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Issue 1
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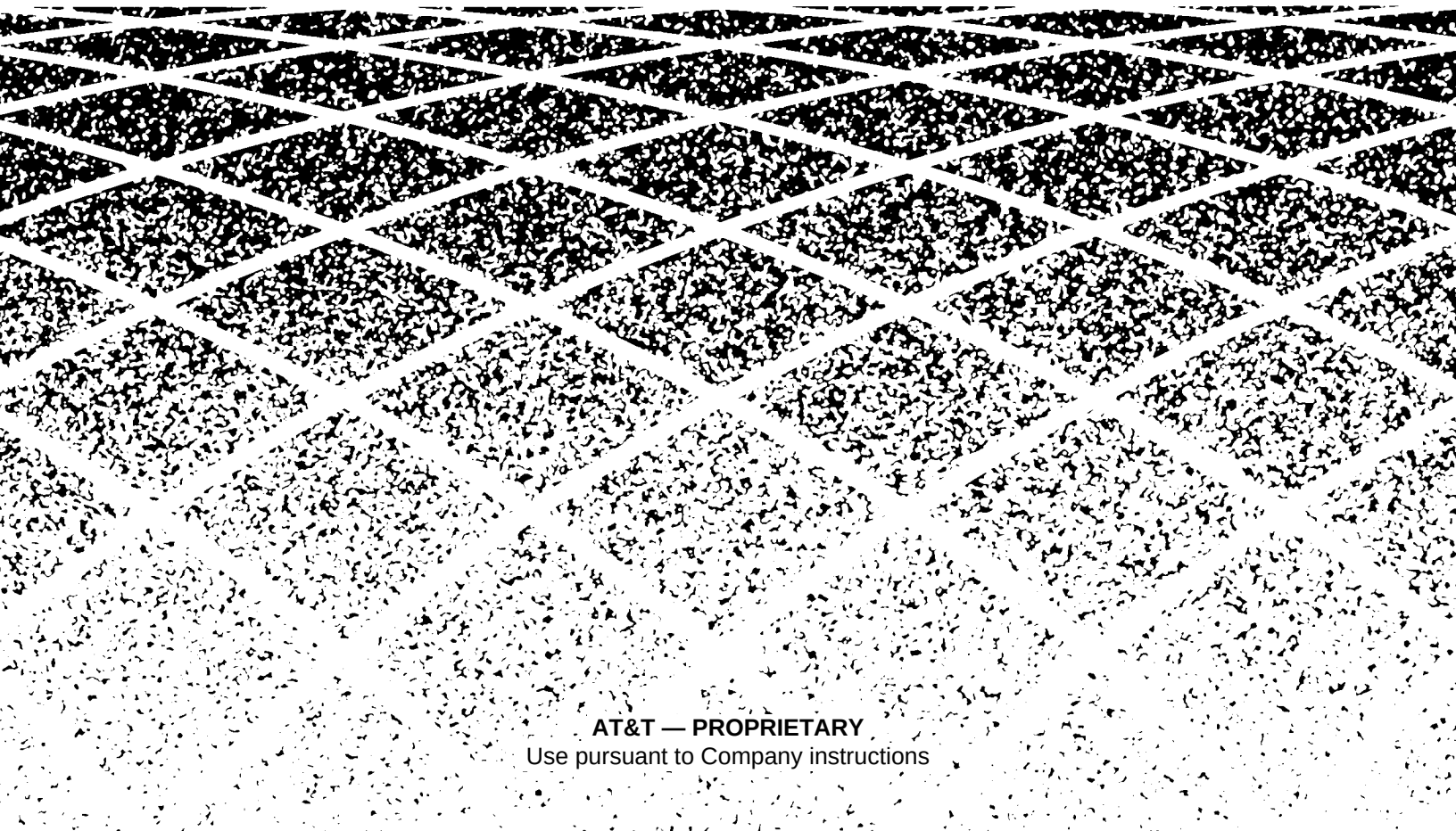
4ESS™ SWITCH

Product Release Document 4E21
Release 1 Generic



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About This Document

1. Purpose

1.01 The purpose of the Product Release Document (PRD) is to provide customers with information pertaining to the new features that are introduced in the *4ESS*™ switch. A PRD is written to cover the features introduced in full generic releases and quarterly generic releases. This particular PRD provides information pertaining to the new features included in the 4E21 Release 1 Generic.

2. Scope

2.01 The Product Release Document provides customers with information not covered in other *4ESS* switch documentation. It is not a replacement for other documentation such as Standard AT&T Practices, Task Oriented Practices (TOP), Maintenance Reference Handbooks, etc., that support the *4ESS* switch. The information in this document is intended only for the introduction of the new 4E21 Release 1 features, not the long-term maintenance. Since other documentation is used for the operation and maintenance of features after their introduction into the *4ESS* switch, this PRD will not be reissued.

3. Intended Audience

3.01 This document is intended for people involved in testing, provisioning, maintenance, administration, and technical support of the *4ESS* switch. Feature managers, Integrated Test Network (ITN) personnel, field support, Technical Control

Center (TCC), Product Engineering Control Center (PECC), and National Electronic Switching Assistance Center (NESAC) personnel are examples of some of the people who will use the PRD.

4. How to Use This Document

4.01 The 4E21 Release 1 Generic contains 22 new features. Each chapter in this document provides information about these features. The chapters are in numerical order according to feature number. The chapter titles are also the feature names.

4.02 The following is a list of the chapters contained in this document with a brief description of the feature covered in that chapter:

Chapter 1: *D-Channel Node Audits Feature (356l)*

This feature provides an audit mechanism consisting of 5 audits for the D-Channel Node (DCN) internal data structures. It also modifies some data structures to help increase the reliability of the DCN.

Chapter 2: *D-Channel Node Backup Flow Control Feature (384e)*

This internal *4ESS* switch feature allows active Q.931 calls to be backed up to the standby D-Channel without affecting the existing circuit-switched calls.

Chapter 3: *Message Transfer Part Restart Feature (400)*

This feature enables a Signal Transfer Point (STP) that has been unavailable to stabilize routing before it starts handling traffic again.

The feature only applies to *4ESS* switches used in Local Exchange Carrier (LEC) networks.

Chapter 4: *15 Digit International Numbering Plan (LEC) Feature (402)*

This LEC-only feature increases the number of digits supported at a LEC *4ESS* access tandem switch for an international telephone number from 12 to 15 digits.

Chapter 5: *Increase in GULP Buffer Size Feature (414a)*

In the 4E20 Release 1 Generic, the size of the Generic Utility Program (GULP) buffer was increased from 512 words to 1024 words. This feature increases the GULP buffer size from 1024 words to 2048 words.

Chapter 6: *Trunk Group Control of Signaling Bits Feature (430)*

This LEC feature provides a way for users of a *4ESS* access tandem switch to control the state of unused signaling bits on a

T1 trunk. Use of this feature can prevent false supervisory information from being passed on to a connecting switch.

Chapter 7: *LEC Toll-Free Treatment for NPA 888 Feature (432)*

This feature provides the means for using two additional SAC (Service Access Code) codes, 888 and 877, for 800 number services. The switch will collect, interpret, query, and route using the new SAC codes for the purpose of toll-free services. Deployment of the new 888 SAC will officially begin on April 1, 1996.

Chapter 8: *Netminder Network Traffic Management Support of Alternate Only Overflow Reroute Feature (435)*

A block existed in the *4ESS* switch that prevented an alternate only overflow reroute request received through the Netminder Network Traffic Management interface. This feature gives the craft the capability to apply regular (overflow) reroute controls to alternate (ALT) only traffic.

Chapter 9: *AIN Dialed Number Trigger (DNT) Expansion Feature (442)*

This LEC feature increases the number of 10-digit Advanced Intelligent Network (AIN) Dialed Number Triggers (DNTs) supported on the *4ESS* switch. Prior to this feature, the maximum number of 3 through 10-digit DNTs supported by the *4ESS* switch was 8,191. This feature provides an additional 262,000 10-digit DNTs.

Chapter 10: *15-Digit International Numbering Plan Feature (3133)*

This feature increases the number of digits supported at a *4ESS* toll switch for an international telephone number from 12 to 15 digits.

Chapter 11: *Program Store Expansion Feature (3333a)*

The Program Store Expansion feature expands the Extended Store (XS) and Program Store of the 1B Processor. This expansion is critical because of the increase in data storage needed due to the deployment of Automatic Number Identification (ANI) and call-monitor services.

Chapter 12: *1B Processor Extended Store (XS) Implementation Feature (3355)*

This feature provides Phase 2 of a two part program to expand the Call Store (CS) memory in the 1B Processor. Phase 1 was introduced with Feature 3355a, 1B Processor Extended Store (XS), in 4E20 Release 1. Feature 3355a (when activated by this feature) expands the CS memory spectrum so that a fully equipped XS memory system can provide up to 15 Mw of additional duplicated CS Bus (CSB)-based memory.

Chapter 13: *High Speed A/E Links (HSAL) Feature (3599)*

The HSAL feature replaces the 56-kbps signaling links that the *4ESS* switch uses to access the CCS7 signaling network with 1.544-Mbps signaling links.

Chapter 14: *Universal Subscriber Data Structure (USDS) Feature (3964)*

The USDS feature provides a data structure for processing calls consistently at the Originating AT&T Switch (OAS) regardless of the network point of entry. The feature has two functions—the Shared Directory Function and Query Processing Function. The feature supports Customer Long Distance Custom Services, Select/Collect, Call Complete International, Call Organizer/Language Added, True Voice ANI/PCC, and Network Access Interruption.

Chapter 15: *Signaling Link Selection (SLS) Load Balancing Feature (3967)*

This feature ensures that the selection of CCS7 signaling links will remain evenly balanced when links are placed in service either through changeback or initial provisioning.

Chapter 16: *Type of Digital Interface Unit (TDIU) Redefinition Feature (4099)*

This feature restructures the TDIU assignment scheme. The restructuring allows the type of hardware to be separated from the type of service or function and provides for individual programming of each Digital Signal 1 (DS1) interface.

Chapter 17: *Automatic Number Identification Trigger Table Expansion, Phase 2 Feature (4206)*

This feature allows the ANI Trigger Tables to be relocated from the 1B Processor main CS to the 1B Windowed Call Store (WCS) in selected *4ESS* switches.

Chapter 18: *Software Defined Network-Network Remote Access Using Automatic Speech Recognition Feature (4557)*

This feature enhances the existing Software Defined Network–Network Remote Access (SDN—NRA) feature. Using this feature, callers are allowed to complete a telephone call by speaking into the handset. The capability to enter digits using a touch-tone key pad already exists.

The Automatic Speech Recognition (ASR) capability is supported only by *4ESS* switches equipped with the AT&T Trigger Platform.

Chapter 19: *Post Answer Call Redirection (PACR)-to-POTS Billing Fix Feature (4721)*

The PACR-to-POTS Billing Fix feature fixes Automatic Message Accounting (AMA) recording so that customers can be properly billed for calls that are redirected to POTS numbers.

Chapter 20: *Check Application Call Status Feature (4779)*

The Check Application Call Status feature enhances the signaling communications between an OAS and a 2DSD NCP for Inbound Service features such as Alternate Termination Sequence (ATS) and features that support queuing.

Chapter 21: *RCAS RC Activity Indicator Feature (4995)*

This feature causes the lighting of an indicator labeled "RC ACTIVITY" on the Master Control Complex when recent change activity is taking place.

Chapter 22: *Single Entry MRTT Counts (SEMC) Feature (5000)*

This feature changes the value of the Egress Switch Indicator (ESI) sent in the case of a single Destination Switch Number (DSN) entry Multiple Routing Treatment Table (MRTT) at the OAS to 0, indicating a single Terminating AT&T Switch (TAS).

4.03 A list of abbreviations and acronyms, and their definitions, is included at the end of this document.

5. Product Safety Labels

5.01 There are three types of safety labels used in AT&T documentation: DANGER, WARNING, and CAUTION. This document contains safety labels in the form of CAUTIONS. A CAUTION safety label indicates the presence of a hazard that will or can cause minor personal injury or property damage if the hazard is not avoided.

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D-Channel Node Audits Feature (356l)

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D-Channel Node Audits Feature (356l)

1

1. Feature Description

1.01 This feature provides an audit mechanism consisting of 5 audits for the D-Channel Node (DCN) internal data structures. It also modifies some data structures to help increase the reliability of the DCN.

1.02 The DCN internal data structures have been subject to corruption for unknown reasons, which has caused difficulty in correcting problems in field offices. Prior to this feature, the DCN did not run audits on its internal structures.

1.03 The audit mechanism provided by this feature will execute an audit to detect problems within the DCN's internal data. If a problem is detected, an appropriate error message will be produced, and recovery action will be taken. The audits run in Routine, Manual, and Software mode. Routine audits run every 5 minutes to check the sanity of the DCN data structures. Audits can be run in the Manual mode via input command from the AT&T 3B Processor MCRT terminal. Audits can run in the Software mode when the DCN software detects a problem.

1.04 The DCN Routine and Software mode audits will provide an alert when any DCN data inconsistencies occur. The DCN Manual mode audits also provide a way of immediately gathering information about DCN internal data.

1.05 The following areas are impacted by the DCN audits:

- Audit Commands—New input commands are available to run an audit in Manual mode, stop a currently active audit, inhibit (disable audits and prevent the disable audits from being routinely dispatched) or allow (routinely execute audits that were previously inhibited) an audit and to report the status of an audit.

- DCN Agent Process(DCNAP)—A new process that is used to send messages to the DCN, send acknowledgements, and for receiving audit final reports and error reports from the DCN for printing on the 3B Processor Receive Only Printer (ROP).
- DCN—A new Real Time Executive (RTX) process will be used to implement the audit mechanism provided by this feature. The audits process will have a lower priority than the Message Handler process in use prior to this feature, and will run on spare cycles from the Message Handler.

The audits can be inhibited via an input command.

1.06 Feature 356l is an internal feature that is proprietary to AT&T.

New Audit Commands

1.07 The following new audit commands were created to support this feature:

- AUD:DCNAUD—Used to execute audits in the Manual mode.
- STOP:DCNAUD—Used to stop currently active audits.
- ALW:DCNAUD—Used to allow audits.
- INH:DCNAUD—Used to inhibit audits.
- OP:DCNAUD—Used to report the status of audits.
- OP:DCNAUDERR—Used to report the error counts and the number of times the audits have been scheduled for a particular DCN.

1.08 The messages can be entered to parse the input commands and send an RTR message to DCNAP. The DCNAP will then send that information to the DCN and also send an acknowledgement to the sender.

1.09 The specific input commands are as follows:

- AUD:DCNAUD a;LNb c!
- STOP:DCNAUD a;LNb c!

  where a = audit number, b = DCN group number, and c = DCN member number.
- ALW:DCNAUD {ALL | a};{LNb c | ALL}!
- INH:DCNAUD {ALL | a};{LNb c | ALL}!

- OP:DCNAUD {ALL | a}; LNb c!
- OP:DCNAUDERR {ALL| a};LNb c!

where ALL = all audits, a = audit member number, b = DCN group number, c = DCN member number, and ALL = all DCN.

Audit Process

1.10 The audit process provided by this feature supports the following modes (listed in descending order of priority):

- Manual—Allows audits to be invoked by entered input commands.
- Software—Allows DCN application software to request audits.
- Routine—Provides execution of an audit at a given time.

1.11 Because the audit process runs with lower priority than the Message Handler process, it has time to run when the Message Handler process is idle. The audit process is responsible for receiving audit commands in the form of IMS messages from DCNAP (Manual mode request), in the form of RTX messages from the Message Handler process on the node (Software mode request), and in the form of timer-expiration event every 5 minutes (Routine mode request). It is also responsible for execution of the received audit messages (STOP, OP, and INHIBIT or ALLOW), for sending audit reports via an IMS message to DCNAP, and for sending an RTX message to the Message Handler process to perform certain recovery actions.

1.12 The Message Handler process sends an RTX message to the audit process to request an audit in the Software mode and to receive an RTX message from the audit process to perform some audit recovery actions, if needed.

New Audits

1.13 This feature provides the following Routine/Manual/Software audits for the DCN's data structures:

- Data Block List Audit—Verifies that the idle Data Blocks on the list are linked correctly, that only idle Data Blocks are linked on the list, and that all idle Data Blocks are on the Idle Data Block List.
- Active Data Blocks Audit—Verifies that the link, CHID and CRV fields in the active Data Blocks are valid. It also accesses the CHID Table and the CRV Table (User or Network) to verify that the contents of the tables are consistent with the contents of the active Data Blocks.

- Channel ID Table Audit—Parses through the entries of the non-idle Channel ID Table to verify that the CRVs contained in the table are valid. Then, this audit goes to the appropriate CRV Table (User or Network) to access the Data Block associated with the current link and CHID (the indices of the CHID Table). If it can access the Data Block, this audit will verify that the link, CHID, and CRV entries in the Data Block correspond to those used to find the Data Block. This audit will also verify that the Channel Type in the Data Block is not D-Channel, because those channels should not have a CHID Table entry.
- User CRV Table Audit—Parses through all non-idle entries in the User CRV Table and verifies that they contain valid pointers to Data Blocks. This audit also verifies that the link and CRV fields in the Data Blocks are consistent with the indices used to gain access into the CRV Table.
- Network CRV Table Audit—Parses through all non-idle entries in the Network CRV Table and verifies that they contain valid pointers to Data Blocks. This audit also verifies that the link and CRV fields in the Data Blocks are consistent with the indices used to gain access into the CRV Table.

2. Call Flow (Not Affected)

3. Provisioning (Not Affected)

4. Recording (Not Affected)

5. Network Management (Not Affected)

6. Maintenance/Troubleshooting (Not Affected)

7. Transition Considerations

Ubiquity

7.01 It is not necessary for all *4ESS* switches in the network to be running the 4E21 Release 1 Generic for this feature to be operational.

Turn On/Turn Off Mechanism

7.02 This feature is turned on automatically by software deployment.

8. Input/Output Manual Pages

8.01 The input and output manual pages that support this feature are listed in Tables 1-A and 1-B.

Table 1-A. Input Manual Pages

Message	New/ Modified	Description
AUD:DCNAUD	New	Audits the DCN internal data.
IHN:DCNAUD	New	Inhibits the routine and software execution of one or more audits for a particular DCN or for all DCNs. Entering the INH:DCNAUD command sets one or more DCN audits in the inhibited state, which can be removed only by entering an ALW:DCNAUD input message.
ALW:DCNAUD	New	Allows the routine and software execution of one or more audits for a particular DCN or for all DCNs which were previously inhibited. Enering the ALW:DCNAUD command clears one or more DCN audits in the inhibited state.
OP:DCNAUD	New	Reports the status of DCN audits.
OP:DCNAUDERR	New	Reports the error counts of one or more audits and the number of times the audits have been scheduled for a particular DCN.
STOP:DCNAUD	New	Stops a currently active DCN audit.

Table 1-B. Output Manual Pages

Message	New/ Modified	Description
AUD DCNAUD	New	Reports the termination status of the DCN application audit and/or of any errors found.
STOP DCNAUD	New	Reports the termination status of the STOP:DCNAUD input message.
INH DCNAUD	New	Reports the termination status of the INH:DCNAUD input message.
ALW DCNAUD	New	Reports the termination status of the ALW:DCNAUD input message.
OP DCNAUD	New	Reports the termination status of the OP:DCNAUD input message.
OP DCNAUDERR	New	Reports the termination status of the OP:DCNAUDERR input message.
REPT DCNAUDSTAT	New	If DCN audit is inhibited in routine and software mode, DCN sends status report every 15 minutes.
REPT DCNAP	New	Reports up to 13 failure conditions.
REPT DCHAN	Modified	Reports that a DCHAN node has become active or reports DCHAN defensive check failures.

D-Channel Node Backup Flow Control Feature (384e)

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D-Channel Node Backup Flow Control Feature (384e)

2

1. Feature Description

1.01 The D-Channel Node Backup Flow Control Feature is an internal *4ESS*™ switch feature for the 4E21 Release 1 Generic. This feature provides a throttle mechanism to prevent overloading the mate node from bursty backup call information through handshaking between the active node and the mate node. It allows the sender to monitor the mate node's status and congestion level. The sender uses this information to start or stop transmitting backup information and to filter per-call information for backup at the onset of congestion at the mate node.

1.02 The D-Channel backup capability allows active Q.931 calls to be backed up to the standby D-Channel. The backup provides an automatic switch over to the standby link without affecting the existing circuit-switched calls. Since the switch over may take place asynchronously, the mate node is kept current of the call information from the active node in a real-time basis. The active node sends the call information to the mate node when the sending buffer fills up or when the 8-second timer fires.

1.03 The active node is the D-Channel Node that terminates the active link. The mate node is the D-Channel Node that terminates the standby link. Prior to the D-Channel Node Backup Flow Control Feature, there was no guarantee that messages arrived at the mate's D-Channel Node. There was no throttling mechanism to guard against bursty messages arriving from multiple active nodes to a single mate node. The active node was blindly sending the call information even though the mate node was out of service. The lack of synchronization between the two nodes attributed to the corruption of call blocks.

2. Call Flow (Not Affected)

3. Provisioning (Not Affected)

4. Recording (Not Affected)

5. Network Management (Not Affected)

6. Maintenance/Troubleshooting (Not Affected)

7. Transition Considerations

Ubiquity

7.01 It is not necessary for all *4ESS* switches in the network to be running the 4E21 Release 1 Generic for this feature to be fully operational. However, both the active node and the mate node should be running the 4E21 Release 1 Generic.

Turn On/Turn Off Mechanism

7.02 This feature is turned on automatically by software deployment.

8. Input/Output Manual Pages (Not Affected)

Message Transfer Part Restart Feature (400)

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Message Transfer Part Restart Feature (400)

3

1. Feature Description

1.01 The Message Transfer Part (MTP) Restart feature allows a previously unavailable Signal Transfer Point (STP) that has just become available to bring sufficient links into the available state. An STP is considered unavailable when all of the connected signaling routes cannot transmit or receive signaling traffic. This feature applies only to Local Exchange Carrier (LEC) networks served by *4ESS*™ switches.

1.02 The procedure allows the restarting STP to stabilize routing before user traffic is restarted to the point. The MPT Restart procedures are not only performed at a restarting signaling point, but also at adjacent signaling points.

1.03 When a Signaling End Point (SEP) is first accessed, it contains incorrect routing data because of network failures that occurred during the unavailable period. The information to update the SEP routing tables for prohibited and restricted routes is provided by the adjacent STPs.

1.04 The following two messages are used as part of the MTP Restart procedure:

- Traffic Restart Allowed (TRA)
- Traffic Restart Waiting (TRW).

1.05 The TRA message indicates that user traffic can be resumed to the originator of the message. The TRW message indicates that user traffic should not be sent to the originator until a TRA message is received from the originator.

2. Call Flow (Not Affected)

3. Provisioning

Structures Affected

A. OD4OPT

3.01 A new 1-bit item (**OD4OPTMTPRES**) is being added to OD4OPT. This item indicates whether or not the feature is turned on. **OD4OPTMTPRES** is populated from the new field **MTPRES** on Office Data Assembly (ODA) Form T2. Valid entries are listed in Table 3-A.

Table 3-A. MTPRES Population Rules (ODA Form T2)

Value	Compool Symbol	State Value	Description
N	4ODOPT_NO	1	MTP Restart feature is off
Y	4ODOPT_YES	0	MTP Restart feature is on

B. AT&T Customer Interface Translations

3.02 The new 1-bit item **XL4MTPRES_ACT** is being defined in word 5115 (4XL_ACT) of AT&T Customer Interface (ACI) translations. This item indicates whether the feature is turned on or off. This bit is accessed via the 3B Data Management System (DMS).

3.03 **XL4MTPRES** is populated from the MTPRES field on ODA Form T2. See Table 3-A for the valid entries.

NOTE:
Since this is a LEC only feature, the bit can only be set in LEC office ODAs.

Protocol Timers and Parameters

3.04 Three recent changeable timers are used in conjunction with the MTP Restart feature. These timers, along with their associated values, are listed in Table 3-B. These timers may be modified using the DMS timers page (Figure 3-1).

Table 3-B. Recent Changeable Timers (Per Office)

Timer	Description	Provisional Value (In Seconds)	Minimum Range (In Seconds)
T25	Timer at SEP (adjacent to restarting STP) waiting for TRA message	32	0—60
T28	Timer at SEP (adjacent to restarting STP) waiting for TRW message	5	0—60
T29	Timer when either TRA sent in response to expected TRA/TRW or when no TRA received after traffic is restarted	62	30—90

4. Recording (Not Affected)

5. Network Management (Not Affected)

6. Maintenance/Troubleshooting

Measurements

6.01 The 2STP maintains an hourly count of the number of MTP Restarts initiated.

Audits

6.02 Two new AT&T 3B20D computer audits affect the MTP Restart feature:

- NIDATA1—This is an internal audit for the MTP Restart feature.
- NIDATA10—This is an internal audit for timers T25, T28, and T29 (Figure 3-1). This audit also includes updates for timers T22, T23, T24, T26, T27, and T30.

```
****** CNI DATA MANAGEMENT SYSTEM ****** DATE: 05/19/95 TIME: 13:30 ******
FUNCTION : timers    ACTION: ver                OFFICE: NPVLIL01MS1

              PROTOCOL TIMERS AND PARAMETERS

                     LINKID   ccs7

                     TIMER    office

T8    0800        UPDATE(y/n) yes      T10    30         UPDATE(y/n) yes
T11   30          UPDATE(y/n) yes      T16    1400       UPDATE(y/n) yes
T18   30          UPDATE(y/n) yes      T20    12000      UPDATE(y/n) yes
T21   12000       UPDATE(y/n) yes      T25    32         UPDATE(y/n) yes
T28   05          UPDATE(y/n) yes      T29    62         UPDATE(y/n) yes
T(stat.info)  30  UPDATE(y/n) yes      T(coord.chg)  30  UPDATE(y/n) yes
T(ignore SST) 30  UPDATE(y/n) yes      T(rtg.info)   30  UPDATE(y/n) yes
```

Figure 3-1. ver Action for Protocol Timers and Parameters

6.03 The internal audit compares tables in main memory to the tables on disk. If any mismatches are found, a report is generated. Also included in the report are invalid data and table inconsistencies.

7. Transition Considerations

Ubiquity

7.01 It is not necessary for all *4ESS* switches in the network to be running the 4E21 Release 1 Generic for this feature to be operational.

Turn On/Turn Off Mechanism

7.02 This feature is turned on and off by a DMS recent change. The default setting is off. Use DMS Page ofdata (Figure 3-2) to turn the feature on.

```
****** CNI DATA MANAGEMENT SYSTEM ****** DATE: 05/19/95 TIME: 18:22 ******
FUNCTION : ofdata    ACTION: ver               OFFICE: NPVLIL01MS1

                   CNI OFFICE DATA



            LOCAL POINT CODE      254254076
            LOCAL CLLI            npvlil01ms1
            SRST OFFICE TIMER     00600
            MTP RST               no
            ISC W/CCITT7          yes
            INTL POINT CODE       21341

               ALIAS POINT CODE LIST

       000000000      000000000      000000000
       000000000      000000000      000000000
                      000000000
```

Figure 3-2. Example ofdata Page

8. Input/Output Manual Pages

8.01 The **OP:C7NET** Input/Output manual pages have been updated for this feature. The input message **OP:C7NET;PMTP** requests the timer status for the MTP Restart procedure. The output message **OP C7NET** has a new format which is a table of the MTP Restart timers.

15 Digit International Numbering Plan (LEC) Feature (402)

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15 Digit International Numbering Plan (LEC) Feature (402)

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1. Feature Description

1.01 Feature 402 is a Local Exchange Carrier (LEC) only feature. It increases the number of digits supported at a LEC *4ESS*™ access tandem switch for an international telephone number from 12 to 15 digits.

1.02 This feature complies with the applicable sections of the following standards. Contact your AT&T Account Executive for specific compliance information.

- International Telephone and Telegraph Consultative Committee (CCITT) Recommendation E.164 and Recommendation E.165.
- Bellcore TR-NWT-000505 and TR-NWT-1100.

1.03 An increase in the number of digits will allow an increase in the number of available telephone numbers, which are in short supply due to a world-wide demand for telecommunications services.

1.04 The increase supported by this feature applies to international telephone numbers used during dialing, administration, and signaling, and to all external interfaces and feature interactions that use international telephone numbers.

1.05 The expansion of a specific country's numbering plan is left to that country. However, CCITT has identified a time after which all networks should be able to accommodate the expanded number length. That time, known as Time-T, is set by CCITT Recommendation E.164 as December 31, 1996 Universal Coordinated Time (UCT).

1.06 An international telephone number consists of a Country Code (CC) and a National Number (NN). The international telephone number does not include dialing prefixes, such as 01 or 011, and it does not include Carrier Access Codes (CACs) such as 10288 or 1010288. Country Codes are 1, 2 or 3 digits in length and will remain so after Time-T.

1.07 Prior to this feature, the CC+NN combination could be no longer than 12 digits in length (per CCITT recommendation). A country with a 1-digit CC could use an NN of up to 11 digits, and a country with a 3-digit CC could use an NN of up to 9 digits. Following Time-T, the CC+NN combination may be expanded to a maximum of 15 digits, which will allow for growth in the NN of up to 3 digits.

1.08 This feature does not introduce any changes to dialing plans used to make an international call or to the North American Numbering Plan (NANP), which will continue as the 10-digit numbering plan for all countries in World Zone 1 (CC = 1).

1.09 International numbers can be up to 15 digits in length. The CCITT recommends that no more than 6 digits of the international number need to be analyzed to obtain routing information to the destination country. Based on specific needs, telecommunications administrations (TA) can arrange bilateral agreements to translate more than 6 digits.

Call Treatment

A. Originating Treatment

1.10 Calls originated by the end users can be direct dialed or operator assisted. To originate an international call, the end user dials the appropriate prefix followed by a CC and NN. The prefix is either 011 for international direct dialed or 01 for international number operator assistance requested. The CC + NN may be up to 15 digits (after Time-T).

1.11 For switched access calls (where the *4ESS* switch is functioning as an intermediate exchange-local tandem, or access tandem), the called party number is signaled to the switch using Signaling System 7 (SS7) ISDN User Part (ISUP) or Equal Access MF (EAMF) signaling.

1.12 The *4ESS* switch can receive and process up to 15 digits of called party information (CC + NN) when it is signaled via EAMF or 2-stage international MF signaling.

SS7 ISUP

1.13 The treatment described below applies equally to the Local Tandem (also referred to as an intermediate Access Tandem) and the Access Tandem.

1.14 For tandem exchanges, this feature introduces changes where SS7 ISUP trunks are supported. All other signaling arrangements for Access Tandems handling international calls are unchanged.

1.15 The following SS7 ISUP and NI parameters are affected by this feature:

- For calls **to** an international directory number (an originating access tandem, for example):
  - — Called Party Number (CdPN)
  - — Connected Number (CN)
- For calls **from** an international directory number (a terminating access tandem, for example):
  - — Calling Party Number (CPN)
  - — Original Called Number (OCN)
  - — Redirecting Number (RN)

EAMF Incoming/SS7 ISUP Outgoing

1.16 This feature allows the *4ESS* switch to encode up to 15 address digits for the CC + NN received in the second stage of inpulsing from an Equal Access End Office into the CdPN parameter of an Initial Address Message (IAM) that is to be sent on the outgoing trunk. This does not include the ST or KP pulses of the EAMF digits string.

SS7 ISUP Incoming/EAMF Outgoing

1.17 When the *4ESS* switch access tandem receives the second wink from the interexchange carrier (IEC)/ INC, the access tandem will outpulse the second stage of EAMF signaling to the IC/INC. This includes up to 15 digits in the CC + NN portion of the signaled string KP + (II + ANI) + ST + KP + CC + NN + ST.

Traditional 2-Stage MF Incoming/SS7 ISUP Outgoing

1.18 This feature allows the *4ESS* switch to encode up to 15 address digits for the CC + NN received via traditional MF signaling from an End Office into the CdPN parameter of an IAM that is to be sent on the outgoing trunk. This does not include the ST or KP pulses of the MF string.

B. Transaction Capabilities Application Part

1.19 Transaction Capabilities Application Part (TCAP) is used to support the Service Switching Point (SSP)-800 feature, which was introduced in 4E12, and the

Advanced Intelligent Network (AIN) Dialed Number Triggers feature, which was introduced in 4E18. To interact with the SSP-800 feature, this feature allows the *4ESS* switch to receive and process up to 15 address digits for the Routing Number received in the Digits parameter of the SS7 TCAP response message.

1.20 To interact with the AIN feature, this feature allows the *4ESS* switch to send up to 15 address digits with Nature of Number coded to International in the Collected Address Info parameter of the Info Collected query and the Resource Clear message. In addition, the switch can receive and process up to 15 address digits with Nature of Number coded International Number for the Called Party ID parameter in the Analyze Route response message.

TCAP Test Query

1.21 This feature allows the *4ESS* switch TCAP Test Query (used with the AIN features) to send up to 15 digits of address information (CC + NN) with the Nature of Number field coded International in the Collected Address Info parameter in the Info Collected query. In addition, the switch can accept and display up to 15 digits of address information (CC + NN) when the received Nature of Number is coded International Number in the Called Party ID parameter of a TCAP response message.

1.22 This feature allows the *4ESS* switch TCAP Test Query (used with the SSP-800 feature) to accept and display up to 15 digits of address information (CC + NN) when the received Nature of Number is coded International Number in the Digits (Routing Number) of a TCAP response message.

2. Call Flow

2.01 In general, this feature does not affect call flows. All voice and data calls should continue to be routed as they were prior to this feature. Only numbers such as dialed numbers and routing numbers, when they are international numbers, may be expanded up to 15 digits in length.

3. Provisioning

3.01 Feature 402 must be purchased before it can be activated. Contact your AT&T Account Executive for additional information.

4. Recording

Module 164

4.01 Existing Automatic Message Accounting (AMA) can be used for inbound and outbound international calls. However, Module 164, a new Extended Bellcore AMA Format (EBAF) module, will be used to record the longer-length international called number. Module 164 will be generated and appended to the appropriate AMA structure for an international call when the terminating number to be recorded in the terminating Numbering Plan Area (NPA) field (Table 16) and in the terminating number field (Table 17) exceeds 12 digits.

4.02 Module 164 will not be used if the called number is 12 digits or less in length.

4.03 Module 164 will be appended to records for AIN, SSP-800, and Cellular Mobile Carrier (CMC) calls.

4.04 When Module 164 is generated, the terminating NPA and number fields of the existing AMA structures will be zeroed, and the structure code will be marked to indicate that one or more EBAF modules are appended to the structure. If present, the Terminating Number Indicator (Table 8) of the existing structure will be zeroed, and the Significant Digits in Next Field indicator (Table 55) will be filled with Hexadecimal F.

4.05 The new AMA Module 164 and its associated tables are shown in the following tables:

- The Module 164-E.164/X.121 Number Module is shown in Table 4-A. The module code recorded in the Module Code field (Table 88) of this module must be 164.
- The Number Identity field, shown in Table 4-B, identifies whether the number (or address) is an originating or terminating number.
- The Country Code/Data Network Identification Code (DNIC) field, shown in Table 4-C, records the CC or DNIC associated with a terminating number that exceeds 12 digits in length. This field is populated based on the length of the recorded CC or DNIC, as shown in Table 4-D.

Table 4-A. Module 164-E.164/X.121 Number Module

Information	Table Number	Number of Characters
Module Code Identification	88	4
Number Identity	76	2
Country Code or Data Network Identification Code	165	6
Significant Digits in Next Field (s)	55	4
Number	126	16

Table 4-B. Number Identity (Table 76)

Binary Coded Decimal (BCD) Character	Description
1-7	Number Identity 1 = Originating (Source) 2 = Terminating (Destination)
2	SIGN (Hex C)

Table 4-C. Country Code/Data Network ID Code (Table 165)

Characters	Description
1	Numbering Plan Indicator 1 = E.164 Number with 1-Digit Country Code 2 = E.164 Number with 2-Digit Country Code 3 = E.164 Number with 3-Digit Country Code 4 = X.121 Number*
2-5	Country Code or Data Network Identification Code
6	SIGN (Hex C)

*DNIC is not generated by the *4ESS* switch. This value is included for completeness and applies only to packet-switched data calls.

Table 4-D. Population of CC/DNIC Field

Type of Number	Population of Characters					
	1	**2**	**3**	**4**	**5**	**6**
E.164 with 1-Digit CC	1	0 or 9*	0	0	CC	Hex-C
E.164 with 2-Digit CC	2	0 or 9*	0	CC		Hex-C
E.164 with 3-Digit CC	3	0 or 9*	CC			Hex-C
X.121**	4	DNIC				Hex-C

*Use 9 only if Table 184** or Table 185** exists in the associated AMA structure and if its character 2 would have been populated with a 9.

**This value is shown for completeness, is used only with packet-switched data calls, and is never generated by the *4ESS* switch.

5. Network Management

5.01 Network management displays at the *4ESS* switch were upgraded to support this feature.

6. Maintenance/Troubleshooting (Not Affected)

7. Transition Considerations

System Upgrades

7.01 The capability to support 15-digit international numbers is expected to be deployed world-wide by Time-T. This feature provides only a portion of the larger network capability. All LEC network elements and operations systems that handle international numbers must be upgraded to support the expansion of international numbers to 15 digits, including the following:

- Operation Systems (OSs) including Netminder and BILLDATS
- Application Processors (APs)
- Service Control Points (SCPs).

7.02 The following steps should be completed to ensure that a LEC network can accommodate 15-digit international numbers after Time-T:

1. Upgrade APs, OSs and SCPs—Systems that receive or send international number data to or from the switch should be upgraded. However, no attached system should begin sending international numbers in the expanded format prior to completion of the following step. LECs must upgrade their OSs to allow continued billing, administration, and maintenance following the deployment of this feature.
2. Upgrade LEC Switches—Upgrading involves installing the 4E21 Release 1 software and the deployment of this feature in all access tandem and end-office switches in the LEC network. Access tandems should be upgraded prior to upgrading the end-office switches, to insure that the correct interoffice signaling of the expanded international number occurs.

   NOTE:
   Step 3 must be completed before end users are able to complete calls to international numbers containing more than 12 digits.

3. Populate LEC Switches with Dialing Plan Changes—This step should be completed as dialing plan changes are announced following Time-T for CCs that expand their numbering plans.
4. Populate SCPs with 15-Digit Numbers—The SCP data should be updated with expanded length international numbers following Time-T. The SCP should not be upgraded to send international addresses of more than 12 digits (CC+NN) before Step 2 is completed for connected SSPs.

Network-To-Network Signaling

7.03 This feature does not provide Network Interconnect (NI) transition controls. All interLATA and international carriers that handle international traffic must upgrade their networks prior to Time-T.

SCPs/SSPs

7.04 When this feature is deployed, all LEC SSPs can expect to receive TCAP response messages for both AIN and SSP-800 applications without prefix digits in the address digit field. To comply with the requirements of Bellcore TR-NWT-000505, any SCP option to encode a prefix (01/011) in the address digits field must be removed.

CAUTION:
All SCPs in the LEC network must be upgraded to support the expanded address format before connected SSPs are upgraded to this feature. Failure to do so will result in the clearing of any calls where the SCP returns a response message with an international prefix in the address digits field. Call clearing will result because CCs beginning with 0 are not currently assigned.

Turn On/Turn Off Mechanism

7.05 As previously noted, Feature 402 must be purchased before it can be activated. Contact your AT&T Account Executive for additional information.

8. Input/Output Manual Pages

8.01 The START:NVTSESS 3B Attached Processor Input Manual Page was modified to support this feature.

8.02 The TEST:DSIG;NS800 1B Processor Output Manual Page was modified to support this feature.

Increase in GULP Buffer Size Feature (414a)

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Increase in GULP Buffer Size Feature (414a)

5

1. Feature Description

1.01 The Generic Utility Program (GULP) is a manually initiated program that provides a powerful set of tools for performing system maintenance on the *4ESS*™ switch. The following are some of the functions the generic utility program provides:

- The ability to transfer data from one storage medium to another
- The ability to print system data on a terminal
- The ability to perform utility functions at a predictable point in a program flow or when a specific event occurs
- The ability to "freeze" the contents of one or more duplicated stores
- The ability to make permanent changes to system data, that is, overwrite existing 1B Processor data.

1.02 Field Support uses the overwrite capability of the generic utility program to update generics in the field. The process that Field Support follows to generate, test, and deliver software changes to the field is called the GULP process.

1.03 In order to ensure the maximum amount of safety, the new data is placed in a buffer referred to as the "GULP" buffer for a period of time before a permanent change is made.

1.04 In the 4E20 Release 1 Generic, the size of the GULP buffer was increased from 512 words to 1024 words. This feature increases the GULP buffer size from 1024 words to 2048 words.

1.05 Increasing the buffer size results in the following benefits:

- More IN:OWBUF messages can be entered before a COPY:OWBUF is necessary.
- The chance for unscheduled big GULPs is reduced.
- The chance for multi-buffer loading errors is reduced.

2. Call Flow (Not Affected)

3. Provisioning

Data Structures Affected

3.01 The following data structures were affected:

UT1OVRWTBUF	The Overwrite Rollback Buffer increased in size from 1024 words to 2048 words.
UT1OWBACKUP	The File System Overwrite Backup Area increased in size from 1024 words to 2048 words.

4. Recording (Not Affected)

5. Network Management (Not Affected)

6. Maintenance/Troubleshooting (Not Affected)

7. Transition Considerations

Ubiquity

7.01 It is not necessary for all *4ESS* switches in the network to be running the 4E21 Release 1 Generic for this feature to be fully operational.

Turn On/Turn Off Mechanism

7.02 This feature is turned on automatically by software deployment.

8. Input/Output Manual Pages (Not Affected)

Trunk Group Control of Signaling Bits Feature (430)

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Trunk Group Control of Signaling Bits Feature (430)

6

1. Feature Description

1.01 This Local Carrier Exchange (LEC) feature provides a way for users of a *4ESS*™ Access Tandem (AT) switch to control the state of unused signaling bits on a T1 trunk. Control may be desired when the far-end switch does not ignore these bits on Integrated Services Digital Network-User Part (ISUP) Signaling System 7 (SS7) trunks because they are being operated in clear data mode. Use of this feature can prevent false supervisory information from being passed on to a connecting switch.

1.02 The signaling bits controlled by this feature are referred to as AB bits, which are associated with Robbed Bit Signaling. In Robbed Bit Signaling, the AB bits are taken out of the data stream on selected frames to provide signaling information about a call on a trunk. There is no signaling such as AB bits on SS7 trunks. AB bits and similar information bits come from inband MF signaling. However, there is no standard procedure for provisioning converted SS7 trunks, and certain switching equipment cannot tolerate the bits used for signaling in MF to float, as each change of state is seen as a change of state on a call.

1.03 This feature addresses that problem by putting the Per-Channel Inhibit Signaling (PCIS) bits of SS7 trunks into a steady off-hook state. This is done by Recent Change (RC), and prevents a far-end switch from seeing the bits fluctuate and cause unnecessary and possibly excessive transitions that could lead to recovery action.

2. Call Flow (Not Affected)

3. Provisioning

Affected Recent Change Forms

3.01 RC Forms 100, 102, 107 and 109 are used to activate this feature. The specific population rules for these RC forms depend on the 4E generic in use, as stated below.

3.02 To activate this feature in 4E18, 4E19 and 4E20, the following fields on the RC forms listed above must be populated as follows:

- S2 = Y
- TOT= OCC
- OSC = ISUP

3.03 This feature will not be active if S2 is set to N (or if entries different from those listed above are used in the TOT or OSC fields).

3.04 To activate this feature in 4E21, Item XL4TS_SS7PCIS, which is a new 1-bit item, will be set to 1 (yes) if the RC forms listed above have:

- CODSC = Y
- TOT = OCC
- OSC = ISUP

3.05 This feature will not be active if CODSC is set to N (or if entries different from those listed above are used in the TOT or OSC fields).

3.06 For 4E21, the meaning of CODSC was changed to CPE Outgoing Disconnect/Reset SS7 Trunk Subgroup (TSG) PCIS Bits.

Affected Verify Forms

3.07 In 4E21, Verify Form 1a, VER:TSG, OPT (TWOWAY), and Verify Form 1c, VER:TSG, OPT (OUT1WAY), were changed as follows:

- If TOT = STC or PBX and OSC not = Q931, then
  - — Output N if XL4TS_CODSC = 0
  - — Output Y if XL4TS_CODSC = 1
- If TOT = OCC and OSC = ISUP, then
  - — Output N if XL4TS_SS7PCIS = 0
  - — Output Y is XL4TS_SS7PCIS =1
- Otherwise, the output is blank.

3.08 In 4E21, Verify Form 11d, VER:TSGLIST, was changed to allow finding a CODSC value with an associated type of trunk.

Example: Find TSGs that have TOT = OCC and CODSC = Y.

Solution: VER!TSGLIST, FD1 TOT, DT1 OCC, FD2 CODSC DT2 Y.

4. Recording (Not Affected)

5. Network Management (Not Affected)

6. Maintenance/Troubleshooting

6.01 Prior to this feature, the control of the PCIS bits was done by System Integrity's audit and system initialization software. This feature modifies the System Initialization and Audits software to include the TSG option built by RC to condition the PCIS bits to allow signaling bits to be in a steady state, if desired.

6.02 If this TSG option is used, the use of clear data calls will not be allowed on SS7 trunks, since the full data path will not be used.

7. Transition Considerations

Transitioning Between Generics

7.01 The following information describes the required procedure for transitioning between generics:

- 4E18 to 4E19 Retrofits—the existing decompile and recompile Office Data Assembler (ODA) process will preserve the setting of XL4TB_S2.
- 4E19 to 4E20 Retrofits—the existing Office Database Management System (ODMS) process will preserve the setting of XL4TB_S2.
- 4E20 to 4E21 Retrofits—ODMS should set the value of the 4E21 HT4TSG item XL4TS_SS7PCIS from the value of the 4E20 HT4TBNCORE item XL4TB_S2 and reset XL4TB_S2 in 4E21 to 4XLTB_SPARN (0).
- 4E21 to 4E22 and Later Retrofits—ODMS should preserve the value of the HT4TSG item XL4TS_SSPCIS across retrofits and growths.

Ubiquity

7.02 It is not necessary for all *4ESS* switches in the network to be running the 4E21 Release 1 Generic for this feature to be operational.

Turn On/Turn Off Mechanism

7.03 This feature is turned on by populating RC Forms 100, 102, 107 or 109, as described in the Provisioning section of this chapter.

8. Input/Output Manual Pages (Not Affected)

LEC Toll-Free Treatment for NPA 888 Feature (432)

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LEC Toll-Free Treatment for NPA 888 Feature (432)

7

1. Feature Description

1.01 Additional telephone numbers are needed to support the growing uses of toll-free services. This feature provides the means for using two additional predefined Service Access Code (SAC) codes for 800 number services. The switch would collect, interpret, query, and route using the new SAC codes for the purpose of toll-free services.

1.02 This feature is being developed in two phases. The first phase provides for the 888 and 877 SACs to be treated as a toll-free call similar to the current 800 SAC and will be available by the end of 1995. Deployment of the new 888 SAC will officially begin on April 1, 1996.

2. Call Flow (Not Affected)

3. Provisioning

3.01 This feature must be purchased and activated in the Local Exchange Carrier (LEC) *4ESS*™ switches that perform the Service Switching Point (SSP) function.

3.02 The LEC will activate this feature and provision code groups 888 and 877. The 888 and 877 code groups which will query the Service Control Point (SCP) must be provisioned as CALLTYP=SSP, CALLDATA=DB, and the AD1 field (TOS) can be set to the same value as the TOS for the 800 queries. This should reduce the amount of provisioning necessary for the new toll-free code groups.

3.03 If special routing is required, then a new TOS may be assigned for 888/877 code groups. This may cause additional provisioning in the NSR domain for routing the response for these calls. This may also require CNI changes in GTTRAN function if a new translation type is used.

3.04 The Signaling Transfer Point (STP) must be provisioned to global title route the 888/877 code groups to the correct SCPs. This must be done for the translation type specified on the TOSs used.

4. Recording

4.01 The same 800 type records will be made for the 888 and 877 SAC calls and the 888 and 877 are recorded in the dialed number NPA field.

5. Network Management

5.01 Network management manual or Automatic Call Gapping (ACG) controls are now supported
for the new 888 and 877 SACs using the existing Number Service 800 feature processing. The new SACs are allowed on the existing ACG list for toll-free service. The ACG feature supports simultaneous differing treatment of the 800-NXX, 888-NXX, and 877-NXX entries on the ACG list. The existing ACG list shall be used by the 888, 877, and 800 SACs. The size of the ACG list remains the same for this phase of the feature. The 888, 877, and 800 SACs shall have independence in the ACG treatment.

6. Maintenance/Troubleshooting

6.01 Craft input message for Number Service 800 test:(DSIG;NS800,...,) now requires the SAC (800, 888, or 877) as input and does not assume the 800 SAC. The input messages must now be a ten digit DN.

6.02 The craft can query the database to check on connect signaling network provisioning prior to actual toll-free traffic from the subscribers.

7. Transition Considerations

Turn On/Turn Off Mechanism

7.01 LEC customers must contact their AT&T Account Executive for additional information after purchasing this feature.

8. Input/Output Manual Pages (Not Affected)

Netminder Network Traffic Management Support of Alternate Only Overflow Reroute Feature (435)

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Netminder Network Traffic Management Support of Alternate Only Overflow Reroute Feature (435)

8

1. Feature Description

1.01 A block existed in the *4ESS*™ Switch that prevented an alternate only overflow reroute request received through the Netminder Network Traffic Management interface.

1.02 This feature gives the craft the capability to apply regular (overflow) reroute controls to alternate (ALT) only traffic.

1.03 Netminder/NTM provides reroute control data in the following Reverse Control Messages: Domain Selective Regular Reroute Control (16), Domain Selective Code Specific Reroute Control (17), and Domain Selective Routing Data Block Specific Reroute Control (18). The reroute control data that is impacted by this change is contained in WORD 2, fields (A) and (B).

1.04 In WORD 2 of the Reverse Control Messages (16, 17, and 18), field (A - Routing Type) and field (B - Routing Option) provide the capability to perform an alternate only overflow reroute. The combination of field A=0 and field B=1 will provide the alternate only overflow reroute.

2. Call Flow (Not Affected)

3. Provisioning (Not Affected)

4. Recording (Not Affected)

5. Network Management (Not Affected)

6. Maintenance/Troubleshooting (Not Affected)

7. Transition Considerations

Ubiquity

7.01 It is not necessary for all *4ESS* switches in the network to be running the 4E21 Release 1 generic for this feature to be fully operational.

Turn On/Turn Off Mechanism

7.02 This feature is turned on automatically by software deployment.

8. Input/Output Manual Pages (Not Affected)

AIN Dialed Number Trigger (DNT) Expansion Feature (442)

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AIN Dialed Number Trigger (DNT) Expansion Feature (442)

9

1. Feature Description

1.01 Feature 442 is a Local Exchange Carrier (LEC) only feature that was introduced in 4E19 Release 4. Feature 442 increases the number of 10-digit Advanced Intelligent Network (AIN) Dialed Number Triggers (DNTs) supported on the *4ESS*™ switch. Prior to this feature, the maximum number of 3 through 10-digit DNTs supported by the *4ESS* switch was 8,191. This feature provides an additional 262,000 10-digit DNTs.

1.02 Feature 442 is secured and must be purchased before it can be activated and used. In addition, the AIN Dialed Number Trigger Feature (375) is required for the operation of this feature. Feature 375 must be purchased and the proper indicator set in the office.

1.03 Feature 375 provides a set of service independent capabilities that provide advanced services. These capabilities allow the *4ESS* switch in the LEC network to function as an AIN Service Switching Point (SSP) and to recognize calls that require advanced call treatment. The SSP sends an Info Analyzed query for DNTs to the AIN Service Control Point (SCP), which is a centralized database in the LEC network. The SSP receives instructions for processing the calls from the SCP.

1.04 Feature 375 provides two types of triggers: Shared Interoffice Trunk Trigger and DNT, which are briefly described below:

- A Shared Interoffice Trunk Trigger is triggered based on the Carrier ID and Circuit Code/0ZZ value received in the incoming signal. When it encounters an AIN Shared Interoffice Trunk Trigger, the *4ESS* switch sends an Info Collected query to the SCP.

- DNTs use the dialed number received from the End Office to initiate an AIN action. The dialed number received is compared to the DNTs provisioned in the *4ESS* switch. The service provider can specify any number of consecutive leading digits from a minimum of 3 digits to a maximum of 10 digits as the DNT. However, triggers are typically specified on NPA, NXX, NPA+NXX, NPA+NXX-XXXX or NXX-XXXX. Each DNT designator requires that a Recent Change (RC) or Office Data Assembler (ODA) entry be made to the digit translators. The number of entries that can be made depends on the number of DNTs allowed by AIN, and the number of subsequent digit indexes required to link the digits of the AIN DNTs in code grouping translations. Prior to this feature, the maximum number of DNTs supported by the *4ESS* switch was 8,191.

1.05 Refer to AT&T 234-090-019, *4ESS™ Switch Advanced Intelligent Network (AIN), 4E18/19 Software Release, User's Guide*, for additional information on Feature 375.

1.06 Feature 442 also supports the AIN Global Default Routing for DNT Calls Feature (411). However, this feature does not support the following:

- AIN Selective Default Routing Feature (415)
- Selective Triggering by Call Type (voice or data)
- More than 15 different Numbering Plan Areas (NPAs).

1.07 To support this feature, the 4ESS switch provides an additional and separate database, or table, for storing 10-digit AIN triggers. Prior to this feature, the triggers were variable-sized and included 10-digit triggers. All triggers were checked in translation through code grouping to verify the routing.

1.08 This feature builds a new table to hold 262,000 triggers. Only 10-digit triggers are contained in the new table, and no code grouping checks are performed in translation to verify the routing of the triggers.

1.09 Triggers in the new 10-digit table will be detected only when the following conditions are met:

- Originating signaling is MF or Integrated Services Digital Network-User Part (ISUP), or the dialed number was returned from the SSP-800 SCP or the AIN SCP.
- Translation of the dialed number results in a determinate call type (RDB, for example).
- The dialed number is a 7- or a 10-digit number in the POTS domain (7 if HNPA, 10 otherwise), or it is a 10-digit number in the non-POTS EADOM domain.

1.10 Because there are now two tables for storing triggers, it is possible for a trigger to be detected in both tables. For example, 708 555 1234, could have an original AIN trigger on 708 and a new 10-digit trigger on 708-555-1234. Should this occur, both

triggers will be detected (if the number has a determinant route), but the trigger contained in the new 10-digit table will take precedence, and the Type of Service (TOS) associated with that trigger will be used.

1.11 When the *4ESS* switch encounters an AIN 10-digit trigger, it will send an Info Analyzed query to the SCP, according to existing procedures. The trigger criteria type sent in the query message will be NXX-XXXX if the dialed number is translated in POTS and is in the Home Numbering Plan Area (HNPA); otherwise, it will be "NPA-NXX-XXXX".

1.12 There must be sufficient call store available to contain the additional 262,000 triggers. If the office runs out of space (cannot allocate a new subtranslator), it will not be possible to add additional triggers to the new 10-digit table. This feature requires 20,000 words for initial translators and approximately 260,000 additional words to store 262,000 10-digit triggers. In 4E20 and beyond, more than 400,000 words will be needed to store the 10-digit triggers. In 4E21 and later releases, Extended (Windowed) Store may be used if the office has the capability.

1.13 Prior to use, Field Support must perform administrative ODA work (4E19 only).

2. Call Flow (Not Affected)

3. Provisioning

ODA Form 406C

3.01 For 4E21 and later releases, a new field, AINTRG_IN_WCS, was added to ODA Form 406C. This field indicates whether or not the AIN Trigger Tables are in Extended (Windowed) Store or in 1B Main Memory. **Y** is entered if these structures are in Extended (Windowed) Store. **N** is entered if these structures are in 1B Main Memory. The population rules for this field are as follows:

- The valid entries for AINTRIG_IN_WCS are **Y** and **N**.
- If AINTRG_IN_WCS is set to **Y**, the AIN Trigger Table will be populated in Extended (Windowed) Store.
- If AINTRG_IN_WCS is set to **N**, the AIN Trigger Table will be populated in 1B Main Memory.
- AINTRG_IN_WCS can be **Y** only if the package option bit for this feature is set.

New Recent Change Form/Message

3.02 A new Recent Change Message, 6dg, is available for 4E19 Release 4. RC Message, 6dg, which is a new version of RC:MISC;FHT, is used to add or delete up to 16 10-digit triggers at one time. Refer to Figure 9-1.

3.03 RC Message 6dg uses the FHT qualifier with a new 9-character American Standard Code for Information Interchange (ASCII) string to indicate that AIN triggers are being entered. The TOS will be encoded in the new ASCII character string. This message will also include fields for action, domain, and a series of 10-digit triggers. With the format of the message, the TOS and action fields will be the same for each trigger on a particular message.

NOTE:
Each trigger on a form must have the same TOS and action.

```
                              SAMPLE MESSAGES


1. To add three 10-digit AIN triggers (3125551234,3125559999,3125551995 with a TOS (0).

        RC:MISC;FHT,FTA:AINTRIG00,00001,A,P,3125551234,3125559999,3125551995!

2. To add two 10-digit AIN triggers (7085551111,7085555555) with a TOS (31).

        RC:MISC;FHT,FTA:AINTRIG31,99999,A,P,7085551111,7085555555!

3. To delete two 10-digit AIN triggers (3125551234,3125559999 with the corresponding TOS (0).
   Note, the TOS must match what was entered when the trigger was added for all triggers
   being deleted.

        RC:MISC;FHT,FTA:AINTRIG00,00002,D,P,3125551234,3125559999!

4. To delete one 10-digit AIN trigger (7085555555) with a TOS (31).

        RC:MISC;FHT,FTA:AINTRIG31,99998,D,P,7085555555!




                      EQUIVALENT ODA INPUT FORM - NONE

                         ASSOCIATED VERIFY MESSAGES

                    INPUT-16dg-VER:MISC:FHT AINTRIG,DIG a

                      OUTPUT-6dg-VER:MISC:FHT AINTRIG:



                     RECENT CHANGE 10-DIGIT AIN TRIGGERS
                         IN 4E19R4 AND LATER GENERICS
```

Figure 9-1. Recent Change Form/Message 6dg

3.04 The population rules for RC Message 6dg are as follows:

- The format of the message is:

  RC:MISC;FHT,FTA:AINTRIGnn,a,b,c,d!

- The format shown above represents the input message that must be entered. The upper case letters represent data that must be entered exactly as shown. The lower case letters are acronyms for variable fields that require user input data. The exclamation mark (!) following the message denotes the end of the input message.
- **nn**—This field is the TOS, which is encoded in the 9-character ASCII string. Valid entries for the TOS are 2 numeric ASCII characters. When concatenated, the characters must be between 00 and 31, inclusive.
- **a**—This is the order number. It must be a unique number in the range of 1 to 999999.
- **b**—This field specifies the action required. Valid entries are **A** (add triggers) and **D** (delete triggers).
  - — When adding, the trigger entered must not already be present. If any new trigger matches an already existing trigger, the entire message will fail and no triggers will be added.
  - — When deleting, the trigger must be present and the input TOS must match the data in the existing translation. If there is an error for any one trigger for a message, the entire message will fail and no trigger will be deleted.
- **c**—This field specifies the domain. The only valid entry is **P**, which indicates that all AIN 10-digit triggers for this message are in the POTS domain.

  NOTE:
  If EADOM was populated in ODA, then the triggers will be populated in EADOM also.

- **d**—This field is for a series of 10-digit triggers. All triggers must be 10 digits. There must be at least 1 trigger entered, but no more than 16 triggers (separated by a comma) on a single message.

3.05 If the input message cannot be successfully processed, an error code or error code with message will be output. For almost all syntax errors, the following numeric error code will be printed (shown below). The remaining errors, which relate to form usage, will print an error code with a message or description of the error (and are not listed below).

- CODE: **0010,448**
- EXPLANATION: **Invalid Recent Change Message**

New Verify Forms/Messages

A. Verify Input 16dg

3.06 Verify Input 16dg is a new Verify Form/Message that is available in 4E19 Release 4 and later releases. It requests the verification of the 10-digit AIN triggers contained in the expanded 10-digit Trigger Table.

NOTE:
Since all triggers matching the input criteria will be displayed, the length and time of the output may be significant when there are a large number of matches in the Trigger Table. The output will result in more than one message being sent.

The message entry is as follows:

VER:MISC:FHT AINTRIG,DIG a!(EOT)

3.07 The format shown above represents the entries that comprise the input message, and is fixed. The only variable part is that a 3, 6, or 10-digit number can be entered after the keyword DIG, which is used to match 10-digit AIN triggers. Sample messages are shown in Figure 9-2.

B. Verify Output 6dg

3.08 Verify Output 6dg is a new output message that is available in 4E19 Release 4 and later releases. It is used to verify a list of AIN triggers with the same 3, 6, or 10-digit trigger number. Refer to Figure 9-3.

NOTE:
Since all triggers matching the input criteria will be displayed, the length and time of the output may be significant when there are a large number of matches in the Trigger Table. The output will result in more than one message being sent.

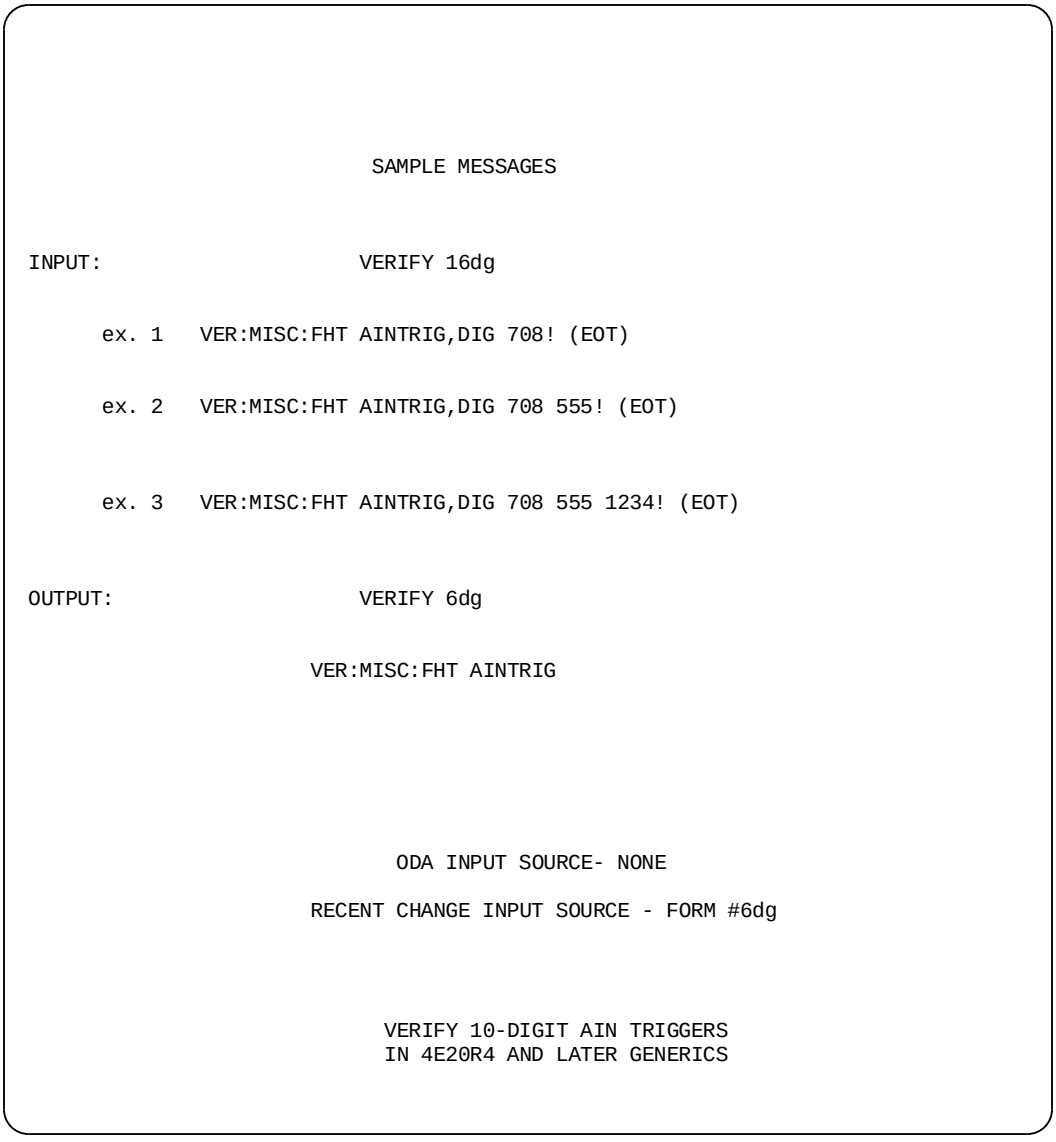

Figure 9-2. Verify Input Form/Message 16dg

```
                          VERIFY 10-DIGIT AIN TRIGGERS


INPUT:                    VERIFY 16dg

VER:MISC:FHT AINTRIG,DIG a! (EOT)




OUTPUT:                   VERIFY 6dg

VER:MISC:FHT AINTRIG:

ABC   DEF   GHIJ     TOS

---,  ---,  ----,    --,
---,  ---,  ----,    --,
---,  ---,  ----,    --,
---,  ---,  ----,    --,
---,  ---,  ----,    --,
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                            ODA INPUT SOURCE- NONE

     RECENT CHANGE INPUT SOURCE - FORM #6dg RC:MISC;FHT,FTA:AINTRIGnn,a,b,c,d!


                          VERIFY 10-DIGIT AIN TRIGGERS
                          IN 4E19R4 AND LATER GENERICS
```

Figure 9-3. Verify Output Form/Message 6dg

4. Recording (Not Affected)

5. Network Management (Not Affected)

6. Maintenance/Troubleshooting (Not Affected)

7. Transition Considerations

Turn On/Turn Off Mechanism

7.01 Feature 442 is a secured feature that must be purchased before it can be activated. Contact your AT&T Account Representative for additional information.

8. Input/Output Manual Pages

8.01 A new input command and response, **VER:MISC:FHT AINTRIG**, and two new Manual Pages were created to support this feature. A new Input Manual Page, **VER:MISC-AINTRIG**, is used to request information on the 10-digit triggers that are contained in the expanded 10-digit trigger database. A new Output Manual Page, **VER:MISC-AINTRIG**, displays the type of service index associated with the 10-digit triggers contained in the expanded 10-digit trigger database.

15-Digit International Numbering Plan Feature (3133)

10

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15-Digit International Numbering Plan Feature (3133)

10

1. Feature Description

1.01 This feature increases the number of digits supported at a *4ESS*™ toll switch for an international telephone number from 12 to 15 digits in accordance with International Telephone and Telegraph Consultative Committee (CCITT) recommendations. The increase in the number of digits will allow an increase in the number of available telephone numbers, which are in short supply due to a world-wide demand for telecommunications services.

NOTE:
Feature 402, 15 Digit International Numbering Plan (LEC), is available for Local Exchange Carriers in 4E21 Release 1.

1.02 The expansion of a specific country's numbering plan is left to that country. However, CCITT has identified a time after which all networks should be able to accommodate the expanded number length. That time, known as Time-T, is set by CCITT Recommendation E.164 as December 31, 1996 Universal Coordinated Time (UCT).

1.03 An international telephone number consists of a Country Code (CC) and a National Significant Number (NSN), which is also referred to as the National Number (NN). The international telephone number does not include dialing prefixes, such as 01 or 011, and it does not include Carrier Access Codes (CACs) such as 10288 or 1010288. Country Codes are 1, 2 or 3 digits in length and will remain so after Time-T.

1.04 Prior to this feature, the CC+NN combination could be no longer than 12 digits in length (per CCITT recommendation). A country with a 1-digit CC could use an NN of up to 11 digits, and a country with a 3-digit CC could use an NN of up to 9 digits. Following Time-T, the CC+NN combination may be expanded to a maximum of 15 digits, which will allow for growth in the NN of up to 3 digits.

1.05 This feature does not introduce any changes to dialing plans used to make an international call or to the North American Numbering Plan (NANP), which will continue as the 10-digit numbering plan for all countries in World Zone 1 (CC = 1).

1.06 When routing numbers are international numbers, they can be up to 15 digits in length. The CCITT recommends that no more than 6 digits of the international number need to be analyzed to obtain routing information to the destination country. Based on specific needs, telecommunications administrations (TA) can arrange bilateral agreements to translate more than 6 digits.

Outbound, Inbound and Transit Call Treatment

A. Outbound Calls

1.07 International outbound calls originate in this country and are destined for foreign countries. Calls can be routed in the AT&T Switched Network (ASN) from the Originating AT&T Switch (OAS) directly or routed through a *4ESS* Via switch to the International Switching Center (ISC). In the description that follows, the originating treatment applies to the OAS and the terminating treatment applies to the *4ESS* switch ISC.

1.08 An Automatic Message Accounting (AMA) record is generated by the OAS for each outbound call.

Outbound Originating Treatment

1.09 Calls originated by the end users can be customer direct-dialed or operator assisted. To originate a call, the customer dials an appropriate number to indicate an international outbound call. Both switched-access and direct-connect calls are supported.

1.10 Switched-access calls are routed to the *4ESS* switch using Common Channel Signaling System 7 (CCS7), Integrated Services Digital Network User Part (ISUP), CCS7 Network Interconnect (NI), or Equal Access Multifrequency (EAMF) signaling. Direct-connect calls are routed to the *4ESS* switch using Q.931, MF, Dial Pulse (DP) DTMF or CCS7 ISUP signaling.

1.11 The CCS7 ISUP and NI parameters that accommodate 15 digits are shown in Table 10-A.

Table 10-A. CCS7 ISUP and NI Parameters

CCS7 Message	Message Parameter
ISUP Initial Address Message (IAM)	Called Party Number (CDPN)
ISUP IAM	Dialed Number (DN)
ISUP IAM	Calling Party Number (CPN)
NI IAM	CDPN
NI IAM	CPN

1.12 Public calling party numbers are 10-digit NANP numbers, but private calling party numbers can have up to 15 digits.

Subsystem Signaling

1.13 The Direct Services Dialing (DSD) Network Services Complex (NSCX) collects Caller Entered Digits on instructions from the *4ESS* switch or the DSD Network Control Point (NCP). Currently, domestic DSD NSCXs can collect up to 30 digits, and international DSD NSCXs can collect up to 21 digits. However, the current interface between the NSCX and the *4ESS* switch is Common Channel Interoffice Signaling System 6 (CCIS6) and the command sent to the DSD NSCX by the *4ESS* switch only allows for the collection of up to 15 digits (for up to a 12-digit international number and a 3-digit prefix). The COL E message sent has no room to expand the number of digits collected. Therefore, to accommodate the new 15-digit international numbering plan, the NCP will send two collect messages if more than 12 digits are to be collected, and the *4ESS* switch will send two collect commands to the DSD NSCX.

ISDN Signaling

1.14 The maximum length of the number digits field of the impacted Q.931 information was increased to support the increased maximum length of international numbers. This field specifies the address digits and was increased to a maximum length of at least 15 digits (from the previous maximum length of 14 digits).

1.15 Four distinct Primary Rate Interface (PRI) types are supported by the *4ESS* switch. These are a commercial interface (PBX) and the three proprietary interfaces listed below:

- Common Platform Adjunct
- Small Scale Adjunct
- *CONVERSANT*® Interactive Voice Information System.

1.16 Because the proprietary interfaces listed above are extensions of the commercial interface, any information element defined for the commercial interface is also defined for each proprietary interface. However, some Q.931 information elements are proprietary and are only defined on specific proprietary interfaces.

I800 Calls

1.17 With this feature, the *4ESS* switch can receive and process international outbound calls with international numbers based on CCITT Recommendation E.164. With the exception of I800 calls, the international numbers enter the switch in the form of [prefix digits] + CC-NN, where CC-NN can have up to 15 digits. For I800 calls, the numbers entering the switch will be in the form 800-NXX-XXXX. These numbers are encoded in the IAM /setup message or as part of the address signals, based on the common channel signaling or inband signaling used.

Routing

1.18 For international calls that do not require a database dip, the *4ESS* switch will hunt idle trunks and route the call directly, or through *4ESS* Via switches in the ASN, to the *4ESS* switch ISC. The international numbers (CC-NN) can have up to 15 digits and are encoded in the Called Party Number (CDPN) and Dialed Number (DN) parameters of the CCS7 ISUP IAM.

1.19 For international calls that require a database dip, the *4ESS* switch will send the DNs to, and receive responses from, the database. The DNs can be up to 15 digits in length and are encoded in the Digits (Dialed Number) parameter of the CCS7 Transaction Capabilities Application Part (TCAP) Begin message. The database will return routing and destination numbers, both of which can be up to 15 digits in length. They are encoded in the Digits (Routing Number) and Digits (Destination Number) parameter of the CCS7 TCAP response messages. Table 10-B lists the CCS7 TCAP parameters that can accommodate 15 digits.

Table 10-B. CCS7 TCAP Parameters

CCS7 TCAP Message	Message Parameter
Begin Message	Digits (Dialed Number)
Begin Message	Digits [Automatic Number Identification (ANI)]
Begin Message	Digits [Network Remote Access (NRA) ANI]
Continue and End Message	Digits (Routing Number)
Continue and End Message	Digits (Destination Number)
Continue and End Message	Digits (Dialed Number)
Continue and End Message	Digits (ANI)

Outbound Terminating Treatment

1.20 When a *4ESS* switch ISC receives the CCS7 ISUP IAMs that indicate an international call, the switch will hunt idle trunks to the destination countries. These calls can be routed to the foreign TA using CCITT7, CCITT7 Telephone User Part (TUP), CCITT6, CCITT5, or CCITT R1 signaling.

1.21 The international telephone numbers that can have up to 15 digits are encoded in the IAMs or as part of the address signals, based on the common channel signaling or inband signaling used. Table 10-C lists the CCITT7 and TUP parameters that can accommodate 15 digits.

Table 10-C. CCITT7 ISUP and TUP Parameters

CCITT7 ISUP/TUP Message	Message Parameter
CCITT7 ISUP IAM	CDPN
CCITT7 ISUP IAM	CPN
CCITT7 TUP IAM	Called Address Signals Field

B. Inbound Calls

1.22 International inbound calls originate in foreign countries and are destined for this country. A call can be routed in the ASN from the ISC directly or through a *4ESS* Via switch to the Terminating AT&T Switch (TAS).

Inbound Call Originating Treatment

1.23 Calls routed from a foreign TA to the *4ESS* switch ISC use CCITT7 ISUP, CCITT7 TUP, CCITT6, CCITT5 or CCITT R1 signaling.

Numbering Plan

1.24 A *4ESS* switch ISC can receive and process international inbound calls where the CPNs are based on CCITT Recommendation E.164. The CPN can be up to 15 digits and is encoded in the IAM.

Routing

1.25 The 4ESS switch ISC will use existing capabilities to determine routes for calls requiring either a database dip or no dip. After hunting idle trunks, the ISC will route the calls directly or through *4ESS* Via switches in the ASN to the TAS. When applicable, the calling party numbers are encoded in the CPN parameter of the CCS7 ISUP IAM. The ISC will transmit the CCS7 ISUP IAM, the Via switch will receive and transmit the CCS7 ISUP IAM in the ASN, and the TAS will receive the CCS7 ISUP IAM.

Inbound Call Terminating Treatment

1.26 When the TAS receives the CCS7 ISUP IAM, indicating an international inbound call, the switch will hunt idle trunks towards customers. For switched-access customers, the *4ESS* will route the calls using CCS7 ISUP, CCS7 NI or MF signaling.

1.27 For direct-connect customers, the switch will route the calls using Q.931, MF, DP, DTMF or CCS7 ISUP signaling. When applicable, the calling party number is encoded in the CPN parameter of the CCS7 ISUP or CCS7 NI IAM, or in the CPN Information Element of the Q.931 Setup message.

C. Transit Calls

1.28 International transit calls originate in one foreign country and are destined for another foreign country while being routed through this country. The two logical switches in the call flow can be two separate ISCs or the same ISC in the ASN. When an international transit call is routed in the ASN between two *4ESS* switch ISCs, the originating treatment discussed below applies to the first ISC and the terminating treatment applies to the second ISC. When a transit call is routed via one *4ESS* switch ISC, both the originating and terminating treatments apply to the same switch.

Transit Call Originating Treatment

1.29 International transit calls are routed from a foreign TA to the *4ESS* switch ISC using CCITT7, ISUP, CCITT7 TUP, CCITT6, CCITT5, or CCITT R1 signaling.

Numbering Plan

1.30 A *4ESS* switch ISC can receive and process international transit calls where the CDPN, CPN, and connected numbers are based on CCITT Recommendation E.164.

Transit Call Routing

1.31 When transit calls are routed between two *4ESS* switch ISCs in the ASN, the called party numbers and the calling party numbers will be encoded in the CDPN and CPN parameters of the CCS7 ISUP IAM, respectively.

Transit Call Terminating Treatment

1.32 The TAS ISC routes transit calls to another foreign TA using CCITT7 ISUP, CCITT7 TUP, CCITT6, CCITT5 or CCITT R1 signaling. The international numbers, which can be up to 15 digits, are encoded in the IAMs or as part of the address signals based on the common channel signaling or inband signaling used.

2. Call Flow

2.01 In general, this feature does not affect call flows. All voice and data calls should continue to be routed as they were prior to this feature. Only numbers such as dialed numbers and routing numbers, when they are international numbers, may be expanded up to 15 digits in length.

3. Provisioning

Affected Office Data Assembler (ODA) Structures

3.01 Structures HT4RDB and HT4CDB were affected by this feature. For HT4RDB, the valid values for XL4RD_DEL in the Routing Data Layouts were modified from 0-14 to 0-15.

3.02 For HT4CDB, the valid values for XLCDB_DEL in the Routing Data Layouts were modified from 0-14 to 0-15

Removal of Prefix (PR) Codes

3.03 As described below, PR codes are in conflict with this feature and must be removed.

3.04 Fully Coded Addressing was implemented in 4E10 to transport international outbound calls to the proper ISC. This was done through the Dynamic Non-hierarchical Routing (DNHR) network in the International Voice Transit (IVT) domain. PR codes in the Call Handling Instructions (CHI) field of the code grouping tables were used to direct these calls. With the advent of Real Time Network Routing (RTNR), these PR codes became obsolete. However, Common Network Routing Data Base/Integrated Routing Assignment System (CNRDB/IRAS), which supports the routing function, could not be changed until all *4ESS* switches were on RTNR and the possible blackout period for RTNR was completed. When that occurred, CNRDB/IRAS was able to remove the logic to add the PR codes for the IVT domain.

3.05 It was expected that these PR codes would be wiped out of translation through normal activity, either with the implementation of Split Access Flexible Egress Routing (SAFER) or rehome activity, and this is occurring. However, this feature is in conflict with the PR codes and their complete removal is required.

3.06 The following procedure for removing the PR codes applies to all AT&T non-ISC offices:

- Search for call type treatments with a CHI value of PR10 - PR19 in the IVT domain (or in any domain that points to or from the IVT domain) with a number of translated digits (NTD) of 3.
- Change the CHI field from PRxx to blank (no CHI).

Affected Recent Change Input Message

3.07 The ANT Recent Change capability was changed to allow population of additional routing digits data. As a result, the ANTRECORD Recent Change Input Message will use a new qualifier, FHB, instead of FHT, which was used prior to this feature. An example of the new format is as follows:

RC:MISC;FHB,FTA: ANTRECORD ...!

Affected Recent Change Forms

3.08 Recent Change Forms 500, 505, 517, 519,and 622 were modified to support this feature. Valid entries for DEL on each of these forms can now be 0 to 15.

Affected Verify Forms

3.09 Verify Forms 5a, 5d, 5f, 5g, and 6y were modified to support this feature. Valid outputs on each of these forms can now be 0 to 15.

4. Recording

AMA Code Structures and Modules

4.01 Four new AMA structure codes were created to support this feature: 00901, 00902, 00903, and 00904. These new structure codes are for Business Communications Services Inbound service recording only.

4.02 New assignments were defined in Tables 896 and 897. Module 935 is used to record the originating number, destination/terminating number, dialed number, redirection number, or station ID that is longer than 12 digits except when structures 00901, 00902, 00903, or 00904 are created.

4.03 Table 922, Expander Digits, is a new table created to support this feature and is used for structures 00901, 00902, 00903, and 00904. Refer to Table 10-D.

Table 10-D. Table 922 (Expander Digits)

Binary Coded Decimal (BCD) Character	Description
1-7	Digits
8	SIGN

4.04 Prior to this feature, the ASN supported 12-digit recording. To support this feature, some of the number fields in the AMA structures and International Call Detail Recording (ICDR) structure were expanded. The national number of the NANP is not expected to be expanded beyond 12 digits in the near future. However, private domestic numbers can have up to 15 digits.

4.05 The number fields for the following services were expanded to support this feature:

- For international egress call services, the destination/terminating numbers and dialed numbers were expanded to 15 digits. For Global Software Defined Network/Software Defined Network-International (GSDN/SDN-I), the station ID was also expanded to 15 digits.
- For Business Communications Services Inbound services, the destination/terminating number, originating number, redirection number, and station ID were expanded to 15 digits.

4.06 There will be two different ways to generate AMA records and ICDR records in the ASN at Time-T. The Call Detail Recording function will be performed at the *4ESS* switch and at the Call Detail Recording Platform (CDRP).

4.07 An ICDR record will be generated by the ISC for each outbound, inbound, and transit call.

5. Network Management

5.01 The 5-minute Alternate Number Translation (ANT) data sent to the Network Management Operations System (NEMOS) from the *4ESS* switch was modified to support up to a 15-digit international routing number.

6. Maintenance/Troubleshooting

6.01 To support this feature, the Network Validation Test (NVT) of the *4ESS* switch can search for dialed and terminating numbers in AMA Module 935 if the number is longer than 12 digits. In addition, the NVT can search for a Billing Number in Module 935 if the number is longer than 10 digits.

7. Transition Considerations

Ubiquity

7.01 It is not necessary for all *4ESS* switches in the network to be running the 4E21 Release 1 Generic for this feature to be operational.

Dependencies on Other Network Components

7.02 The GSDN/SDN-I/Digits Phase 2 feature (3669) must be deployed prior to this feature. Feature 3669 must be turned on manually. Refer to the *4ESS Switch Product Release Document* for 4E17 Release 3 for information on activating Feature 3669.

Turn On/Turn Off Mechanism

7.03 This feature is turned on automatically by software deployment.

CAUTION:
This feature will not operate unless Feature 3669 is active.

8. Input/Output Manual Pages

The following 3B Attached Processor Input Manual Page was modified to support this feature:

START:NVTSESS

Program Store Expansion Feature (3333a)

11

Contents

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Program Store Expansion Feature (3333a)

11

1. Feature Description

General

1.01 Demands for data storage within the *4ESS*™ switch are accelerating with the deployment of Automatic Number Identification (ANI)-based and call-monitor services. Data records associated with these services are normally stored in Call Store (CS). Also, development of new services is accelerating, thereby generating program text at an increasing rate. Program text associated with call processing features normally resides in Program Store (PS) for performance reasons. The 24-bit version of the 1B Processor available in the *4ESS* switch supports a memory spectrum of 2 Mega-Words (Mw) of PS and 6 Mw of CS. Only 5 Mw of the CS will be available for use, while the remaining 1 Mw will be reserved.

1.02 This memory spectrum is insufficient to meet the real need for PS and CS growth. The solution is an expansion of the memory spectrum available to call processing. This may be a direct expansion of the 1B Processor memory spectrum to 30 bits, or a re-architecting of call processing to include call processors on the Interface Bus (IFB). Unfortunately, it is not possible to do either of these long term solutions in time to meet the short term needs. Thus, an interim solution, Extended Store (XS) and Program Store Expansion (PSE), will bridge the "memory gap."

Extended Store

1.03 XS is Call Store Bus (CSB) based memory. It resides in the CS memory spectrum and uses 30 bit addresses. It is designed so that existing data structures may be relocated into it. However, it does not take the place of CS for existing data in general. XS is also intended for new data structures and provides up to 15 Mw of additional duplicated memory.

1.04 XS is implemented by a new memory access mechanism—windowed access. Application software writes a pointer to position a window over the (30 bit) address space that is to be accessed. Then access into a window (23 bit) address range is mapped to access the new memory. There are eight windows (each with its own pointer) and each can access the entire XS address range.

1.05 Windowed IFB Memory Mapped Input Output (MMIO) access will be installed as a step toward IFB evolution. Each of the eight windows can be configured to access XS or to access the expanded MMIO address space. This provides expanded communications between the 1B Processor and future IFB clients. The windowed MMIO capability is referred to as eXtended MMIO (XM).

Program Store Expansion

1.06 The conversion of 1Mw of CS to PS is called Program Store Expansion (PSE). PSE increases the maximum Program Store from 2 Mw to 3 Mw minus 64 Kw and alters the PS/CS split from 2Mw/(6Mw - 64 Kw) to (3Mw - 64 Kw)/5Mw.

NOTE:
CS and PS MCODES are defined as bits 28 - 20 of an address. Unless otherwise stated, MCODES are given in octal and range from 000 to 777. Sometimes MCODES are identified as 0 through 7. This is an abbreviated representation of physical MCODES 770 through 777 respectively.

1.07 PS MCODE 777 includes a 64 Kilo-Word (Kw) range for addressing MMIO, Boot ROM, and the Buffer Bus. Therefore, 64 Kw of usable PS address space is lost.

1.08 Together, the new memory expansion features XS and PSE allow the continued growth of call processing program text and ANI-based services customer data records. In addition it provides memory to add new services such as call-redirection.

Hardware/Software Interface

1.09 The XS feature adds several new elements to the 1B Processor architecture. First is the XS memory which is physically implemented as Call Store (CS or KLW1) circuit packs. Eight windows are added to the 23 bit address space of the 1B Processor, and each window has a corresponding Window Pointer (XAWP).

1.10 To provide additional memory for program text that is execution time sensitive, the 1B Processor address spectrum allocates CS MODE 7 (physical MODE 777) as PS MODE. The PSE MODE 777 is not directly accessible by the Auxiliary Unit Interface (AUI) for pumping from the APS disk. PSE will be pumped by temporarily renaming the PS to MCODE 2 (physical MCODE 772).

1.11 The additional duplex PS will be integrated as part of the 1B Processor PS subsystem. Therefore, the recovery, configuration, and maintenance strategies for PSE are identical to PS. Error free access to all PS data will be maintained by the system/fault recovery programs.

2. Call Flow (Not Affected)

3. Provisioning

Windows and XS Address Translation

3.01 Windowed access requires setting up a pointer and then reading or writing XS memory with Load and Store instructions whose address falls within a window. Address translation occurs on these otherwise standard Load and Store instructions.

3.02 There are eight windows in the 1B Processor address space, and each spans a 8192_{10} word range. Table 11-A gives the window address ranges in octal for 23-bit and 30-bit address formats. Each window can be used for XS or XM access. XS access through a given window requires that the window be both enabled and configured as type XS.

Table 11-A. Window Addresses

Window	Original Address Range		KCODE (23 bit octal)	Original Address Range (octal)	
0	33 600 000	33 617 777	157	77 7360 0000	77 7361 7777
1	33 620 000	33 637 777	157	77 7362 0000	77 7363 7777
2	33 640 000	33 657 777	157	77 7364 0000	77 7365 7777
3	33 660 000	33 677 777	157	77 7366 0000	77 7367 7777
4	33 700 000	33 717 777	157	77 7370 0000	77 7371 7777
5	33 720 000	33 737 777	157	77 7372 0000	77 7373 7777
6	33 740 000	33 757 777	157	77 7374 0000	77 7375 7777
7	33 760 000	33 777 777	157	77 7376 0000	77 7377 7777

3.03 Figure 11-1 illustrates how the original or input address is translated to a target address. Notice that the upper 17 bits of the original address select which pointer is used. This is shown as "Selects Window n" where n is 0 through 7. The value of the corresponding pointer (XAWPn) will be used to generate the target address. Bits 0 through 14 of the pointer appear in the translated address as bits 13 through 27. The pointer contents can be thought of as setting the position of the window over the desired memory.

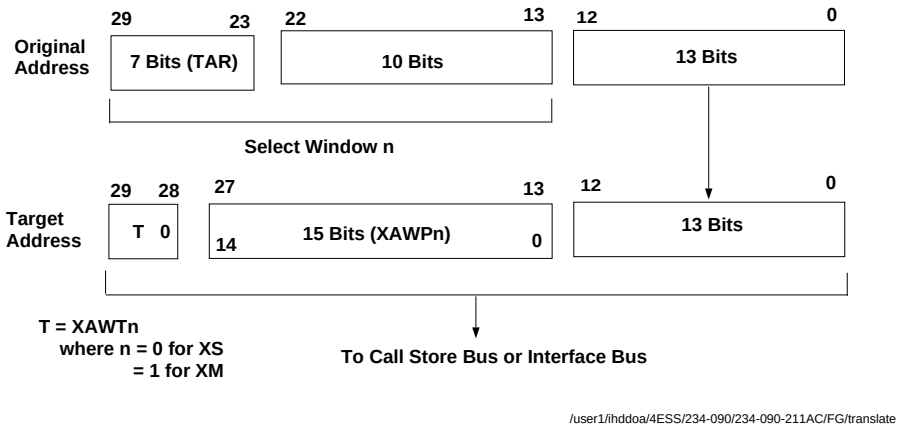

Figure 11-1. Address Translation

XM Address Translation

3.04 Any of the eight windows (see Table 11-A can be configured for XM use via the window type register (XAWT). When a given window is enabled and configured as XM, data port or index port accesses to this window will be translated to reach IFB addresses in the range of $40\ 0000\ 0000_8$ to $57\ 7777\ 7777_8$. This is a subset of the extended MMIO range.

3.05 Figure 11-1 shows how the original address is translated to a target address. The translation is very similar to that for XS. The main difference is that the window type bit is a one rather than a zero. Therefore, bits 29 and 28 of the translated (XM) address are always one and zero respectively. This forces the XM access to address the extended MMIO range and removes the possibility of generating non-MMIO addresses. The pointer contents can be thought of as setting the position of the XM window over the desired IFB address range.

4. Recording (Not Affected)

5. Network Management (Not Affected)

6. Maintenance/Troubleshooting

System Recovery Programs

6.01 Two types of system recovery programs are affected by XS development. First, the system initialization/reinitialization (SR) program moves the XS data from tape to disk or from tape to core, and releases control to the Processor Configuration (PC) program to complete recovery. The PC program pumps data from disk to CS/XS/PS and controls the completion of system recovery. PC also enables windows and sets the window type.

6.02 The second type of system recovery program affected by this development is the front end of interrupt recovery (SIRE) and the back end of interrupt recovery (MARP). SIRE saves the window pointers for interrupts A through E. MARP restores the pointers and re-enables the windows upon exit from interrupts A through E.

A. Fault Recovery Programs

6.03 Call Store Fault Recovery and Program Store Fault Recovery (CSFR/PSFR) is impacted most by the addition of XS and PSE. All areas that process MCODE related items are affected by the need to consult a new status table based on XMCODE.

6.04 The program that configures extended stores uses a technique whereby the MCODE to be written is put in the Transition Address Register (TAR) and then Memory Address Bus Select (MABS) is set to direct the address to the CS bus to reconfigure stores at XS MCODES. Immediately after the write operation, the MABS should be reset and the TAR restored. All interrupts are inhibited during configuration except B level and A level. Therefore, A and B level routines ensure that MABS is reset and TAR is restored for proper memory access.

6.05 CS Fault Recovery tests access to the extended stores with all enabled pointers/windows to guarantee proper fault isolation/recovery.

6.06 Central Control Fault Recovery (CCFR) verifies the XS access through each window as part of its memory access tests. All window pointers must be updated when the standby CC is restored to service for duplex operation.

6.07 IFB fault recovery (IFFR) adds an address range check routine to intercept a faulty access to the extended MMIO range and process the interrupt according to the application requirement. When there is no application, the interrupt should be considered "out of range".

6.08 Write Protect Administration (WPAD) will lock and unlock the access to the XS areas for static data updates.

B. Operating System Programs

6.09 All the Operating System (OS) programs are impacted by the changes in the memory structure. The areas impacted are summarized in Table 11-B.

Table 11-B. Operating System Program Impacts

Program	Impact
Disk Administration	Provides the interface to pumping memory (both XS and PSE) during system/fault recovery. Also translates core to disk addresses.
Memory Audits	Guarantee memory access and data integrity for XS (SAWS) and PSE.
Generic Utilities	Provide the capability to read, write, and copy XS (GULP) and PSE memory.
Library Programs	Modified as needed to access XS or PSE.
Translation Recent Change	Provides the interface to changing translations for XS and PSE growth (XAPP).
Tape Programs	Provide SR and audit of disk data (both XS and PSE).
Master Control Center Programs	Provide control and display of XS and PSE units.
Maintenance Control Program	Provides input to Address Range Check Routine.
New Routines	Provide basic access to XS via macros to be used by Processor Software or Generic programs.

C. MUP

6.10 The MCC Call Store Status Page displays the status of all forty CS and all possible PS units indicates the state as unequipped, growth, active, standby, or update. Also included is the MCODE name and bus routing of each store unit.

6.11 The MCC Call Store Control Page allows via pokes to remove, restore and diagnose all forty CS and all possible PS units.

D. Diagnostic Programs

6.12 Central Control Diagnostics tests the window pointers and XS window translation if they exist. If the diagnostic employs a helper unit that is set to a XMCODE, then the memory access can be made through the window. The diagnostic program is transparent to the additional window hardware by employing a Hardware Version for the FI and FA. Also, CC diagnostics must be aware of the possible equipage of the extended call store address space.

6.13 Memory Unit Diagnostics is impacted by the addition of XS MCODE structures and reallocation of PS memory. The diagnostic tests call stores at XS MCODEs but avoids accessing the highest 64K of PSE.

6.14 Memory Bus Diagnostics is impacted by an in-service unit that is configured to a XS MCODE or as a PSE. The access to XS units are made through the window.

Audits

6.15 Audits 43, 44, 45, 66, and 72 are affected by the PSE feature. The main impact is the time it will take to perform system procedures with the new memory. Table 11-C defines these audits.

Table 11-C. Audit Descriptions

Audit Number and Description	PIDENT	Program Unit (PU)	Memory Checked	Action Taken (By Audit)	Inhibit Risk (Note)
43 File System-to-Core Generic	SAWSCMMN		Matching and hashing for generic only data, file system-only generic, and library program	Detects memory errors and if possible correct	L
44 Core Resident Generic Data Hash			Hashes core resident generic data		L
45 Nongeneric Core Resident and Extended Store (XS) Data Hash Check			Hashes core and extended store resident nongeneric data		L
66 File System-to-Core Nongeneric Audit	SAWSCMMN		Matching and hashing over nongeneric data. This audit also checks file system-only data.	Detects memory errors and if possible correct	L
72 1B Memory Fault Audit	SAWSSUBR	PU21	Check accessibility and parity of all CS and PS memory	None. Fault recovery invoked if D and E level is not PESTed	L

Note: High (H), Medium (M), or Low (L) indicate the risk to basic call processing if the audit is inhibited and other problems exist. If "open defensive check" audit printouts are occurring or other numbered audits and TRs or CRs are in the output message, then any number of the High Risk Audits may be needed to achieve sanity.

7. Transition Considerations

Ubiquity

7.01 It is not necessary for all *4ESS* switches in the network to be running the 4E21 Release 1 Generic for this feature to be operational.

Turn On/Turn Off Mechanism

7.02 This feature is turned on automatically by the software deployment of the platform for Expanded Memory features.

8. Input/Output Manual Pages

8.01 Table 11-D lists the Input/Output (I/O) manual pages affected by this feature.

Table 11-D. *4ESS*™ Switch Computer I/O Messages

Message	Type	Description
SET:SOAK	Input	Adds either a Call Store, Program Store, or a Central Control Unit to a soak list. See the **CAUTION** statement at the end of this table.
OP:SOAK	Output	Reports the number of days a Central Control Unit has left to soak.
REPT:SOAK	Output	Reports the status of a Central Control Unit soak test.

CAUTION:
Since this message has the potential to affect service, the Central Control Unit should be switched to standby before starting a soak test (not applicable to CS or PS).

1B Processor Extended Store (XS) Implementation Feature (3355)

12

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1B Processor Extended Store (XS) Implementation Feature (3355)

12

1. Feature Description

1.01 This feature provides Phase 2 of a two part program to expand the Call Store (CS) memory in the 1B Processor. Phase 1 was introduced with Feature 3355a, 1B Processor Extended Store (XS), in 4E20 Release 1. Feature 3355a provided the hardware and software changes to expand the 1B Processor memory but did not make the new capabilities available for use by applications. This feature activates the capabilities that were put in place with Feature 3355a and makes them available for use by new network features and services.

1.02 Prior to this feature, the 1B Processor supported a memory spectrum of 2 Megawords (Mw) of Program Store (PS) memory and 6 Mw of CS memory. [Only 5 Mw of CS memory are used; the other 1 Mw is reallocated as future Program Store Expansion (PSE) memory.] Feature 3355a (when activated by this feature) expands the CS memory spectrum so that a fully equipped XS memory system can provide up to 15 Mw of additional duplicated CS Bus (CSB)-based memory.

1.03 Figure 12-1 shows an example of the 1B Processor memory allocation of 5 Mw CS and 6 Mw XS that will be available after Feature 3355a is activated by this feature.

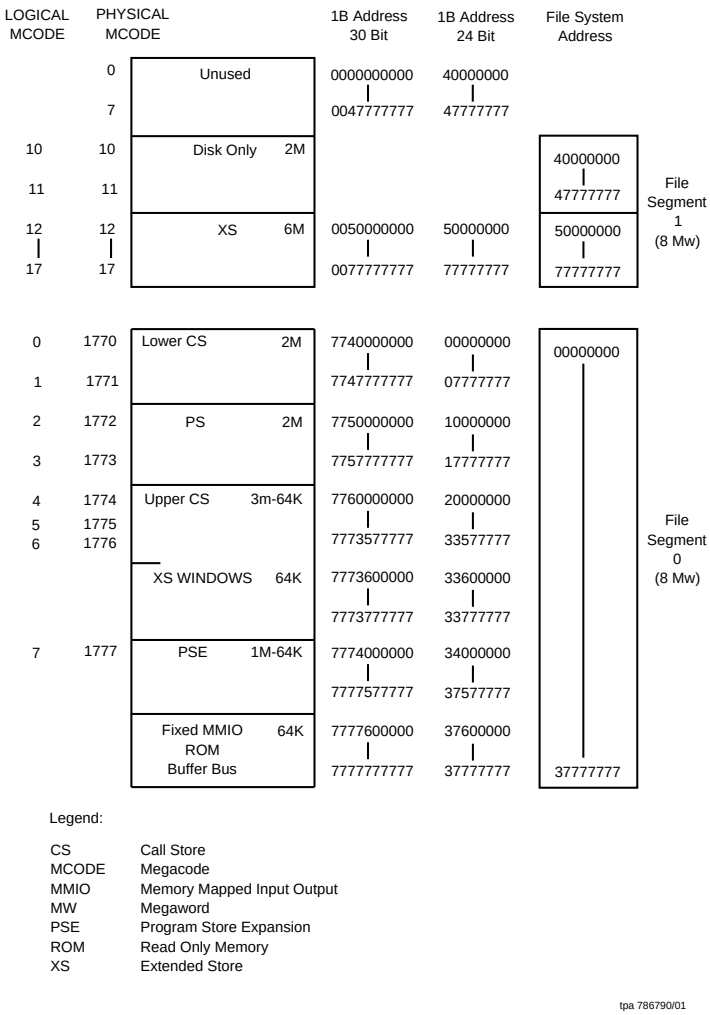

Figure 12-1. Example of 1B Processor 5 Mw CS and 6 Mw XS Memory Allocation

NOTE:
The term "Extended Store" refers to the additional CSB-based memory known as Windowed Call Store (WCS).

1.04 The XS feature (3355a) is an optional feature. The software and hardware allow the 1B Processor to operate with or without the XS units. Although the XS feature is a 4E20/4E21 Generic feature, it can also be installed in later releases. If the feature is installed in a later generic release, the installation must still take place in the generic prior to its intended use.

1.05 Refer to AT&T 234-090-201AC, *4ESS™ Switch, Product Release Document, 4E20 Release 1 Generic* for additional information on Feature 3355a. Growth procedures for installing the new hardware are covered in Task Oriented Practice (TOP) AT&T 234-353-010, *1B Processor Growth*.

1.06 Refer also to AT&T 234-090-201AC for additional information on the 1B File Expansion on Attached Processor System Disk Feature (3356) which was introduced in that release. Feature 3356 provides the disk storage required to back up XS.

2. Call Flow (Not Affected)

3. Provisioning

Office Data Assembler (ODA) Structures Affected

A. New Data Structures

3.01 The following new data structures have been added to support this feature:

HT4WCS21D

3.02 This is a 64-word structure defined in protected, simplex, disk-backed and ODA populated (PSBO) memory for storing ID tags of structures that can optionally exist in either 1B main memory or XS memory. This structure is indexed by XL4SAUSE which points to disk ID tags for the translator.

OD4DMINWCS1, OD4DNUMWCS1, OD4DMAXWCS1

3.03 These are 1-word structures which point to file store for storing the XS disk backup in File Segment 1. These structures are defined sequentially, immediately following the OD4DMINEXDA structure.

XL1MCTRANC

3.04 This is a new 1024-word translator that provides the capability for assigning up to 256 extended call store megacodes (MCODEs). It is used for assigning every

MCODE and one word of data stored for each MCODE. An MCODE represents bits 20 to 28 of an address. The XL1MCTRANC structure is used to indicate the following:

- The equipage status of the MCODE (unequipped, grow or operational)
- The configuration mode of the MCODE (simplex or duplex)
- If the MCODE is needed in the emergency minimum configuration
- If the MCODE can be accessed on call store bus, program store bus, or interface bus
- If the MCODE is accessible directly via API
- Flag to indicate that the MCODE contains transient data and requires full memory initialization when MCODE duplex fails
- Flag to indicate that the MCODE has a restricted area
- Pointer to the restricted area translator.

The data in XL1MCTRANC is fixed assigned by the Office Database Management System (ODMS).

XL1MCTRANP

3.05 This is a new 1024-word translator that provides the capability for assigning up to 256 extended call store MCODEs. It is used for assigning every MCODE and one word of data stored in each MCODE. It contains exactly the same data as translator XL1MCTRANC.

XL1RATRANC and XL1RATRANP

3.06 These are restricted area translators that are used to define the areas within the MCODE that are unused, undefined, or which have special access characteristics. They are 64-word structures consisting of 32 blocks of two words each. The structures are indexed by a restricted area index number. The information stored in the first word (word 0) consists of a flag to indicate that this entry has the last restricted area within the MCODE and a start address of the restricted area. The second word (word 1) of the block consists of the reason the area is restricted and the size of the restricted area.

XL1MCTCM1

3.07 This is a 1-word translator that is used as a stop search word for XL1MCTRANC.

XL1MCTPM1

3.08 This is a 1-word translator that is used as a stop search word for XL1MCTRANP.

DK1ID2SEG

3.09 This is a 32-word structure, indexed by disk ID tag to obtain the associated file

segment value (0-3). A disk ID tag can only be used on one file segment even though a file segment may contain data for a number of ID tags. The contents of each word in the structure is a number from 0-3 for assigned entries or set to 1DKNOSEG for unassigned entries.

DK1SEGPTRS

3.10 This is a 4-word structure indexed by file segment number for mapping the core address to a disk address. If a file segment is used to provide disk backup of core memory, bits 22-23 will be 0 and bits 0-21 in the structure will contain bits 10-29 of a physical 32-bit 1B Processor address.

B. New ID Tags

3.11 The following new ID tags were assigned to ODA disk backup structures in file segments 1-3, and the associated data needs to be copied on the ODA TWRP tape:

- 1DKTRANl (ID Tag 20)
- 1DKTRAN2 (ID Tag 21)
- 1DKTRAN3 (ID Tag 22)

ODA Forms

ODA Form 406C

3.12 As shown in Figure 12-2, a new field, NWCSMU, was added to ODA Form 406C and is used to indicate the number of XS memory units needed for an office. Each memory unit is configurable in 1 Mw. Valid entries are 0-6 and blank.

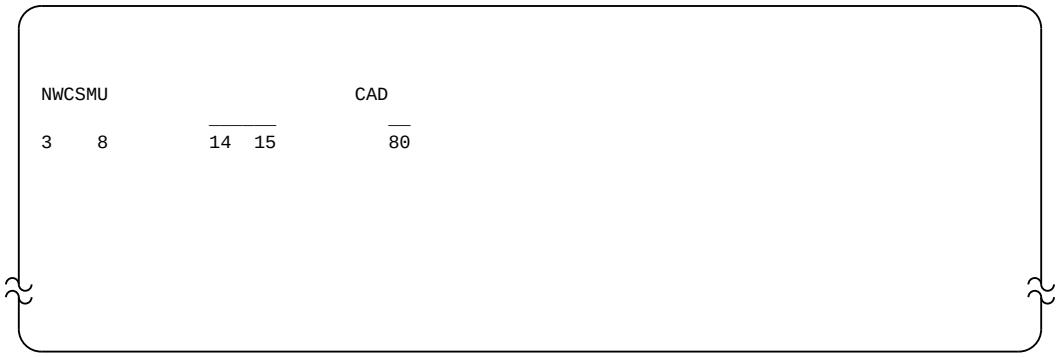

Figure 12-2. Portion of ODA Form 406C

Recent Change (RC) Forms

3.13 RC Form 812, Main Core and Extended Store Word Change (Figure 12-3), has been created to support this feature. It is used to change the contents of a maximum of 24 words of ODA translation data which is in core, backed up on disk, or is disk-only data. A part or all of the word may be changed for a given address. The XS address used on RC Form 812 is the backup disk address.

```
# FORM 812 ENHANCED ABSOLUTE WORD CHANGE

RC:FUNC;CHG;OPT(ENHABS),---:     FSONLY -,   FSEG --,

ORNU ------,

ADDRESS     SIZE     DISP     OLDDATA     NEWDATA

--------     --,      --,     --------,   --------,
--------     --,      --,     --------,   --------,
--------     --,      --,     --------,   --------,
--------     --,      --,     --------,   --------,
--------     --,      --,     --------,   --------,
--------     --,      --,     --------,   --------,
--------     --,      --,     --------,   --------,
--------     --,      --,     --------,   --------,
--------     --,      --,     --------,   --------,
--------     --,      --,     --------,   --------,
--------     --,      --,     --------,   --------,
--------     --,      --,     --------,   --------,
--------     --,      --,     --------,   --------,
--------     --,      --,     --------,   --------,
--------     --,      --,     --------,   --------,
--------     --,      --,     --------,   --------,
--------     --,      --,     --------,   --------,
--------     --,      --,     --------,   --------,
--------     --,      --,     --------,   --------,
--------     --,      --,     --------,   --------,
--------     --,      --,     --------,   --------,
--------     --,      --,     --------,   --------,

REMARKS --------------------------------------------------!


           EQUIVALENT ODA INPUT FORM - NONE

             ASSOCIATED VERIFY MESSAGE

           INPUT - 18f - VER:ABSOLUTE:ADR --------,CORE/DISK/XS!(EOT)

           OUTPUT - 8f - VER:ABSOLUTE,OPT(CORE/DISK/XS):
```

Figure 12-3. Recent Change Form 812

3.14 The population rules for RC Form 812 are as follows:

- Valid input for FSONLY is either N or Y.
- Valid input for FSEG is 0, 1, 2 or 3.
- Valid input for SIZE is 1-24.
- Valid input for DISP is 0-23.
- The SIZE plus DISP cannot exceed 24.
- Valid input for NEWDATA is 0-O(77777777).
- Valid input for OLDDATA is 0-O(77777777).
- Each ADDRESS must be an octal number and must be unique on the form.
- For consecutive addresses, the ADDRESS field can be blank, but the SIZE, DISP, OLDDATA, and NEWDATA fields must have input.

Affected Verify Forms

3.15 Verify Forms 6b, 6c, 8a, 18a, and 16b were affected by this feature to provide for verifying the usage of XS memory.

Verify Form 6b

3.16 Verify Form 6b [VER:SPARE_MEMORY,OPT(CORE/DISK):VERIFY OUTPUT #6b - SPARE 1024 WORD BLOCKS] is shown in Figure 12-4. Two new fields, TYPE and SEG, were added to this form. TYPE refers to the type of memory and has the following possible entries:

- MAIN_CS—Core memory located in the base 1B Processor Call Stores. It is used for storing ODA translators which are backed up on disk File Segment 0.
- EXT_CS—Core memory located in XS Call Stores. It is used for storing ODA structures which are backed up on disk File Segments 1-3.
- DO_TRAN—Disk memory used to store disk-only ODA structures such as the DISK TSG translator. DO_TRAN translators can only exist in File Segment 0.
- ACI_TRAN—Disk memory used to store disk-only ODA structures for the Data Link Nodes. ACI_TRAN translators can only be located in File Segment 0.

3.17 SEG refers to the segment number of memory. Segment 0 is the base 1B Processor disk and core memory. Segments 1-3 are used for disk memory that was added by Feature 3356 (1B File Expansion), core memory that was added with XS expansion by Feature 3355a, and this feature. Each segment is an 8 Mw block of memory.

3.18 The following three entries can be used in the ADDRESS field on Verify Form 6b:

- CS—Core address in base 1B Processor Call Store memory range (MAIN_CS type of memory). Valid for Segment 0 only.
- XS—Core address in XS Call Store memory range (EXT_CS type of memory). Valid for Segments 1-3 only.
- DSK_—Disk address (DO_TRAN or ACI_TRAN type of memory). DO_TRAN and ACI_TRAN can only be located in Segment 0.

```
INPUT:                VERIFY 16b

                  VER:MEMORY:a!(EOT)


OUTPUT:             VERIFY 6b


VER:SPARE_MEMORY,OPT(----): TYPE:-------, SEG -,


---ADRESS     SIZE

---------     ----
---------     ----
---------     ----
---------     ----
```

Figure 12-4. Portion of Verify Form 6b

Verify Form 6c

3.19 The changes to Verify Form 6c [VER:MEMORY:OPT(EM): VERIFY OUTPUT #6c - LIST USED AND AVAILABLE SWITCH RESOURCES] are shown in Figure 12-5. The changes are the following additions to the ENGINEERED ITEM field:

- MAIN_CS BLOCKS—Blocks of core memory in segment 0 (1024 words each).
- DO_TRAN BLOCKS—Blocks of file store memory in segment 0 (1024 words each).
- ACI_TRAN BLOCKS—Blocks of file store memory in segment 0 (1024 words each).
- EXT_CS1 BLOCKS—Blocks of extended core memory in segment 1 (1024 words each).

- EXT_CS2 BLOCKS—Blocks of extended core memory in segment 2 (1024 words each).
- EXT_CS3 BLOCKS—Blocks of extended core memory in segment 3 (1024 words each).

```
INPUT:                VERIFY 16b

                  VER:MEMORY:EM!(EOT)


OUTPUT:             VERIFY 6c

VER:MEMORY:OPT(EM)                    GENERIC     TOWN  ST  BL  NBS

                                      ---------   ----  --  --  ---,


ENGINEERED          NUMBER     NUMBER
                    SPARE       USED

MAIN_CS BLOCKS      ------,      -----,
DO_TRAN BLOCKS      ------,      -----,
ACI_TRAN BLOCKS     ------,      -----,
EXT_SC1 BLOCKS      ------,      -----,
EXT_SC2 BLOCKS      ------,      -----,
EXT_SC3 BLOCKS      ------,      -----,
```

Figure 12-5. Portion of Verify Form 6c

Verify Form 16b

3.20 Verify Form 16b [VER:MEMORY:a!(EOT) VERIFY INPUT #16b - REQUEST VERIFICATION OF SPARE MEMORY] now includes verification of Extended Call Store memory.

4. Recording (Not Affected)

5. Network Management (Not Affected)

6. Maintenance/Troubleshooting

System Integrity

6.01 Audit 66, File System to Core Nongeneric Audit, has been created to support this feature. Audit 66 matches and hashes nongeneric data and checks file system-only data including the following ODA ID tags:

- IDKMERGE
- IDKTRAN
- 1DKTRAN1
- 1DKTRAN2
- 1DKTRAN3
- 1DKMEASMSCH
- 1DKROLLBACK
- 1DKNETWMNGM

6.02 The following four audits have been modified to support this feature:

Audit 43 — The scope of Audit 43 will be reduced, and it will be referred to as the File System to Core Generic Audit. It will continue to do matching and hashing, but only for generic data, file system-only generic data, and library programs. It will audit ID tags 2DKMERGE, 1DKGENERIC, 1DKLIBRARY, and 1DKPAGEDPGM.

Audit 44 — Audit 44 was modified to provide for XS memory access.

Audit 45 — Audit 45, Nongeneric Data Audit, has been expanded to include XS ID tags 1DKTRAN1, 1DKTRAN1, 1DKTRAN2, and 1DKTRAN3.

Audit 72 — Audit 72 was modified to provide for XS memory access.

7. Transition Considerations

Ubiquity

7.01 It is not necessary for all *4ESS* switches in the network to be running the 4E21 Release 1 Generic for this feature to be operational.

Turn On/Turn Off Mechanism

7.02 This feature is turned on automatically by software deployment. As previously noted, Feature 3355a (hardware and software) must be installed.

8. Input/Output Manual Pages

Input Manual Pages

8.01 Table 12-A lists and describes the 9 new and 30 modified input manual pages that support this feature.

Table 12-A. Input Manual Pages

Message	New/ Modified	Description
AUD:NUM	Modified	Runs the audit or audits specified.
CLR:UTILFLG	Modified	Clears the generic utility flag located at the given address.
COPY:A1B	New	Copies the data at designated locations of main memory to the specified destination in main memory, file system, or tape.
COPY:CS	Modified	Copies data from call store to main memory, disk, or tape.
COPY:CSS	Modified	Copies data from call store secure (CSS) to main memory, to a file system, or to tape.
COPY:FS	Modified	Copies data from disk to main memory, to tape, or to another disk location.
COPY:PSS	Modified	Copies data from program store secure (PSS) to main memory, to a file system, or to tape.
COPY:TAPE	Modified	Copies data from tape to main memory or to disk.
COPY:XS	New	Copies the data at designated locations of main memory to the specified destination in main memory, file system, or tape.
DUMP:A1B	New	Causes the specified words from main memory to be printed on a terminal.
DUMP:CC	Modified	Causes data resident in certain central control active or standby buffer bus locations to be printed on a terminal or displayed on the master control complex (flag triggered only).

Table 12-A. Input Manual Pages (Contd)

Message	New/ Modified	Description
DUMP:CS	Modified	Causes the specified number of words from main memory to be printed on a terminal.
DUMP:CSS	Modified	Causes the specified number of words from main memory to be printed on a terminal.
DUMP:PSS	Modified	Causes the specified number of words from main memory to be printed on a terminal.
DUMP:REG	Modified	Prints the contents of one or more central control registers. It is meaningful in the active system only after a WHEN:[X]ADR input message.
DUMP:XS	New	Causes the specified number of words from XS memory to be printed on a terminal.
IF:A1B	New	Allows specification of a condition that must be met in order for the generic utility function following the IF clause to be executed. A1B refers to any core memory.
IF:CC	Modified	Allows specification of a condition that must be met in order for the generic utility function following the IF clause to be executed. CC refers to Central Control.
IF:CS	Modified	Allows specification of a condition that must be met in order for the generic utility function following the IF clause to be executed. CS refers to non-secure Call Store.
IF:CSS	Modified	Allows specification of a condition that must be met in order for the generic utility function following the IF clause to be executed.
IF:PSS	Modified	Allows specification of a condition that must be met in order for the generic utility function following the IF clause to be executed.
IF:REG	Modified	Allows specification of a condition that must be met in order for the generic utility function following the IF clause to be executed. REG refers to Register.
IF:UMEM	Modified	Allows specification of a condition that must be met in order for the generic utility function following the IF clause to be executed. UMEM refers to Utility Memory.

Table 12-A. Input Manual Pages (Contd)

Message	New/ Modified	Description
IF:XS	New	Allows specification of a condition that must be met in order for the generic utility function following the IF clause to be executed. XS refers to Extended non-secure Call Store.
IN:OWBUF	Modified	Initiates the first step of the permanent overwrite procedure.
LOAD:A1B	New	Causes the data given in the data field to be written into the designated location in main memory.
LOAD:CS	Modified	Causes the data given in the data field to be written into the designated location in main memory.
LOAD:CSS	Modified	Causes the data given in the data field to be written into the designated location in main memory.
LOAD:PSS	Modified	Causes the data given in the data field to be written into the designated location in main memory.
LOAD:XS	New	Causes the data given in the data field to be written into the designated location in main memory.
OP:ERAPDATA	Modified	Outputs the specified error analysis data.
OP:UTILMTCH	Modified	Outputs the status of generic utility program match conditions set up using GULP WHEN:ADR [X] or WHEN:XADR [X] input messages.
RMV:PS-MCODE	Modified	Freezes data in duplicated PS by placing the standby store in the maintenance mode.
SET:CS	Modified	Sets the specified CS to a particular MCODE.
SET:PS	Modified	Sets the specified PS to a particular MCODE.
SET:SOAK	Modified	Modifies the soak list. CC, CS, or PS unit can be added to or removed from the soak list for a specified number of days. The number of soak days for a unit on the soak list can be modified. Observe stated Warning notice before use.
VER:ABSOLUTE	Modified	Requests the contents of memory used for office data at the address or range of addresses.
WHEN:ADR	Modified	Provides the capability to flag generic utilities.
WHEN:XADR	NEW	Provides the capability to flag generic utilities.

Output Manual Pages

8.02 Table 12-B lists and describes the 12 new and 24 modified output manuals that support this feature.

Table 12-B. Output Manual Pages

Message	New/ Modified	Description
AUD:0	Modified	Reports the results of a manual request to audit a data base using the system backup tape as a reference.
AUD:NUM	Modified	Provides one of the following (determined by format selected): identifies the number of errors detected during a requested audit; notifies user that requested audits have been previously requested and are in progress; indicates (and may print) if any audit(s) is inhibited.
CLR:UTILFLG	Modified	Reports successful request to clear a specific generic utility flag.
COPY:A1B	New	Reports results of request to copy data from one data storage area to another.
COPY:CS	New	Reports results of request to copy data from one data storage area to another.
COPY:CSS	New	Reports results of request to copy data from one data storage area to another.
COPY:FS	New	Reports results of request to copy data from one data storage area to another.
COPY:PSS	New	Reports results of request to copy data from one data storage area to another.
COPY:REG	New	Reports results of request to copy data from a central control register to another data storage area.
COPY:TAPE	New	Reports results of request to copy data from a central control register to another data storage area.
COPY:UMEM	New	Reports results of request to copy data from a utility memory indicator to another storage area.
COPY:XS	New	Reports results of request to copy data from one data storage area to another.

Table 12-B. Output Manual Pages (Contd)

Message	New/ Modified	Description
DUMP:A1B	New	Provides an output of data requested by the DUMP:A1B input message.
DUMP:CC	Modified	Provides an output of data requested by the DUMP:CC input message.
DUMP:CS	Modified	Provides an output of data requested by the DUMP:CS input message.
DUMP:CSS	Modified	Provides an output of data requested by the DUMP:CSS input message.
DUMP:FS	Modified	Provides an output of data requested by the DUMP:FS input message.
DUMP:PSS	Modified	Provides an output of data requested by the DUMP:PSS input message.
DUMP:XS	New	Provides an output of data requested by the DUMP:XS input message.
IN:OWBUF	Modified	Responds to the IN:OWBUF input message by printing the address of the overwrite, the data currently at that address, and data to be placed there. This helps the user verify that the overwrite is in the correct location.
LOAD:A1B	New	Reports the results of a request to write data to the designated location for any 1B Processor core memory (A1B) address.
LOAD:CS	Modified	Reports the results of a request to write data to the designated location for a non-secure CS address.
LOAD:CSS	Modified	Reports the results of a request to write data to the designated location for a CS Secure address.
LOAD:PSS	Modified	Reports the results of a request to write data to the designated location for a PS Secure address.
LOAD:XS	New	Reports the results of a request to write data to the designated location for a non-secure central control XS address.

Table 12-B. Output Manual Pages (Contd)

Message	New/ Modified	Description
OP:CSSTATUS	Modified	Provides one of the following (as selected): Prints the current CS MCODE status of the system including an alarm message as a CS MCODE that should be duplicated but is not; or, reports acceptance or denial of a master control complex request to print the status of the CS community (prints later if accepted).
OP:PSSTATUS	Modified	Provides one of the following (as selected): Prints the current PS MCODE status of the system; or, reports acceptance or denial of a master control complex request to print the status of the PS community (prints later if accepted).
OP:UTILMTCH	Modified	Reports the status of the match conditions set up with the generic WHEN: utility input message
PCRV:0	Modified	Outputs a processor configuration recovery action.
REPT:0	Modified	Reports the occurrence of an interrupt or other action requiring intervention by maintenance recovery.
REPT:UTIL	Modified	Reports information concerning the state of the last utility request.
TEST:MUP	Modified	Reports the results of the master control complex and utility processor deferred fault recognition tests.
TEST:SSD	Modified	Reports the results of a scan and signal distributor deferred fault recognition tests.
UPD:0	Modified	Reports the results of the request to update a disk from tape.
VER:ABSOLUTE	Modified	Displays the contents of office data memory in response to a VER:ABSOLUTE input message.
VER:MEMORY-EM	Modified	Lists spare and used engineered memory items via various printing option.
VER:SPARE	Modified	Lists spare blocks of memory on either core or disk.

High Speed A/E Links (HSAL) Feature (3599)

13

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High Speed A/E Links (HSAL) Feature (3599)

13

1. Feature Description

1.01 This feature replaces the 56-kbps signaling links that the *4ESS*™ switch uses to access the Common Channel Signaling System 7 (CCS7) signaling network with 1.544-Mbps signaling links. The following are some of the advantages of using 1.544-Mbps signaling links:

- Increased signaling capacity
- Existing No. 2 Signal Transfer Point (2STP) link terminations will be freed up for other features or network growth.
- The cost of operating and maintaining the 1.544-Mbps links will be less than the 56-kbps links.
- Better delay performance in the presence of long or correlated signaling units.
- Fewer signaling links required. For example, a signaling load that requires sixteen 56-kbps signaling links can be handled by only four 1.544-Mbps signaling links.

1.02 This feature requires a new Common Network Interface (CNI) user node called a Universal Link Node (ULN) which serves as a platform for the 1.544-Mbps links. The ULN node consists of the following two circuit packs:

- Ring Interface Board (RIB)
- Link Interface Board (LIB)

2. Call Flow (Not Affected)

3. Provisioning

Data Management System

3.01 The Data Management System (DMS) on the 3B20 computer is used for administration of the CNI database. Numerous changes were made to the DMS to support this feature: the link functions lkdata, lkadmn, and lkinfo were all modified for CCS7 links; the timer functions for CCS7 links were modified; and a new miscellaneous function, pmthre, was created.

A. Link Functions

lkdata Page

3.02 Major changes have been made to the layout of the Link Data (lkdata) Page for CCS7 links. A new data item, T1 XMIT CLOCK MODE, was added, and the following data items were removed for the 1.544-Mbps links feature:

- ENCRYPTED
- ERROR CORRECTION
- TRANSMISSION MEDIUM
- FACILITY ACCESS TYPE
- LINK INTERFACE TYPE

3.03 Figure 13-1 is an example of the modified lkdata Page.

lkadmn Page

3.04 The following data item was added to the Link Administration (lkadmn) Page

N1 LIMIT OF MSU'S IN THE RETRANS BUFFER

for both 56-kbps and 1.544-Mbps links. Also, the default values have been changed for 1.544-Mbps links. Figure 13-2 is an example of the modified lkadmn Page.

```
******* CNI DATA MANAGEMENT SYSTEM   ***** DATE: 05/25/95    TIME: 17.43******
FUNCTION: lkdata    ACTION: chg     ORDER: 25Y121212121      OFFICE: NPVLIL01MS1

                                LINK INFORMATION

                             ITEM:             001
                             GROUP - MEMBER:   00 - 06
                             LINK TYPE ID:     ccs7



LINK SPEED           15440                  T1 XMIT CLOCK MODE      mnl-slave
FAR END FUNCTION     00598                  MATE GROUP - MEMBER     32 - 03
FAR END CLLI         CHCGILCLMS2            COMBINED LINK SET       003
LINK SET             001                    FAR END POINT CODE      254250000
SIGNALING LINK CODE  01                     LINK SET ASSOCIATED PC  000000000
LINK TYPE            a                      MAJOR STATE              unavailable
```

Figure 13-1. Example of lkdata Page for a CCS7 Link

```
******* CNI DATA MANAGEMENT SYSTEM   ***** DATE: 05/25/95    TIME: 17.43******
FUNCTION: lkadmn                ACTION: ver                 OFFICE: NPVLIL01MS1

                                LINK ADMINISTRATION


                           GROUP - MEMBER:   00 - 06
                           LINK TYPE ID:     ccs7


          MAJOR STATE                                       available

          RECEIVE QUEUE SIZE                                02006
          TRANSMIT QUEUE SIZE                               205151
          RETRANSMIT QUEUE SIZE                             30000
          CONGESTION ONSET THRESHOLD                        04800
          CONGESTION ABATEMENT THRESHOLD                    02400
          NORMAL AERM-SU ERROR RATE THRESHOLD               00004
          EMERGENCY AERM-SU ERROR RATE THRESHOLD            00001
          N1 LIMIT OF MSU'S IN THE RETRANS BUFFER           1023
```

Figure 13-2. Example of lkadmn Page for a CCS7 Link

lkinfo Page

3.05 Major changes were also made to the Link Information (lkinfo) Page for the High Speed A-Links feature. The following data items were removed from the page for 1.544-Mbps links:

- ENCRYPTED
- ERROR CORRECTION
- TRANSMISSION MEDIUM
- FACILITY ACCESS TYPE
- LINK INTERFACE TYPE

A new data item, T1 XMIT CLOCK MODE, was added. This data item is only displayed in the verify mode for 1.544 Mbps links. It is not displayed in the add or change mode since this field cannot be changed using the lkinfo Page.

3.06 Another change is the MAJOR STATE data item is no longer displayed when doing a change or an add for either 56-kbps or 1.544-Mbps links.

3.07 Figure 13-3 is an example of an lkinfo Page for CCS7 links with a link speed of 1.544 Mbps.

```
******* CNI DATA MANAGEMENT SYSTEM   ***** DATE: 05/25/95    TIME: 17.43******
FUNCTION: lkinfo    ACTION: ver     ORDER: 25Y121212121      OFFICE: NPVLIL01MS1

                                LINK INFORMATION

                             ITEM:             001
                             GROUP - MEMBER:   00 - 06
                             LINK TYPE ID:     ccs7



LINK SPEED           15440                  T1 XMIT CLOCK MODE      mnl-slave
FAR END FUNCTION     00598                  MATE GROUP - MEMBER     32 - 03
FAR END CLLI         chcgilclms2            COMBINED LINK SET       003
LINK SET             001                    FAR END POINT CODE      254250000
SIGNALING LINK CODE  01                     LINK SET ASSOCIATED PC  000000000
LINK TYPE            a                      MAJOR STATE             unavailable
```

Figure 13-3. Example of lkinfo Page for a CCS7 Link

B. Miscellaneous Functions

3.08 The Parameter Threshold (pmthre) is a new miscellaneous function. This new function provides the capability to recent change the 15-minute and 24-hour thresholds in the ULN. Figure 13-4 is an example of the new pmthre Page.

```
******* CNI DATA MANAGEMENT SYSTEM   ***** DATE: 05/25/95    TIME: 17.43******
FUNCTION: pmthre                ACTION: ver                 OFFICE: NPVLIL01MS1

                         LINK TRANSMISSION PARAMETERS

                            GROUP - MEMBER:   00 - 06

BROADCAST EVENT 15 MINUTE THRESHOLD

ERRORED SECONDS      015                     BURST SECONDS     015
SEVERELY ERRORED     005                     FAILED SIGNAL     002
FAILED SECONDS       005                     SLIPS             001

BROADCAST EVENT 24 HOUR THRESHOLD

ERRORED SECONDS      04320                   BURST SECONDS     00600
SEVERELY ERRORED     00090                   FAILED SIGNAL     00004
FAILED SECONDS       00090                   SLIPS             00004
```

Figure 13-4. Example of pmthre Page

NOTE:
The pmthre function supports only changes; adds cannot be done.

3.09 The new miscellaneous function, pmthre, was added to the DMS Menu Page.

C. Timers Function

3.10 The timers function provides a capability to verify and change the protocol timers and thresholds. Table 13-A describes the changes that were made to the CCS7 protocol timers as a result of this feature.

Table 13-A. Changes to Timers

Timer	Changes
t1.111.3	A LINK SPEED field was added for all functions, i.e., "ver," "add," and "chg." If the link speed is 1.544 Mbps, this page does not contain the SUERM field.
t1.111.4	The "chg" action does not require a SCOPE field; the "add" action does.
t1.111.7	This timer was normally link set scoped, but has been changed to per link scoped.
threshold	A LINK SPEED field was added for all functions, i.e., "ver," "add," and "chg." This timer was normally link set scoped, but has been changed to per link scoped.
eim	A SCOPE field was added for the "add" action
office	No change

4. Recording (Not Affected)

5. Network Management

5.01 Measurement data that is sent to the Network Management Operations System (NEMOS) was affected by this feature. One new message type, Message Type 115 (High Speed A-Link Measurements), was created and the following message types were modified:

- Message Type 1 (30-Second Discrete Data)
- Message Type 59 (CNI Configuration Data)
- Message Type 255 (Five-Minute Data Request)

Message Type 1

5.02 Eight new 30-second "carryover" discretes have been implemented for this feature on a link, link set, or combined link set basis.

NOTE:
A carryover discrete is set when the monitored condition occurs at least once during the 30-second interval. It remains set in the next interval if the condition still exists at the beginning of the interval. The discrete will be reset only when the condition does not exist over a 30-second period.

5.03 These new carryover discretes, which are identified in the following list, have been added to Message Type 1.

- Link Set Failure
- Combined Link Set Failure
- Ring Receiver Buffer Overflow Level 1
- Ring Receiver Buffer Overflow Level 2
- Ring Receiver Buffer Overflow Level 3
- Auto Out-of-Service (OOS)
- Link Manual OOS
- Link Congestion Discard Level 1, 2 or 3.

Message Type 59

5.04 Message Type 59 (CNI Configuration Data)— ULN was added as a new node type that can appear in the header element. Also, this message now includes the near end link set number and the combined link set number for each link.

Message Type 115

5.05 This is a new 5-minute data message. The message contains 39 link related measurements, 2 link set related measurements, and 2 combined link set related measurements. All the new measurements are populated by the AT&T 3B20 computer and sent to NEMOS. Table 13-B identifies the new link related measurements. Table 13-C identifies the new link set and combined link set related measurements.

Table 13-B. New Link Related Measurements

Symbol	Measurement Description
L7MFLT	Duration of Manual Link Out of Service
L7ACO	Auto Link Out of Service
L7AFLT	Duration of Auto Link Out of Service
L7LCDIS1X	Transmit Buffer Congestion Discard Level 1
L7LCDIS1XT	Duration of Transmit Buffer Congestion Discard Level 1
MSUDISC0	Number of Messages dropped due to Transmit Buffer Congestion Discard Level 1
L7LCDIS2X	Transmit Buffer Congestion Discard Level 2
L7LCDIS2XT	Duration of Transmit Buffer Congestion Discard Level 2
MSUDISC1	Number of Messages dropped due to Transmit Buffer Congestion Discard Level 2
L7LCDIS3X	Transmit Buffer Congestion Discard Level 3
L7LCDIS3XT	Duration of Transmit Buffer Congestion Discard Level 3
MSUDISC2	Number of Messages dropped due to Transmit Buffer Congestion Discard Level 3
RRBOVFLW1	Ring Receive Buffer Overflow Level 1
RRBOVFLW1T	Duration of Ring Receive Buffer Overflow Level 1
RRBOVFLW2	Ring Receive Buffer Overflow Level 2
RRBOVFLW2T	Duration of Ring Receive Buffer Overflow Level 2
RRBOVFLW3	Ring Receive Buffer Overflow Level 3
RRBOVFLW3T	Duration of Ring Receive Buffer Overflow Level 3
DMRRBOVFL2	Number of Messages dropped due to Ring Receive Buffer Overflow Level 2
UROVLD1	Node Ring Interface Processor Overload Level 1

Table 13-B. New Link Related Measurements (Contd)

Symbol	Measurement Description
UROVLD2	Node Ring Interface Processor Overload Level 2
UROVLD1T	Duration of Node Ring Interface Processor Overload Level 1
UROVLD2T	Duration of Node Ring Interface Processor Overload Level 2
U0OVLD1	Node Ring Application Processor Overload Level 1
U0OVLD2	Node Ring Application Processor Overload Level 2
U0OVLD1T	Duration of Node Ring Application Processor Overload Level 1
U0OVLD2T	Duration of Node Ring Application Processor Overload Level 2
U1OVLD1	Node Link Application Processor Overload Level 1
U1OVLD2	Node Link Application Processor Overload Level 2
U1OVLD1T	Duration of Node Link Application Processor Overload Level 1
U1OVLD2T	Duration of Node Link Application Processor Overload Level 2
ULOVLD1	Node Link Processor Overload Level 1
ULOVLD2	Node Link Processor Overload Level 2
ULOVLD1T	Duration of Node Link Processor Overload Level 1
ULOVLD2T	Duration of Node Link Processor Overload Level 2
L7BOFR	Number of CCS7 messages discarded due to a full Link Receiver Buffer
L7BOFRT	Duration of Link Receive Buffer Overflow
L7BOLR	Number of times the quantity of Signal Units (SUs) in the Link Receive Buffer Increases
L7BOLRT	Duration of Link Receive Buffer Overload

Table 13-C. New Link Set and Combined Link Set Related Measurements

Measurement	Symbol	Description
Link Set	CMLSCLF	Frequency of a Link Set Failure
	CMLSCLFT	Duration of a Link Set Failure
Combined Link Set	CMCLSCLF	Frequency of a Combined Link Set Failure
	CMCLSCLFT	Duration of a Combined Link Set Failure

Message Type 255

5.06 MSGTYPE 115 was added to this message type.

6. Maintenance/Troubleshooting

Audits

6.01 The following audits have been modified to support this feature:

- NIDATA 2—Modified to support the LNDATA changes for the High Speed A-Links
- NIDATA 10—Checks of the 12 new per-link transmission threshold parameters and the 4 new Error Interval Monitor (EIM) parameters have been added. Also, information for Error Code 1015 has been added.
- LKBDST—New checks for n1_msu_rxmt and t1_clock_mode have been added for the High Speed A-links.

Measurements

6.02 A new program was created to collect information on CNI ULN node measurements. The information that is collected is placed in archives for the Data Acquisition, Reports and Integrated Control System (DARICS). This information can also be requested by the DUMP:SMEAS input message. Table 13-D identifies the measurements that are collected.

Table 13-D. High Speed Link Measurement Descriptions

Name	Measurement Description
CMBCLF	Measures the number of times a combined linkset has failed.
CMBCLFT	Measures the duration of a combined linkset failure
DRPRRBOV2	Number of messages dropped due to Ring Receive Buffer Overflow State 2.
SBMEMERR	Single Bit ULN Memory Errors
U0OVLD1	For Application Processor 0 (APP0), the number of occurrences of Interprocess Message Switch (IMS) user processor real-time Overload Level 1
U0OVLD2	For APP0, the number of occurrences of IMS user processor real-time Overload Level 2
U0OVLD1T	For APP0, the cumulative duration, in milliseconds, of the number of occurrences of IMS user processor real-time Overload Level 1
U0OVLD2T	For APP0, the cumulative duration, in milliseconds, of the number of occurrences of IMS user processor real-time Overload Level 2
U1OVLD1	For Application Processor 1 (APP1), the number of occurrences of IMS user processor real-time Overload Level 1
U1OVLD2	For APP1, the number of occurrences of IMS user processor real-time Overload Level 2
U1OVLD1T	For APP1, the cumulative duration, in milliseconds, of the number of occurrences of IMS user processor real-time Overload Level 1

Table 13-D. High Speed Link Measurement Descriptions (Contd)

Name	Measurement Description
U1OVLD2T	For APP1, the cumulative duration, in milliseconds, of the number of occurrences of IMS user processor real-time Overload Level 2
ULOVLD1	For link processor, the number of occurrences of IMS user processor real-time Overload Level 1
ULOVLD2	For link processor, the number of occurrences of IMS user processor real-time Overload Level 2
ULOVLD1T	For link processor, the cumulative duration, in milliseconds, of the number of occurrences of IMS user processor real-time Overload Level 1
ULOVLD2T	For link processor, the cumulative duration, in milliseconds, of the number of occurrences of IMS user processor real-time Overload Level 2
UROVLD1	For ring processor, the number of occurrences of IMS user processor real-time Overload Level 1
UROVLD2	For ring processor, the number of occurrences of IMS user processor real-time Overload Level 2
UROVLD1T	For ring processor, the cumulative duration, in milliseconds, of the number of occurrences of IMS user processor real-time Overload Level 1
UROVLD2T	For ring processor, the cumulative duration, in milliseconds, of the number of occurrences of IMS user processor real-time Overload Level 2

Display Pages

6.03 A new display page, Page 1110 - Specific HSL T1 Test Request, was added as a poke page for the HSAL T1 maintenance so that loopback tests can be run on the HSALs. (See Figure 13-5.)

```
Name            Type        Generic            <C>    Date      Time
_____________________________________________________________________
 SYS EMER       CRITICAL    MAJOR    MINOR                        SYS NORM
 OVERLOAD       SYS INH      CU      CU PERPH   OS LINKS   CNI   API  NSC  HSL
CMD<                                     1110 - SPECIFIC HSL T1 TEST REQUEST
ENTER GROUP-MEMBER:  __-__
ENTER REPORT INTERVAL: __

  LOOPBACK TESTS           NEAR END XMIT TESTS        FAR END XMIT TESTS
  --------------           -------------------        ------------------
   CMD  ACTION             CMD  ACTION                CMD  ACTION
   ---  ------             ---  ------                ---  ------
   200  SET NE LOOPBACK    202  START HIGH DENSITY    207  START HIGH DENSITY
   300  CLR NE LOOPBACK    302  STOP HIGH DENSITY     307  STOP HIGH DENSITY
   201  SET FE LOOPBACK    203  START LOW DENSITY     208  START LOW DENSITY
   301  CLR FE LOOPBACK    303  STOP HIGH DENSITY     308  STOP LOW DENSITY
                           204  START YELLOW ALM      209  START YELLOW ALM
   600 SET RPT INTRVL      304  STOP YELLOW ALM       309  STOP YELLOW ALM
                           205  START ALL ZEROS       210  START ALL ZEROS
                           305  STOP ALL ZEROS        310  STOP ALL ZEROS
                           206  START QRS TEST        211  START QRS TEST
                           306  STOP QRS TEST         311  STOP QRS TEST

 MAJOR:      MINOR:         NELPBK:         FELPBK:


_____________________________________________________________________
```

Figure 13-5. Example of Display Page 1110—Specific HSL T1 Test Request Page

6.04 The following changes were made to existing display pages to support this feature:

- HSL was added as a new system critical indicator on all the common and application display pages. (See Figure 13-6.)
- Display Page 1108, Link Status Summary Page, was modified to include HSAL as a valid entry under the PROT TYPE column. (See Figure 13-6.)
- Display Page 1110, SPECIFIC HSL T1 TEST REQUEST, was added to Display Page 100, Index Page.

```
Name            Type        Generic            <C>    Date      Time
SYS EMER      CRITICAL    MAJOR    MINOR                          SYS NORM
OVERLOAD      SYS INH      CU      CU PERPH   OS LINKS   CNI   API  NSC  HSL
CMD<                                        1108 - SIGNALING LINK SUMMARY PAGE
ENTER GROUP-MEMBER:  __-__                          TOTAL LINK FAILURES:
 CMD   FUNCTION              NEXT/PREV  FUNCTION            NEXT/PREV FUNCTION
20x    CHG SLK MOOS(line x)  400/401    LOCAL LINK FAILURE  430/431   DCHN LINKS
30x    CHG SLK ARST(line x)  406/407    ALL EQUIPPED LINKS  440/441   SADC LINKS
                             410/411    CCS7 LINKS          450/451   SSN LINKS
                             420/421    CIT7 LINKS          460/461   SIN LINKS

  GROUP      PROT      LS    SLC     CCLI/      MATE   LINK      NODE     PRO
  MEMBER     TYPE    LACID           CIN               STATE     STATE    RCVD

1  6 5       CCS7      44    00    NPVCLIIHL02  38 3   AVL-IS     ACT     NO
1  6 6       CCS7      70    00    NPVCLIIHL02  38 4   AVL-IS     ACT     NO
1  6 7       CCS7      71    00    NPVCLIIHL02  38 5   AVL-IS     ACT     NO
1  6 8       CCS7      42    00    NPVCLIIHL02  38 6   AVL-IS     ACT     NO
1  6 9       CCS7      43    00    NPVCLIIHL02  38 7   AVL-IS     ACT     NO
1 32 1       HSAL      72    00    NPVCLIIHL02   0 1   AVL-IS     ACT     NO
1 32 6       CCS7      16    00    NPVCLIIHL02   0 6   AVL-IS     ACT     NO
1 32 11      CCS7       2    00    NPVCLIIHL02   0 11  AVL-IS     ACT     NO
```

Figure 13-6. Example of Display Page 1108—Link Status Summary Page

7. Transition Considerations

Hardware Dependencies

7.01 The ULN must be grown into the CNI ring. Procedures for accomplishing this growth are contained in Task Oriented Practice (TOP), AT&T 234-153-055AC, *4ESS™ Switch, Common Network Interface Growth/Degrowth*.

Dependencies on Other Network Components

7.02 The HSAL feature will not support the Embedded Common Channel Inter-Office Signaling 6 (ECIS6)/ Destination Common Channel Inter-Office Signaling 6 (DCIS6) protocols; therefore, all DCIS based Network Control Points (NCPs) must be retired before this feature is deployed.

7.03 The 4AP<14> generic should be in place in the 3B20 computer and stable before the retrofit to 4E21R1 takes place.

Ubiquity

7.04 It is not necessary for all *4ESS* switches in the network to be running the 4E21 Release 1 Generic for this feature to be fully operational.

Turn On/Turn Off Mechanism

7.05 This feature is turned on by DMS recent change activity.

7.06 To activate the ULN and HSAL features, the *4ESS* switch must provision the ULN and High Speed A-Links.

8. Input/Output Manual Pages

8.01 New 4ESS/APS messages were created and some existing 4ESS/APS manual pages were modified to support this feature. Four (4) new input and 4 new output messages were created; 2 input and 8 output manual pages were modified. Table 13-E identifies the new and modified input manual pages. Table 13-F identifies the new and modified output manual pages.

Table 13-E. Input Manual Pages

Message	New/ Modified	Description
CLR:T1M	New	This message allows you to clear addressable T1 terminations.
EXC:T1M	New	This message allows the starting and stopping of test signals and the activating and deactivating of payload loopback at the ULN.
OP:T1M	New	This message is used to collect and display T1 status and performance measurements data of the ULNs and Network Channel Office Equipment (NCOE).
SET:T1M	New	This message changes the Periodic Indication Interval for Intrusive Testing (PIIT) at the ULNs.
OP:NODES	Modified	HSAL has been added to this message as a new node.
DUMP:SMEAS	Modified	CNI ULN node measurements have been added to the list of measurements that require the node option.

Table 13-F. Output Manual Pages

Message	New/ Modified	Description
CLR T1M	New	This message prints in response to the CLR:T1M input message. It reports the results of a request to clear the Errored Extended Super Frame (ESF) count or the performance measurements data counts of the ULNs and NCOEs.
EXC T1M	New	This message prints in response to the EXC:T1M input message. It indicates that either the request was completed or stopped. If the request was stopped, this message indicates the reason why it was stopped.
OP T1M	New	This message prints in response to the OP:T1M input message. It either displays the status and performance measurements data requested or indicates that the request was stopped. If the request was stopped, this message indicates the reason why it was stopped.
SET T1M	New	This message prints in response to the SET:T1M input message. It indicates that either the request is completed, PIIT is completed, or the PIIT timer is not scheduled or not available.
AUD LKBDST 1	Modified	New values were added to the *d* field to support HSALs.
AUD NIDATA 2	Modified	New error codes were added to support HSALs.
AUD NIDATA 10	Modified	The descriptions of many error messages covered on this manual page have been changed to reflect the use of the Protocol Parameters and Timers (PTP) data structure. Also, error codes 1011 and 1012 are no longer related to the Signal Unit Error Rate Monitor (SUERM) threshold because SUERM is not used in ULN.

Table 13-F. Input Manual Pages (Contd)

Message	New/ Modified	Description
OP LNSTAT	Modified	New values have been defined for many of the variables associated with this output message, for example, link speed, facility type, and firmware version.
OP NODES	Modified	The new node HSAL has been added to this message
OP SDC	Modified	HSAL has been added as a node type
OP SLK	Modified	New indications, new values, and new ranges have been defined for many of the variables associated with this output message, for example, the T1 clock mode, new values for link speed, and new ranges for the transmit queue length.
REPT SMR	Modified	Changes were made to this output message

Universal Subscriber Data Structure (USDS) Feature (3964)

14

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Universal Subscriber Data Structure (USDS) Feature (3964)

14

1. Feature Description

1.01 The Universal Subscriber Data Structure (USDS) feature provides a set of base capabilities for processing a call at the originating AT&T switch (OAS).

1.02 The USDS Network architecture consists of the OAS and two functions: the USDS Shared Directory Function (USDS-SDF) and the USDS Query Processing Function (USDS-QPF). The USDS-SDF makes it possible to identify a call requiring additional service processing and to notify the initial service processor that a call requires attention. The USDS-QPF provides customer-specific feature processing and feature interaction mediation for calls identified as requiring attention.

1.03 An important part of the USDS feature is determining whether a call is eligible for USDS treatment. There are two methods of determining eligibility: explicit and implicit. At any given time, a *4ESS*™ switch can only be using one of these methods. If explicit determination is being used, a call may be eligible for USDS if the Adjunct-Based Capability (ABC) Automatic Number Identification (ANI) trigger table *Query USDS* indication is set for the ANI key on that call. If implicit determination is being used, there is no such restriction, although there is a complex set of rules for determining whether the call is eligible. If a call is eligible for USDS treatment, a TCAP BEGIN message is sent to the USDS-SDF requesting USDS instructions.

Eligibility for USDS Treatment

1.04 Several types of calls are not eligible for USDS query, regardless of whether implicit or explicit method of determination is being used. Among them are the following:

- Data calls
- The following switched access call types:
  - — SDN calls incoming on 10732 trunks or on 10288 trunks with a feature indicator of "SDN NCP" in the ABC ANI trigger data
  - — Calls that are provisioned NOT to send an NAI/NCD query
  - — Business Long Distance Service (BLDS) calls incoming on 10288 trunks with II/OLI digits indicating the call is WATS/MEGACOM, or which match with a feature indicator of "BLDS PCP NCP" or "BLDS NCD" in the ABC ANI trigger data
  - — 800 calls provisioned through an NAI/NCD indication
  - — Translated 800 calls
  - — Nationwide Emergency Telecommunications System and Government Emergency Telecommunications System calls provisioned through an NAI/NCD indication.
- All incoming direct access calls, including the following:
  - — Incoming SDN or MEGACOM/WATS calls
  - — Incoming calls from network adjunct trunk types
  - — Incoming call from Small Scale Adjunct (SSA) trunk type.

2. Call Flow

2.01 The protocol used in communications between the *4ESS* switch and the USDS shared directory and query functions is Common Channel Signaling System 7 (CCS7) Transaction Capabilities (TCAP). A typical TCAP call flow begins with the switch sending a query to the USDS-SDF to determine if the USDS eligible call requires specific feature processing. If not, the SDF may respond with a proceed message indicating that the call should proceed as if USDS treatment had not occurred. If so, the USDS-SDF passes processing of the query to the applicable USDS-QPF. The USDS-QPF determines the intended disposition of the call and sends the switch instructions about how to handle the call.

2.02 The rest of this section includes a description of the network architecture, a call flow diagram, and a detailed callflow narrative explaining how the USDS feature works.

Network Architecture

2.03 USDS is an integral part of the ASN, interconnecting with the AT&T Signaling System 7 (SS7) Network, AT&T provisioning systems, and AT&T operations and maintenance systems.

2.04 The USDS platforms are deployed in a paired configuration, with information duplicated in all USDSs in the network. Each STP in a mated pair of STPs in a signaling region connects to each platform in a pair of USDS platforms. Note, however, that although a signaling region only connects to one pair of USDS platforms, a pair of USDS platforms may be serving more than one signaling region.

2.05 The *4ESS* switch has an administrable office parameter which controls whether the switch queries the USDS for eligible calls. The switch also has a second administrable office parameter controlling the method (explicit or implicit) the switch uses to determine USDS query eligibility.

2.06 If the parameter "determining USDS query eligibility" is set to "explicit" determination, the switch sends a query to the USDS only if the ABC ANI trigger table feature indicator for "USDS query" is set to "yes." Otherwise, no USDS query is sent and the call is handled according to existing processing. If the parameter "determining USDS query eligibility" is set to "implicit" determination, however, it is not necessary that the Query USDS flag be set in the ANI trigger table in order for a call to be USDS eligible. However, it must meet other complex criteria to be eligible.

2.07 In other words, with the explicit method, the switch initiates a USDS query only if the ANI Trigger Table indicates that it should. With the implicit method, the switch initiates a USDS query unless services or features applicable to the call make it USDS ineligible. Specific calls not eligible for USDS treatment are listed in the "Feature Description" section of this chapter.

Call Flow Narrative

2.08 The call flow described in this section is followed when the USDS capabilities parameter is set to "enable." If the parameter is set to "disable," the call is processed according to previously existing requirements.

1. When a USDS eligible call is received, the *4ESS* switch does the following:
   - — Selects the next platform from the list of in-service USDS platforms
   - — Determines and includes a Call ID in the TCAP BEGIN message
   - — Sends the message to the USDS-SDF via SS7/TCAP
   - — Starts timer T_DF
   - — Waits for a response.
2. The USDS-SDF does the following:
   - — Receives the TCAP BEGIN message from the switch
   - — Accesses the SDF data using the ANI, DN, and service type as the key
   - — Formulates an answer by sending one of the following switch action indicators: **Proceed**, **Deny**, **Wait for Instructions**, or **Instructions**.
3. The *4ESS* switch reacts as follows:

If the message is *Proceed:*	**Then the *4ESS* switch:**
	Receives the **Proceed** message from the USDS-SDF
	Stops timer T_DF
	Discards the information received in the response message.
	Processes the call using previously existing requirements.
	[End of call flow].

If the message is *Deny:*	Then the *4ESS* switch:
	Receives the **Deny** message from the USDS-SDF
	Stops timer TD_F
	Discards the information received in the response message
	Provides final handling treatment with a Network Call Denial (NCD) announcement—FHC 2101
	Clears the call.
	[End of call flow].

If the message is *Wait for Instructions:*	Then the *4ESS* switch:
	Receives the **Wait for Instructions** message
	Stops timer T_DF and starts timer T_SP
	Waits for an **Instruction** from the service processor.

If the message is the *Instructions:*	Then the *4ESS* switch:
	Receives the **Instruction** message from the service processor
	Stops whichever timer is running
	Executes the instructions.

4. If the instruction is **Proceed with Call Handling**, the switch handles the call as it would if it had initially received a response message with a **Proceed** indication.
5. If the instruction is to **Invoke Switch Capability**, the switch invokes the designated capability. The following are invocable USDS instructions:
   - — Disable AT&T True Voice (TV)
   - — Disable 1+Directory Link (1+DL)
   - — Query Network Access Interruption (NAI)
   - — Route to Adjunct Logical Address (ALA).

6. The switch then processes the call as instructed.
7. The Terminating AT&T Switch (TAS) checks the ABC terminating-DN trigger data and processes the call according to existing requirements.

3. Provisioning

3.01 This feature is proprietary to AT&T, and may be used only by AT&T switches. The mechanism for disallowing access to this feature is Recent Change (RC).

ODA Structures Affected

3.02 Several ODA structures are affected by this feature.

A. OD4OPT Structure

3.03 A new item, OD4OPTUSDS, which overlays the existing OD4OPTENH item, is used to perform proprietary checks for this feature.

B. OD4OFCCOPY Structure

3.04 Existing item OD4PF9 is assigned as an office parameter used to indicate whether or not the USDS feature is enabled. "On" means the feature is enabled. The default is "Off."

3.05 Existing item OD4PF10 is assigned as an office parameter used to indicate whether the USDS query eligibility is determined implicitly or explicitly. "On" means eligibility is determined implicitly. The default is "Off."

C. HT4ANI_IJLKP Structure

3.06 Item XL4ANI_FI1 is assigned as the "USDS Query" indicator in the ANI Trigger Table records. "On" means the indicator is set; the default is "Off." The FI1 indicator is populated from RC forms 650 and 658.

New ODA Structures

A. OD4USDSPC

3.07 This new ODA structure is defined in Protected, Simplex, Disk-backed, and ODA populated memory to contain the Signaling Point Code (SPC) and Subsystem Numbers (SSNs) for each of the two USDS platforms.

3.08 This structure must be populated with the appropriate USDS PC/SSN pairs before the feature is turned on.

B. OD4USDST

3.09 This new ODA structure includes the timers associated with USDS. These timers are adjustable from 1 second to 2 seconds. The defaults for the SDF and QPF timers are 1 second.

Recent Change (RC) Forms Affected

A. RC Form 650

3.10 The FI1 feature indicator in the ANI Trigger Table is "USDS Query" beginning in the 4E21 Generic.

B. RC Form 658

3.11 The FI1 feature indicator in the ANI Trigger Table is "USDS Query" beginning in the 4E21 Generic.

C. RC Form 809

3.12 The on/off flags for this feature are populated from RC Form 809. Item PF9 is described as "USDS Feature Enabled," and Item PF10 is described as "USDS Query Determined Implicitly." The verify forms associated with the on/off flags are 16az and 8j. Table 14-A gives the information needed to populate form 809 with the on/off flags.

Table 14-A. On/Off Flags For USDS Feature

809 Form Entry				
FEATURE ITEM	ON/OFF	Populates ITEM	With	Checks
PF9	ON	OD4PF9	4ODFB_ON	none
	OFF		4ODFB_OFF	none
PF10	ON	OD4PF10	4ODFB_ON	none
	OFF		4ODFB_OFF	none

D. RC Form 810

3.13 The description for DATA on RC Form 810 is modified to include the following in the list of proprietary names:

- USDSTDF 100-200 centiseconds to wait for a response from the USDS SDF
- USDSTSP 100-200 (in centiseconds) to wait for a response from the USDS QPF.

E. RC Form 6dc

3.14 A new message is added to add, change, or delete the USDS point code records. Each USDS point code must have both an SDF-SSN and a QPF-SSN.

3.15 The format of the message is **RC:MISC:FHT,FTA:USDSPCSSN,** a,b,c,d[,e]**!** In this case, a=order number, b=action required (**A**dd, **C**hange, or **D**elete), c=**D** (to indicate that USDS data is being input), d=the 9-digit AT&T SPC, and e= 6 digits to specify the QPF and the SDF SSNs where QPF is shown first.

3.16 For **A**dd and **C**hange requests, variable e must consist of 3 digits for each SSN (SDF and QPF). The valid range of SSNs is 001 to 255. An entry of 000 indicates there is no SSN. On **A** and **C** requests, both SSNs cannot be 000. Also, the two SSNs for an SPC cannot have the same value. For **D**elete requests, an entry for variable e is not required.

Verify Forms Affected

A. Verify Form 16az

3.17 A new input message is added to verify the status of USDS timers beginning in the 4E21 Generic. The entry is **VER:MISC USDST!**

B. Verify Form 16dc

3.18 This is a new input message to request verification of the USDS point code records. The format of the input is **VER:MISC:FHT USDSPCSSN!**

C. Verify Form 6dc

3.19 This is a new message in the 4E21 Release 1 Generic to output the USDS point code records. The message gives the Point Code, the QPF-SSN, and the SDF-SSN.

D. Verify Form 8j

3.20 The descriptions on this form are modified as follows:

- PF9—USDS Feature Enabled
- PF10—USDS Query Determined Implicitly.

E. Verify Form 8k

3.21 This output message verifies the two USDS timers. The values defined are the following:

- **SP TIMER**—The amount of time (100-200 centiseconds) that the *4ESS* will wait for a response from USDS-QPF after receiving a *wait for instructions* message from USDS-SDF.
- **DF TIMER**—The amount of time (100-200 centiseconds) that the *4ESS* will wait for a response after sending a query to the USDS SDF.

4. Recording

AMA Recording

4.01 In cases where the switch receives a **Wait for Instructions** message but no instructions follow, the AMA record will have AMA Module 937, Database Access Response Module, appended to it. Module 937 includes the following tables:

- 88—Module Code (Module number 937)
- 889—Database Identification (001=USDS Database)
- 890—Database Query Response (002=Response received by the *4ESS* switch, but no instruction received).

4.02 In the case of each of these tables, there are four characters. The first three characters (B, C, and D) are the numerical entries (937, 001, 002) and the fourth is a sign (hex c).

Measurements

4.03 Table 14-B summarizes the new measurements introduced with this feature. The *4ESS* switch can support a maximum value for all measurements of at least 4 million. The hourly counts are available in Traffic Data Accounting System (TDAS) files for collection.

Table 14-B. USDS Peg Counts

Peg Count	Frequency	Description
USDS_QRY_ATMPT	5-min/hourly	Number of USDS Query attempts
USDS_QRY_RESP	hourly	Number of USDS Query responses
USDS_MSG_NOT_DLVRD	5-min/hourly	Number of USDS messages not delivered
USDS_QRY_DF_1TMOUT	hourly	Number of T_DF timeouts on first query
USDS_QRY_DF_2TMOUT	5-min/hourly	Number of T_DF timeouts on second query
USDS_QRY_SP_TMOUT	5-min/hourly	Number of USDS Service Processor timeouts
USDS_NOMTCH_CID	hourly	Number of response or instruction messages for which the switch cannot match the Call ID with that of a pending call
USDS_RPLY_NRCGNZBL	5-min/hourly	Number of response or instruction messages containing no Call ID or other error condition
USDS_QRY_CUST_ABANDON	hourly	Number of in process queries during which the customer abandoned the call
USDS_QRY_BLOCK_SO	5-min	Number of calls for which USDS was required but did not occur because of switch overload
USDS_QRY_BLK_NCP	5-min/hourly	Number of queries not sent because of No. 2 Customer Control Processing (2CCP) No. 2 Network Control Point (2NCP) Overload Control
USDS_QRY_BLK_NOC	5-min	USDS queries not sent because of controls initiated by the Network Operations Center (NOC)

5. Network Management

Several new Network Management functions are provided to allow Operations Support Systems (OSSs) to control the USDS feature. Those functions are the following:

- Automatic SPC control list
- Manual SPC control list, controlled by Network Management Operations System (NEMOS)
- Request contents of manual control list (NEMOS)
- 5-minute measurements provided to NEMOS
- The following new NEMOS discretes (flags) sent to NEMOS in MSGTYPE1:
  - — USDS queries not sent due to 2CCP/2NCP overload control
  - — USDS queries not sent due to NOC initiated control
  - — USDS queries not sent due to switch overload
  - — USDS queries not sent due to CCS7 signalling link or network problems
  - — USDS DF query timeout
  - — USDS SP timeout
  - — USDS PC x/SSN a(SDF) not available
  - — USDS PC x/SSN b(QPF) not available
  - — USDS PC y/SSN a(SDF) not available
  - — USDS PC y/SSN b(QPF) not available.

5.01 The first six of these discretes are set by USDS call processing software. The last four are set by network management software.

5.02 When the USDS experiences an overload condition, the USDS sends an Automatic Call Gapping (ACG) request which causes the *4ESS* switch to begin gapping USDS queries. The switch may receive an ACG component in either the *instruction* message (from the USDS-QPF) or in the *response* (from the USDS-SDF.) The ACG component includes a gap level, a duration level, and the affected Point Code (PC).

5.03 The *4ESS* switch uses these parameters to cut back on query attempts by PC. When the switch gaps a query, it kills the query based on automatic controls and pegs the USDS_QRY_BLK_NCP measurement, continuing with call processing as if no match had occurred in the USDS-SDF and the switch had received a response message with a **Proceed** action indicator as described in step 3 of the call flow narrative in this chapter.

6. Maintenance/Troubleshooting

New Final Handling Codes

6.01 There are two new Final Handling Codes related to this feature. These codes are listed in Table 14-C.

Table 14-C. Final Handling Codes

Code Number	Description
2100	**Last Normal Condition**– Call was designated eligible for USDS. **Irregular Condition**– While attempting USDS, an exception occurred which caused the call to be routed to its destination without further USDS processing. DSDC Exception field on trap indicates specific exception. **Handling**–The *4ESS*™ switch will allow the call to proceed to the original called number.
2101	**Last Normal Condition**–A query was sent to the USDS, and a deny response was received and successfully processed. **Irregular Condition**–The USDS analyzed the query and sent a message instructing the switch to final handle the call. **Handling**–The *4ESS* switch will final handle the call, playing the Network Call Denial announcement. The associated switch resource will be idled.

New Maintenance Command

6.02 The *4ESS* switch supports a new command, USDS Test Call request. This command, executable from the TTY maintenance channel, allows the craft to specify the following items:

- ANI/DN (entry required)
- Service Type (*4ESS* switch default value=identified line–no special treatment)
- Access Type (*4ESS* switch default value=1+switched)
- Data Rate/Data Indicator (*4ESS* switch default value=voice).

6.03 Please refer to the **TEST:TCAPDSD** message in the *4ESS* Switch Input/Output Message Manual.

7. Transition Considerations

Ubiquity

7.01 It is not necessary for all *4ESS* switches in the network to be running the 4E21 Release 1 Generic for this feature to be operational.

Turn On/Turn Off Mechanism

7.02 This feature is turned on by RC Form 809. Please refer to "Provisioning" in this chapter.

7.03 This feature can also be turned on or off, and it can be set for implicit or explicit method, by an absolute word change. However, it is highly recommended that RC Form 809 be used to turn on this feature where possible.

7.04 Item OD4PF9 in ODA structure OD4OFCCOPY is used to turn this feature on or off. The following is the information needed to turn ODA bit OD4PF9 on or off using an absolute word change. The default in both cases is "Off."

CAUTION:
The OD4OFCCOPY structure also contains the on/off bits for many other features. Be certain that any changes you make only affect this feature.

- Structure: OD4OFCCOPY
- Core address in 4E21 Generic: 6731267
- Size of OD4PF9: 1
- Displacement of OD4PF9: 8
- On: 1
- Off: 0

7.05 Item OD4PF10, also in OD4OFCCOPY, is used to determine whether the USDS query will use the implicit or explicit method. The structure and address are the same.

- Size of OD4PF10: 1
- Displacement of OD4PF10: 9
- On (Use implicit method): 1
- Off (Do not use implicit method): 0

Note that "Do not use implicit method" means "Use explicit method."

8. Input/Output Manual Pages

8.01 One input message and one output message are modified for this feature. They are the following:

- IM-4B000-01—TEST:TCAPDSD–Format [5] used to request a USDS Test Query
- OM-4B000-01—TEST:TCAPDSD–Format [5] is the response to the USDS Test Query.

Signaling Link Selection (SLS) Load Balancing Feature (3967)

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Signaling Link Selection (SLS) Load Balancing Feature (3967)

15

1. Feature Description

1.01 This feature ensures that the selection of CCS7 signaling links will remain evenly balanced when links are placed in service either through changeback or initial provisioning. Balancing the selection of signaling links reduces the congestion on CCS7 links which results in fewer blocked calls and a more stable CCS7 network.

1.02 Selection of signaling links is controlled by the the load share table. An entry for each in-service link appears in the load share table and is matched to one or more Signaling Link Selection (SLS) codes. [The SLS code is part of the label field in the Message Signal Unit (MSU).]

1.03 When the load share table is originally provisioned, all the SLS codes are evenly balanced across the in-service links. However, the load share table is a dynamic table that is rebuilt every time a link is removed from service or placed in service. Without this feature, the algorithm used to rebuild this table does not effectively balance the SLS codes across the signaling links. This feature introduces a new algorithm for rebuilding the load share table that will more evenly distribute the SLS codes among the CCS7 links.

NOTE:
The new load balancing algorithm applies only to domestic CCS7 linksets, not to CCITT7 linksets.

2. Call Flow (Not Affected)

3. Provisioning (Not Affected)

4. Recording (Not Affected)

5. Network Management (Not Affected)

6. Maintenance/Troubleshooting (Not Affected)

7. Transition Considerations

Ubiquity

7.01 It is not necessary for all *4ESS* switches in the network to be running the 4E21 Release 1 generic for this feature to be fully operational.

Turn On/Turn Off Mechanism

7.02 This feature is turned on automatically by software deployment.

8. Input/Output Manual Pages (Not Affected)

Type of Digital Interface Unit (TDIU) Redefinition Feature (4099)

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Type of Digital Interface Unit (TDIU) Redefinition Feature (4099)

16

1. Feature Description

1.01 The Type of Digital Interface Unit (TDIU) Redefinition Feature restructures the TDIU assignment scheme. The restructuring allows the type of hardware to be separated from the type of service or function and provides for individual programming of each Digital Signal 1 (DS1) interface. The TDIU refers to the hardware configuration and the service/function that is provided by the facilities in the Digital Interface Unit (DIU). Any unused TDIU values that exist in *4ESS*™ switch offices will be eliminated with this feature. This feature reduces provisioning and capital costs that are associated with the Digital Interface Frame (DIF) by allowing versatility in the programming of each DS1 interface. This will eliminate the need to move circuits from one DIU to another and having more DIUs equipped to accommodate customers' needs.

1.02 Each DIU is assigned three new data parameters called Type of Hardware (THW), Type of Digroup (TDG), and a THW for the fifth Digroup (THW5) for the service circuit DIU only. The THW parameter specifies the type of hardware that is used in the DIU. Each of the five DS1 interface boards within the DIU will have a TDG parameter that specifies the format/signaling type and zero code treatment. The THW, TDG, and THW5 parameters are discussed further under "Provisioning." Brief background information is provided to show the relationship between the DIF and the DIU.

Background Information

1.03 The *4ESS* switch uses the Digital Interface Frame (DIF) to terminate 160 DS1 facility lines. The DIF consists of 32 working DIUs and two spare DIUs for protection switching if failures occur. Each DIU terminates five DS1 facility lines. Each DS1 facility line (also called Digroup) is comprised of 24 circuits. The five DS1s multiplied by the 24 circuits make up the DS120 stream that is linked to the Time Division Network (TDN). The TDN is the switching fabric within the *4ESS* switch for call interconnections.

1.04 The following circuit packs are only allowed to occupy the five interface positions within the DIU:

- SM1B—Plain Old Telephone Service (POTS)
- SM9—POTS, 4-State Signaling, Integrated Access Digital Capability (IADC), or Circuit-Switched Digital Capability (CSDC)
- SM10—POTS, 4-State Signaling, IADC, CSDC, or Per-Call Control (PCC)
- SM6—Multifrequency (MF) Receivers and Transmitters (four per circuit pack)
- SM7—Dual-Tone Multifrequency (DTMF) Receivers and Transmitters (four per circuit pack).

1.05 The four service circuit DIUs handle MF or DTMF signaling and are equipped with four SM6s or four SM7s. The fifth position still remains a DS1 interface. Previous configurations only allowed an SM1B circuit pack in the fifth position. This feature allows three interface circuit packs (SM1B, SM9, and SM10) to be located in the fifth position and will be defined by the THW5 field.

1.06 Previous configurations dealing with original DIUs only allowed one hardware and format/signaling type/zero code treatment to be assigned per DIU. If a DS1 has to be provisioned for a particular TDIU, it can only be assigned to a DIU that has an idle DS1 slot and matches the requested TDIU state. The hardware configurations remain the same within the DIU; however, this feature allows for independent programming of each of the DS1s.

2. Call Flow (Not Affected)

3. Provisioning

THW, TDG, and TDG Parameters

3.01 The THW, TDG, and THW5 parameters are provisioned and updated via the *4ESS* switch Recent Change (RC) system.

3.02 The THW parameter allows for a maximum of 16 hardware types to be assigned as specified in Table 16-A.

Table 16-A. THW Parameter Assignments

THW Values	Description
0	Unequipped hardware
1	SM1B
2-5	Unassigned THW values
6	SM6 (MF service circuit)
7	SM7 (DTMF service circuit)
8	Unassigned THW value
9	SM9
10	SM10
11-15	Unassigned THW values

3.03 The TDG parameter allows for a maximum of 16 service/function types to be assigned. Each DS1 interface circuit pack can handle a certain set of DS1 format/signaling types. These format/signaling types are now in a list structure called TDGs. Each TDG that is assigned to a DIU can be set/changed on a Digroup basis without impacting service on the other Digroups on the same DIU. Table 16-B shows the relationship of the THWs to the available TDGs. Also included are the previous TDIU types that are now mapped to the THWs and TDGs. Only valid combinations of THW and TDG values can be installed. For example, a THW value of "1" and a TDG value of "1" can be installed, whereas a THW value of "1" and a TDG value of "4" cannot be installed.

Table 16-B. TDG Parameter Assignments

TDG Values	Function/Services	TDIU Values		
		SM1 THW=1	SM9 THW=9	SM10 THW=10
0	Not Available	—	—	—
1	POTS-SF (SF+POTS+RB+ZCS)	1 or 6	14	34
2	POTS-SF/B8ZS (SF+POTS+RB+B8ZS)	x	19	39
3	4ST/INT-SF (SF+RB+4ST+ZCS)	x	18	38
4	4ST/INT-ESF (ESF+RB+4ST+B8ZS)	x	23	43
5	POTS-64kR (ESF+POTS+RB+ZCS)	x	15	35
6	POTS-ESF (ESF+POTS+RB+B8ZS)	x	24	44
7	POTS-64CC [ESF+64CC(B8ZS)]	x	11	31
8	POTS-PCC [ESF+PCC(B8ZS)]	x	x	48
9-15	Unassigned TDG values	—	—	—

NOTE:
The "x" in the SM1 and SM9 columns indicates an invalid TDG value for the specified THW value. The dash (—) in the SM1, SM9, and SM10 columns indicates not applicable.

3.04 The THW5 parameter follows the THW parameters. The THW5 parameter is only used to identify the hardware type in the fifth Digroup in a service circuit DIU.

Structures Affected

3.05 Three Office Data Assembler (ODA) data structures have been changed to accommodate the new THW and TDG parameters. These data structures are as follows:

- HT4UT
- HT4UTEN
- XL4USDIF

RC Form Affected

A. RC Form 700

3.06 RC Form 700, Grow Unit Type Equipage Bits, is used to change the equipage state of *4ESS* switch equipment to allow for growth. There are no changes to the actual layout of this form. However, there is a population rule change. When the DIF Sub-Member Equipage (**SME**) field is changed from **UNEQ** (unequipped) to **GROW**, the corresponding **THW** field from RC Form 702 must not be zero.

B. RC Form 701

3.07 RC Form 701, Degrow Unit Equipage Bits, is used to change the equipage state of *4ESS* switch equipment to allow for degrowth. There are also no changes to the layout of this form. However, there is a population rule change. When the **UTYN** field is **DIF** and the **SME** field is **UNEQ**, the corresponding XL4UTHWii (where ii is the Sub-Member), XL4U5THW, and XL4UDIUTDGD items must be set to "0."

C. RC Form 702

3.08 RC Form 702, DIU Function Assignment, is used to change Digroup circuitry and the functional capability of DIUs. Table 16-C lists the possible combinations for THW, THW5, and TDG Digroup1 through Digroup5 used for 4E21 Release 1 and later generics. The new layout of RC Form 702 is shown in Figure 16-1. The **OLD TDIU** and **NEW TDIU** fields have been removed from this form and replaced with seven new fields. These seven new fields are highlighted on the screen to show their new positions on the form.

NOTE:
When only changing TDG fields, it is no longer necessary to remove or restore a DIU because the RC software will automatically restore the Digroup.

Table 16-C. THW, THW5, and TDG Combinations

THW	THW5	TDG				
		Digroup1	**Digroup2**	**Digroup3**	**Digroup4**	**Digroup5**
1	Blank	1	1	1	1	1
6	1	Blank	Blank	Blank	Blank	1
6	9	Blank	Blank	Blank	Blank	1, 2, 5, 6, 7
6	10	Blank	Blank	Blank	Blank	1, 2, 5, 6, 7, 8
7	1	Blank	Blank	Blank	Blank	1
7	9	Blank	Blank	Blank	Blank	1, 2, 5, 6, 7
7	10	Blank	Blank	Blank	Blank	1, 2, 5, 6, 7, 8
9	Blank	3, 4	3, 4	3, 4	3,4	3, 4
9	Blank	1, 2, 5, 6, 7	1, 2, 5, 6, 7	1, 2, 5, 6, 7	1, 2, 5, 6, 7	1, 2, 5, 6, 7
10	Blank	3, 4	3, 4	3, 4	3,4	3, 4
10	Blank	1, 2, 5, 6, 7, 8	1, 2, 5, 6, 7, 8	1, 2, 5, 6, 7, 8	1, 2, 5, 6, 7, 8	1, 2, 5, 6, 7, 8

```
# Form 702  CHANGE DIU FUNCTION CAPABILITY
  4E21>


RC:UTYPE;CHG;OPT (DIU),TST:

ORNU _______,


DIF MEMN ___,          DIU MEMN ___,


                          DIGROUP1 DIGROUP2 DIGROUP3 DIGROUP4 DIGROUP5

THW ___, THW5 ___,     TDG    ___,     ___,     ___,     ___,     ___,


REMARKS _____________________________________________________________!
```

Figure 16-1. RC Form 702

Population Rules

3.09 The following population rules apply to the seven new fields that have been added to RC Form 702. For additional population rules, refer to the *4ESS*™ Switch Translation Guide (TG-4, DIV.7, SEC.7c). Refer to Table 16-C for the THW and TDG various combinations.

a. The valid entries for the **THW** field are blank, 1 (SM1B), 6 (SM6), 7 (SM7), 9 (SM9), and 10 (SM10).

b. When the **THW** entry is 6 or 7, the DIU Member Number must be 1, 9, 18, or 26.

c. The valid entries for the **THW5** field are blank, 1 (SM1B), 9 (SM9), and 10 (SM10). The **THW5** field must be blank when the THW is 1, 9, or 10.

d. The valid entries for the **TDG** Digroup fields depend on the THW and the THW5 entries. The Digroups are populated as follows:

- When THW is 1, **DIGROUP1-DIGROUP5** entry is 1.
- When THW is 9, **DIGROUP1-DIGROUP5** entries are 1-7.
- When THW is 10, **DIGROUP1-DIGROUP5** entries are 1-8.
- When THW is 6 or 7, **DIGROUP1-DIGROUP4** entries are blank. The TDG for **DIGROUP5** depends on the THW5 entry. The valid entries for **DIGROUP5** are 1, 2, 5, 6, 7, and 8. This field is populated as follows:
  - — When THW5 is 1, **DIGROUP5** entry is 1.
  - — When THW5 is 9, **DIGROUP5** entry is 1, 2, 5, 6, and 7.
  - — When THW5 is 10, **DIGROUP5** entry is 1, 2, 5, 6, 7, and 8.
- When assigning a TDG 3 or 4, **DIGROUP1-DIGROUP5** must be 3 or 4.

  NOTE:
  The reason that each Digroup must be in a 4-state (4ST) mode is because the controller only works 4-state signaling on a DIU basis.

- When any Digroup's TDG is 3 or 4, the DIU Member Number must be an even number. For example, DIU 0, 2, 4, 6.....30.

Verify Form Affected

A. Verify Form 7b

3.10 This form, which has been changed for the 4E21 Release 1 and later generics, is used to verify the output of the DIF unit type submembers. The new layout of Verify Form 7b is shown in Figure 16-2. Seven new fields are output on this form as highlighted on the screen.

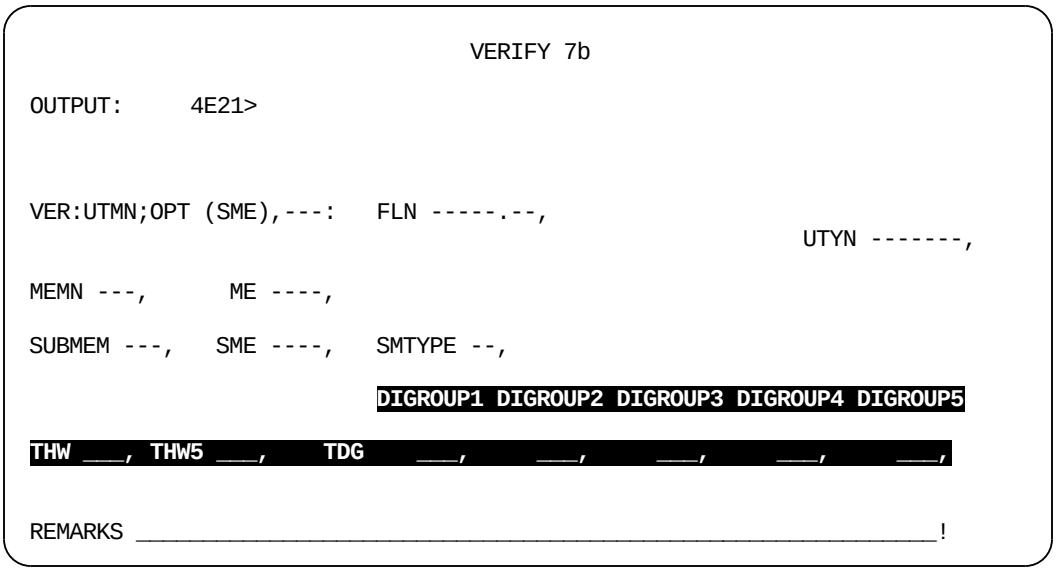

Figure 16-2. Verify Form 7b

4. Recording (Not Affected)

5. Network Management (Not Affected)

6. Maintenance/Troubleshooting (Not Affected)

7. Transition Considerations

7.01 The THW and TDG values are provided to replace the existing TDIU values.

Depending on the *4ESS* switch generic release and/or the Operations Support System (OSS) involved, either the existing TDIU values (Table 16-D) or the new THW values (Table 16-A) and the new TDG values (Table 16-B) can be used. Presently, only the Service Now-Trunking (SNOW-T) OSS has been modified to use the new THW and TDG values. Other support systems such as the various Circuit Layout Systems will continue to use the existing TDIU values. Those systems that are not equipped to use the new THW and TDG values will pass the existing TDIU values to SNOW-T to be converted. SNOW-T will take the new THW and TDG values from the *4ESS* switch and convert them back to the TDIU values for the OSS.

CAUTION:
When performing provisioning and/or maintenance functions involving DIUs, exercise care to determine whether the new THW and TDG values are used or whether the existing TDIU values are used. The specific generic in the **4ESS** *switch office should be determined to help decide which value(s) to use.*

7.02 Before the *4ESS* switch office is retrofitted to Generic 4E21 Release 1, the DIFE1 (DTMF and MF4ST) frames must have their Maintenance Processors (MPs) pumped to the new software. In Generic 4E20 Release 4, the new MP software is being made available in MP Versions 6 and 7, and is also maintained in the 4E21 Release 1. By having one MP software version cover both generics, transition from TDIU values to THW/TDG values relieves the retrofit process of the extra time it would need to stop and pump all of the DIFE1 frames. And if a problem occurred, the frames would not have to be pumped back to the original software.

7.03 To ensure that the DIFE1 (DTMF and MF4ST) frames are running the new MP software, verify the DIFE1's unit type image and inspect Word 60 for both controllers configured to MP Version 6 or 7 (depending on the unit type). The DIFE1 (DTMF) Word 60 is 01460146, and the DIFE1 (MF4ST) Word 60 is 01270127. The input message used for dumping the DIFE1's unit type image is as follows:

VER:UTYPE:DIF x!

7.04 When the Software Change Package (SCP) S24 becomes available on the Software Change Administration and Notification System (SCANS), an office can start updating all of its DIFE1 (DTMF and MF4ST) frames. If a DIFE1 (DTMF or MF4ST) frame is missed in the process, audit messages will print out on the 1B Processor to indicate that a DIFE1 is on the wrong software load. For a DIFE1 (DTMF), the message is as follows:

RST:DIF x PUMPING OLD FIRMWARE VERSION (LATEST VERSION IS 01460146)
DIFTOPMS.CB+136

7.05 Additionally, for a DIFE1 (MF4ST), the message is as follows:

RST:DIF x PUMPING OLD FIRMWARE VERSION (LATEST VERSION IS 01270127)
DIFTOPMS.CB+136

7.06 These messages appear after Peripheral Unit (PU) Routine Exercises (REXs) are completed on the DIFE1 controllers. If a message does appear, make sure to pump that DIFE1.

7.07 Prior to retrofitting to Generic 4E21, if the REX audit message has been ignored, the 3B computer compare program will audit DIFE1 MP versions and will print out an audit message along with sounding a critical/major alarm. The 3B computer input message for the compare program is as follows:

CMPR:ODA:MTRANS

7.08 If a DIFE1's current unit type image (ODA) is not yet updated, the following message will appear:

REPT NORM DIF x NOT ON CORRECT FIRMWARE VERSION
MUST REPUMP PRIOR TO PERFORMING 4E21 RETROFIT

7.09 When the 3B computer compare program is comparing Generic 4E20's ODA to Generic 4E21's ODA and encounters a wrong DIFE1 MP version, the following message will appear:

REPT UPD DIF x NOT ON CORRECT FIRMWARE VERSION
MUST REPUMP PRIOR TO PERFORMING 4E21 RETROFIT

7.10 This is the last chance at seeing a wrong software load within the DIFE1s. If a DIFE1 (DTMF or MF4ST) does not get pumped onto the new MP software and goes through Generic 4E21 retrofit, the results are that the service circuit DIUs would all come out of service from Base Level Messages (BLM), and the DIUs with SM9/SM10s would be programmed to the mode of TDIU 9 and TDIU 10. This means that any DS1 interface that is connected to a customer operating in ESF (Extended Superframe) would immediately go to a red alarm, and the customer would not be able to make phone calls. With such dire consequences and repercussions, the DIFE1 (DTMF and MF4ST) frames must be pumped to the new MP software.

Table 16-D. TDIU Values

TDIUs		
SM9	**SM10**	**Descriptions**
8	28	4-State Signaling (SF+RB+4ST+ZCS)
9	29	Circuit-Switched Digital Capability (CSDC) (SF+RB+ZCS+CSDC)
10	30	Direct Connect (SF+RB+ZCS+IADC)
11	31	64-Kbps Clear Channel (64CC) [ESF+64CC (B8ZS)]
12	32	Digital Multiplexed Interface (DMI) (SF+DMI+POTS+ZCS)
13	33	DMI - (ESF+DMI+POTS+B8ZS)
14	34	SM1B Services (SF+RB+POTS+ZCS)
15	35	64-Kbps Restricted (64KR) (ESF+RB+POTS+ZCS)
16	36	Direct Connect (ESF+RB+IADC+ZCS)
17	37	Direct Connect (ESF+RB+IADC+B8ZS)
18	38	Direct Connect (ESF+RB+POTS+NO ZCS)
19	39	SM1B Services (SF+RB+POTS+B8ZS)
20	40	Direct Connect (SF+RB+IADC+B8ZS)
21	41	DMI - (ESF+DMI+POTS+ZCS)
22	42	4-State Signaling (SF+RB+4ST+B8ZS)
23	43	4-State Signaling (ESF+RB+4ST+B8ZS)
24	44	SM1B Services with ESF (ESF+RB+POTS+B8ZS)
25	45	CSDC - (ESF+RB+CSDC+ZCS)
26	46	CSDC - (ESF+RB+CSDC+B8ZS)
27	47	CSDC - (SF+RB+CSDC+B8ZS)
	48	64CC Per-Call Control (PCC) [ESF+PCC (64CC, B8ZS)]

7.11 The following definitions of the acronyms used in Table 16-D are provided as additional information:

Acronym	Definition
4ST	4-State Signaling
B8ZS	Bipolar 8 Zero Substitution
CC	Clear Channel
CCITT	International Telegraph and Telephone Consultative Committee
CSDC	Circuit-Switched Digital Capability
DMI	Digital Multiplexed Interface
ESF	Extended Superframe
IADC	Integrated Access Digital Capability
PCC	Per-Call Control
POTS	Plain Old Telephone Service
RB	Robbed Bit
SF	Superframe
ZCS	Zero Code Suppression

Ubiquity

7.12 It is not necessary for all *4ESS* switches in the network to be running the 4E21 Release 1 Generic for this feature to be fully operational. This feature operates on a generic, per-switch basis.

Turn On/Turn Off Mechanism

7.13 This feature is turned on automatically by software deployment.

8. Input/Output Manual Pages

8.01 One *4ESS* switch output verify message has been changed as a result of this feature. The output message is **VER:UTMN**. This message verifies information about THWs and TDGs. The *4ESS*™ Switch Translation Guide (TG-4) has been updated to reflect the new changes.

8.02 One 3B computer output verify message has been changed in the 3B Generic 4AP<14>4E.R1. This output message is **VER:DGA;DIF**. It is used to verify trunk usage per DIU.

Automatic Number Identification Trigger Table Expansion, Phase 2 Feature (4206)

17

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Automatic Number Identification Trigger Table Expansion, Phase 2 Feature (4206)

17

1. Feature Description

1.01 The Automatic Number Identification (ANI) Trigger Table Expansion, Phase 2 feature allows the ANI Trigger Tables to be relocated from the 1B Processor Main Call Store (CS) to the 1B Windowed Call Store (WCS) in selected *4ESS*™ switches. The table size is increased to approximately 1.3 million ANIs. This increase ensures that not only will Positive Call Processing (PCP)-base applications have enough capacity, but that applications residing in Main CS will have additional memory as well.

1.02 WCS provides the capability to store up to 15 mega-words of data, with the memory being deployed in 1 mega-word increments. In order to support the full capacity of WCS in the 4E21 Release 1 Generic, 2 mega-words of WCS hardware have been deployed. Regardless of where the Trigger Table is located, the architecture remains unchanged.

1.03 The data is accessed by the following regardless of where the data is stored (Main CS or WCS):

- 10-digit ANI
- Numbering Plan Type (NPT)
- Type of Access (TOA)
- Type of SerViCe (TSVC).

1.04 Data stored in 1B Processor Main CS is backed up on disk File Segment 0. An expanded disk backup system is required to back up data stored in WCS. The expanded disk capacity was provided in the 4E20 Release 1 Generic (Feature 3356, 1B File Expansion on Attached Processor System Disk). File Segment 1 is used for the WCS memory backup.

1.05 This feature is proprietary to AT&T.

2. Call Flow (Not Affected)

3. Provisioning

Structures Affected

A. HT4WCS2ID

3.01 The data for the following PCP subtranslators may be optionally in Main or Extended memory:

- **HT4PLUANI** (4XLSAPLUANI)
- HT4ANI_GHLKP (4XLSAGHLKP)
- HT4ANI_IJLKP (4XLSAJKLKP).

3.02 The corresponding entries in **HT4WCS2ID** are populated as follows:

- If the PCP subtranslators are located in 1B Processor Main Memory, use ***1DKTRAN***.
- If the PCP subtranslators are located in Extended Memory, use **1DKTRAN1**.

B. HT4PLUANI, HT4ANI_GHLKP, and HT4ANI_IJLKP

3.03 Head tables for these structures remain in 1B Processor Main CS. If the ANI tables are in WCS, then the head tables are populated with the address of the WCS translator. The address must then be translated via a 1B Processor macro into a core address that is used to set up windows to access data. The unassigned entries are set to ones (negative zero). If the ANI tables are in 1B Processor Main CS, then the population rules do not change.

Forms Affected

A. Office Data Assembler Form 406C

3.04 The field, **ANI_IN_WCS**, is added to Office Data Assembler (ODA) Form 406C. This field is used to indicate whether the PCP structures are in WCS or Main CS.

3.05 The population rules are as follows:

- Valid entries are **Y** (Yes) or **N** (No).
- If ANI_IN_WS is set to **Y**, then the ANI tables are populated in WCS and the NWCSMP field cannot be zero.
- If ANI_IN_WCS is set to **N**, then the ANI tables are populated in Main CS.

B. Recent Change Forms 645, 650, 657, and 658

3.06 The layout of these forms is not changing. However, the population rules are as follows:

- If ANI_IN_WCS is set to **Y**, then the structures **HT4PLUANI, HT4ANI_GHLKP**, and **HT4ANI_IJKLP** are populated in WCS.
- If ANI_IN_WCS is set to **N**, then the structures **HT4PLUANI, HT4ANI_GHLKP**, and **HT4ANI_IJKLP** are populated in 1B Processor Main CS.

C. Verify Forms 6aq and 6ax

3.07 The layout of these forms is not changing. Entering a verify command will retrieve data from either WCS or 1B Processor Main CS.

4. Recording (Not Affected)

5. Network Management (Not Affected)

6. Maintenance/Troubleshooting (Not Affected)

7. Transition Considerations

Constraints

7.01 The ANI Trigger Tables can be moved from 1B Processor Main CS to WCS (or from WCS to 1B Processor Main CS) ***only*** on generic boundaries. The Trigger Tables ***cannot*** be moved to WCS if XS memory units have not been installed in an office.

Dependencies

7.02 This feature (4206) depends on the expanded disk capacity provided in the 4E20 Release 1 Generic (Feature 3356, 1B File Expansion on Attached Processor System Disk). File Segment 1 is used for the WCS memory backup.

Ubiquity

7.03 It is not necessary for all *4ESS* switches in the network to be running the 4E21 Release 1 Generic for this feature to be operational.

Turn On Mechanism

7.04 This feature is turned on at retrofit or growth. The ANI Trigger Table data is populated in either Main CS or WCS using ODA Form 406C. If **Y** is entered in the ANI_IN_WCS field:

- The NWCSMU (Number of Memory Unit for Extended Store) field cannot contain a zero
- The Office Database Management System (ODMS) retrofit program populates the ANI Trigger Table data in WCS.

Turn Off Mechanism

7.05 This feature is also turned off using ODA Form 406C. If **N** is entered in the ANI_IN_WCS field, the ODMS retrofit program populates the ANI Trigger Table data in 1B Processor Main CS.

8. Input/Output Manual Pages

8.01 The verify message **VER:MEMORY:EM!** is used to determine the location of the ANI translators. If the subtranslators are in WCS, the output under the NUMBER OF TRANSLATORS ASSIGNED BY SPACE ADMIN heading and a USE of 70, 74, and 91 has a TYPE of EXT_CS and a SEG of 1.

Software Defined Network-Network Remote Access Using Automatic Speech Recognition Feature (4557)

18

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Software Defined Network-Network Remote Access Using Automatic Speech Recognition Feature (4557)

18

1. Feature Description

1.01 The Software Defined Network (SDN)–Network Remote Access (NRA) Using Automatic Speech Recognition (ASR) feature provides greater flexibility in that callers can complete a telephone call by speaking into the handset. The capability to enter digits using a touch-tone key pad already exists.

1.02 This feature enhances the existing SDN–NRA feature. The AT&T Trigger Platform (ATP) provides the means to collect digits using ASR. ATP monitors the call and the Improved Service Announcement and Information Collection (ISAIC) Service Circuit System (SCS) collects the digits after ATP detects a trigger.

1.03 The ASR capability is supported only by *4ESS*™ switches equipped with ATP.

1.04 The SDN–NRA feature allows destination number lengths of up to 18 digits when a caller uses a touch-tone key pad. If the destination number is entered via speech, lengths of 7, 10, and 1+10 digits are allowed.

1.05 The Custom Data Service Unit (CDSU) provides the recognition function. However, all announcements are played by ISAIC SCS via a Service Circuit Unit (SCU). Each CDSU supports 24 ports of simultaneous ASR via 2 T1 connections to an SCU. An Ethernet Local Area Network (LAN) provides communication and control between the SCU and the CDSU.

2. Call Flow

Call Flow Key Points

2.01 The network architecture is illustrated in Figure 18-1. The Custom Data Service Unit (CDSU) provides the recognition function. However, all announcements are played by ISAIC SCS via an SCU. Each CDSU supports 24 ports of simultaneous ASR via 2 T1 connections to an SCU. An Ethernet Local Area Network (LAN) provides communication and control between the SCU and the CDSU.

2.02 An incoming call from the calling party is switched by the *4ESS* switch fabric and hair pinned through the SCU back to the caller (or the called party). Information captured by the CDSU (for example, digits or key words) are reported to the ATP switch by means of report codes.

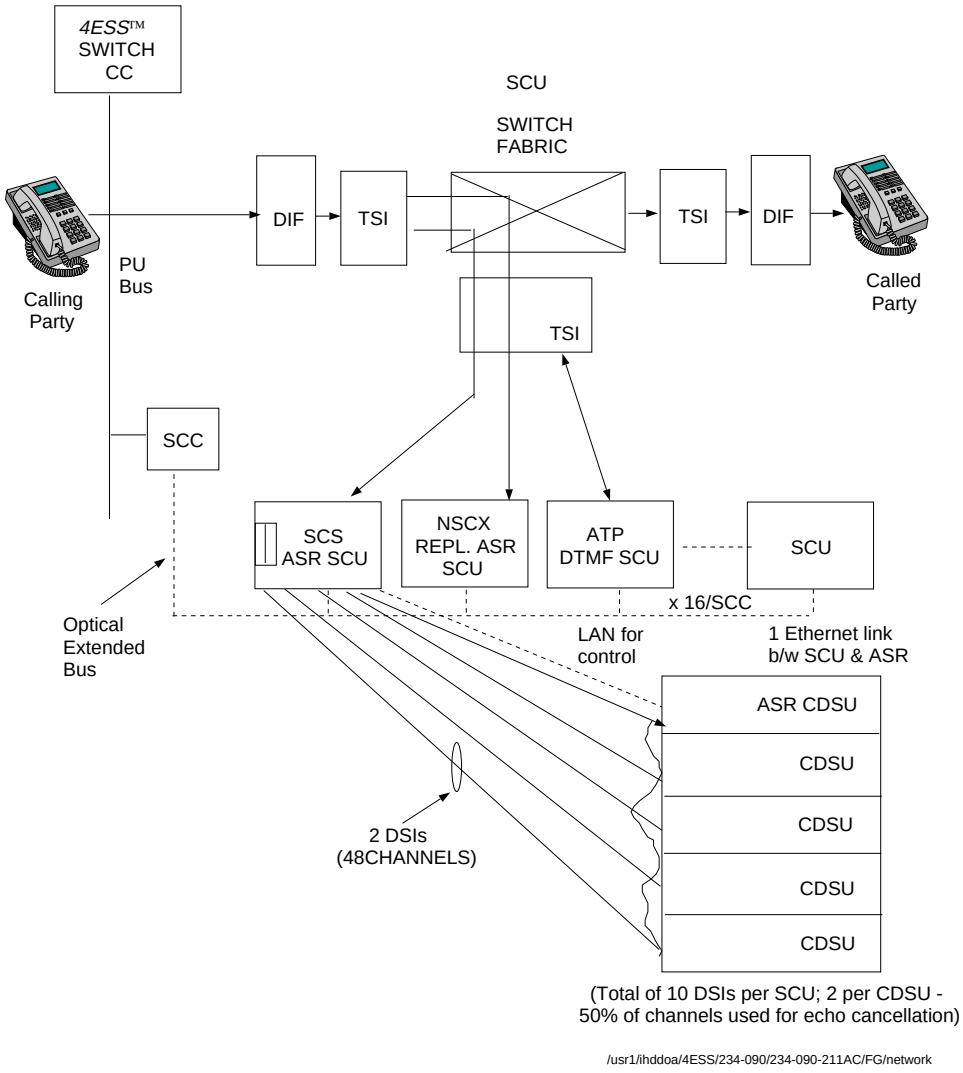

Figure 18-1. Network Architecture

Call Flow Narratives

2.03 The following call flow applies to a customer whose account allows prompting for an authorization code before prompting for a destination number.

1. A customer dials 1-800-NXX-XXX. The End Office (EO) routes the call to the Originating AT&T Switch (OAS). The OAS receives the call and, based on 6-digit translation, queries the INWATS Database (IDB).

2. The IDB returns a Network Routing Number (NRN) in the form 126-WXY-NPA0 to the OAS. The number 126 indicates the Special Services Code (SSC). The OAS receives a response from the IDB and translates the NRN in the POTS domain. Based on the 3-digit (126) translation, the OAS points to the appropriate Multiple Routing Treatment (MRT) Table.

3. When the call arrives at the ATP switch, the NRN is translated in the POTS domain. Based on the 3-digit (126) translation, the ATP switch determines that this is an SDN NRA sequence call.

4. The ATP switch then performs a 10-Digit Global Title Translation (GTT) on the 126 NRN to determine the proper SDN/Network Control Point (NCP).

5. The ATP switch sends a Transaction Capabilities Application Part (TCAP) BEGIN message to the NCP. The Customer Announcement Capabilities (CAC) in this message is set to Announcement Set S. The Node Capabilities, Bit E parameter is set to 1 (indicates ASR is available) and the Supplemental Originating Information (SOI) parameter is populated with a Sequence Call Indicator (SCI) value of 5 (indicates the first call of an ATP sequence call).

   NOTE: Bit E determines if ASR is available (set to **1**). If this bit is set to **0**, ASR is not available.

6. The NCP executes the Customer Account Logic (CAL). The CAL determines if the call is to be blocked based upon the Automatic Number Identification (ANI) lockout fraud control feature. If so, CAL instructs the ATP switch to final handle the call via a TCAP END message. Otherwise, the call continues.

7. The CAL (based on the SOI value and customer account feature description) collects the authorization code (if necessary) and the destination number. The CAL requests the NCP to collect the digits from the ATP switch. The NCP verifies that the switch has the required capabilities (ATP and Announcement Set S). If not, the request is handed off to another *4ESS* switch to collect the digits and invoke ATP.

   CAL indicates that two sets of authorization code strings are to be returned and also indicates the appropriate custom grammar to be used (14-digit or fixed length grammar).

8. The 2NCP sends a CONTINUE message to the ATP switch containing the:

   - Component type = Invoke
   - Operation = Caller Interaction—Play announcement and Collect Digits
   - Mandatory parameters of Customized Announcement (announcement set and announcement ID) and Digit Collection Indicators
   - Optional parameter of Speech Control (I, II, or III).

   If Option Code 1 is to be collected, the Speech Control I field encodes the exact number of digits to collect (from 1 to 15 digits). The Speech Control II field is not used.

   If Option Code 2 is to be collected, the Speech Control II field encodes the exact number of digits to collect (10 or 14 digits only). The Speech Control II field is not used.

9. The ATP switch connects to the SCS (ASR) SCU and plays an announcement to the caller. The text of the announcement is

   Please enter your authorization code.

   After this announcement is played, the caller responds by either entering the authorization code using a touch-tone key pad or responds by speaking the digits.

   If the Caller responds via Touch-tone key pad, the ATP switch collects one authorization code string.

   If ringing occurs, the caller enters a number to indicate sequence dialing.

   If a busy signal is encountered, the ATP switch removes OGT and ICT and tears down the call if the caller hangs up within 6 seconds. However, if the caller enters a number within the 6-second time frame, the ATP switch removes the OGT and sends a TCAP BEGIN message to the 2NCP (dialed number set to zeroes, SCI set to 6, and Bit G of SOI parameter set to 1).

   If the call is denied, the ATP switch terminates the call.

   If the caller responds by speaking the digits, the ATP switch collects authorization code strings.

10. If the authorization code is invalid, the NCP instructs the *4ESS* switch to collect the authorization code again. The new code is sent to the NCP for validation. If the code is still invalid, the NCP instructs the switch to final handle the call. If the code is valid, the call continues.

11. The CAL checks the format of the destination number and determines the billing and routing data, among other things. The CAL instructs the NCP to send a TCAP END message to the ATP switch to invoke ATP for valid calls and to bill and route the call.

12. The ATP is then disabled. Monitoring for both Inband and Out-of-Band triggers is stopped, all timers are cleared, per-call information is deleted, and announcement and digit collection are stopped.

2.04 The following call flow is applicable to SDN NRA-International (NRA-I) calls.

1. The customer dials a toll-free number. The Foreign Administration (FA) switch routes the call to the ASN. It also sends the ANI (if available) and an NRN in the format 143-WXY-CCCZ.

2. The AT&T International Switching Center (ISC) receives the call and translates the NRN in the POTS domain. Based on the 3-digit (143) translation, the ISC points to the appropriate MRT Table.

3. When the call arrives at an ATP switch, the NRN is translated in the POTS domain. Based on the 3-digit (143) translation, the ATP switch determines that this is an SDN NRA sequence call and maps the 143-WXY-CCCZ to a 143-WXY-CCC0 (sets the Z digit to 0).

4. The ATP switch performs a 10-digit GTT on the 143 NRN to determine the appropriate SDN/NCP. From this point, the call flow proceeds the same as the domestic call flow (beginning with Step 5).

3. Provisioning

3.01 Provisioning of the ATP database to support this feature will be done by the CCS Network Administration Center (CNAC).

4. Recording (Not Affected)

5. Network Management (Not Affected)

6. Maintenance/Troubleshooting (Not Affected)

7. Transition Considerations

Dependencies

7.01 Feature 4557 depends on the following:

- Feature 4306, ATP, Jr.
- Feature 3172, NXCS Replacement
- Feature 4183, Automatic Speech Recognition, Phase 1.

All three features must be active in the *4ESS* switch before Feature 4557 will work.

Ubiquity

7.02 For Feature 4557 to become operational, *4ESS* switches in the network must be running the 4E21 Release 1 Generic (ATP and ASR active).

Turn On/Turn Off Mechanism

7.03 This feature is turned on automatically by software deployment.

8. Input/Output Manual Pages (Not Affected)

Post Answer Call Redirection (PACR)-to-POTS Billing Fix Feature (4721)

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Post Answer Call Redirection (PACR)-to-POTS Billing Fix Feature (4721)

19

1. Feature Description

1.01 Prior to the 4E21 Release 1 Generic, the Post Answer Call Redirection (PACR) Release 1.2 Feature expanded the redirection of calls to 800 numbers to include redirection of calls to Plain Old Telephone Service (POTS) numbers. It allowed customers to use customer-selected Speed Dial codes to redirect or transfer calls in progress to other destinations. When a call was to be redirected or transferred, the customer (referred to as the Redirecting Party) would dial a sequence of numbers that includes a request for redirection and the dialable 800 or POTS number of the person who is to receive the transferred call (known as the Target Party). When the Target Party answers, this triggers Automatic Message Accounting (AMA) recording. Due to the time frame in which the PACR Release 1.2 Feature was to be released, the AMA function that handles PACR-to-POTS message recording was not fully implemented in the *4ESS*™ switch. Therefore, a non-*4ESS* switch method of recording was used to calculate PACR-to-POTS charges. This method of recording created a billing problem.

1.02 The billing problem associated with PACR-to-POTS Redirection occurred because only one AMA record was generated for a call from the Calling Party to the Redirecting Party. This AMA record would continue to record charges even after the Redirecting Party had redirected the call to the Target Party and dropped off the call. This same AMA record was also used to record charges from the Calling Party to the Target Party. So when customers redirected calls, the calls were recorded inaccurately and, therefore, the customers were being billed inaccurately.

1.03 Currently, the non-*4ESS* switch method of calculating AMA data for PACR-to-POTS calls has been replaced with the 4E21 Release 1 Generic PACR-to-POTS Billing Fix Feature. This PACR-to-POTS Billing Fix Feature fixes AMA recording so that customers can be properly billed for calls redirected to POTS numbers. In general, this feature does the following:

- Generates a separate AMA record for a call from the Calling Party to the Redirecting Party (original called party) and for each subsequent redirection.
- Allows the Redirecting Party to be billed at a flat rate for a call to the Target Party. Thus, a second AMA record is used to record the billing data.
- Stops the Call In Progress (CIP) counter so that the Redirecting Party is no longer being charged after the call has been redirected and the Redirecting Party drops off.
- Maintains the same Service Feature Values (SFVs) in the AMA record at the Originating AT&T Switch (OAS) when calls are being redirected to a POTS number, a 10-digit toll-free voice number, or an Action Point Number (APN).

2. Call Flow

Call Flow Diagram

2.01 The call flow diagram that depicts a PACR-to-POTS is shown in Figure 19-1.

Call Flow Narratives

2.02 This feature impacts the call flow for a PACR-to-POTS call. Only those steps that pertain to the implementation of the PACR-to-POTS Billing Fix Feature are highlighted in bold print. The call flow is as follows:

1. The caller dials a toll-free number.
2. The Local Exchange Carrier (LEC) identifies the toll-free number as belonging to AT&T and sends the call to an AT&T switch.
3. The OAS sends a Transaction Capabilities Application Part (TCAP) BEGIN message to the Number 2 Direct Service Dialing (DSD) Network Control Point (NCP). The TCAP BEGIN message includes the dialed number and the caller's Automatic Number Identification (ANI), or the 3-digit Numbering Plan Area (NPA) code and seven zeroes if an ANI is not available. This message executes the customer record that is associated with the dialed number.
4. The 2DSD NCP sends a TCAP message back to the OAS with a routing number that will route to the Adjunct. Also, the 2DSD NCP will send a termination notification to the OAS if the customer is subscribed to "Next Available Agent

Routing (NAAR)." The 2DSD NCP then instructs the OAS to start AMA recording.

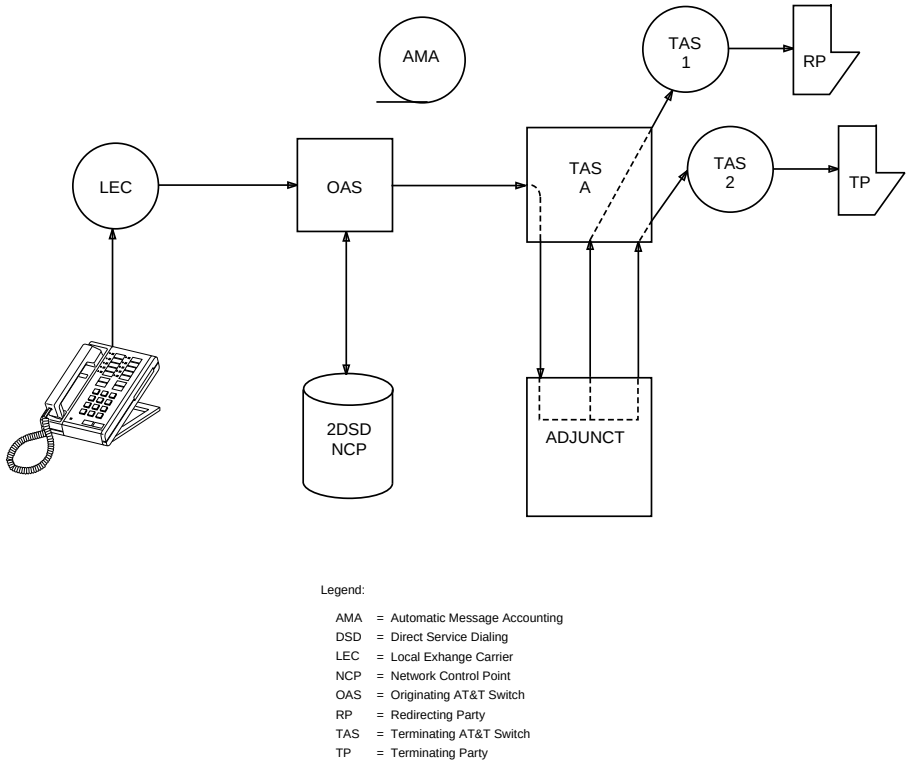

Figure 19-1. PACR-to-POTS Call Flow

5. The OAS sets up a call to Terminating AT&T Switch (TAS) A using the routing number, ANI, and dialed number.
6. The TAS A sends a Q.931 SETUP message to the Adjunct.
7. The Adjunct accesses the customer record in its database, retrieves the Redirecting Party's number, determines what PACR features the customer has, and sets up a call to the Redirecting Party. The PACR features are described briefly in Table 19-A.
8. The Adjunct sends an Update Bill message to the OAS to update the AMA record with the Redirecting Party's number, Service Identity Code (SIC), Call Code (CC), and SFV.
9. The Redirecting Party answers and later redirects the call to a Target Party. To redirect a call, the Redirecting Party enters ***T** followed by a 10- or 11-digit POTS number.

10. The Adjunct screens for a valid redirection number format. If the format is valid, call processing continues with the next step.

11. The Adjunct then screens the Invalid NPA and NXX Tables for the POTS number entered. If the POTS number is invalid, the Adjunct plays an announcement to the Redirecting Party to indicate that the number entered is invalid and please try again. If the POTS number is valid, the Adjunct compares the caller's NPA with the Target Party's NPA. If they match, then the Adjunct screens the redirection number (3-digit Target Party's NPA) against the Jurisdiction Table entries. If a match is found in the Jurisdiction Table, the Adjunct plays an announcement to the Redirecting Party to indicate that the call cannot be completed.

12. If a match is not found in the Jurisdiction Table, the following actions occur:

    — **The Adjunct sets up a call to the Target Party by sending a Q.931 SETUP message to TAS A. This triggers AMA recording at TAS A for the call from the Calling Party to the Target Party. The TAS A sets up a call to TAS 2 to request connection to the Target Party**.

    — **If the Redirecting Party's attempt to redirect the call to the Target Party fails because of a Busy signal or a Ring No Answer, TAS A will create an AMA record for the attempt with Elapsed Time = 0 . A maximum of four redirection attempts (answered or unanswered) are allowed**.

    — **When the Redirecting Party drops off the call, the following actions occur**:

        (a) **The Adjunct sends a Bill Closure message to the OAS to close the AMA record.**

        (b) **The OAS sends a Termination message to the 2DSD NCP with the Redirecting Party's CIP Identification (ID) if the customer is subscribed to NAAR. The 2DSD NCP decrements the CIP counter that is associated with the Redirecting Party's CIP ID.**

        (c) **The Adjunct sends a Call Merge message to the TAS A and merges out of the call after the Target Party answers.**

    — **When the Calling Party or Target Party hangs up the phone, and the TAS A detects a disconnect message, TAS A will close the AMA record**.

NOTE:
When Speed Dialing to POTS, if the Speed Dial code maps into a POTS number, the POTS number does not have to be screened against the Invalid NPA and NXX Tables. The POTS number is pre-provisioned and, therefore, has already been screened by the Service Management Workstation.

If the Speed Dial code maps into an APN, the Adjunct sends a Bill Update message to the OAS to update the SFV for the Redirecting Party's AMA record. A second AMA record is not created for a redirection to an APN.

Table 19-A. PACR Features

PACR Feature	Description
BT-H	Blind Transfer for Human Agents—Calls are redirected using human agents. The Redirecting Party agent enters ***T (*8)**, the 10-digit toll-free or POTS number to be redirected, and drops off the call. Verbal announcements are played.
BT-V	Blind Transfer for Voice Response Units (VRUs)—Same as BT-H except that calls are redirected using VRUs on customer premises. Instead of playing verbal announcements, Dual-Tone Multifrequency (DTMF) tones are played.
ST-H	Soft Transfer for Human Agents—Allows the Redirecting Party to stay on the call long enough to determine whether the redirection has taken place. Calls may be reattempted up until the time an answer is received. If the Target Party's line is busy, the Redirecting Party could either speak to the Calling Party again or attempt another redirection. After the Target Party has answered, the Redirecting Party will hear an announcement and be dropped.
ST-V	Soft Transfer for Voice Response Units (VRUs)—Same as ST-H except that calls are redirected using VRUs on customer premises. Instead of playing verbal announcements to the Redirecting Party, Dual-Tone Multifrequency (DTMF) tones are played.
CC-H	Consultation and Conference for Human Agents—Allows 3-way calls between the Calling Party, Redirecting Party, and the Target Party. Multiple redirections are allowed. CC-H is only offered to customers with human agents on premises.

3. Provisioning

3.01 The provisioning process remains the same as the previous provisioning for the PACR service based on the Adjunct. However, the customer's profile data has been modified as a result of the PACR-to-POTS Billing Fix Feature.

3.02 The Small-Scale Adjunct (SSA) Service Management Workstation (SMW) is used to update customer records in the Provisioning and Maintenance module of the adjunct. Three additional fields have been added to the Adjunct's customer because of

the PACR-to-POTS billing fix. These fields are as follows:

- NCP Account ID
- Market Segmentation Indicator (AMA Table 399)
- Revenue Accounting Office (AMA Table 46).

4. Recording

4.01 For calls that are redirected to a POTS number, the PACR-to-POTS Billing Fix Feature generates separate AMA records for the Calling Party to Redirecting Party leg of the call (Redirecting Party AMA record) and for each subsequent redirection attempt to POTS termination (Target Party AMA record).

Redirecting Party AMA Recording

4.02 The Redirecting Party AMA record is created at the OAS via the original toll-free number query to the 2DSD NCP. This record is closed when the Redirecting Party disconnects after a Q.931 Billing Closure message is sent by the Adjunct. This record contains the same SFVs (AMA Table 12) that were used previously to direct calls to toll-free numbers.

Target Party AMA Recording

4.03 The Target Party AMA record is created at the TAS A via the receipt of a Q.931 SETUP message that triggers AMA recording. The SETUP message contains all the call-specific data that the *4ESS* switch needs to create a toll-free type AMA record. The Target Party AMA record contains the new "881" (PACR-to-POTS call) SFV. The Terminating Number used on the Target Party AMA record is that of the Redirecting Party instead of the actual Target Party's POTS number.

AMA Data

4.04 No new AMA Structure, AMA Module, or Call Code requirements have been defined for the PACR-to-POTS Billing Fix Feature. However, for the 4E21 Release 1 Generic, the *4ESS* switch generates AMA Structure 901 or 902 using existing events. Additionally, Call Distribution Module (317) is generated and appended automatically for all 10-digit toll-free voice calls. No new triggers are needed. The Numbering Plan Type Module (923) is generated and appended based on existing events.

Downstream Billing

4.05 Downstream billing systems will have to support the new POTS "881" SFV on the AMA record that is created at the TAS for calls that are redirected to POTS. Once the data is recorded, the Redirecting Party and the Target Party AMA records are sent to the Recording Information Collection System (RICS). RICS then passes the appropriate billing information to the downstream systems.

5. Network Management (Not Affected)

6. Maintenance/Troubleshooting

Final Handling Code (FHC)

6.01 One FHC is affected by this feature. FHC 1093 applies to billing received in a SETUP message from the Adjunct. When a Billing Facility message contains errors, the *4ESS* switch will final handle the call and send a Release Complete message to the Adjunct.

7. Transition Considerations

7.01 The PACR-to-POTS Billing Fix feature deployment in the *4ESS* switch network occurs in only Terminating AT&T Switches (TAS) initially (that is, switches that host the adjunct). It will be extended to other switches later. The *4ESS* switch and adjunct changes that support this fix are to be done simultaneously in the network. However, it is preferable to deploy the *4ESS* switch changes before the adjunct changes are deployed.

Ubiquity

7.02 It is not necessary for all *4ESS* switches in the network to be running the 4E21 Release 1 Generic for this feature to be fully operational.

Turn On/Turn Off Mechanism

7.03 This feature cannot be turned on until the downstream billing is ready to accept the new "881" SFV. This feature will be turned on by a feature bit in the Adjunct software.

8. Input/Output Manual Pages (Not Affected)

Check Application Call Status Feature (4779)

20

Contents **Page**

Check Application Call Status Feature (4779)

20

1. Feature Description

1.01 This feature enhances the signaling communications between an Originating AT&T Switch (OAS) and a 2 Direct Services Dialing (DSD) Network Control Point (NCP) for Inbound Service features such as Alternate Termination Sequence (ATS) and features that support queuing.

1.02 ATS and queuing features provide subscribers with the ability to regulate the number of calls routed to their locations. These features allow subscribers to coordinate the number of calls going to a location with the number of available agents at each location. Programs in the 2DSD NCPs control the routing of the calls.

1.03 In order to correctly route calls, the programs must know the number of calls "in progress" at any time. The number of calls "in progress" are tracked by Calls in Progress (CIP) counters in the NCP. These CIP counters rely on Transaction Capabilities Application Part (TCAP) Termination (Term) messages sent from the OAS for their input. (A TCAP Term message is sent to the 2DSD NCP when a call to the subscriber destination has been terminated.)

1.04 Accurate counts are important for controlling the number of calls routed to each destination. However, because of network conditions, TCAP Term messages are not always received by a 2DSD NCP. This results in the CIP counters not always being accurate. If the CIP counters are too high, calls are not routed; if the CIP counters are too low, calls are routed to busy terminations.

1.05 Steps have been taken to compensate for the lost Term messages until the problem of lost messages is resolved. Unfortunately, the steps taken over compensate and hold the CIP counter artificially low, which results in calls being routed to busy terminations.

1.06 The Check Application Call Status feature provides the 2DSD NCPs with the capability to periodically check the status of calls that use the ATS and queuing features. Having this information allows the 2DSD NCPs to maintain a more accurate count of ATS and queuing calls.

2. Call Flow

2.01 The following steps (along with Figure 20-1) describe the call flow for this feature.

NOTE:
Steps 1 through 9 describe the call flow without this feature being installed. Steps 10 through 14 are the additional steps that take place after adding this feature.

1. A caller dials an 800 number.
2. The call is routed to an OAS via a Local Exchange Carrier (LEC) switch.
3. The OAS formulates a TCAP Begin message and sends it to a 2DSD NCP.

If the calling party's billing number...	Then the TCAP Begin message...
Is available	Includes the dialed number and the calling party's 10 digit billing number.
Is not available	Contains the 3 digit NPA with seven zeroes.

4. The 2DSD NCP receiving the TCAP Begin message executes the Customer Account Logic (CAL) associated with the dialed number that was received.
5. After executing the CAL logic, the 2DSD NCP does the following:
   - Starts a Call Duration Timer (CDT)
   - Sends a TCAP Continue message to the OAS that contains the following information:
     - — The routing number
     - — The dialed number
     - — The ANI
     - — AMA recording instructions
     - — A request for a TERM message.
6. When the OAS receives the TCAP Continue message, it begins AMA recording and routes the call to the destination number.

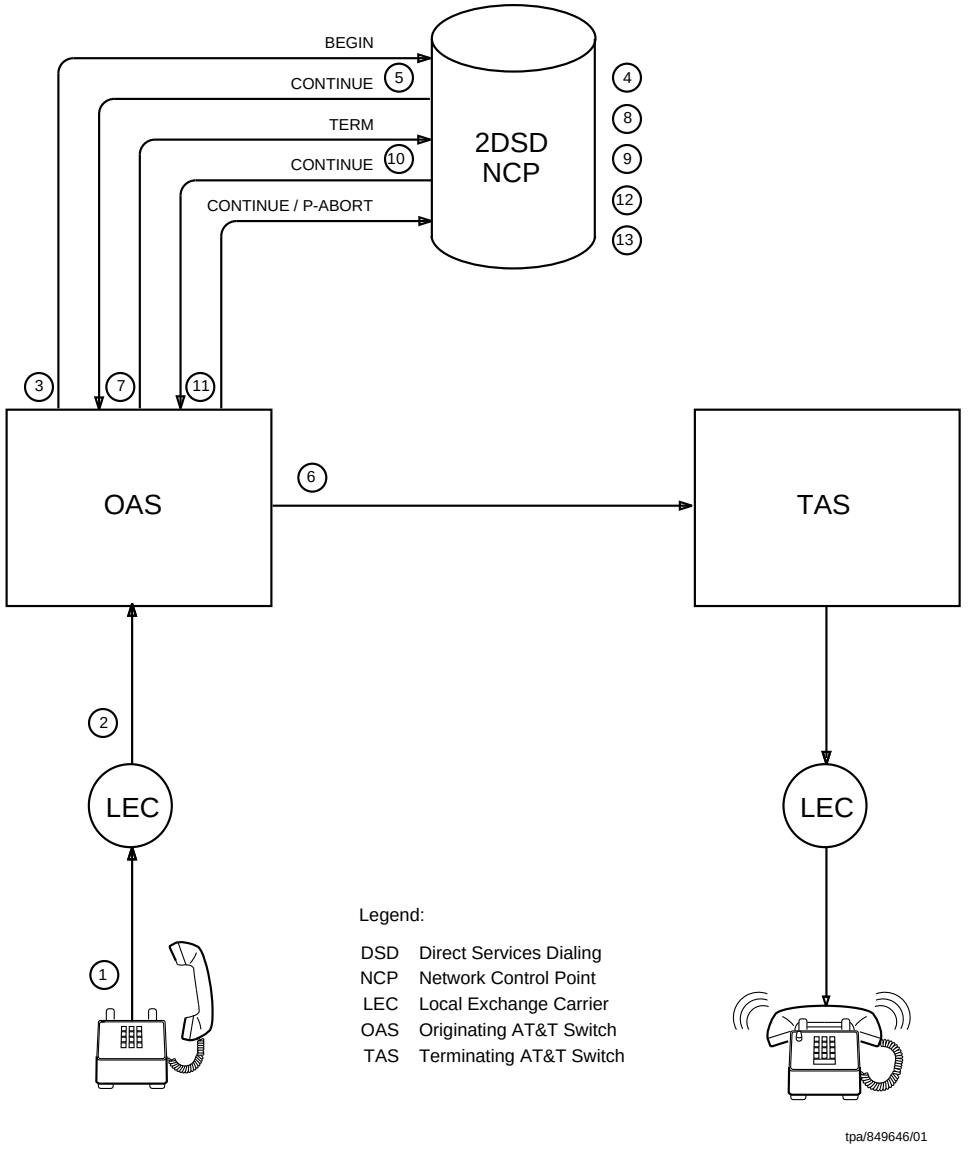

Figure 20-1. Check Application Call Status Call Flow

7. When the call is terminated, the OAS detects the disconnect and sends a TCAP Term message to the 2DSD NCP.
8. If the 2DSD NCP receives the TCAP Term message, it decrements the appropriate CIP counter and disables the CDT. (Disabling the CDT allows another call to be sent to the destination.)
9. Sometimes network conditions prevent an OAS from sending the TCAP Term message back to the 2DSD NCP. If the 2DSD NCP does not receive the TCAP Term message, the CDT eventually times out and the CIP counter is decremented even though the call could still be in progress.

   Since TCAP Term messages do not always make it to the 2DSD NCP, the CIP counters in the 2DSD NCP do not always give accurate counts of the number of calls in progress.

If the CIP counters indicate...	**Then...**
A high number of calls in progress	No new calls are routed.
A low number of calls in progress	Calls are routed to busy terminations.

   The addition of this feature enables the 2DSD NCP to periodically check the status of ATS and Queuing calls thus maintaining more accurate counts on these calls. The following steps (10 through 14) describe how the status of these calls is checked.

10. If the 2DSD NCP does not receive a TCAP Term message about the call before the CDT expires, the 2DSD NCP does the following:
    - Sends a TCAP Continue message to the OAS requesting a check of the call status.
    - Activates a Check Status Message Timer (CSMT)
    - Increments the Check Application Status Messages counter. (This is a new measurement.)

11. When the OAS receives the TCAP Continue message, it checks the status of the call transaction.

If the call is...	**Then the OAS returns a...**
Still in progress	TCAP Continue message to the 2DSD NCP acknowledging that the call is still in progress.
No longer active	TCAP P-Abort message to the 2DSD NCP.

12. The 2DSD NCP response depends on the message it receives from the OAS.

If the message returned is a...	Then the 2DSD NCP...
TCAP Continue message	- Resets the CDT - Disables the CSMT - Starts another timing interval.
TCAP P-Abort message	- Decrements the appropriate CIP counter - Disables the CDT - Disables the CSMT - Terminates the call.

13. If the CSMT expires while waiting for a response, the following actions occur:
    - The CDT is disabled
    - The CSMT is disabled
    - The CIP counter is decremented
    - The call transaction is terminated.
14. A new measurement for the number of times that the CSMT times out while waiting for a response from the switch, DSDCSMTTO, is incremented whenever CSMT expires while waiting for a response.

3. Provisioning (Not Affected)

4. Recording (Not Affected)

5. Network Management (Not Affected)

6. Maintenance/Troubleshooting

6.01 A new call irregularity code (2102) was created to support this feature. This code is issued by a *4ESS*™ switch when an NCP sends it a check application status message that contains a protocol error.

7. Transition Considerations

Ubiquity

7.01 It is not necessary for all *4ESS* switches in the network to be running the 4E21 Release 1 generic for this feature to be fully operational.

Turn On/Turn Off Mechanism

7.02 This feature is turned on automatically by software deployment.

8. Input/Output Manual Pages (Not Affected)

RCAS RC Activity Indicator Feature (4995)

21

Contents **Page**

RCAS RC Activity Indicator Feature (4995)

21

1. Feature Description

1.01 The Recent Change Administration System (RCAS) feature (4366) was introduced in the 4E20 Release 2 Generic. With that feature, the lighting of the "UPDATE IN PROGRESS" lamp on the Master Control Complex (MCC) indicated that Recent Change (RC) activity was in progress.

1.02 The current feature adds the lighting of the "RC ACTIVITY" lamp on the MCC as an additional indicator that recent change activity is taking place.

2. Call Flow (Not Affected)

3. Provisioning (Not Affected)

4. Recording (Not Affected)

5. Network Management (Not Affected)

6. Maintenance/Troubleshooting (Not Affected)

7. Transition Considerations

Ubiquity

7.01 The RCAS RC Activity Indicator feature was released in the 4E20 Release 4 Generic. It is not necessary for all *4ESS* switches in the network to be running the current generic for this feature to be operational.

Turn On/Turn Off Mechanism

7.02 This feature is turned on automatically by software deployment.

8. Input/Output Manual Pages (Not Affected)

Single-Entry MRTT Counts (SEMC) Feature (5000)

22

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Single-Entry MRTT Counts (SEMC) Feature (5000)

22

1. Feature Description

1.01 This feature adds a new condition under which "first egress" counts are scored at a Split Access Flexible Egress Routing (SAFER) or End-to-End Class of Service (ECOS) Terminating Switch. First egress counts are Terminating First Egress (TFE) and Terminating First Overflow (TFO). The new condition for scoring these counts is that the Multiple Routing Treatment Table (MRTT) at the originating switch contains a single routing entry. TFE and TFO are scored as before under all other conditions.

1.02 This feature changes the value of Egress Switch Indicator (ESI) sent in the case of a single Destination Switch Number (DSN) entry MRTT at the Originating AT&T Switch (OAS) to 0 , indicating Single Terminating AT&T Switch (TAS).

1.03 The rules for scoring counts at the TAS are also modified so that if ESI equal 0 is received and Egress Route Indicator (ERI) does not equal 0 is received, then the TAS is considered both the First Switch and the Final Switch, and so TFE, TFO, Terminating Last Egress (TLE), and Terminating Last Overflow (TLO) are all scored as appropriate.

2. Call Flow

2.01 This section gives an example of the call flow.

1. At the OAS number translation points to an Multiple Carrier Treatment (MCT) table, MCT 1. Carrier 2 , Foreign Administration Identity (FAI)=2 is selected based on a random selection. This routing treatment for FAI 2 is MRTT 2.
2. The MRTT for FAI 2, MRTT 2, indicates a DSN route with ERI 2 to International Switching Center (ISC)2. The call is sent to ISC2 with ESI=0, since there is only one entry in the MRTT which is a DSN route, and ERI=2, from the MRTT.
3. The MCT Table at ISC2 indicates that MRTT 22 should be used for carrier 2.
4. The MRTT has a single Routing Data Block (RDB) which contains an ECOS marker Trunk Subgroup (TSG) with an activated Far-End AREA (FEAREA), or the set of TSGs on which to route the call. TFE and TLE are scored for the call. If the call cannot be completed on any available trunks, then TFO and TLO are scored for the call.
5. The call is then cranked back to the OAS.
6. Since FAI 2 overflows to FAI 1, the call flow will then continue with the routing for FAI 1.

3. Provisioning (Not Affected)

4. Recording (Not Affected)

5. Network Management (Not Affected)

6. Maintenance/Troubleshooting (Not Affected)

7. Transition Considerations

Ubiquity

7.01 It is not necessary for all *4ESS* switches in the network to be running the 4E21 Release 1 generic for this feature to be fully operational.

Turn On/Turn Off Mechanism

7.02 This feature is turned on automatically by software deployment.

8. Input/Output Manual Pages (Not Affected)

Abbreviations and Acronyms

1+DL
1+Directory Link

A

ABC
Adjunct-Based Capability

ACG
Automatic Call Gapping

ACI
AT&T Customer Interface

AIN
Advanced Intelligent Network

ALA
Adjunct Logical Address

ALT
Alternate

AMA
Automatic Message Accounting

ANI
Automatic Number Identification

APN
Action Point Number

APP0
Application Processor 0

APP1
Application Processor 1

ASCII
American Standard Code for Information Interchange

ASR
Automatic Speech Recognition

AT
Access Tandem

ATP
AT&T Trigger Platform

ATS
Alternate Termination Sequence

C

CAL
Customer Account Logic

CC
Call Code

CCFR
Central Control Fault Recovery

CCITT
International Telephone and Telegraph Consultative Committee

CCS7
Common Channel Signaling System 7

CdPn
Called Party Number

CDSU
Custom Data Service Unit

CDT
Call Duration Timer

CHI
Call Handling Instructions

CIP
Calls in Progress

CN
Connected Number

CNI
Common Network Interface

CNRDB
Common Network Routing Data Base

CPN
Calling Party Number

CS
Call Store

CSB
Call Store Bus

CSDC
Circuit-Switched Digital Capability

CSFR
Call Store Fault Recovery

CSMT
Check Status Message Timer

D

DARICS
Data Acquisition, Reports and Integrated Control System

DCIS6
Destination Common Channel Inter-Office Signaling 6

DCN
D Channel Node

DCNAP
D Channel Node Agent Process

DIF
Digital Interface Frame

DIU
Digital Interface Unit

DLN
Direct Link Node

DMS
Data Management System

DNHR
Dynamic Non-Hierarchical Routing

DNT
Dialed Number Trigger

DSD
Direct Services Dialing

DSN
Destination Switch Number

DTMF
Dual-Tone Multifrequency

E

EBAF
Extended Bellcore AMA Format

ECIS6
Embedded Common Channel Inter-Office Signaling 6

ECOS
End-to-End Class of Service

EIM
Error Interval Monitor

ERI
Egress Route Indicator

ESF
Extended Super Frame

ESI
Egress Switch Indicator

F

FAI
Foreign Administration Identity

FEAREA
Far-End AREA

G

GULP
Generic Utility Program

H

HNPA
Home Numbering Plan Area

I

IADC
Integrated Access Digital Capability

IAM
Initial Address Message

ID
Identification

IE
Information Element

IEC
Interexchange Carrier

IFB
Interface Bus

IFFR
IFB Fault Recovery

II
Information Indicator

INC
International Carrier

IRAS
Integrated Routing Assignment System

ISAIC
Improved Service Announcement and Information Collection

ISC
International Switching Center

ISDN
Integrated Services Digital Network

ISUP
Integrated Services Digital Network User Part

ITN
Integrated Test Network

IVT
International Voice Transit

L

LAN
Local Area Network

LEC
Local Exchange Carrier

LIB
Link Interface Board

M

MABS
Memory Address Bus Select

MCC
Master Control Complex

MCT
Multiple Carrier Treatment

MF
Multifrequency

MMIO
Memory Mapped Input Output

MSU
Message Signal Unit

MTP
Message Transfer Restart

Mw
Megawords

N

NAAR
Next Available Agent Routing

NAI
Network Access Interruption

NANP
North American Numbering Plan

NCOE
Network Channel Office Equipment

NCP
Network Control Point

NEMOS
Network Management Operations System

NESAC
National Electronic Switching Assistance Center

NPA
Numbering Plan Area

NPT
Numbering Plan Type

NRA
Network Remote Access

NSCX
Network Services Complex

O

OAS
Originating AT&T Switch

OCN
Original Called Number

ODA
Office Data Assembler

ODMS
Office Database Management System

OLI
Original Line Indicator

OOS
Out-of-Service

OS
Operating System

P

PACR
Post Answer Call Redirection

PC
Point Code

PC
Processor Configuration

PCC
Per-Call Control

PCIS
Per Channel Inhibit Signaling

PCP
Positive Call Processing

PECC
Product Engineering Control Center

PITT
Periodic Indication Interval for Intrusive Testing

POTS
Plain Old Telephone Service

PR
Prefix

PRD
Product Release Document

PS
Program Store

PSE
Program Store Expansion

PU
Peripheral Unit

Q

QPF
Query Processing Function

R

RC
Recent Change

RCAS
Recent Change Administration System

RDB
Routing Data Block

REX
Routine Exercise

RIB
Ring Interface Board

RN
Redirecting Number

ROP
Receive Only Printer

RTNR
Real Time Network Routing

RTX
Real Time Executive

S

SAC
Service Access Code

SAFER
Split Access Flexible Egress Routing

SAFER
Split Access Flexible Egress Routing'

SCANS
Software Change Administration and Notification System

SCP
Service Control Point

SCS
Service Circuit System

SCU
Service Control Unit

SDF
Shared Directory Function

SDN
Software Defined Network

SEP
Signaling End Point

SFV
Service Feature Value

SIC
Service Identity Code

SLS
Signaling Link Selection

SR
System Reinitialization

SS7
Signaling System 7

SSP
Service Switching Point

STP
Signal Transfer Point

SU
Signal Unit

SUERM
Signal Unit Error Rate Monitor

T

TA
Telecommunications Administration

TAR
Transition Address Register

TAS
Terminating AT&T Switch

TCAP
Transaction Capabilities Application Part

TCC
Technical Control Center

TDAS
Traffic Data Accounting System

TDG
Type Digroup

TDIU
Type of Digital Interface Unit

TFE
Terminating First Egress

TFO
Terminating First Overflow

THW
Type Hardware

TLE
Terminating Last Egress

TLO
Terminating Last Overflow

TOA
Type of Access

TOP
Task Oriented Practice

TOS
Type of Service

TRA
Traffic Restart Allowed

TRW
Traffic Restart Waiting

TSC
Temporary Signaling Connections

TSG
Trunk Subgroup

TSVC
Type of Service

TV
True Voice

TWRP
Tape Write, Read Program

U

UCT
Universal Coordinated Time

ULN
Universal Link Node

USDS
Universal Subscriber Data Structure

W

WCS
Windowed Call Store

WPAD
Write Protect Administration

X

XM
Extended MMIO

XS
Extended Store