Cellular Networking Perspectives

Editor: David Crowe • Phone +1-403-289-6609 • Email crowed@cnp-wireless.com Vol. 8, No. 9 September, 1999

In This Issue...

Quote of the Month

"A CALEA solution is not like buying a software program at the office supply store where you can go home and load the program onto your computer in a few minutes. Manufacturers are having to develop solutions that must interface with hundreds of different network elements while not crashing the telecommunications network."

Matthew J. Flanigan
TIA President

FCC Rules on CALEA

The FCC has ruled on the US CALEA electronic surveillance legislation, providing a much-needed official interpretation of this controversial legislation. The FCC has recognized the status of joint TIA/ATIS standard J-STD-025, with additions, as a 'safe harbor' for the telecommunications industry, probably the first time that a network standard driven by the wireless industry has been the leading choice for the entire telecommunications industry. However, far from all of the ruling is good for the telecommunications industry.

The FCC has ordered that modifications to J-STD-025 be completed by TIA subcommittee TR-45.2 no later than March 30, 2000 and that carriers implement them by September 30, 2001. Based on extensive experience with the development of standards using the TIA process, *it can be confidently predicted that this schedule is impossible to meet.* It is anticipated that even the usually apolitical TIA standards committee TR-45 may release a statement protesting the impracticality of this schedule. It may be that the FCC worked backwards from a politically acceptable date, leaving the industry 18 months to implement the standard, and leaving the standards committees with the short end of the stick.

The FCC Report and Order allows J-STD-025 to retain two items that were under particular scrutiny:

- The identity of the cell or sector at the beginning and end of a call, and
- Packet data (either packet-identifying information only, or also including contents of the packets).

J-STD-025 will have to be modified to incorporate six out of nine of the items on the FBI's contentious 'Punch List':

- Access to all parties in multi-party calls, even those placed on hold,
- Notification of every change in a connection to a multi-party call (join, hold or drop),
- In-call dialing and other signaling from a surveillance subject,
- Notification when tones or recordings are provided during a call by the surveillance subject's system,
- Access to DTMF tones generated during a call, even when transparent to the switch providing surveillance services, and
- Timing information to correlate call data and call content.

We will be providing more details in our October issue. For a summary of the status of J-STD-025 before this ruling, and a discussion of some of the technical and political issues swirling around it, consult our July 1997 and August 1997 issues.

Next Issue: October 4, 1999

Cellular Networking Perspectives (issn 1195-3233) is published monthly by Cellular Networking Perspectives Ltd., 2636 Toronto Cresc. NW, Calgary AB, T2N 3W1, Canada.
Contact Information: Phone: 1-800-633-5514 (+1-403-274-4749) **Fax:** +1-403-289-6658 **Email:** cnpsales@cnp-wireless.com **Web:** http://www.cnp-wireless.com/.
Subscriptions: CDN$300 in Canada (incl. GST), US$300 in the USA and US$400 elsewhere. Payment by cheque, bank transfer, American Express, MasterCard or Visa.
Delivery: Email or 1st class mail. **Back Issues:** Available individually for $35 in the US and Canada and $40 elsewhere, or in bulk at reduced rates. **Discounts:** Educational and small business discount: 25% off any order. **Copies:** Each subscriber is licensed to make up to 10 copies of each issue or back issue. Please call for rates to allow more copies.

CIBER: The Inter-Carrier Billing & Settlement Standard, Part II: Rejects and Returns

Jack Hwang has worked in the telecommunications industry since 1990, being involved with industry standards since 1994. He has been actively involved with the maintenance and transformation of the CIBER record format since 1996. He works for Cap Gemini Telecommunications, based in Denver, with much of his work focused on ensuring standards compliance in new and existing systems. He can be reached at jhwang@usa.capgemini.-com. *For information about Cap Gemini, visit* www.capgemini.com.

In Part I of this article (August, 1999), the format and purpose of CIBER records was discussed. When dealing with financial information, such as billing records, it is necessary to ensure that information is thoroughly checked ('edited'), and that charges do not get lost (or duplicated) through the process of rejecting batches or individual records. It may be possible to resubmit batches or records once problems are corrected.

There are two types of rejects and returns in CIBER: Batch-level, and Record-level. As its name implies, a batch-level reject occurs when the next downstream entity cannot process the batch due to format errors or integrity issues. Similarly, a record-level reject occurs when a record fails a technical or business edit. The following sections describe some scenarios for batch-level and record-level rejects, they do not constitute a complete set.

Batch Level Rejects

Rejection by Serving Carrier Clearinghouse (Figure 1)

1. A batch of CIBER records is generated by the Serving Carrier Billing System. The batch is then sent to the Serving Carrier Clearinghouse.
2. If the batch fails a technical edit, it is returned to the Serving Carrier Billing System which may then correct the batch and resubmit it to the Serving Carrier Clearinghouse.

Rejection by Home Carrier Clearinghouse (Figure 2)

1. A batch of CIBER records is generated by the Serving Carrier Billing System and sent to the Serving Carrier Clearinghouse.
2. The Serving Carrier Clearinghouse does not find any problems with the batch and forwards it to the Home Carrier Clearinghouse.
3. If the Home Carrier Clearinghouse does find fault with the CIBER batch, then it can be rejected. Because the batch had already passed the Serving Carrier Clearinghouse edits, the fault may be a result of a transmission error. If the fault was the result of a technical error, the error should have been previously identified by the Serving Carrier Clearinghouse.
4. The problem is corrected by the Serving Carrier Clearinghouse and the CIBER batch is retransmitted to the Home Carrier Clearinghouse.

No Batch Reject Allowed from Home Carrier Billing System (Figure 3)

1. A batch of CIBER records is generated by the Serving Carrier Billing System and sent to the Serving Carrier Clearinghouse.
2. The Serving Carrier Clearinghouse does not find any problems with the batch and forwards it to the Home Carrier Clearinghouse.
3. The Home Carrier Clearinghouse also does not find any problems with the batch and forwards it to the Home Carrier Billing System.
4. The Home Carrier Billing System finds fault with the batch. Because the batch financial totals have now been logged at both clearinghouses and the batch sequence number has been incremented, the Home Carrier Billing System is not allowed to reject the batch. It can, however, reject every record in that batch.

   Typically, because a batch has already passed through two clearinghouses, the Home Carrier Billing System will not find any technical errors with the batch. The Home Carrier Billing System may, however, determine that the batch does not comply with some prearranged business agreement. All the records in that batch are then rejected.

Figure 1: Batch Rejected by *Serving* Carrier Clearinghouse

Figure 2: Batch Rejected by *Home* Carrier Clearinghouse

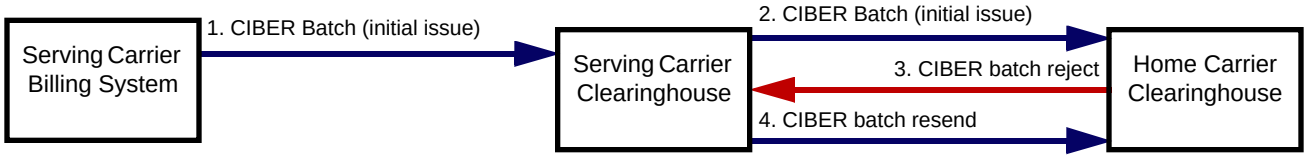
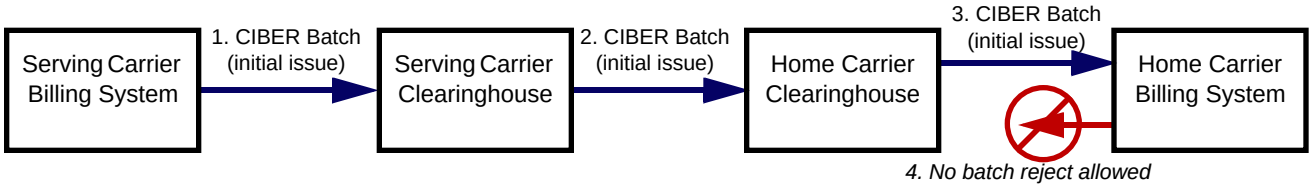


Figure 3: Batch cannot be Rejected by Home Carrier *Billing System*



Record Level Rejects

It is possible for the Home Billing System and the Home or Serving Clearinghouses to reject only selected records from a batch. When handling rejected records, the entities that are involved should make any necessary financial adjustments to maintain billing integrity specific to their own systems.

Records Rejected by Serving Carrier Clearinghouse (Figure 4)

1. A batch of CIBER records is generated by the Serving Carrier Billing System and sent to the Serving Carrier Clearinghouse.
2. The Serving Carrier Clearinghouse finds fault with some of the CIBER records. The valid records are forwarded to the Home Carrier Clearinghouse.
3. The erroneous records are batched and returned to the Serving Carrier Billing System, which should make any necessary financial adjustments to maintain billing integrity specific to its own systems.
4. The Home Carrier Clearinghouse, not finding fault with the batch of CIBER records sent from the Serving Carrier Clearinghouse, then forwards the valid batch of CIBER records to the Home Carrier Billing System.

Records Rejected by Both Serving and Home Carrier Clearinghouses (Figure 5)

1. A batch of CIBER records is generated by the Serving Carrier Billing System and sent to the Serving Carrier Clearinghouse.
2. The Serving Carrier Clearinghouse finds fault with some of the CIBER records. The valid records are forwarded to the Home Carrier Clearinghouse.
3. The erroneous records are batched and returned to the Serving Carrier Billing System. Upon receipt of the rejected records, it should make any necessary financial adjustments to maintain billing integrity specific to its own systems.
4. The Home Carrier Clearinghouse also finds fault with some of the CIBER records. The erroneous records are batched and sent back to the Serving Carrier Billing System via the Serving Carrier Clearinghouse. Upon receipt of the rejected records, the involved entities should make the necessary financial adjustments to maintain billing integrity specific to its own systems.
5. The remaining valid CIBER records are then forwarded to the Home Carrier Billing System.

Records Rejected by both Home Carrier Billing System and Both Clearinghouses (Figure 6)

1. A batch of CIBER records is generated by the Serving Carrier Billing System and sent to the Serving Carrier Clearinghouse.
2. The Serving Carrier Clearinghouse finds fault with some of the CIBER records. The valid records are forwarded to the Home Carrier Clearinghouse.
3. The erroneous records are batched and returned to the Serving Carrier Billing System. Upon receipt of the rejected records, it should make any necessary financial adjustments to

Figure 4: Some Records Rejected by *Serving* Carrier Clearinghouse

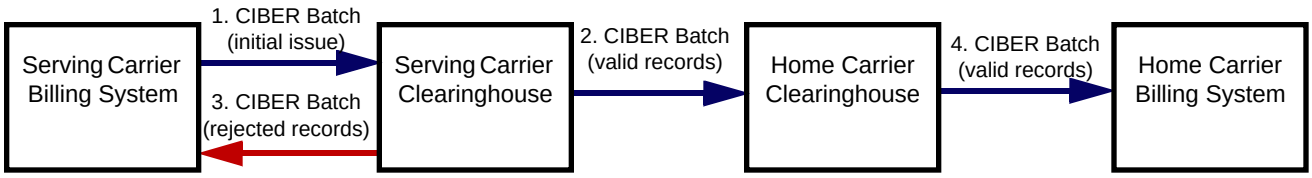


Figure 5: Some Records Rejected by both *Serving* and *Home* Carrier Clearinghouse

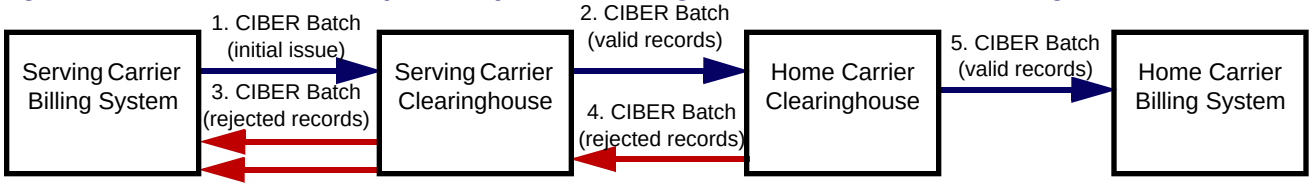
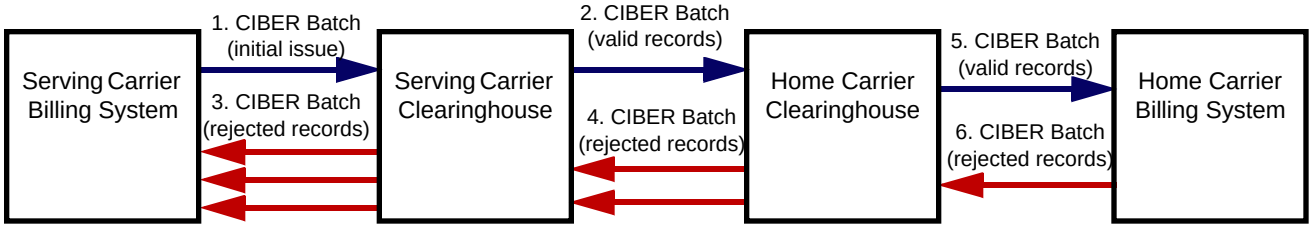


Figure 6: Records Rejected by Home Carrier Billing System and by both Serving and Home Carrier Clearinghouses



maintain billing integrity specific to its own systems.

4. The Home Carrier Clearinghouse finds fault with some of the CIBER records. The erroneous records are batched and sent back to the Serving Carrier Billing System via the Serving Carrier Clearinghouse. Upon receipt of the rejected records, the involved entities should make any necessary financial adjustments to maintain the billing integrity specific to its own systems.
5. The remaining valid CIBER records are then forwarded to the Home Carrier Billing System.
6. The Home Carrier Billing System finds fault with some of the CIBER records. For example, some of the records were dated prior to the effective date of a roaming agreement. The valid records are processed in the Home Carrier Billing System for end user billing. The erroneous records are batched and sent to the Serving Carrier Billing System via the Home and Serving Carrier Clearinghouses. Upon receipt of the rejected records, the involved entities should make any necessary financial adjustments to maintain billing integrity specific to its own systems.

Summary

The CIBER record is the most mature industry accepted intercarrier billing standard in the world. The maturity is evident in the detailed specifications of the edits, processes, and procedures for submitting and rejecting records.

Although mature, the CIBER record went through some significant changes in the last year to support industry trends and business needs. The X2 records are the results of these changes.

Realizing that there are significant industry changes on the horizon, CIBERNET is working with a group of industry experts to determine the necessary changes to support the next generation of intercarrier billing. This meeting took place in July, 1999. A discussion paper will be created soliciting comments on the proposed changes and asking for recommendations for additional changes.

Once the changes have been identified and agreed upon, the results of these changes will be incorporated into the CIBER record specifications and designated as version 3.0. Not knowing the extent of the changes, a date has not been set for the release of CIBER 3.0.

TIA TR-45.3 TDMA Digital Air Interface Standards

Cellular Networking Perspectives

Editor: David Crowe • Phone +1-403-289-6609 • Email crowed@cnp-wireless.com ***Last published March, 1999***

First Generation - IS-54

TIA Standard	ANSI	Description	Status
IS-54-B	TIA/EIA-627	Original TDMA Dual-Mode Air Interface Standard	ANSI pub. 06/96
	TIA/EIA-627-1	Addendum to TIA/EIA-627	Published 04/98
IS-55	TIA/EIA-628	TDMA mobile station minimum performance standards	ANSI pub. 06/96
IS-56	TIA/EIA-629	TDMA base station minimum performance standards	ANSI pub. 06/96
IS-85	TIA/EIA-635	TDMA full-rate voice coder (3:1)	ANSI pub. 06/96
TSB-46		Verification of Authentication for IS-54-B Mobiles (replaced by IS-137-A)	Published 03/93
TSB-47		IS-54 Implementation Issues (replaced by TIA/EIA-627)	Published 05/94
TSB-50		User Interface for Authentication Key Entry	Published 03/93

Second Generation - IS-136 Revision 0 (Digital Control Channel)

TIA Standard	Description	Status
IS-130-0	Data services radio link protocol	Published 04/95
IS-135-0	Asynchronous data and fax services	Published 04/95
IS-136.1 Rev. 0	Digital Control Channel (DCCH)	Published 12/94
IS-136.1-1	Addendum to IS-136.1 Rev. 0 (DCCH)	Published 12/94
IS-136.2 Rev. 0	FSK control channel, analog voice channel, TDMA traffic channel	Published 12/94
IS-136.2-1	Addendum to IS-136.2 Rev. 0 (Analog voice channel and FSK control channel)	Published 12/94
IS-137-0	TDMA/analog mobile minimum performance standards	Published 12/94
IS-138-0	TDMA/analog base station minimum performance standards	Published 12/94

Third Generation - IS-136 Revision A (ACELP Voice Coder)

TIA Standard	Description	Status
IS-130-A	Radio Link Protocol 1 (data services)	Published 07/97
IS-136.1-A	Enhanced digital control channel (9-1-1, OTA, Calling Name ID, One–button Callback, Private Networks (enhanced), PACA)	Published 10/96
IS-136.1-A-1, -2	IS-136 Rev. A, addendums 1 and 2: section 1 corrections (DCCH)	Pub. 11/96, 12/97
IS-136.2-A	FSK control channel, analog voice channel, TDMA traffic channel	Published 10/96
IS-136.2-A-2	IS-136 Rev. A, second addendum: section 2 corrections	Published 12/97
IS-137-A	Mobile minimum performance standards for IS-136-A	Published 07/96
IS-137-A-1	Revised transmission tests for IS-137-A	Published 08/97
IS-138-A	Base station minimum performance standards for IS-136-A	Published 07/96
IS-641-A	Enhanced full-rate voice coder (ACELP)	Published 05/96
IS-684	Radio Link Protocol 2 (for STU-III)	Published 07/96
IS-686	Enhanced full rate voice coder (ACELP) performance standards	Published 12/96
IS-727	Discontinuous transmission (DTX) with ACELP (IS-641) voice coder, including generation of comfort noise	Published 07/98
TSB-73	IS-136 Rev. 0/Rev. A compatibility issues	Published 07/96
TSB-77	IS-641 implementation issues	Published 12/96
TSB-105	**Audit order clarification**	**03/99**
TSB-108	**Determining when R-DATA is encrypted**	**03/99**

Fourth Generation - TIA/EIA-136 Revision 0

TIA Standard	Description	Status
TIA/EIA-136-000	Introduction and list of document parts	**All parts published 03/99**
TIA/EIA-136-010	Optional mobile station facilities	
TIA/EIA-136-020	SOC, BSMC and carrier specific HLPI assignments	
TIA/EIA-136-100	Introduction to channels	
TIA/EIA-136-110	RF channel assignments	
TIA/EIA-136-12x	Digital control channel (DCCH) layer 1 (136-121), 2 (136-122) and 3 (136-123)	
TIA/EIA-136-13x	Digital traffic channel (DTC) layer 1 (136-131), 2 (136-132) and 3 (136-133)	
TIA/EIA-136-140	Analog control channel	
TIA/EIA-136-150	Analog voice channel	
TIA/EIA-136-210	ACELP voice coder minimum performance requirements	
TIA/EIA-136-220	VSELP voice coder minimum performance requirements	
TIA/EIA-136-2x0	Mobile station (136-270) and base station (136-280) minimum performance requirements	
TIA/EIA-136-420	VSELP voice coder	
TIA/EIA-136-510	Authentication and encryption of signaling information, user data and voice	
TIA/EIA-136-511	List of messages subject to encryption	
TIA/EIA-136-7xx	Short Message Service: Introduction to teleservices (136-700), text/numeric messaging (136-710), Over-the-Air Activation (OATS, 136-720) and Over-the-Air Programming to support intelligent roaming (OPTS, 136-730)	
TIA/EIA-136-910	Informative information	

Fifth Generation - TIA/EIA-136 Revision A

TIA Standard	Description	Status
SP-4027-000-A	Introduction, list of document parts, and revision marker	**ANSI ballot for all parts was completed May 1999. Following resolution of a default ballot in August 1999, it is expected that publication will be recommended in September 1999.**
SP-4027-005-1	Introduction, identification and semipermanent memory	
SP-4027-010-A	Optional mobile station facilities	
SP-4027-020-A	SOC, BSMC and other code assignments	
SP-4027-100-A	Introduction to channels	
SP-4027-121-A	Digital control channel (DCCH) layers 1 (121-A), 2 (122-A) and 3 (123-A-1)	
SP-4027-131-A-1	Digital traffic channel (DTC) layer 1	
SP-4027-133-A-1	DTC layer 3	
SP-4027-140-A-1	Analog control channel	
SP-4027-150-A	Analog voice channel	
SP-4027-2x0-A-1	Mobile station (270-A-1) and base station (280-A-1) minimum performance requirements	
SP-4027-310-1	Radio link protocol 1 (for data services)	
SP-4027-350-1	Data services control	
SP-4027-410-1	ACELP voice coder	
SP-4027-430	US1 voice coder (GSM compatible)	
SP-4027-510-A	Authentication and encryption of signaling information, user data and voice	
SP-4027-511-A	List of messages subject to encryption	
SP-4027-620-1	Teleservice allowing segmentation and reassembly (TSAR)	
SP-4027-630	Broadcast short message teleservice transport (BATS)	
SP-4027-700-A	Introduction to teleservices	
SP-4027-710-A	Short message service (text/numeric messaging teleservice)	
SP-4027-720-A-1	Over-the-Air Activation teleservice (OATS)	
SP-4027-730-1	Over-the-Air Programming teleservice to support intelligent roaming (OPTS)	
SP-4027-750	General UDP transport service (GUTS)	
SP-4027-910-A	Informative information	

Sixth Generation - TIA/EIA-136 Revision B - UWC-136 - ITU-R 3G Specification

TIA Standard	Description	Status
SP-4027-000-B	Introduction, list of document parts, and revision marker	
SP-4027-005-A	Introduction, identification and semipermanent memory	
SP-4027-010-B	Optional mobile station facilities	
SP-4027-020-B	**System Operator Code (SOC), Base Station Manufacturer Codes (BSMC), etc.**	
SP-4027-100-B	**Introduction to channels.**	
SP-4027-110-A	**RF channel assignments**	
SP-4027-122-B	DCCH layer 2	
SP-4027-123-B	DCCH layer 3	
SP-4027-131-B	Digital traffic channel (DTC) layers 1 (-131-B), 2 (-132-A) and 3 (-133-B)	
SP-4027-140-B	**Analog (FSK) control channel**	
SP-4027-150-B	**Analog voice channel**	
SP-4027-210	**ACELP voice coder minimum performance (formerly IS-686)**	
SP-4027-220	**VSELP voice coder minimum performance (formerly IS-85)**	
SP-4027-230	Minimum performance requirements for US1 voice coder (GSM)	
SP-4027-270-B	Mobile station minimum performance requirements	
SP-4027-280-B	Base station minimum performance requirements	
SP-4027-290	**RF minimum performance for 200 kHz and 1.6MHz bearers**	
SP-4027-310-A	**Radio Link Protocol - 1 (user data)**	
SP-4027-320	**Radio Link Protocol - 2 (STU-III encrypted voice). Formerly IS-684.**	
SP-4027-330	Packet data service - overview	**Development is in progress, with ANSI ballot anticipated by the 4th Quarter of 1999.**
SP-4027-331	Packet data service - physical layer	
SP-4027-332	Packet data service - medium access control (MAC)	
SP-4027-333	Packet data service - logical link control. Based on GSM 04.64.	
SP-4027-334	Packet data service - subnetwork dependent convergence protocol. Based on GSM 04.65.	
SP-4027-335	Packet data service - radio resource management	
SP-4027-336	Packet data service - mobility management	
SP-4027-337	Packet data service - tunneling of signaling messages. Subset of GSM 09.18.	
SP-4027-34x	**Outdoor high-speed packet data service - Overview (-340), Physical layer (-341) and Medium access layer (-342)**	
SP-4027-350-A	**Data service control**	
SP-4027-36x	**Indoor high-speed packet data service - Overview (-360), Physical layer (-361) and Medium access layer (-362)**	
SP-4027-420-A	**VSELP voice coder**	
SP-4027-510-B	Authentication, and encryption of signaling information, user data and voice	
SP-4027-511-A	**Messages subjection to encryption**	
SP-4027-610	**R-DATA/SMDPP Transport**	
SP-4027-7xx	Teleservices: Introduction (-700-B), **Over-the-Air activation teleservice (OATS, -720-B),** Over-the-Air Programming Teleservice (OPTS, -730-A), **Broadcast Short Messages (-740) and** Charge-rate indication teleservice (CIT, -760)	
SP-4027-900	**Introduction to Annexes and Appendixes**	
SP-4027-905	**Normative Information**	
SP-4027-910-B	**Informative Information**	
SP-4027-932	Packet data services - Stage 2 descriptions	
SP-4027-933	Packet data services - Description of MAC layer	
SP-4027-940	**Capacity and Performance Characteeristics of UWC-136 (TIA/EIA-136-B)**	

Note: 1. IS- TIA Interim Standard, TSB- TIA Telecommunications Systems Bulletin, PN- TIA Project Number, SP- ANSI Standards Proposal. Parts ending in "-A" or "-B" have been revised, and those ending in "-1" have had to be reballoted once.

2. **Bold Type** indicates a modification since the previous publication of this information.

3. Published TIA standards can be purchased from Global Engineering Documents (800-854-7179, http://global.ihs.com).

Thanks to Peter Nurse (Chairman of TR-45.3) and Al Sacuta (Next Generation) for their assistance compiling the information in this table.