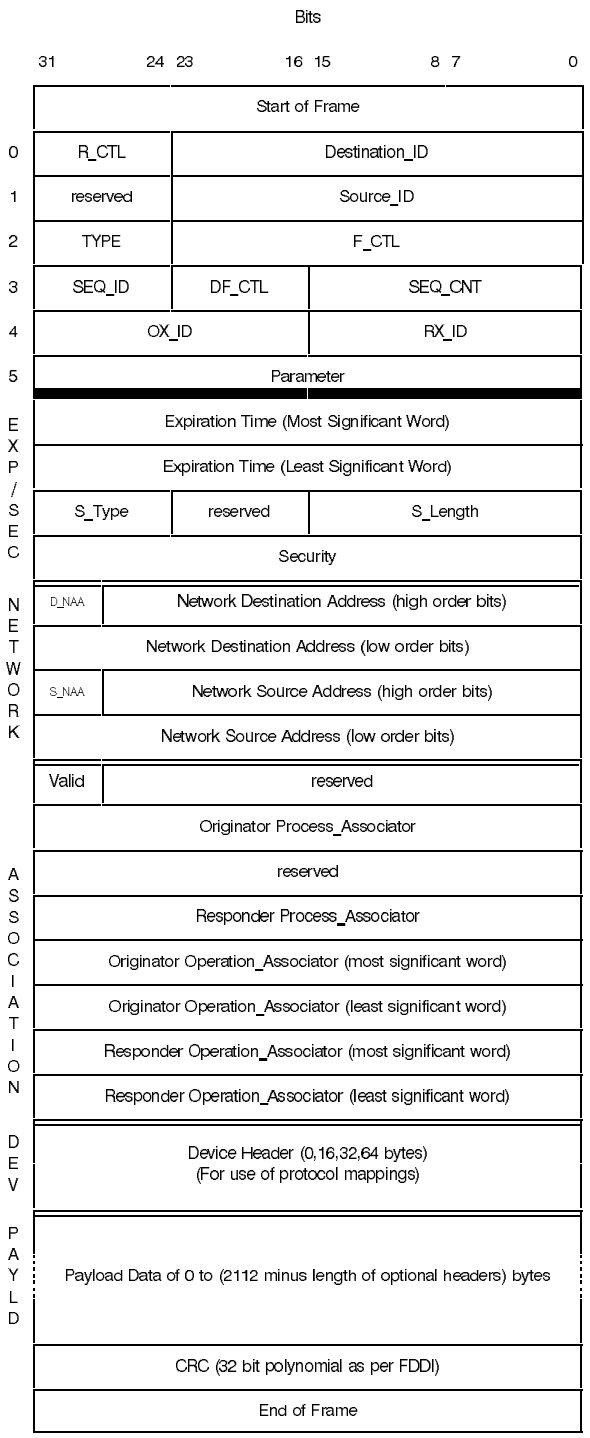
FC-PH FRAME



HEADER FIELDS BY FRAME GROUP

Field	# hex	"Data"	Non-basic Link Services	Basic Link Services	Link Control
R_CTL bits 31-28 (routing bits) (# in field ->)		0 device 4 video	2 extend 3 FC-4	8	C
R_CTL bits 27-24 information category	0	uncategorized	reserved	nop	ACK_1
	1	solicited data		abort seq	ACK_N ACK_0
	2	unsolicited ctrl	Request	rem conn	P_RJT
	3	solicited ctrl	Reply	reserved	F_RJT
	4	unsolicited data	reserved	BA_ACC	P_BSY
	5	data descrpt.		BA_RJT	F_BSY (data)
	6	unsolicited cmd		reserved	F_BSY (link ctrl)
	7	cmd status			LCR
	other	unspec			reserved
TYPE (# in field ->)		device - see next page video reserved	1 extend FC-4 as dev	0	1Z F_BSY 3Z P_BSY (Z - see note) other reserved
F_CTL bits 5-4 (data 1st frame of Exch)	0	abort, discard mult seq		not meaningful	cont seq
	1	abort, discard one seq			abort seq request ABTS
	2	process seq (infinite buffers)			stop seq
	3	discard mult seq (immed retrans)			immed retrans request
DF_CTL		all valid	exp_sec only	not meaningful	
Parameter		relative offset	not meaningful		ACK 0,1,N BSY&REJ reason&action
Payload		0-2112 bytes		0-12 bytes	0 bytes

DF_CTL: bit 22=1 Expiration_Security header present
bit 21=1 Network_ Header present
bit 20=1 Association_Header present
bits17-16 Device Header (01=16, 10=32, 11=64)

Parameter in Link_Ctl P&F_REJ P&F_BSY: bits 31-24 are action code, bits 23-00 are reason code
Act 01 retry, 02 non-retry. reason see next page
Action 01 Seq term, 02 Seq active. Reason 01 N_Port phys bsy, 03 N_port resource bsy, FF vendor unique

Note: Z in Type field is Info Cat of frame being busied.

"DEVICE" TYPE FIELD VALUES OF FC-4 DATA & LINK FRAMES

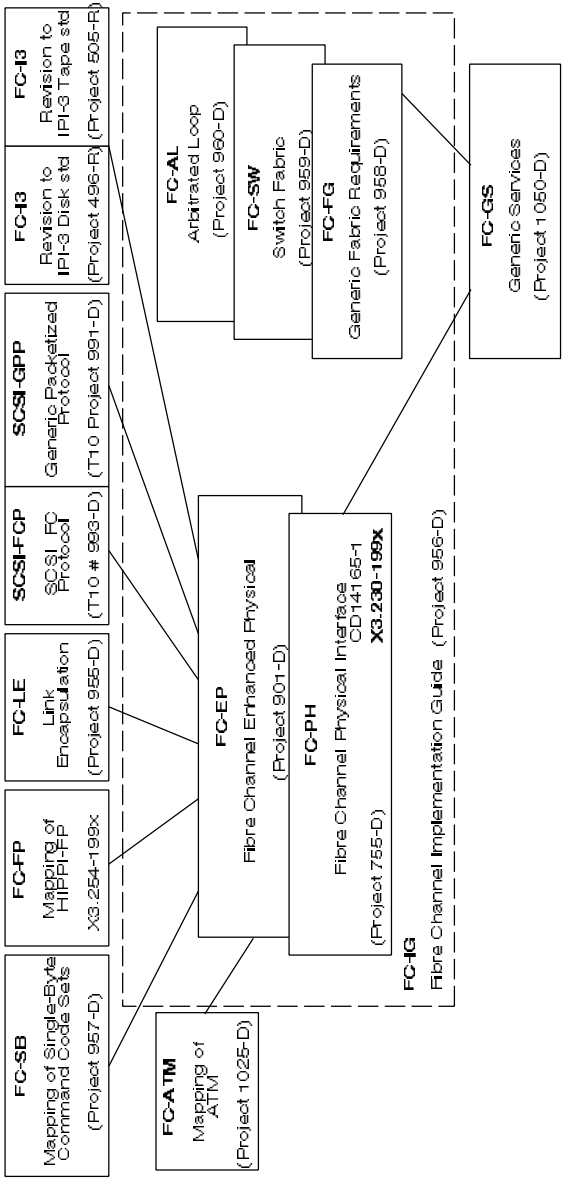
hex	FC-4	hex	FC-4	hex	FC-4
04	LLC (in order)	19	SBCCS Chan	28 to 2F	Reserved for FutureBus
05	LLC/SNAP	1A	SBCCS CU		
08	SCSI-FCP	20	FC-GS		
09	SCSI-GPP	21	FC-FG	40	FC-FP
11	IPI-3 master	22	FC-SW	E0 to FF	Vendor Unique
12	IPI-3 slave	23	FC-AL		
13	IPI-3 peer	24	SNMP		

F_CTL BITS FOR ALL FRAMES (WORD 2)

Bit	Function	Bit	Function	Bit	Function
23	exch Orig¦Resp	16	hold¦xfer Sl	7 to 6	Seq to follow: 00 no info 01 immediate 02 soon 03 delayed
22	seq Init¦Recp	15	X_ID reassign		
21	1st seq of exch	14	X_ID invalidate		
20	last seq of exch	9	orig¦rexmit Seq	3	RO present
19	last frame in seq	8	unidir connect	1 to 0	Fill Data Bytes 00 None 01 One etc.
18	end_connection	5 to 4	See left page		
17	chained_seq				

REJECT (P_RJT, F_RJT) REASON CODES

Code	Description	By	Code	Description	By	Code	Description	By
01	D_ID invalid	B	0A	F_CTL invalid	P	13	length error	B
02	S_ID invalid	B	0B	OX_ID invalid	P	14	unexp ACK	P
03	N_Port not avail (temp)	F	0C	RX_ID invalid	P	15	unexp link_resp	P
04	N_Port not avail (perm)	F	0D	SEQ_ID invalid	P	16	login required	B
05	class unsup	B	0E	DF_CTL invalid	P	17	excessive seq attempt	P
06	delimiter use error	B	0F	SEQ_CNT invalid	P	18	establish exch. error	P
07	type unsupported	B	10	parameter invalid	P	19	exp/sec hdr invalid	P
08	link ctl invalid	P	11	exchange error	P	1A	fabric path error	P
09	R_CTL invalid	P	12	protocol error	P	FF	vu error	P



CLASS CHARACTERISTICS

Characteristic	Class 1	Class 2	Class 3
Function	Dedicated Connection	Multiplex (Frame Switched)	Datagram
Fabric discards frames?	No	No	Yes
Communications type between ports	One to One	Many to many	
Initial Roundtrip delay?	Yes	No	No
Stacked Connect Request	Optional	Not applicable	
Unidirectional Connection	Optional	Not applicable	
End-End flow ctrl	Yes	Yes	No
Buffer-buffer flow ctrl	First frame only	Yes, throughout Fabric	Yes, N_Port to F_port only
Fabric can reject frames?	No	Yes, only for routing problems etc.	No, frame is discarded
Fabric busies frames?	No	Yes, for long-term resource contention	No, frame is discarded
Delivery order guaranteed?	Yes	Depends on Fabric, Yes for some Fabrics	

Topics to be included as future enhancements:

- 2, 4, 8 & 16 gigabaud physical variants
- Variants based on twinax cable
- Asynchronous and Isochronous services
- Fractional bandwidth allocation
- Hunt Groups and Striping
- Unacknowledged multicast service
- Generic Service definitions including Directory and Time services
- Mapping for many more existing and new protocols

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FIBRE CHANNEL ASSOCIATION

FIBRE CHANNEL REFERENCE CARD

FEEDS AND SPEEDS

	Transmitter	Media	Performance		Dist
			MBaud	MByte/s	km
OPTICAL	Longwave Led	62.5 μm Multimode Fiber	132.81	12.5	1
	Longwave Laser	Single Mode Fiber	265.62	25	2 or 10
	Longwave Led	62.5 μm Multimode Fiber			1.5
	Shortwave Laser	50 μm Multimode Fiber			2
	Shortwave Laser	50 μm Multimode Fiber	531.25	50	1
	Longwave Laser	Single Mode Fiber			2 or 10
	Shortwave Laser	50 μm Multimode Fiber	1062.5	100	0.5
	Longwave Laser	Single Mode Fiber			2 or 10
ELECTRICAL	ECL	CATV Coax	132.81	12.5	0.100
		Submin Coax			0.040
		Twist pair			0.100
		CATV Coax	265.62	25	0.075
		Submin Coax			0.030
		Twist pair			0.050
		CATV Coax	531.25	50	0.050
		Submin Coax			0.020
		CATV Coax	1062.5	100	0.025
		Submin Coax			0.010