originator) using the recovery abort (see 12.3).

The specified Exchange shall be terminated by the initiator FCP_Port using the recovery abort. To be compliant with FC-FS-2, the ABORT TASK task management function may not immediately release all Exchange resources, since a Recovery_Qualifier may be established to allow for the management of information that may already have been delivered to the fabric.

In addition to recovering Exchange resources that may have been left unavailable while processing task management functions, recovery abort may be used to recover Exchange resources left in an undefined state by any of the task abort events defined in SAM-3 or by any similar events

9.2 FCP_CMND IU

9.2.1 Overview and format of FCP_CMND IU

9.2.2 FCP_CMND IU field descriptions

9.2.2.5 TASK MANAGEMENT FLAGS field

The TASK MANAGEMENT FLAGS field specifies the task management function to be performed, if any.

Task management functions shall be requested by the initiator FCP_Port (Exchange Originator) using a new Exchange. If the TASK MANAGEMENT FLAGS field is set to a nonzero value, the FCP_CDB field, the FCP_DL field, the TASK ATTRIBUTE field, the RDDATA bit, and the WRDATA bit shall be ignored and the FCP_BIDIRECTIONAL_READ_DL field shall not be included in the FCP_CMND IU payload. If the TASK MANAGEMENT FLAGS field is set to a reserved value, the target FCP_Port shall return an FCP_RSP IU containing the RSP_CODE field set to 02h (i.e., FCP_CMND fields invalid).

The clearing actions performed by task management functions are specified in table 5.

The format of the TASK MANAGEMENT FLAGS field is specified in table 20.

Table 20 — TASK MANAGEMENT FLAGS field

Code	Task management function [a]
00h	None
02h	ABORT TASK SET
04h	CLEAR TASK SET
10h	LOGICAL UNIT RESET
20h	Obsolete
40h	CLEAR ACA
80h	Obsolete
81h	*QUERY TASK SET per 07-066*
82h	QUERY UNIT ATTENTION
All others	Reserved

[a] The ABORT TASK management function is specified in 4.9.

The **CLEAR ACA** task management function causes the ACA condition to be cleared. When the task manager clears the ACA condition, any task within that task set may be completed subject to the rules for task management specified by SAM-3. If there is no ACA condition present, the CLEAR ACA task management function shall be accepted and the FCP_RSP IU shall contain a RSP_CODE field set to 00h (i.e., Task Management function complete).

The use of the ACA bit in the CDB control field and the implementation of ACA is described in SAM-3.

Depending on the mode page parameters that have been established (see SPC-3), additional FCP I/O operations may have to be aborted by the recovery abort as part of the process of clearing the automatic contingent allegiance.

The CLEAR ACA is transmitted by the initiator FCP_Port (Exchange Originator) using a new Exchange.

Support of the CLEAR ACA task management function is mandatory in the Fibre Channel Protocol if the FCP device sets the NORMACA bit to one in the INQUIRY data. It shall not be sent to a logical unit with a NORMACA bit equal to zero in the INQUIRY data.

The **LOGICAL UNIT RESET** task management function performs a LOGICAL UNIT RESET task management function as defined in SAM-3. LOGICAL UNIT RESET aborts all tasks in the task set for the logical unit and performs a LOGICAL UNIT RESET for all dependent logical units. Support of the LOGICAL UNIT RESET task management function is mandatory for the Fibre Channel Protocol.

The LOGICAL UNIT RESET is transmitted by the initiator FCP_Port (Exchange Originator) using a new Exchange. LOGICAL UNIT RESET resets the internal states of the target FCP_Port and logical unit as shownin 4.10. Exchange resources to be cleared may be cleared by the following mechanisms:

a) a recovery abort sequence (see 12.3) may be generated by the initiator FCP_Port that sent the LOGICAL UNIT RESET for each task in the logical unit known to that initiator FCP_Port;
b) a task, if any, for an initiator FCP_Port other than the initiator FCP_Port that sent the LOGICAL UNIT RESET is ended in the logical unit. The initiator FCP_Port for that task shall determine by a timeout that the task did not finish. Subsequent retries fail because the task resources have been cleared in the logical unit, so the initiator FCP_Port shall clear the Exchange resources with a recovery abort sequence. See 12.3; or
c) a task for an initiator FCP_Port other than the initiator FCP_Port that sent the LOGICAL UNIT RESET may be completed by returning CHECK CONDITION status with the sense key set to UNIT ATTENTION and the additional sense code set as specified in SAM-3.

NOTE 3 - SAM-3 has defined the TASK ABORTED status for tasks terminated by a LOGICAL UNIT RESET task management function if the Control mode page indicates that the TASK ABORTED status is supported.

The **CLEAR TASK SET** task management function causes all tasks from all initiator FCP_Ports in the specified task set to be aborted as defined in SAM-3. Support of the CLEAR TASK SET task management function is mandatory for the Fibre Channel Protocol.

The CLEAR TASK SET is transmitted by the initiator FCP_Port (Exchange Originator) using a new Exchange. CLEAR TASK SET resets internal states of the target FCP_Port as shown in 4.10. Exchange resources to be cleared may be cleared by one or more of the following mechanisms:

a) a recovery abort sequence (see 12.3) may be generated by the initiator FCP_Port that sent the CLEAR TASK SET for each task known to that initiator FCP_Port;
b) a task, if any, for an initiator FCP_Port other than the initiator FCP_Port that sent the CLEAR TASK SET is ended in the logical unit. The initiator FCP_Port for that task shall determine by a timeout that the task did not finish. Subsequent retries fail because the task resources have been cleared in the logical unit, so the initiator FCP_Port shall clear the Exchange resources with a recovery abort sequence. See 12.3; or
c) a task for an initiator FCP_Port other than the initiator FCP_Port that sent the CLEAR TASK SET may be completed by returning CHECK CONDITION status with the sense key set to UNIT ATTENTION and the additional sense code set as specified in SAM-3.

NOTE 4 - SAM-3 has defined the TASK ABORTED status for tasks terminated by a CLEAR TASK SET task management function if the Control mode page indicates that the TASK ABORTED status is supported.

The **ABORT TASK SET** task management function requests the ABORT TASK SET task management function to be performed as defined in SAM-3. Support of the ABORT TASK SET task management function is mandatory in the Fibre Channel Protocol.

The ABORT TASK SET is transmitted by the initiator FCP_Port (Exchange Originator) using a new Exchange. ABORT TASK SET resets internal states of the target FCP_Port as shown in 4.10. Exchange resources may be cleared by a recovery abort sequence (see 12.3) generated by the initiator FCP_Port that sent the ABORT TASK SET for each task known to the initiator FCP_Port.

The **QUERY UNIT ATTENTION** task management function requests the QUERY UNIT ATTENTION task management function to be performed as defined in SAM-4. Support of the QUERY UNIT ATTENTION task management function is optional in the Fibre Channel Protocol.

9.2.2.8 FCP_CDB field

The FCP_CDB field contains the CDB to be sent to the addressed logical unit. The maximum CDB length is 16 bytes unless the ADDITIONAL_FCP_CDB_LENGTH field has specified that there is an ADDITIONAL_FCP_CDB field. The FCP_CDB field shall be ignored if the task management flags field is set to a nonzero value.

The CDB format is defined by SAM-3 and the contents of the CDB are defined in the SCSI command standards.

Bytes between the end of a CDB and the end of the FCP_CDB field or, if applicable, the ADDITIONAL_FCP_CDB field shall be reserved.

9.2.2.9 ADDITIONAL_FCP_CDB field

The ADDITIONAL_FCP_CDB field contains any CDB bytes beyond those contained within the 16 byte FCP_CDB field.

The ADDITIONAL_FCP_CDB field shall not be present if the task management flags field is set to a nonzero value. The contents of the field shall be those bytes of an extended CDB beyond the first 16 bytes of the CDB as defined in the SCSI command standards.

9.5 FCP_RSP IU

9.5.16 FCP_RSP_INFO field

The FCP_RSP_INFO field contains information describing only the protocol failures detected during the processing of an FCP I/O operation. If none of the specified protocol failures have occurred, the FCP_RSP_INFO field shall not be included in the FCP_RSP IU and the FCP_RSP_LEN_VALID bit shall be zero. The FCP_RSP_INFO does not contain link error information, since FC-FS-2 provides the mechanisms for presenting such errors. The FCP_RSP_INFO field does not contain SCSI logical unit error information, since that is contained in the FCP_SNS_INFO field as described in 9.5.17. The FCP_RSP_INFO field shall contain valid information if the target FCP_Port detects any of the conditions indicated by an FCP FCP_RSP_CODE. The format of the FCP_RSP_INFO field is specified in table 23.

Table 23 — FCP_RSP_INFO **field format**

Byte\Bit	7	6	5	4	3	2	1	0
0	~~Reserved~~ADDITIONAL_RSP_INFO							
2								
3		RSP_CODE						
4	Reserved (if any)							
7								

The ADDITIONAL_RSP_INFO field contains additional response information defined in SAM-4 for certain response code values as specified in table 24.

The RSP_CODE field is defined in table 24.

Table 24 — RSP_CODE **field**

Code	Description	Additional response information
00h	Task Management function complete	No
01h	FCP_DATA length different than FCP_BURST_LEN	No
02h	FCP_CMND fields invalid	No
03h	FCP_DATA parameter mismatch with FCP_DATA_RO	No
04h [a]	Task Management function rejected	No
05h	Task Management function failed	No
08h [a]	Task Management function succeeded	Yes
09h [a]	Task Management function incorrect logical unit number	No
06h - 07h 0Ah - FFh	Reserved	

[a] Only valid when responding to task management functions

The completion status of the task management function is indicated by the RSP_CODE field. If the Exchange is aborted before the FCP_RSP IU is returned, the completion status is unknown. If the RSP_CODE field is set to 05h (i.e., Task Management function failed), the state of the logical unit is unknown.

Activities started by a task management function may continue after the FCP_RSP IU for the task management has been delivered.