SWITCHING SYSTEMS MANAGEMENT
NO. 2 ELECTRONIC SWITCHING SYSTEM
SYSTEM INITIALIZATION PROCEDURES

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1. INTRODUCTION

1.01 When a No. 2 Electronic Switching System (ESS) is failing to process calls properly it should be automatically attempting to recover itself by taking automatic emergency actions. This condition should be indicated to office personnel by the apparent switching of control units, teletypewriter (TTY) printouts, etc. If automatic emergency actions do not restore the system to a working control unit, manual emergency actions will be required utilizing the emergency action panel (EAP). These automatic and manual emergency actions are termed ***initializations*** or ***maintenance reset functions*** (MRFs). This section describes system initialization, or MRF, for the No. 2 ESS. It provides the network administrator with information pertaining to the effects of initializations in such areas as call processing, the traffic work table (TWT), and traffic registers. It also indicates those areas where recovery action on the part of the network administrator is necessary.

1.02 When this section is reissued, this paragraph will contain the reason for reissue.

2. INITIALIZATION PROCESS

2.01 Serious No. 2 ESS System difficulties may be caused by equipment (hardware) troubles, by difficulties in the program or translations (software), or by human error. An initialization is an attempt to regain system sanity by restarting the program at some fixed location and proceeding in an orderly manner to the beginning of the call processing monitor cycle.

2.02 System initialization will result from the following:

- Switching of control units: either a single switch when the control units are not synchronized or multiple switching when the control units are synchronized.
- Manual operation from the emergency action panel.

2.03 System initializations are triggered by the MRF circuit. The purpose of the MRF circuit is to force the control unit to run the initialization program INIT by jamming the address of INIT into the program address register and initializing

enough hardware to ensure the execution of code at that program location. It is then up to the initialization program to complete the initialization based upon data made available to it.

2.04 Initialization is a systematic approach to solving a problem in the No. 2 ESS equipment. An initialization process which cleared all call store areas and restored the entire network would be effective in solving the problem at hand but would seriously disrupt call processing. A more desirable approach, and the approach that is used in the No. 2 ESS, is to perform the initialization in stages, with each stage clearing or restoring on a functional basis and then allowing call processing to resume. If, after this, call processing were to continue normally for some probationary period it could be assumed that the problem was corrected. If call processing were to falter, a higher level of initialization would be attempted. In the No. 2 ESS the stages of initialization are referred to as levels. Each initialization adds one to a system level count (a peg count of the number of system initializations which have occurred during a particular period of time). As a rule, the higher the level of initialization the more disruptive it will be to call processing.

2.05 Every system initialization loads selected bits of data into a dedicated area of call store known as the "postmortem" area. This loading is done early enough in the initialization process to be useful both during that initialization and later to the craft personnel.

2.06 Data in the postmortem area (the level count) and the source of the initialization (manual or automatic) determine the action which the initialization program will take. The level count is zeroed after 1024 base level scans have successfully elapsed from the last initialization (approximately 102 seconds, assuming 100 milliseconds per scan).

2.07 Table A lists the types and level count of system initializations along with a synopsis of the effect that each has on call processing and traffic measurements.

2.08 An additional initialization, not shown in Table A, is the TTY clear initialization. The TTY clear initialization is intended to be used when it is felt that the TTY is in trouble but there is still network action indicating that call processing is taking place. The TTY clear initialization is generated manually at the emergency action panel, is not triggered by the MRF circuit, and does not interrupt call processing.

3. SYSTEM INITIALIZATIONS

TTY PRINTOUTS

3.01 The network administrator's primary indicator and information source for initializations is the network administration TTY. Each time an initialization occurs a message will be printed on the network administration TTY. The format of the message will be MI SY CLR. This is a supplemental output message for information purposes only. The main initialization printout is available at the maintenance TTY only. An explanation of the message and variable field is given in the No. 2 ESS output message manual, OM-2H200.

3.02 In addition to the TTY message in 3.01, some system initializations cause secondary output messages at the network administration TTY. These messages will give more detailed information concerning the type and extent of clearing action taken by a particular level of initialization. These messages, along with any action to be taken by the network administrator, are discussed in 3.03 through 3.19.

NOMINAL INITIALIZATION

3.03 The nominal initialization is a level 1 system initialization and the only system initialization which does not clear any areas of call store. In a level 1 initialization the program fails all sending originating registers and returns to the normal call processing loop. This action will cause those registers to recycle and begin sending again. The effect will be an imperceptible delay in the processing of outgoing calls. No action is required on the part of the network administrator.

PARTIAL CLEAR INITIALIZATION

3.04 System initialization level counts 2 and 3 are partial clear initializations. The two levels differ only in the extent of the call store clearing action performed; level 3 performs more extensive clearing than level 2. The initialization program uses data from the postmortem area of call store to determine which branch of call processing was in progress (which program was in control) at the

time the initialization occurred and directs the clearing of call store areas accordingly. Individual areas which could be affected include originating registers, transient call records (TCRs), peripheral order buffers, the off-hook hopper list, and the supervisory queue list. Some or all of any individual area could be cleared; the extent of clearing is a function of the initialization level and the area cleared is a function of the data retrieved from the postmortem block in call store.

3.05 Upon returning to the normal call processing loop, audits are run on the network and call store to clear any inconsistencies resulting from the initialization. Some users may experience a setback to dial tone if their calls are not yet stable. No action is required on the part of the network administrator.

EMERGENCY AUDIT INITIALIZATION

3.06 System initialization level counts 4 and 5 are emergency audit initializations. A level 5 initialization is the same as a level 4 and will occur automatically only if a level 4 initialization is attempted but does not complete. Level 5 is also the lowest-level system initialization which can be manually initiated from the emergency action panel.

3.07 When an emergency audit initialization occurs, the initialization program will first audit the recent change area of call store, searching for inconsistencies such as improperly stored data and parity errors. Possible trouble areas will be cleared when detected. This being done, the initialization program will call for the running of emergency audits. The emergency audits are discussed in detail in PD-2H109. The emergency audits do the following:

(a) Idle some types of TCRs. Some of the items included in this category are:

- Most customer calling TCRs
- TCRs where a tone is connected
- TCRs included in maintenance.

Certain other TCRs are not idled unless a correctness check fails. Some of the items included in this category are:

- TCRs in the digit-collection state
- TCRs in the ringing state.

(b) Idle originating registers except those associated with the retained TCRs.

(c) Idle all transient terminal memory records except those associated with the retained TCRs.

(d) Restore the line ferrods of those lines still marked idle in memory after resumption of call processing (some lines may have originated before this step can be completed).

(e) Restore system network map(s).

(f) Idle all peripheral order buffers.

3.08 Emergency line ferrod restoration is started as soon as call processing is resumed. This allows customer line origination on lines affected by the initialization. Some customers will no doubt experience a setback to dial tone if their calls are not yet stable. Completed calls will not be interrupted. No action is required on the part of the network administrator.

TRANSIENT CLEAR INITIALIZATION

3.09 The transient clear initialization is a level 6 system initialization. It is the most extensive initialization which can occur automatically. It also can be manually triggered from the emergency action panel.

3.10 When a transient clear initialization is initiated, the program will clear all transient data in call store. A list of customer lines involved with cleared TCRs will be formed and those line ferrods will be restored upon resumption of call processing. Selected audits will be run to rebuild the status bit area of the network map based on the stable calls.

3.11 The network administrator is affected by a transient clear initialization due to the extent of call store clearing action. The TWT in the transient area of call store will be cleared. In addition, a number of traffic registers are in the transient area of call store. Table B lists all of the traffic and plant registers and the respective areas of call store in which they reside. All traffic registers in the transient area of call store will be cleared by a transient clear initialization.

3.12 The call store TWT will be restored automatically from the TWT in program store. Any changes to the TWT made recently which have not been written into the program store will not appear on the restored TWT. The TWT will require updating for these changes (see Dial Facilities Management Practices, Division H, Section 10d[8]).

3.13 The network administration TTY will print out a message containing the load service measurements (LSMs) collected since the last quarter-hour. Hopefully, this will provide a picture of the traffic load at the time of the transient clear. The format of the output message will be TI PR LSM. An explanation of the message and variable field is given in the No. 2 ESS output message manual, OM-2H200.

3.14 Although the registers containing the LSMs are not in the transient area of call store (see Table B), they will be recycled as they are printed and effectively zeroed. However, it is normal processor routine to transfer the contents of the LSM registers to the complimentary Q-schedule registers before recycling and the data are therefore retained. When the Q-schedule is printed at the next quarter-hour, the data collected by the LSM registers (subsequent to the initialization) will be transferred and added to the data already contained in the Q-schedule registers (data collected prior to the initialzation) and the data for the entire 15-minute period will be available.

STABLE CLEAR INITIALIZATION

3.15 The stable clear initialization is a level 6 initialization which can only be triggered manually from the emergency action panel. The stable clear initialization will, among other things, destroy all stable calls in the office at the time of initialization and clear the TWT in the transient area of call store (see 3.12). It provides for the clearing of all stable data in call store, initializing the physical equipment, and restoring customer lines disconnected during the initialization.

3.16 When a stable clear initialization is initiated, the system does the following:

- Clears all of call store except the recent change area
- Idles all trunks and service circuits
- Causes the traffic monitor to print out on the network administration TTY that all traffic, plant, and performance measurements have been lost
- Restores the line ferrods of those lines still marked idle in memory after resumption of call processing (some lines may have originated before this step can be completed).

3.17 The network administration TTY will print out a message to indicate that all traffic registers in the transient and stable areas of call store have been cleared and thus the traffic, plant, and performance measurements have been lost (see Table B). The format of the output message will be TI PR CLR. An explanation of the message and variable field is given in the No. 2 ESS output message manual, OM-2H200.

3.18 A stable clear initialization will either automatically allow or automatically deny the use of dynamic service protection (DSP) depending upon the generic program issue being used in the office. Prior to generic program LO-1, Issue 4.6, and EF-1, Issue 3.4, a stable clear initialization will automatically allow DSP. Later issues of either program will automatically deny DSP after a stable clear initialization. The use of DSP is a matter of judgment for the network administrator and the decision to allow or deny DSP should be based on those factors which affect the central office. For additional information concerning the use of DSP refer to Dial Facilities Management Practices, Division H, Section 10d(1).

RECENT CHANGE CLEAR INITIALIZATION

3.19 The recent change clear initialization is a level 6 initialization which can only be triggered manually from the emergency action panel. It, in turn, will cause an emergency audit initialization and a transient clear initialization which have been described previously. The only action unique to the recent change clear is the clearing of all data in the recent change area of call store. This will include service order information, traffic register assignments, recent change area registers of the plant schedule (see table B), TWT changes, and changes to custom calling features data (speed calling list and call forwarding).

3.20 A recent change clear initialization will destroy any register assignment changes made to

the hourly or weekly traffic schedules. These changes would be made to the program store weekly measurements list during the next single card write session but are effective while in the recent change area. The changes must be restored to the recent change area manually using the network administration TTY.

3.21 A recent change clear initialization will clear the TWT in the recent change area of call store. This copy of the TWT contains any changes to be made to the program store copy of the TWT during the next single card write session. The changes must be restored to the recent change area manually using the network administration TTY.

3.22 Customer service-order information in call store will be lost in a recent change clear initialization. A backup paper tape of service-order information should be available to restore the lost information via the service-order TTY. If a tape is not available, each recent change cleared must be manually reinstated.

3.23 Maintenance personnel have the advantage of knowing when a recent change clear initialization is to occur. They may thus audit the custom calling features data prior to the initialization and restore the data later via the maintenance TTY. If the custom calling feature data are lost it must be restored by the customer or fron customer records.

3.24 The amount of administrative data lost by a recent change clear initialization will vary with the size and activity of the office. The network administrator does not always have the advantage of knowing when a recent change clear initialization is to occur. In an active office the network administrator may wish to cut a paper tape of all recent change activity which occurs at the network administration TTY.

STABLE AND RECENT CHANGE CLEAR INITIALIZATION

3.25 The stable and recent change clear initialization is a level 6 initialization which can only be triggered manually from the emergency action panel. It is the most extensive system initialization. As the name implies, it causes both a stable clear and recent change clear initialization. Both types of initializations have been described in previous parts of this section. A stable and recent change clear initialization will, by design, include a level 5 and all level 6 initializations.

4. SUMMARY

4.01 An initialization is an attempt to regain system integrity by restarting the program at some fixed location and proceeding in an orderly fashion to the beginning of the call processing monitor cycle. Selected data are stored in a protected area of call store and these data along with a count of the number of initialization attempts incurred during a given time are used to progressively clear out areas of call store and initialize physical equipment.

4.02 There are 6 levels of system initialization with clearing action becoming more extensive at each higher level. Level 6 initializations which clear recent change or stable data must be triggered manually from the emergency action panel but all other system initialization can occur automatically.

4.03 Although the network administrator should be aware (via the network administration TTY) of occurring initializations, no recovery action is required until the count reaches level 6. However, all initializations should be logged into the TTY activity log.

4.04 All level 6 initializations will clear the working copy of the TWT which will then be restored from the program store copy. Changes made to the working copy since the last single card write must be restored manually using the network administration TTY.

4.05 A transient clear initialization (level 6) will print out and recycle the LSM registers and clear all traffic registers in the transient area of call store.

4.06 A stable clear initialization (level 6) will zero all traffic, plant, and performance measurements with the exception of the recent change area measurements of the plant schedule.

4.07 A recent change clear initialization (level 6) will clear all recent change call store data and cause a transient clear initialization. Service-order recent change information can be restored via the service-order TTY using a backup paper tape. Custom calling features data can be restored from the maintenance TTY. The TWT and any hourly

or weekly traffic schedule register assignments in the recent change area of call store will be cleared and changes which were pending to the program store will have to be manually restored in the recent change area using the network administration TTY.

4.08 The most extensive system initialization is a stable and recent change clear initialization. It includes a level 5 and all level 6 initializations.

TABLE A

SYSTEM INITIALIZATIONS

TYPE INITIALIZATION	SOURCE REQUESTED	LEVEL COUNT	EFFECT ON CALL PROCESSING
Nominal (no memory cleared)	Automatic	1	Fails all sending originating registers (ORs)
Partial clear	Automatic	2	Partially clears areas of call store
		3	Same as level count 2 except more drastic
Emergency audit	Automatic	4	• Idles all peripheral order buffers (POBs) • Idles all transient call records (TCRs) except designated TCRs which are checked for correctness • Idles ORs* • Idles all transient terminal memory records (TMRs)* • Restores all line ferrods to enable customer origination • Restores system network map *Except those associated with designated TCRs
	Automatic and manual	5	Same as level count 4; occurs only if 4 does not complete
Transient clear	Automatic and manual	6	• Zeros all transient data except TCRs and transient TMRs • Forms a list of customer lines involved in TCRs • Idles all TCRs • Sets up a special POB to restore customer line ferrods upon resumption of call processing on those lines that were involved with a TCR • Calls in a TMR audit to zero transient TMRs, a line status bit (LSB) audit to reconstruct line status bits for stable calls and a network audit to rebuild the network map based on stable calls • Call store copy of the traffic work table (TWT) is cleared • LSM schedule printed on traffic and maintenance TTYs (call store copy of TWT restored using program store copy)
Recent change clear	Manual	6	• Clears recent change data such as service orders, customer-originated changes to custom calling features, traffic and plant measurements • Disables calls in transient state causing an emergency audit • Performs transient clear initialization *Note:* A backup tape of service order information should be available when a recent change clear is initiated to restore data following the initialization.
Stable clear	Manual	6	• Clears all of call store except recent change area • Idles all trunks and service circuits • Restores all idle line ferrods after resumption of call processing • Causes network administration and maintenance TTYs to print out that all traffic, plant, and performance measurements have been lost
Recent change and stable clear	Manual	6	• All calls are disconnected • Zeros all transient data • Zeros all recent change data in call store • Zeros all stable data in call store and initializes the physical equipment

TABLE B

TRAFFIC REGISTER LOCATIONS IN CALL STORE

SCHEDULE	REGISTERS	CALL STORE AREA	CLEARED BY (†)
Quarter-Hourly (Q)	Q	Stable	S
Load Service Measurements (LSM)	LSM	Stable	S*
Hourly (H or C)	TRK	Transient	T, S, RC
	SIM	Transient	T, S, RC
	MLH	Transient	T, S, RC
	OFT	Stable	S
	BYL	Stable	S
	PRC	Stable	S
	JCT	Transient	T, S, RC
	CTX	Transient	T, S, RC
Daily (D)	D	Stable	S
Weekly (W)	NW	Stable	S
	CLU	Stable	S
Plant (PLT)	CUA	Stable	S
	PUM	Stable	S
	TDR	Stable	S
	BSM	Stable	S
	RCA	Recent Change	RC

* These registers will be recycled by a transient clear initialization but the data will not be lost (see 3.14).

† T = Transient Clear Initialization
S = Stable Clear Initialization
RC = Recent Change Clear Initialization