

**FEATURE DOCUMENT**  
**AUTOMATIC BROADCAST WARNING FEATURE**  
**2-WIRE NO. 1 ELECTRONIC SWITCHING SYSTEM**

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**FEATURE DEFINITION AND DESCRIPTION****1. DEFINITION/INTRODUCTION****DEFINITION**

**1.01** The Automatic Broadcast Warning (ABCW) feature is a system for applying program store overwrites to the No. 1 ESS. It allows input of the overwrite data either directly from paper tape or manually and provides automatic selection of applicable broadcast warning data under control of the ESS. The broadcast warning data is automatically checked as it is entered. This feature provides automatic program store configuration control during overwrite application and a series of aids and simplifications of the required program store card manual operation.

**INTRODUCTION**

**1.02** Statistical data was collected from the Bell Telephone Operating Companies to determine the causes of downtime experienced by No. 1 ESS switching machines. This data indicated that approximately 20 percent of the downtime experienced by the No. 1 ESS switching machines was directly attributable to procedural errors during program store broadcast warning overwrite application. Some of the procedural errors in applying broadcast warning overwrites were:

- (a) Typing errors and omissions during entry of broadcast warning overwrites
- (b) Failure to verify that the program store words to be overwritten had not been changed by a previous local or special overwrite and that the words to be overwritten contained the expected values
- (c) Failure to apply a broadcast warning because it appeared unnecessary to a particular office
- (d) Errors during manual program store reconfiguration resulting in old and new program stores being on-line simultaneously
- (e) Insertion of cards in the wrong program store or location and subsequent failure to verify the newly inserted data.

**1.03** The ABCW feature has been developed in order to minimize the probability of the above errors occurring. This feature provides a method for incorporating program changes in the No. 1 ESS program stores with minimal manual operation. The features which have been automated are:

- (a) The broadcast warning overwrites are computer-generated in a form suitable for broadcasting via the Administrative Data Network (ADNET) and for paper tape perforation at each destination point. The paper tape is then read directly into each No. 1 ESS machine. The broadcast warning data is formatted in such a way that each ESS machine picks up only the data applicable to the generic issue and (if applicable) the set of feature packages installed in that machine.
- (b) The ESS machine error checks all new and old data as it is read in and matches expected old data from the paper tape against the current contents of the program store words to be changed.
- (c) The ESS machine directs each step of the operation by means of output messages and provides error indications when an error or trouble condition is detected.
- (d) The feature provides for verification of the program store cards as they are written and provides for detection of improperly inserted cards. It also provides for rewriting of cards that fail verification.
- (e) The feature provides for removing the program change from the program store by using the same paper tape previously used for inserting the change. This is done without the need for the original program cards.
- (f) The ESS machine configures the program stores, as required, and maintains the configuration in the presence of low level interrupt activity and invalid automatic or manual program store configuration requests.

## 2. USER PERSPECTIVE

## TELEPHONE COMPANY

## A. Broadcast Warning Tape Overwrites

## Verify On-Line (VON) Mode

**2.01** The broadcast warning telegram (BWT) received at the operating company office is both a telegram with English text explaining the change and a paper tape for direct reading into the No. 1 ESS machine. Figure 1 gives the format of the paper tape as it is received.

**2.02** After the tape has been received, it is taken to the BWT application location [normally a Switching Control Center (SCC)] and mounted on a tape reader patched to the local maintenance, remote maintenance, or the service order teletypewriter channel. The tape reader is then started manually.

**Overwrite Sequence Check**

**2.03** The first ESS interpretable message on BWT tape will be an MCW-STRTWX-VON message, which specifies that the overwrite is to be done in VON mode and gives a unique sequence number for this overwrite. (See Table A for an

explanation of the various overwrite modes.) The ESS reads the sequence number and checks that it is equal to the sequence number of the last broadcast warning tape plus one. If the current tape is out of sequence, tape reading stops and a CW02 output message is printed out. This message gives the current number of local overwrites applied since the last generic issue load and the sequence number of the last broadcast warning applied.

**Initial Configuration Checks**

**2.04** If the sequence number is correct, the system is put in the **overwrite input state** if the following initial checks pass. (See Fig. 2.)

- (a) A previous overwrite process is not already active.
- (b) Program store module cardwriting is not in progress.
- (c) All program stores in the office are on-line and not marked in trouble.

If any of these checks fails, tape reading stops and a CW05 output message is printed out specifying the type of error encountered. Appropriate steps should be taken to correct the error. If all the

PRIMARY TAPE MOUNTING REGION (100 DELETES)
EXPLANATORY ENGLISH TEXT TRANSMITTED WITH THE BROADCAST WARNING (NOT ESS INTERPRETABLE)
SECONDARY TAPE MOUNTING REGION (40 DELETES)
BROADCAST WARNING OVERWRITE DATA (ESS INTERPRETABLE)
TEXT TRAILER (100 DELETES)

## NOTES:

1. START THE TAPE AT THE PRIMARY MOUNTING REGION TO PRINT OUT THE DESCRIPTIVE ENGLISH TEXT AND OVERWRITE SYMBOLICS ACCOMPANYING EACH BWT (PREFERABLY ON AN OFF-LINE TTY)
2. START THE TAPE AT THE SECONDARY MOUNTING REGION WHEN ACTUALLY APPLYING THE OVERWRITE UNLESS A PRINTOUT OF THE ENGLISH TEXT IS DESIRED

Fig. 1—Layout of ABCW Paper Tape

TABLE A  
ABCW FEATURE INPUT MODES

PROGRAM STORE OVERWRITE TYPE	SINGLE CARD WRITING APPLICATION MODES AVAILABLE		MEANING OF MODE
Broadcast warning tape	Verify on-line (VON)		<p>At the start of the procedure, all program stores must be on-line and procedure executed in three system-controlled states: update, soak, and copy.</p> <p>Update stage — Program stores are automatically put out of service as cards are written. Update cards are inserted and verified. Then the system configures all update program stores on-line and all copy program stores off-line.</p> <p>Soak stage — Period during which the system is checked out while processing calls with the overwritten program stores on-line. The change can be backed out manually at any time up to the end of the soak stage.</p> <p>Copy stage — All copy cards are inserted and verified; then all program stores are configured on-line.</p>
	Verify off-line (VOF)		<p>At the start of the procedure, the program stores containing the data to be changed must be off-line. No program store switching occurs, and only the update stage is used, otherwise similar to VON mode.</p>
Locally prepared	Single card verify modes	Verify backout on-line (VBN)	Backout VON mode — Tape used in two passes to restore program stores to original contents.
		Verify on-line (VON)	Same as VON explanation above.
		Verify off-line (VOF)	Same as VOF explanation above.
		Verify backout off-line (VBF)	Backout VOF mode — Same as VBN except program stores affected are off-line at start.

TABLE A (Cont)

## ABCW FEATURE INPUT MODES

PROGRAM STORE OVERWRITE TYPE	SINGLE CARD WRITING APPLICATION MODES AVAILABLE		MEANING OF MODE
Locally prepared	Single card nonverify modes	Nonverify on-line (NON)	Nonverify on-line mode — All program stores must be on-line at start. No program store switching occurs, and only the update stage is used, otherwise similar to VON mode.
		Nonverify off-line (NOF)	Nonverify off-line mode — Same as NON except affected program stores must be off-line at start.
		Nonverify backout on-line (NBN)	Backout NON mode — Tape used in two passes to restore program stores to original contents.
		Nonverify backout off-line (NBF)	Backout NOF mode.

above checks pass, an OK acknowledgment is printed out and paper tape reading continues.

#### ***Automatic Selection of Applicable BWT Overwrite Data***

**2.05** The broadcast warning tape may contain overwrite data applicable to one or more generic issues or point loads. If an overwrite applies to only one generic program, issue, and point load, the overwrite data is preceded by an MCW-PGTAPE-FOR input message specifying that generic program, issue, and point load. If an overwrite applies to more than one generic program, issue, and point load, the MCW-PGTAPE-FOR input message is followed by as many MCW-PGTAPE-ORG messages as necessary to specify the other applicable generics. If an overwrite applies to a relocatable feature package, the overwrite data is preceded by an MCW-PGTAPE-IFF message specifying the applicable feature package number. After the overwrite data applicable to a feature package, there is an MCW-PGTAPE-ELS input message. This is followed by the overwrite data, if any, for each card to be written if the applicable

feature package is not loaded. The end of the feature package relocatable data is specified by an MCW-PGTAPE-END message. The general rule is that for each PGTAPE type input message, the system checks conditions specified by the input message to determine whether the overwrite is applicable. If it is applicable, an OK is printed out and paper tape reading continues in the ***overwrite input state***. If it is not applicable, an NA message is printed out and paper tape reading continues in the ***advance tape state***.

#### ***Automatic Error and Old Data Checking of BWT Data***

**2.06** BWTs contains an old data check (MCW-MATCH) message for each new data word (MCW-WORD) in the overwrite. If the old data mismatches, a NO is typed out; and if paper tape reading was in progress, the system will not restart the reader. Along with each line of old or new data, a 2-digit check code (computer-generated and too complex for manual calculation) is included. As each line is entered, the program recomputes the check code, which should appear in the last two digits of the

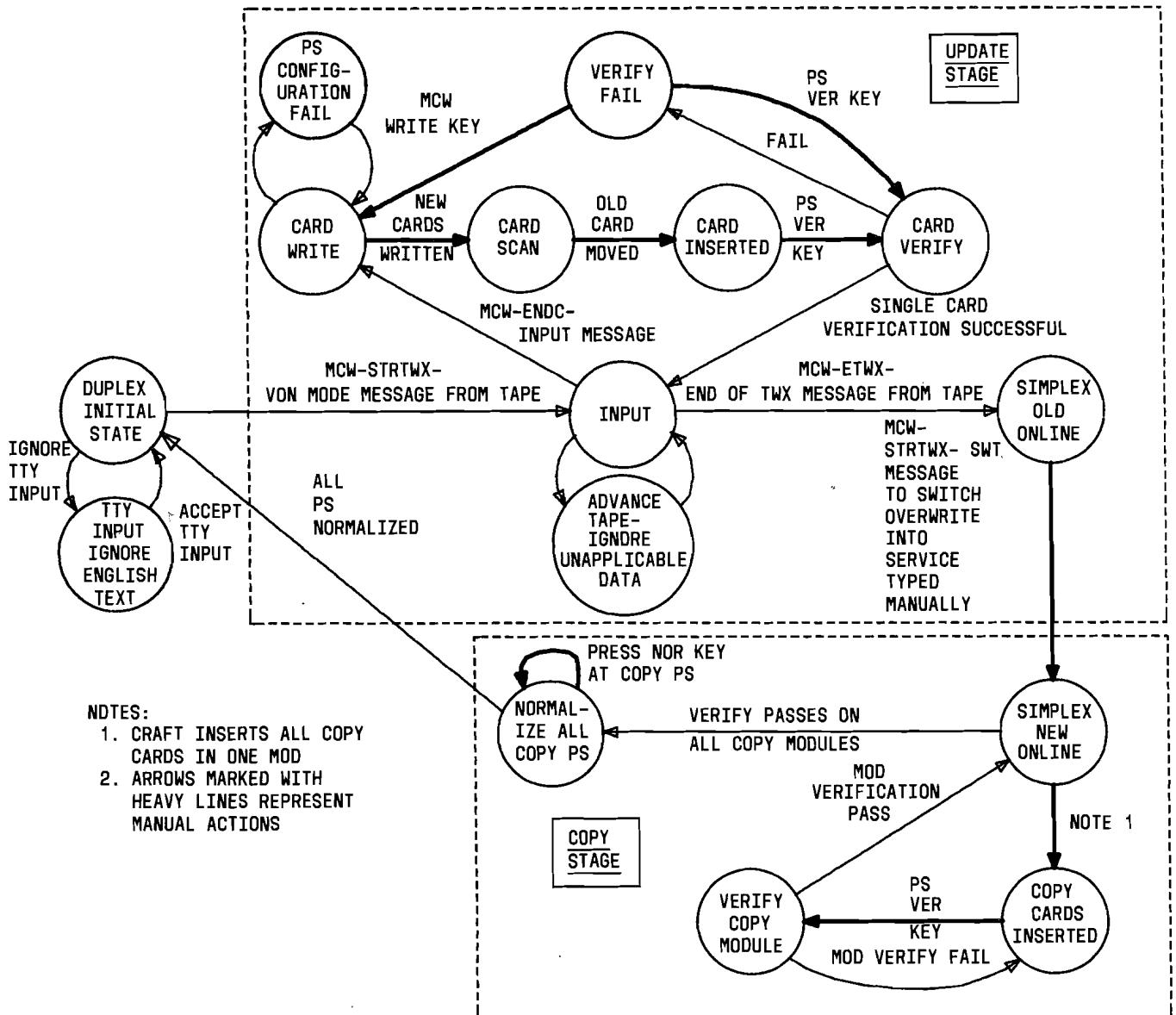


Fig. 2—State Diagram for Program Store Overwrite Process, VON Mode

line. If the computed check code mismatches the entered check code, one or more characters of the line are in error and the system types out an NG message. Paper tape reading (if in progress) stops.

**Aid to Identification and Tagging of the Old and New Program Store Cards**

**2.07** The system will type out the program store (PS), module, card, and pass locations of the update and copy cards to be written via two

CW06 WRITE output messages. These messages request the craftsperson to write and tag each card of an identical pair of new (update and copy) cards.

**Aid to Location of Correct Program Store Card to be Replaced**

**2.08** The out-of-service (OS) lamp of the **update** program store containing the old card to be replaced flashes after the second card of the pair

is written. When the *correct* card is pulled, the OS lamp will stop flashing.

### ***Automatic Single Card Verification***

**2.09** One of the cards should be inserted into the appropriate slot in the OS program store and the VER key depressed at this store. If verification is successful, the VER lamp lights and a CW01 message is printed out indicating successful verification. Paper tape reading resumes, and the REQ INH key on the update program store should be depressed. Otherwise, the VER lamp does not light, and a CW01 message is printed out indicating that verification was not successful. A CW06 message is printed out following the CW01 verification message, allowing a new pair of cards to be written if necessary. Verification failure can occur because the card is not properly seated, a wrong card was inserted, or the card was bad. After appropriate corrective action has been taken, the REQ INH key and then the VER key on the appropriate program store should be depressed to check the new card. After verification has been achieved, paper tape reading resumes and the REQ INH key should be depressed.

### ***Automatic PS Configuration Control***

**2.10** To switch the update copy of the overwrite into service, an MCW-STRTWX-SWT message should be typed in.

### ***Prompting for Copy Card Insertion***

**2.11** After the MCW-STRTWX-SWT input message is typed, the system responds with a CW12 message which specifies where the first set of copy cards is to be inserted.

### ***Emergency Backout Provision***

**2.12** If the system indicates trouble after the switch of the update copy of the overwrite into service, either program store bus at the master control center should be selected. The PSSC switch should be set to state 2, and the SET MAN key should be operated. This causes the copy stores, which still have the old data, to be used for call processing.

**2.13** After all cards have been inserted and verified, the NOR key on an affected copy program store should be operated. This should

be repeated for the remainder of the copy program stores. The program stores are then put in service in the on-line state.

### ***Defective Overwrite Removal Provision***

**2.14** If the broadcast overwrite is defective, it may be removed without affecting other overwrites using the same tape used to apply the overwrite. The MCW message specifying the VON mode is changed to MCW-STRTWX-VBN to specify the VBN mode and to make the broadcast warning sequence number equal zero. The tape is then read twice. On the first pass, the presence and accuracy of the overwrite data to be backed out are checked. On the second pass, the overwrite is done; that is, the original old data is card written. The procedure for this is the same as for overwriting with new data.

### ***Verify Off-Line (VOF) Mode***

**2.15** The VOF mode allows the application of overwrites to data or program contained in off-line program stores, making the contents of these stores different from the contents of the on-line stores.

**2.16** For parameter for translation overwrites or for generic overwrites during a generic update, the VOF mode is used because there is only one copy to be overwritten. It is requested by the MCW-STRTWX-VOF TTY input message.

**2.17** The VOF mode application procedure differs from the VON mode procedure in only the following ways.

(a) The affected program stores are not automatically switched out of service but must already be out of service at the start of the procedure. If neither program store containing the affected address is out of service, a CW05 message is printed specifying the update and copy stores containing the affected addresses. After the appropriate program store is switched out of service, an MCW-RST TTY input message should be manually typed in specifying a restart. Inputting then resumes.

(b) The procedure consists of only the update stage.



**2.18** The VOF mode could be used for ABCW tapes in case a broadcast warning is sent at a time when the receiving office is doing a generic update. With the old generic in one set of program stores only, the application of the overwrite tape would be done in the VOF mode to prevent affecting the stores which are processing calls.

#### **B. Locally Generated Overwrites**

**2.19** Locally generated overwrites are applied using nearly identical procedures to those used for applying BWTs. However, the composition of the overwrite input messages differs from BWTs in that no MCW-MATCH (old data compare) or MCW-PG TAPE messages need be prepared and typed in. Also, the sequence number field in the MCW-STRTWX message should be specified as 999.

**2.20** When entering local overwrites, it is still necessary to verify the old contents of the program store words about to be overwritten. *Before* starting the overwrite, all addresses to be changed should be checked by using the T-READ message to assure that they contain the expected old data.

**2.21** The overwrite should be tested for proper operation immediately after the update cards have been switched on-line (after typing MCW-STRTWX-SWT,000.) and before any copy cards are inserted in the off-line PS. If one of the verify modes is used to apply the overwrite, it is not necessary to verify the new cards manually since they are automatically verified as they are inserted.

#### **Special Purpose Modes**

##### **NON Mode**

**2.22** The NON mode is used to write cards only. The ESS does not expect the craftsperson to insert each update card in the appropriate PS after each pair is written. No single card verification occurs. The process ends when all cards are written.

##### **NOF Mode**

**2.23** The NOF mode is the same as the NON mode except that the affected PSs must be off-line at the start.

##### **VBF Mode**

**2.24** The VBF mode is used to back out an overwrite from the off-line stores using the original paper tape.

##### **CHK Mode**

**2.25** The CHK mode is used to verify the tape and office applicability without writing the cards.

### **3. SYSTEM PERSPECTIVE**

#### **FEATURE OPERATION**

##### **General**

**3.01** Figure 2 is a state diagram of the program store overwrite process using the VON mode. The update and copy stages are outlined. A state diagram for the VOF mode would contain the update stage only and would have no automatic program store configuration changes. A state diagram for the NON mode would be the same as for VON mode except that there would be no automatic verification of cards written, no automatic program store configuration changes, and no copy stage. A state diagram for the NOF mode would be the same as for the VOF mode except that there could be no automatic verification of cards written.

##### **VON Mode**

**3.02** Data is entered via an ABCW tape transmitted over the ADNET. The ABCW tapes are formatted so that they can be read directly into the No. 1 ESS machine.

**3.03** The first ESS interpretable message on the tape is an MCW message specifying the VON mode and giving an ABCW sequence number. The ESS checks to see that all program stores are on-line, in service, and that the sequence number is exactly one greater than the last sequence number in memory. One call store and one program store word are used to store this sequence number

and the number of local overwrites since the last generic load. The program store word is used merely as a backup for the call store word.

**3.04** The ABCW tape contains overwrite data for one generic pair, e.g., 1E(CCB3)3 and 1E(SPB3)3. The tape contains special selection messages that the No. 1 ESS machine checks to determine the applicability of the overwrite. The No. 1 ESS machine checks these messages and skips the overwrite if it is not applicable.

**3.05** The ABCW BWT contains a 2-digit cyclic error check code for each line of old and new data. The check code is recomputed and checked by the No. 1 ESS machine as each line is read.

**3.06** The tape contains overwrite information for each card in two consecutive blocks, the first block containing the old data and the second block containing the new data. The No. 1 ESS machine checks the old data on the tape against the old data in the affected program store(s).

**3.07** As cards are written and placed in the program store(s), the ESS checks for insertion in the correct program store. (The No. 1 ESS will not accept a verify request for a wrong program store.) Tape reading stops during card reading and verification. If the verification fails, the overwrite card image is still available (in call store) for rewriting (in the case of a bad card) and repeated verification. Repeated verification would be used without rewriting if the trouble was caused by the card not being properly seated, the wrong card being inserted, etc. Card verification also detects hamming and parity errors.

**3.08** Since cards must be inserted as the overwrite is entered, errors due to dependence between different BWTs are eliminated. When card verification passes, tape reading automatically resumes.

**3.09** If the card being written falls in the address range of a 1E3, Issue 3, or later modular generic relocatable feature package, the No. 1 ESS uses the feature package map in parameters in converting the relative address to an absolute address.

**3.10** In the case of card writer jamming or improper loading (e.g., loading card face down, wrong edge first, bent card, etc.), the BWT reading is stopped. The program looks for card writer reset; when reset occurs, it returns to writing mode.

**3.11** During the overwrite process, two call store words are used to keep a record of all program stores affected by the overwrite. This record is used to formulate the resultant program store configuration of the overwrite and is used in the interface with the program store maintenance and verification programs. When all the update cards have been verified, the system can be directed by the craftsperson to automatically cause the reconfiguration necessary to put the affected program stores on-line and start the soak stage.

**3.12** During the copy stage, a 6-word call store table is used to record the affected modules in all affected copy program stores. This record is built as the data is entered, is used to prompt the craftsperson to insert the copy cards in the proper slots, and is used during copy mode card verification. The record is erased as the copy stores pass compare verification.

**3.13** The system selects as the update stores the program stores which would be off-line in program store state control (PSSC) switch state 2. Thus, when the soak stage indicates a problem, the old (copy) stores can be switched on-line for call handling purposes by selecting either program store bus, selecting PSSC=2, and operating the set manual key. This recovery procedure causes the old copy (before the ABCW overwrite) of the program to be used for call handling.

**3.14** If the overwrite gives trouble after it has been installed, it may be backed out using the same tape used to install it. The first MCW message on the tape must be changed to specify the VBN mode and a zero sequence number. The tape is read in two passes. On the first pass, the system compares the overwrite from the paper tape with the rewritten cards in program store to verify that the overwrite actually was applied. On the second pass, the old (preoverwrite) data is written on the appropriate cards using the same procedure as was used in applying the overwrite. The old data is then in program store and used for call processing.

**3.15** Affected program stores are unduplicated by the ABCW program from the time card writing starts in these stores until the entire overwrite is installed. Isolated hardware fault interrupts detected by the program store fault recognition program are not allowed to cause reconfiguration of the program stores affected by the overwrite while these program stores are unduplicated. However, the program store fault recognition bootstrap program is allowed to reconfigure program stores. The bootstrap portion of the program store fault recognition program is entered if a working configuration is not achieved within a limit of three fault interrupts occurring within 2 minutes.

**3.16** If critical messages are to be printed out during the overwrite procedure or if the output message buffer area is more than 80 percent full, paper tape reading is delayed until the situation no longer exists.

#### **VOF Mode**

**3.17** The system implementation for the VOF mode is similar to that for the VON mode except for the following.

- (a) The program stores containing the data to be changed must already be off-line at the start of the procedure.
- (b) There are no automatic program store configuration changes.
- (c) No copy cards are used, although cards are still written in pairs. Only the update stage is used.

#### **NON Mode**

**3.18** The system implementation for the NON mode is similar to that for the VON mode except for the following.

- (a) No automatic verification of cards is written.
- (b) There are no automatic program store configuration changes.
- (c) No copy cards are used. Only the update stage is used.

#### **NOF Mode**

**3.19** The system implementation for the NOF mode is similar to that for the VOF mode except that no automatic verification of cards is written.

### **FEATURE ATTRIBUTES**

#### **4. APPLICABILITY**

**4.01** The ABCW feature is furnished on a per-central-office basis.

#### **5. LIMITATIONS AND RESTRICTIONS**

**5.01** Not applicable.

#### **6. COMPATIBILITY AND INTERACTIONS**

**6.01** Not applicable.

#### **7. COST FACTORS**

##### **MEMORY**

##### **A. Fixed**

**7.01** The following memory is required whether or not the ABCW feature is used.

- Generic (program store): Approximately 950 words of generic program store are required for the ABCW feature.
- Call store: Fourteen words of fixed call stores are required for the ABCW feature.

##### **B. Conditional**

**7.02** Not applicable.

##### **C. Variable**

**7.03** Not applicable.

##### **REAL TIME**

**7.04** The maximum utilization of real time by the ABCW feature is 0.2 percent while the card image is being formed.

**HARDWARE**

7.05 Not applicable.

**8. AVAILABILITY**

8.01 The ABCW feature is available with the 1E3 generic program.

**CONSIDERATIONS FOR INCORPORATION OF FEATURE INTO SYSTEM**

**9. PLANNING**

9.01 In order to utilize the ABCW feature fully, the operating companies should make the following arrangements in advance of the introduction of the feature.

(a) Arrange to have ABCW tapes automatically punched upon reception at the ADNET terminal at which the ABCW BWTs are presently being received. The ADNET receiving stations to be used as reception points for ABCW tapes must be either automatic send and receive teletypewriters with a reperforator or, if receive only models, must be equipped with an adjunct receiving-only typing reperforator. The standard ADNET terminal is an ASR Model 35 machine with a built-in reperforator. It is normally equipped to respond to DC2 (tape on) and DC4 (tape off) control characters. These control characters are present in the transmitted ABCW BWTs and are employed to selectively perforate ABCW BWTs for later reading by the No. 1 ESS machines.

(b) Arrange to have the ABCW paper tape transmitted, without manual retyping of the BWT, to the maintenance engineer, technical assistance centers, switching control centers, or other operating company maintenance centers for the No. 1 ESS that have been designated as broadcast warning BWT administration and control points.

(c) Equip these ABCW BWT administration centers with at least one paper tape reader-printer such as the ASR Model 35 teletypewriter patched to or connected to the local, remote, or service order teletype channels of the No. 1 ESS systems to be supported from these centers.

**10. HARDWARE**

10.01 Not applicable.

**11. DETERMINATION OF QUANTITIES**

11.01 Not applicable.

**12. ASSIGNMENTS AND RECORDS**

**INPUT AND RECORD KEEPING**

12.01 Not applicable.

**UNIFORM SERVICE ORDER CODES**

12.02 Not applicable.

**13. NEW INSTALLATION AND GROWTH**

13.01 Not applicable.

**14. TESTING**

14.01 Not applicable.

**15. MEASUREMENTS**

15.01 Not applicable.

**16. CHARGING**

16.01 Not applicable.

**SUPPLEMENTARY INFORMATION**

**17. GLOSSARY**

17.01 Not applicable.

**18. REASONS FOR REISSUE**

18.01 Not applicable.

**19. REFERENCES**

**A. Bell System Practices**

- (1) Section 231-104-302—Single Card Writing Procedures (Generic Program Overwrites)—2-Wire No. 1 Electronic Switching System.