

SFF Committee – 25 Years of Service

IN THE BEGINNING

When the Small Form Factor Committee was formed in May 1990 it had only one member company, Western Digital. Although over 50 attendees from 25 companies responded to the invitation about standardizing the emerging 2.5" disk drive, there was widespread skepticism about whether anything could be achieved.

Prior to the Small Form Factor Committee, ENDL had formed the ESDI (Enhanced Small Device Interface) Committee to reach industry agreement for high performance 5.25" disk drives which became the X3.170 standard. When Microsoft showed no interest in supporting SCSI (Small Computer Systems Interface), ENDL led the CAM Committee which resulted in a pair of standards.

- o X3.232 for CAM (Common Access Method)
- o X3.221 for ATA (AT Attachment) aka IDE (Integrated Device Electronics)

Both committees were formed with a sunset clause, they would disappear when the task was finished. It was assumed the same would apply to the Small Form Factor Committee, but less than two years later the members took action to turn the committee into a long-lived entity. Their hopes were rewarded, the projects which were integrated into standards, or became standards in their own right is the stuff of legend.

Fast forward 25 years to the present day. True, there have been changes in the players and the projects, but the committee has evolved with the times. Five of the companies that had representatives at the first meeting are still Members.

| | |
|---------------------------|-----------------|
| AMP (now TE Connectivity) | Toshiba America |
| IBM | Western Digital |
| Seagate | |

The rest are no longer in the storage business or did not survive at all.

There are dozens of megabytes of data in the SFF Minutes and the ENDL Letter Happenings about the committee. Ploughing through it brought back poignant memories of events and the personalities, and sad to say, many of whom are no longer with us.

The narrative below covers three highlights of the early years (at some time in the future there may be more of a history on the committee).



I. Dal Allan
ENDL Inc
SFF Committee Chairman

FORM FACTORS

When OEMs have a problem that involves their vendors, it is not uncommon for them to host a gathering of competitors at one of their sites. If other OEMs have the same interest, they may be invited to the gathering, but the locale will morph into a neutral location.

Nonetheless, sending invitations are to a select few can raise ugly hackles that cause many other troubles. Just such a circumstance arose in early 1990.

Small Form Factor Disks 1990

One of the subjects discussed in the hallways during the April 23 X3T9.2 plenary was the meeting in Longmont of several disk vendors, one connector company, and a couple of system integrators. Nobody who was at Longmont participated in the hallway discussions, and there was a general air of disgruntlement at a "private meeting" which had excluded interested parties. There were even mumblings about "skating close to the wind on anti-trust."

- o One story had it that Conner Peripherals was 'hard-nosed about using a 2mm connector using a pinout incompatible with the SCSI-2 standard,' and a decision was made to follow Conner.*
- o Conflicting with this was that no decisions were made, and that Conner would continue to do as it wanted, but that other vendors did not have an entrenched position and would react to what the market wanted.*
- o A third variation was that most vendors seemed confused about what they were doing for a connector, and would use whatever an OEM specified.*

The meeting had been initiated by the East Coast labs of Sun Microsystems as a means to assess the current state of 2 1/2" disks as regards packaging. The 2 1/2" disk is unlike other form factors in that there are no cables to give the integrator any packaging flexibility. Sun was disturbed that there was no cohesive industry direction, and no physical compatibility between the disks.

Paul Rikkonen (Sun Microsystems) had sent invites to many OEMs, but many were not prepared to be involved because they had no programs in place capable of integrating 2.5" disks.

It may be that the only way to achieve multiple sourcing is through a committee. If so, it will be the first time, as a de facto could develop while the committee is sitting around listening to debates on what should be done...

The first meeting of the SFF Committee will begin at 1:00 pm on May 29. The late start is to help those flying from the East to avoid the Memorial Day travel crush.

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Small Form Factor May 29-30 1990

Seagate Technology hosted at the Le Baron Hotel in San Jose. With over 50 present, the attendance was much higher than anticipated, so the start time was delayed while the hotel arranged a larger room.

There was a strong similarity between the current designs on pinouts, but...there was no commonality in the connector position relative to the HDA, nor in the connector configuration chosen.

| | | |
|--------------------|--------------------------|-----------------|
| <i>PrairieTek</i> | <i>Straddle Mount</i> | <i>Centered</i> |
| <i>Conner</i> | <i>Right Angle Mount</i> | <i>Offset</i> |
| <i>Intellistor</i> | <i>Right Angle Mount</i> | <i>Centered</i> |
| <i>JVC</i> | <i>Right Angle Mount</i> | <i>Centered</i> |

A list of what had to be agreed upon to create a standard form factor was lengthy, and the interface with the loudest proponents was SCSI, way noisier than ATA and MCA (Micro Channel Architecture).

The last action of the ad hoc before breaking up at the end of the first afternoon was to charter Bob Snively (Sun Microsystems) with the responsibility to come up with a configuration alternative that everyone could critique when the ad hoc resumed the following day.

Bob had started out with intentions of using the Conner pinout and the 2mm connector but upon examination became concerned with the integrity of the signal configuration in applications where several drives were daisy-chained together.

What Bob had done was change the basic assumption on how the 2 1/2" drives were going to be used, not one or two in a chassis, but as part of a daisychain to which several devices were attached. This meant that all integrity issues of a larger cable plant had to be considered and the signal crosstalk had to be kept to a minimum.

No decisions were reached on forming a Small Form Factor Committee. It was left up to the companies to vote with their checkbooks on whether to support an industry effort along the same lines as the CAM Committee.

Although official Job One was to define a 2.5" drive, the ambition to achieve more leapt dramatically forward only three months later.

Small Form Factor Committee August 27 1990

Steve Doherty (Sun Microsystems) had come prepared with a new layout of the 2 1/2" form factor, complete with pinouts for SCSI. He described it as one that assumed board-board connection with the option of cabling. Power and test pins are assigned to the reserved lines of 50-pin SCSI.

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A number of ideas were listed for discussion for smaller form factors such as the pending 1.8" disk. First up, it was assumed that cabling will not be typical, and that configurations will be board-board mating.

Tom Hanan (Western Digital) put a profile on the drive:

"Take four credit cards, and you've got your form factor. The drives will be small enough to carry in your pocket and pop in and out of laptops."

There was an air of confidence that everything was proceeding well, and the focus at the next meeting was on futures. Unfortunately, progress was slow because of oscillations between SCSI and ATA, 2.5" and smaller sizes, edge connectors and 'real' connectors, ribbon and pin connectors, cold insert and hot plugging, disk retention or no retention, compatible pinouts and pinouts that could not smoke a drive if inserted upside down, and on and on...

Not all the news was negative.

Despite all of the fighting that occurred in the first couple of meetings over connectors (2mm naked header vs the rest), there has been remarkably little acrimony between the connector suppliers.

This is in marked contrast to previous standards efforts. This is probably a reflection of the fact that when they have nothing to sell, they can work together on an engineering basis.

The focus on the 2.5" form factor had been undermined by the segue to 1.8", and then came even more erosion in March 1991.

George Penokie (IBM) had been busy, and had gone even further by exploring possible ways to build a really small drive of 1.3". Everybody was in for a surprise at his drawing of what looked more like a chip on steroids than a disk drive.

The PCB was not mounted to the HDA, the HDA was mounted to the PCB. This was no ordinary PCB but was thick silicon or ceramic with fingers that made contact on the top side of the PCB, at both ends.

Despite (or maybe due to) the mix of drive sizes being developed, there was still enthusiasm to devise a common form factor for each. Mounting holes, how to dimension, connectors, materials, board overhang, and a long list of other items were argued about with technical zeal (aka religious fervor).

Technical merit clearly influences most of the participants most of the time, but it seemed like everyone had an implacable opinion on some items some of the time. On way too many occasions, a decision that seemed to have been cast in stone would be back on the table in the twinkling of an eye. Efforts to find a way out of the swamp were not succeeding.

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The *raison d'etre* of the Small Form Factor Committee was on the ropes, each meeting saw a whittling away at the strict dimensioning of a 2.5" drive as the vendors strove to keep 360 degrees of freedom for their engineers. The brewing storm broke in May 1992.

Although every meeting has been filled with activities, the number of pages devoted to intermatability has shrunk steadily, and a call was made for companies to step forward and address the real issue of hard mating.

Bob Brown (Areal) drew a document out of his briefcase which he held up as being the product of an MCC (Manufacturer Compatibility Committee), and held the dimensions for 2 1/2" disk drives. Heads swiveled all around the room but it was George Penokie who led the pack by demanding an explanation about the MCC and its member companies.

"Areal, Conner Peripherals, Maxtor, Quantum, Seagate, Toshiba, and Western Digital."

"You realize of course that sitting in this room right now are three major disk manufacturers who were not invited to these private meetings?"

"Don't you think DEC, Hewlett Packard and IBM should have been there?"

"That was an oversight."

"I really tried to reach everyone."

"It's just that SFF has not achieved anything in all the time it has been meeting, so I thought it best to go outside and start a little group to get these things settled."

"Wait a minute."

"These are the same companies that last year argued against all the dimensions we were trying to settle on."

"Now you're telling me that it was okay to sit down in another meeting and reach this agreement."

"This was not a normal meeting."

"I asked everybody to get together and set aside their egos and come to a settlement on these issues."

The longer Bob spoke, and the more justification he offered for the private meetings, the higher rose tempers in the room. Eventually, attention turned to the dimensions, which bore an uncanny resemblance to the product planned by Conner Peripherals.

When discussion returned to the hard mounting of 2 1/2" disk drives, Tom Hanan proclaimed the failure of SFF.

"This information was in the original drawings that were submitted and bit by bit it was the SFF Committee that removed it."

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Reggie Murray (MiniStor) shot back.

"Who do you think removed it?"

"The people that you claim are so constructive as MCC are the same people who destroyed the original drawings."

"What really happened here is a matter of market timing."

"Eighteen months ago, a year ago, six months ago, nobody was willing to share information."

"What you're telling me is that now you have access to the dimensions of an upcoming Conner drive and you've agreed to copy them."

"That's not a failure of SFF. It's a fact of market positioning."

Once the emotions had dissipated, it was back to business as usual...working through the dimensions and tolerances. Almost a year later, at the March 1993 meeting, Robert Brown (Areal) showed the new form factor drawing for 2 1/2" drives which had 'almost' been completely agreed to by several disk manufacturers. His optimism was shattered in July.

The ballot on SFF-8004 (2 1/2" Form Factors) concluded with negative votes from Conner Peripherals, Maxtor, Quantum and Seagate. In light of the four largest independent disk drive manufacturers voting against it, it was clear that this SFF Specification was going nowhere fast.

Another nail in the coffin was a fax letter from David White (Compaq) which listed the characteristics he wanted to see in a 2 1/2" form factor. David encouraged the members to ignore what existed and plan for the future, as the only way to address system integrators needs. Other points were.

- o Short term considerations should not impede the adoption of the best long term standard.*
- o The connector should be dimensioned from the side of the drive instead of the bottom mounting hole.*
- o Tolerances on connector locations should be held to +/-0.010", and on other dimensions to the same or tighter.*
- o Height should be the only difference in drives. If a system has space for a 19mm drive, all small drives should fit.*
- o Tolerances on dimensions should be viewed as allowances for manufacturing variation, not as latitude to achieve other design goals.*

The immediate consequence of David's fax was promotion to the newly-available post of SFF-8004 editor. Things looked much brighter in November.

David White had made tremendous progress in refining SFF-8004 for 2 1/2" drives, and must have been disappointed that the disk drive vendors were protesting some of the dimensions. Fortunately, he was not dismayed. The tight tolerances were the basis of the objections, not the concept or principles he had followed.

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David has maintained intensive contact with each vendor rather than holding SSWGs which everybody has to attend. His efforts have paid off in a pair of drawings and a couple of tables that specify dimensions more tightly than for any other form factor. With only a few items remaining as objections, David made a last call for input, in the hope that this would be the last necessary revision before final agreement.

David was serious about this being the last revision. His deadline was to have it completed for inclusion in the next RFQ (Request For Quotation) put out by Compaq Purchasing for laptop builds. He displayed no distress at the shocked reactions by drive vendors, and emphasized that a proffered drive that did not meet spec would not be considered for evaluation. The fact that the ballot on SFF-8004 would be happening in the same timeframe was pure coincidence...

The 2.5" form factor passed the technical ballot with no comments, and a surprise lay in store.

SFF Committee Meeting January 10 1994

The SFF mailing had proposed that the project to define SFF-8014 Unitized Connector for Rack Mounted Drives be canceled due to lack of interest. There was surprising resistance, led by Jim McGrath (Quantum).

"We need SFF-8014, it is the right place to do dimensioning of 3 1/2" disk drives."

Gene Milligan (Seagate) was scornful.

"Come on. Two years ago in SFF, we said it was t-o-o late to define the 3 1/2" form factor. It's even later and you want to to do it, now?"

Tom Hanan bought in.

"The market has shifted in the last couple of years, and drives are a lot closer to each other physically than they used to be."

"We can boost the data rate by being closer to the bus, and direct mating is a much more practical option now than it was in the past."

"Tom's right, we've converged a lot, so it will not be a big deal to tie things down more tightly."

"We managed to do it on 2 1/2", and David White did such a good job, I was kinda hoping he would take on the task for 3 1/2" disks."

David had been quietly observing, now he found himself in the middle.

"Oh. Ah well, I'll go for it."

"See, we're halfway there already!"

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"I'm willing to create the drawings but resolving all the details will not be easy, and I am not willing to do that at this time."

"That will be the job of the leader and we don't have one yet. However, to kick things off I am willing to do that for a short while, and to host the first SSWG in the next couple of weeks."

Bob Snively was shaking his head in incredulity at what he was hearing.

"You mean you guys are really ready to get together and work on the form factor so that you can specify an extension?"

"I don't believe it!"

"Do you realize how much equipment is built around this form factor?"

John Scheible (IBM) felt there was a good reason.

"This industry is driven by \$/MB, and moving that connector out of the way increases the room available in the HDA by one, maybe two, platters."

"That means we can get at least 10% more capacity into the same HDA (Head Disk Assembly) for pretty much the same cost."

"It will look a lot more attractive when I offer you 100 MB for free."

When David questioned what material he should use to prepare a preliminary drawing for participants to consider at the first SSWG. Bob provided him with a copy of Sun's SCA documentation, which has received general industry support.

What a turnabout, from disagreement on 2.5" dimensions in November, a revised spec balloted in December, to approval in January. And to top it all off, a request to start all over again on the 3.5" drive.

The vote to Publish is a political ballot, and when the ballot was posted in March there were three naysayers.

DEC IBM Seagate

Seagate may have voted against Publication, but the drives sold to Compaq met the SFF-8004 specification...

Jim McGrath was impatient to have a 3.5" form factor specification.

"What is important is the new generation disk drives under development, and I want them to be built to the same form factor."

"That means we have to decide on the HDA (Head Disk Assembly) dimensions first."

"We have to meet the design windows for new 3 1/2" disk drives!"

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Bob Whiteman (AMP) hypothesized on the difficulty of trying to complete several mechanical specifications at a time, and came up with an alternative that avoided to trying to do everything at once.

"We will never finish anything on dimensions that has more than one figure in it. If we do what Jim wants and define the form factor of the drive, then we can use annexes or something for each connector type."

"This approach makes it possible for everybody to operate on different timeframes and still remain under the same umbrella."

Bob was right, and the SFF-8x00 (where x represents disk size) specification represented the suite of all specifications in the number bank i.e. SFF-8300 included SFF-8301 Form Factor Drive Dimension plus the specifications for each of the connectors available on 3.5" drives. The suites are what became EIA-720 1997 Small Form Factor 63.5 mm (2.5 in) Disk Drives and EIA-740 1999 Small Form Factor 88.9 mm (3.5 in) Disk Drives.

The SFF-8248 2.5 inch Form Factor w/Combo Connector inc USB Micro-B Receptacle, SFF-8252 2.5 inch Form Factor Drive w/SFF-8784 Connector and SFF-8348 3.5 inch Form Factor w/Combo Connector inc USB Micro-B Receptacle were Published in 2014. A new pair of suites are currently at EIA to cover the latest generation of disk form factors.

It took much longer than anticipated to reach agreement on the 2.5" form factor because the drive companies liked the idea but not the self-imposed restrictions it represented. However, once it registered that being close but not identical was an impediment, disk vendors embraced the design constraints and moved forward to a world of compatibility and interchangeability. In cultural terms it was a tectonic shift.

SINGLE CONNECTOR ATTACH

When Steve Cornaby (Conner Peripherals) proposed the 3.5" Unitized Connector to X3T9.2 in May 1992 there was plenty of interest, and it was suggested that he begin a project at SFF.

Tom Hanan had concerns about direct mounting SCSI drives into a cabinet and asked for a SSWG (Specific Subject Working Group) on unitized connectors to cover both ATA and SCSI.

"There are several ideas that need to be considered, and they apply to ATA as well as SCSI, and they affect 2 1/2" as well as 3 1/2" drives."

"There are several issues that need to be considered, such as sequencing, when making a direct insertion."

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Larry Lamers (Maxtor) was afraid this might slow down progress.

"Why not break this into two activities?"

"We can approve the connector 'as is' along with assigning all the feature pins, and get that approved quickly."

"We can then address the sequencing and other applications such as for ATA as a separate matter."

Larry's idea made such good sense there was no opposition, and Bob Whiteman rose to the occasion by agreeing to head a SSWG on the 'Rack 'n Stack' of drives. This involves the position of the connector relative to the form factor of the drive as well as pin sequencing.

The effort to turn the SFF-8009 Unitized Connector for Cabled Drives into an all-purpose pluggable solution as the SFF-8014 Unitized Connector for Rack Mounted Drives project ticked along until a new alternative appeared in the Sun Microsystems booth at Comdex Fall.

Sun was so proud of the SCA (Single Connector Attach) that it had printed a small booklet to describe the merits of a subsystem backplane pluggable with Conner Peripherals and Seagate drives. The development had been a co-operative effort, and Bob Snively explained the rationale.

"This does not, and was not intended to, provide the ability to blind mate using inexperienced personnel."

"It is assumed the individual inserting drives is either at the factory or has some training. It is not a difficult job, because the rails guide most of the way, and then you just jiggle the drive around to seat it."

"There are two side rails to align the drive in the correct position for mating in the rack."

"The dimensions are not the same for both drives. We could not see a way to resolve the issues that revolve around how a vendor chooses to mount the circuit board on an HDA."

"We took an easy out, compensating for the Z-height differences by using separate rails for each drive type."

One of the favorite features coming into vogue now is hot plugging, and it is being driven by the RAID (Redundant Array of Independent Disks) industry, a matter which George Penokie cares greatly about.

"Is there a date for when this connector will be hot pluggable?"

"Not yet. The connector does not have staged pins, and although there has been talk of changing the configuration to allow for it, that particular need is low on the stack of things to do on my desk."

It may have been low on Bob's priority list, but there was through-the-roof demand by many SFF members, none of whom were the least bit shy.

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A next-generation project to the March 1993 SFF-8015 SCA Connector for Rack Mounted SFF SCSI Drives appeared the following year as SFF-8451 SCA-2 Unshielded Connector. In the September 16, 1994 meeting it was reported that SCA had taken off to the extent that it represented 30% of SCSI drive shipments and SCA-2 was expected to vault that even higher.

The guide pins for blind insertion, pre-charge for hot plugging with variable length contact pins, plus a low speed signaling protocol for cabinet services made SCA-2 the focus of industry interest.

The specifications for SFF-8045 40-pin SCA-2 Connector w/Parallel Selection and 80-pin SCA-2 Connector for SCSI Disk Drives plus SFF-8067 40-pin SCA-2 Connector w/Bidirectional ESI were companions to the SCSI Enclosure Services standard. There were even projects to provide 36V power until Dan Colegrove (IBM) put an end to both of them in January 1996.

"Following last month's discussion, I conducted a detailed survey inside IBM to learn what the most likely voltage would be for high rpm drives."

"What number did you come up with?"

"12V, 12V and 12V!"

"There is nobody who thinks a change to another voltage is necessary, and the overwhelming consensus is that there is more to lose than gain from moving away from 12V."

"Are you saying that all the work we just completed is unnecessary?"

"Well, yeah, I guess I am."

SCA-2 ended the era of cabled high performance drives, and it helped fuel the huge growth in storage cabinets. Sun's SCA was a step forward in disk packaging, and the SFF Committee developed a plug-compatible evolution which came to dominate the connectivity market.

ATAPI

When Phil Devin (Dataquest) forecast a meteoric rise in CD shipments if they only cost \$100 it lit a bonfire under OEMs and vendors. Compaq enlisted the assistance of Western Digital to investigate how to add CD drives to a system by using the second ATA connector on motherboards. The club was no secret but nobody else could participate until Compaq hosted the first open meeting for those interested in ATAPI (AT Attachment Packet Interface).

The day got off to a rough start.

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ATAPI Meeting October 20 1993

"Well, we're here."

"Now, who is the chairman?"

"I would like the answers to be in the minutes."

"What auspices are we running under?"

"I would like those answers to be in the minutes."

The last organizational issue came down to how the 'club' wanted to proceed in a public forum. John Antonchick (Mitsumi) summarized his perspective.

"I've been involved in this since the beginning, and I can tell you that about 6 months ago, all the CD-ROM vendors were independently developing specifications for IDE drives."

"Our customers told us that was not a good idea, they wanted a standard and they wanted it fast."

"About that time, WD picked up the ball and floated a draft proposal."

"We have solicited comments from all those we thought could contribute."

"Today, every OEM has told us the existing draft is acceptable, and go build drives to it as soon as possible."

"We don't need to submit anything to a standards committee, and we don't want anything to get in the way."

Rich Rutledge (Western Digital) added his thoughts.

"This effort was driven by Western Digital, to support IDE for CD-ROMs."

"The issues involved here are driven by market considerations and cost of attachment, not the standards process."

"This document is more of a procurement specification than a standard."

Steve Finch (Silicon Systems) saw a way to force a decision on where to go from here.

"I move that the ATAPI specification be submitted to X3T9."

Tom Hanan was reluctant.

"I would prefer that SFF (Small Form Factor) be the body which submits ATAPI to X3T9, and to use an SFF SSWG to reach stability."

The vote came out to an even split of 9:9:7, so the motion failed.

Dennis Pak (Apple) proposed the middle of the road solution to submit ATAPI to the SFF Committee, and it was endorsed by 19:0:8.

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ATAPI became the SFF-8020 ATA Packet Interface for CD-ROMs, and the SSWG's were a learning experience as the proprietary CD-ROM players struggled with having to correspond to the de facto requirements of the ATA market. One such was the issue of connector placement.

ATAPI SSWG November 3 1992

"Aren't we talking about something here that could be left to discretion of the manufacturer?"

Dennis Pak's response left both men shattered.

"I feel that defining relative location is not good enough. What I would really prefer is that we specify the absolute position of connectors so that they are identical between vendors."

"The connector layout has to be the same as ATA hard disks."

Ken Bush (Compaq) took a different tack.

"I don't care what is in the document about connector layout as regards what is called mandatory or optional. That's not important to me."

"What I can say is that it will be mandatory for CD-ROMs to use the same layout as hard disk if you want to sell any to Compaq."

As ATAPI moved forward, the implacable opposition of the drive vendors to the packet interface increased because of the implicit threat that OEMs such as Apple would demand disk drives that ran under ATAPI.

After CDs were integrated under the ATAPI umbrella, vendors began developing the DVD standard in the private Mt Fuji group. To provide continuity and take advantage of the wide distribution for SFF specs, this became INF-8090i ATAPI for Multimedia Devices (Mt Fuji).

STANDARDS

Almost 50 specifications have been either integrated into standards or become standards in their own right. In the early years it was necessary to integrate SFF specifications because the committee was not recognized as an 'acceptable' reference. Since being recognized, a similar number of specifications have been implicitly included in a standard by reference to the ftp site.

Only the latest revision of a specification is at the ftp site, which avoids the need to constantly keep updating references in standards. Becoming a standard does not mean an end to development, which is why the front page identifies the revision at which the specification was standardized.

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| ATA | INF-8033 | Improved ATA Timing Extensions to 16.6 MBs |
| ATA | INF-8034 | ATA High Speed Local Bus Line Termination Issues |
| ATA | INF-8035 | Self-Monitoring Analysis & Reporting Technology |
| ATA | INF-8036 | ATA Signal Integrity Issues |
| ATA | INF-8039 | Phoenix EDD (Enhanced Disk Drive) Specification |
| ATA | INF-8055 | ATA SMART Application Guide |
| ATA | SFF-8001 | 44-pin ATA (AT Attachment) Pinouts for SFF Drives |
| ATA | SFF-8002 | 68-pin ATA (AT Attachment) for SFF Drives |
| ATA | SFF-8011 | ATA Timing Extensions for Local Bus |
| ATA EDD | INF-8050 | Bootable CD-ROM |
| ATA/MMC | SFF-8020 | ATA Packet Interface for CD-ROMs |
| ATA/MMC | SFF-8028 | ATA Packet Interface for CD-ROMs - Errata to Rev 2.5 |
| ATA/MMC | SFF-8029 | ATA Packet Interface for CD-ROMs - Errata to Rev 1.2 |
| EIA-674 | SFF-8005 | 1.8 inch Form Factor Drives |
| EIA-675 | SFF-8006 | 1.3 inch Form Factor Drives |
| EIA-676 | SFF-8010 | 1.8 inch Form Factor 15mm Drives |
| EIA-676 | SFF-8111 | 1.8 inch Form Factor (60x70mm) |
| EIA-676 | SFF-8120 | 1.8 inch Form Factor (78x54mm) |
| EIA-677 | SFF-8012 | 4-Pin Power Connector Dimensions |
| EIA-700 | SFF-8441 | VHDCI 1X Shielded Connector |
| EIA-720 | SFF-8200 | 2.5 inch Form Factor Drives (all of 82xx family) |
| EIA-720 | SFF-8201 | 2.5 inch Form Factor Drive Dimensions |
| EIA-720 | SFF-8212 | 2.5 inch Form Factor Drive w/50-pin Connector |
| EIA-720 | SFF-8222 | 2.5 inch Form Factor Drive w/SCA-2 Connector |
| EIA-720 | SFF-8223 | 2.5 inch Form Factor Drive w/Serial Attached Connector |
| EIA-720 | SFF-8248 | 2.5 inch Form Factor w/Combo Connector inc USB Micro-B Receptacle |
| EIA-720 | SFF-8252 | 2.5 inch Form Factor Drive w/SFF-8784 Connector |
| EIA-740 | SFF-8300 | 3.5 inch Form Factor Drives (all of 83xx family) |
| EIA-740 | SFF-8301 | 3.5 inch Form Factor Drive Dimensions |
| EIA-740 | SFF-8302 | 3.5 inch Form Factor Cabled Connector Locations |
| EIA-740 | SFF-8323 | 3.5 inch Form Factor Drive w/Serial Attached Connector |
| EIA-740 | SFF-8337 | 3.5 inch Form Factor Drive w/SCA-2 Connector |
| EIA-740 | SFF-8348 | 3.5 inch Form Factor w/Combo Connector inc USB Micro-B Receptacle |
| EIA-741 | SFF-8500 | 5.25 inch Form Factor Drives (all of 85xx family) |
| EIA-741 | SFF-8501 | 5.25 inch Form Factor Drive Dimensions |
| EIA-741 | SFF-8508 | 5.25 inch Form Factor ATAPI CD-ROM w/Audio Connectors |
| EIA-964 | SFF-8436 | QSFP+ 4X 10 Gb/s Pluggable Transceiver |
| EIA-965 | SFF-8642 | Mini Multilane 12X 10 Gb/s Shielded Cage/Connector (CXP10) |
| EIA-966 | SFF-8482 | Serial Attachment 2X Unshielded Connector |
| EIA-967 | SFF-8486 | Serial Attachment 4X Unshielded Micro Connector |
| EIA-974 | SFF-8086 | Mini Multilane 4X 10 Gb/s Common Elements Connector |
| EIA-975 | SFF-8087 | Mini Multilane 4X Unshielded Connector Shell and Plug |
| EIA-976 | SFF-8088 | Mini Multilane 4X Shielded Connector Shell and Plug |
| JEDEC M0-29 | SFF-8156 | 54mm x 39mm Form Factor w/SATA Connector |
| SAE AS8472 | SFF-8472 | Diagnostic Monitoring Interface for Optical Transceivers |

This Special Edition has been prepared to celebrate the 25th Anniversary of the SFF Committee. Congratulations to all!