

# The Light company

Houston Lighting & Power South Texas Project Electric Generating Station P. O. Box 289 Wadsworth, Texas 77483

January 5, 1990  
ST-HL-AE-3320  
File No.: G4.2,  
J41.3, G9.17  
10CFR50

U. S. Nuclear Regulatory Commission  
Attention: Document Control Desk  
Washington, DC 20555

South Texas Project Electric Generating Station  
Units 1 and 2  
Docket Nos. STN 50-498, STN 50-499  
Completion of Modifications to the Safety Parameter  
Display System (SPDS) for the First Refueling Outage

- Reference: A. Issuance of Facility License No. NPF-71, South Texas Project Unit 1; D. M. Crutchfield, NRC; Letter to J. H. Goldberg, HL&P; August 21, 1987.
- B. Safety Evaluation Report Related to the Operation of South Texas Project Units 1 and 2, NUREG-0781, Supplement No. 4, July 1987.
- C. Safety Parameter Display System (SPDS); M. A. McBurnett, HL&P; Letter to the NRC; March 18, 1988; ST-HL-AE-2589.
- D. Safety Evaluation Report Related to the Operation of South Texas Project Units 1 and 2, NUREG-0781, Supplement No. 6, December 1988.
- E. Modifications to the Safety Parameter Display System (SPDS); M. A. McBurnett, HL&P; Letter to the NRC; February 2, 1989; ST-HL-AE-2962.

THC/SPDS1289.LTR

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- F. Submittal of Safety Parameter Display System (SPDS) Safety Analysis Report; M. R. Wisenburg, HL&P; Letter to Vincent S. Noonan, NRC; December 23, 1986; ST-HL-AE-1861.

The Safety Parameter Display System (SPDS) provides a display of plant parameters from which the safety status of the plant may be assessed both during normal/abnormal operation and emergency conditions. The primary function of the SPDS is to help operating personnel in the Control Room make quick assessments of plant safety status. The SPDS displays are designed in accordance with NUREG-0696 and NUREG-0700.

In Reference A, the NRC identified a license condition regarding the SPDS that HL&P was required to satisfy prior to startup after the first refueling outage. This license condition referenced five actions which are shown on page 18-9 of SSER 4 (Reference B). In Reference C, HL&P provided detailed descriptions of actions taken to resolve items 2 through 5. SSER 6 (Reference D) subsequently closed these four items.

Item 1 required modification of the critical safety function displays to provide the status of the radioactivity control safety function and to continuously display the status boxes that summarize plant safety status. These modifications were completed on Unit 1 prior to startup from its first refueling outage.

Attachment I provides a detailed description of the SPDS modifications which added two displays for Radioactivity Status. This attachment also describes the additional modifications required to other displays as a result of the new radioactivity status displays. Attachment II provides a description of SPDS keyboard and keypad modifications required as a result of the addition of the two new Radioactivity Status SPDS displays.

Attachments I and II also contain a description of the modifications to the SPDS software and keyboards to provide continuous display of the safety status indicators on a dedicated SPDS CRT.

The completion of these modifications fullfills HL&P's previous commitments outlined in Reference E and provides the final closeout for the license conditions, for Unit 1, associated with the NRC audit of the SPDS. These same modifications will be performed on Unit 2 during its first refueling outage.


As a result of various observations by the NRC, HL&P Engineering, HL&P Operations, and the SPDS Man-in-the Loop Validation Testing, several Human Engineering Discrepancies (HEDs) have been identified against the SPDS displays. An extensive review of the SPDS displays, considering these HEDs, the STP CRDR criteria, and technical correctness, has recently been completed. The SPDS revisions to address these HEDs and the results of this review are

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being treated as Category C HEDs, and are scheduled to be completed prior to startup from the third refueling outage of Unit 1 and the second refueling outage of Unit 2. The SPDS Safety Analysis Report (originally provided by Reference F) will be updated and submitted to the NRC upon completion of these modifications.

If you should have any questions on this matter, please contact Mr. A. W. Harrison at (512) 972-7298.

  
M. A. McBurnett  
Manager, Licensing

THC/

Attachments: I. Description of New Displays and Other SPDS Display  
Modifications

II. Description of Keyboard Modifications

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## DESCRIPTION OF NEW DISPLAYS AND OTHER SPDS DISPLAY MODIFICATIONS

### Addition of Radioactivity Status Safety Function Display to the Safety Parameter Display System

Two new displays were added to the Safety Parameter Display System (SPDS) to provide the radioactivity control status safety function, to address the NRC concerns with the requirements of Supplement 1 to NUREG-0737. The two new displays are identical and are titled Radioactivity Status. The names for these two displays are NRAD (Normal Radioactivity Status) and CRAD (Critical Radioactivity Status).

To develop these displays, a review was performed by Engineering and Operations personnel to determine which radiation monitors provided the most useful information relative to the plant radioactivity status. This review also considered uses of radiation monitors in accident type determination. The following radiation monitors were selected for these displays:

1. RCB Purge
2. Control Room/EAB Vent
3. Spent Fuel Pool Exhaust
4. Unit Vent Exhaust
5. RCB Atmosphere
6. Containment High Range Area Radiation
7. Condenser Vacuum Pump Exhaust
8. Main Steam Line
9. Steam Generator Blowdown

The normal radioactivity [NRAD] and critical radioactivity [CRAD] displays are shown in Figures I-1 and I-2, respectively. These displays have a similar layout to the other SPDS displays. The top left box of each display contains the display mnemonic, the display number, and South Texas Project (STP) unit number. The top middle box of each display contains the display name. The top right box of each display contains the date, time, and the plant operational mode.

The bottom left section of the displays contains the status indicators for the Normal Safety Functions (NSF) and Critical Safety Functions (CSF). The computer displays the NSF or CSF indicators based on the position of the reactor trip breakers. The NSF indicators are displayed if the reactor trip breakers are closed. The CSF indicators are displayed if the reactor trip breakers are open.

The center bottom section of each display is reserved for the system detail function. The bottom right section displays the Emergency Response

Facilities Data Acquisition and Display System (ERFDADS) computer operational "health" via an alpha/color-cued indicator.

The middle section of the Radioactivity Status displays provides the readings of the nine radiation monitors listed above in three rows of three, based on similarity of information provided and type of accident and/or release for which they provide a response or information. The overall format of these displays was coordinated with the Operations Department and reviewed in accordance with the STPEGS Control Room Design Review (CRDR) program.

The top three radiation monitors on the NRAD and CRAD displays, RCB PURGE, CR/EAB VENT, and SFP EXHAUST, are ESF actuation monitors and provide automatic responses to accidents.

The middle three radiation monitors, UNIT VENT, RCB ATMOSPHERE, and CNTMT HI RANGE, are release/containment monitors. These monitors provide information regarding breaches of the reactor coolant system boundary and regarding releases from the plant to offsite.

The bottom three radiation monitors, COND VAC PUMP, MAIN STM LINE, and SG BLOWDOWN, provide information useful in identifying a steam generator tube rupture accident.

#### Modifications to Other Displays

The addition of the radioactivity control safety function also required the revision of the other SPDS and ERFDADS displays.

Both the Top Level Normal Safety Function (TOP-N) and Top Level Critical Safety Function (TOP-C) displays previously contained six status bars, one for each of the six safety functions, Subcriticality [S], Core Cooling [C], Heat Sink [H], Integrity [P], Containment [Z], and Inventory [I]. A status bar for Radioactivity [R] has been added to both the TOP-N and TOP-C displays. This status bar is located at the right of the display, separated from the other six safety function bars. It is identified underneath with an "R", a solid triangle status indicator, and "RAD". Figures I-3 and I-4 show the revised TOP-N AND TOP-C displays, respectively.

All SPDS and ERFDADS displays containing the safety status boxes were also revised to include the Radioactivity [R] status indicator. This status indicator was added in the bottom left section, as a solid triangle to the right of the six safety function boxes with the letter "R" to the right of the triangle. Figure I-5 shows a typical display with the addition of the radioactivity safety status indicator.

#### Modification to ERFDADS Software for Determination of Radioactivity Status Bar Height and Status Indicator Color

The color of the radioactivity status triangle and the color and height of the status bar are determined in a manner similar to the NSF status bars and colors. For each of the radiation monitors on the Radioactivity Status displays, the reading is compared to predetermined normal, alert, and alarm values for that monitor, and a "normalized" reading is generated.

The bar length for the top level radioactivity status normal safety function is calculated by the software as the largest "normalized" difference of the radiation monitor value from its predetermined normal value. The color of the radioactivity status bar and the status triangle changes as a function of the highest alarm level reached by any of the radiation monitors.

#### Modification to ERFDADS for Continuous Display of Safety Function Status

The ERFDADS has been modified so that one display CRT, identified as the SPDS Display, can only bring up displays which have the safety function status indication as part of the display. Appropriate keyboard modifications were also made as a result of this change (See Attachment II).

R:0 NRAD (6812) UNIT 1		RADIOACTIVITY STATUS [R]		25 AUG 89 14: 34: 07 MODE 1B AUTO A00000 0000	
RCB PURGE RADIATION HI		CR/EAB VENT RADIATION HI		SFP EXHAUST RADIATION HI	
	uCi/cc		uCi/cc		uCi/cc
RT-8012	9.50E-10B	RT-8033	9.50E-10B	RT-8035	9.50E-10B
RT-8013	9.50E-10B	RT-8034	9.50E-10B	RT-8036	9.50E-10B
UNIT VENT (RT-8010)		RCB ATMOSPHERE (RT-8011A THRU 8011C)		CNTMT HI RANGE	
	uCi/cc		uCi/cc		R/HR
PARTICULATE	9.50E-10B	PARTICULATE	9.50E-10B	RT-8050	9.50E-10B
IODINE	9.50E-10B	IODINE	9.50E-10B	RT-8051	9.50E-10B
NOBLE GAS	9.50E-10B	NOBLE GAS	9.50E-10B		
	uCi/sec				
RELEASE RATE	9.50E-10B				
COND VAC PUMP (RT-8027)		MAIN STM LINE (RT-8046 THRU 8049)		SG BLOWDOWN (RT-8022 THRU 8025)	
	uCi/cc		uCi/cc		uCi/cc
NOBLE GAS	9.50E-10B	SG A	9.50E-10B	SG A	9.50E-10B
	uCi/sec	SG B	9.50E-10B	SG B	9.50E-10B
RELEASE RATE	9.50E-10B	SG C	9.50E-10B	SG C	9.50E-10B
		SG D	9.50E-10B	SG D	9.50E-10B

FIGURE I-1  
NRAD DISPLAY

S C H P Z I R

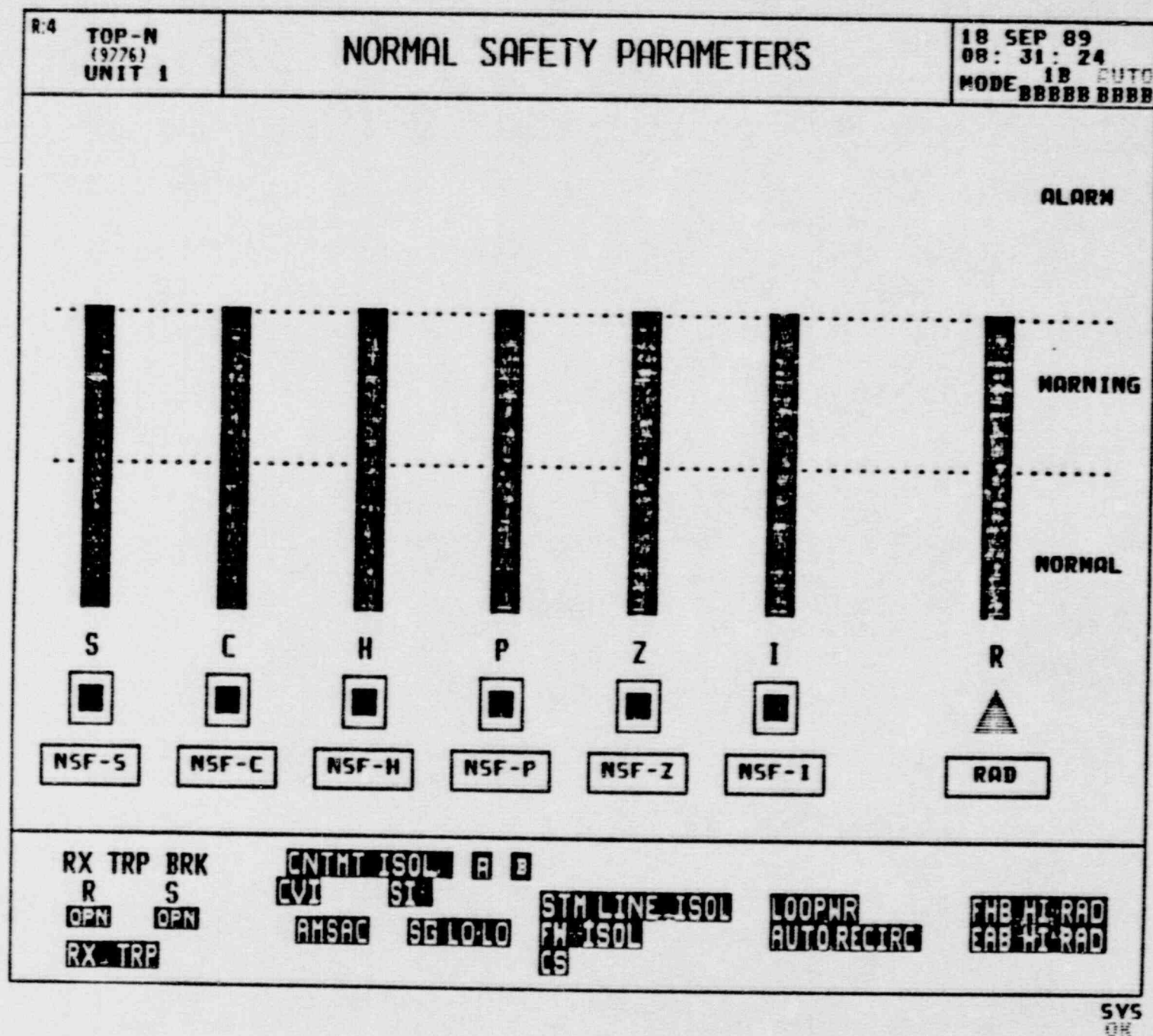
SYS  
OK

FIGURE I-2  
CRAD DISPLAY

RADIOACTIVITY STATUS [RI]		25 AUG 89 14:18:58 MODE 12 AUTO BBBBBBBB	
R:0 CRAD (1812) UNIT 1			
RCB PURGE		SFP EXHAUST	
RADIATION HI		RADIATION HI	
uCi/cc		uCi/cc	
RT-8012	9.50E-10B	RT-8033	9.50E-10B
RT-8013	9.50E-10B	RT-8034	9.50E-10B
UNIT VENT		CNTMT HI RANGE	
(RT-8010)			
		RCB ATMOSPHERE	
		(RT-8011A THRU 8011C)	
uCi/cc		R/HR	
PARTICULATE	9.50E-10B	PARTICULATE	9.50E-10B
IODINE	9.50E-10B	IODINE	9.50E-10B
NOBLE GAS	9.50E-10B	NOBLE GAS	9.50E-10B
RELEASE RATE		9.50E-10B	
COND VAC PUMP		SG BLOWDOWN	
(RT-8027)		(RT-8022 THRU 8025)	
uCi/cc		uCi/cc	
NOBLE GAS	9.50E-10B	SG A	9.50E-10B
		SG B	9.50E-10B
uCi/sec		SG C	9.50E-10B
RELEASE RATE		SG D	9.50E-10B

S C H P Z I R

SYS  
OK

FIGURE I-3  
TOP-N DISPLAY

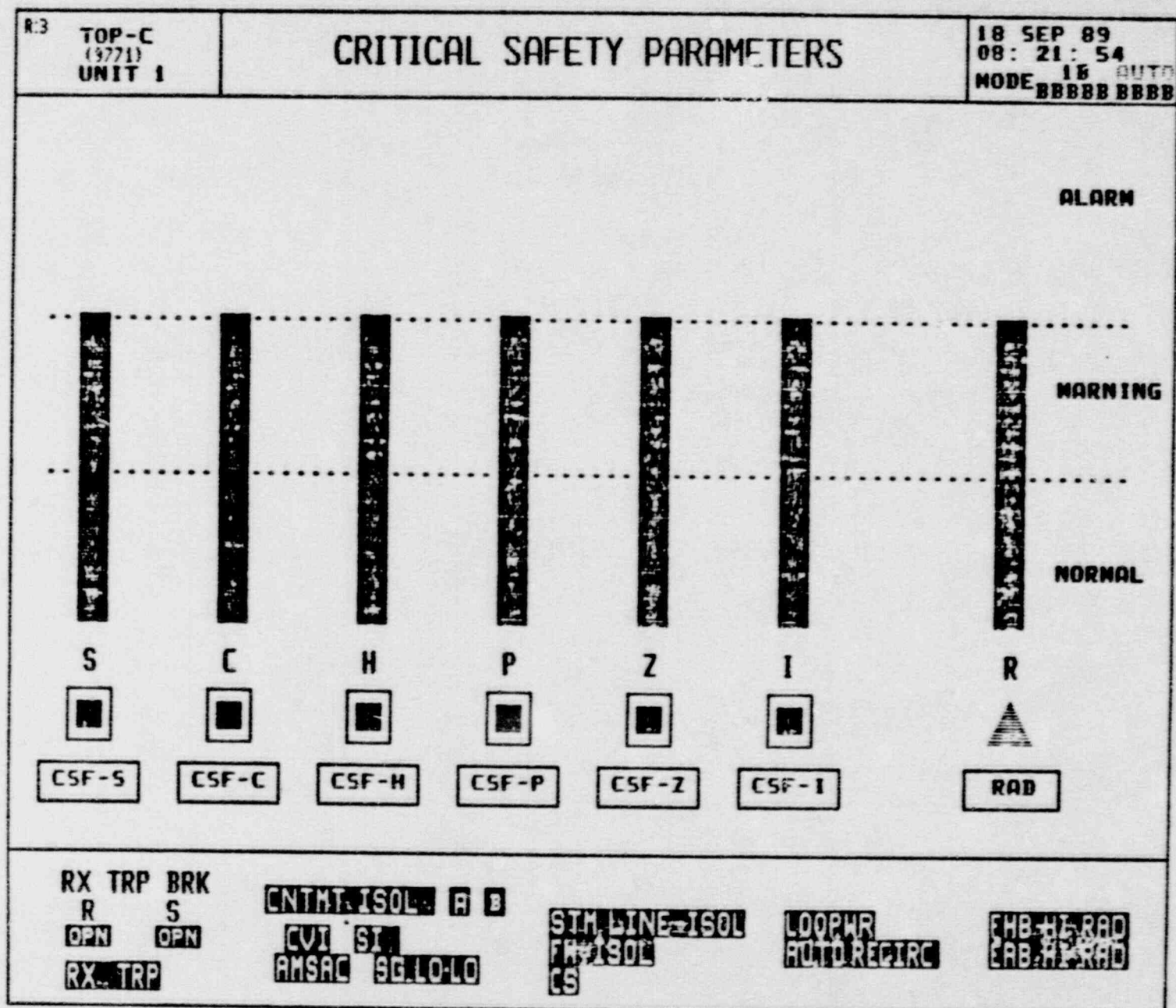
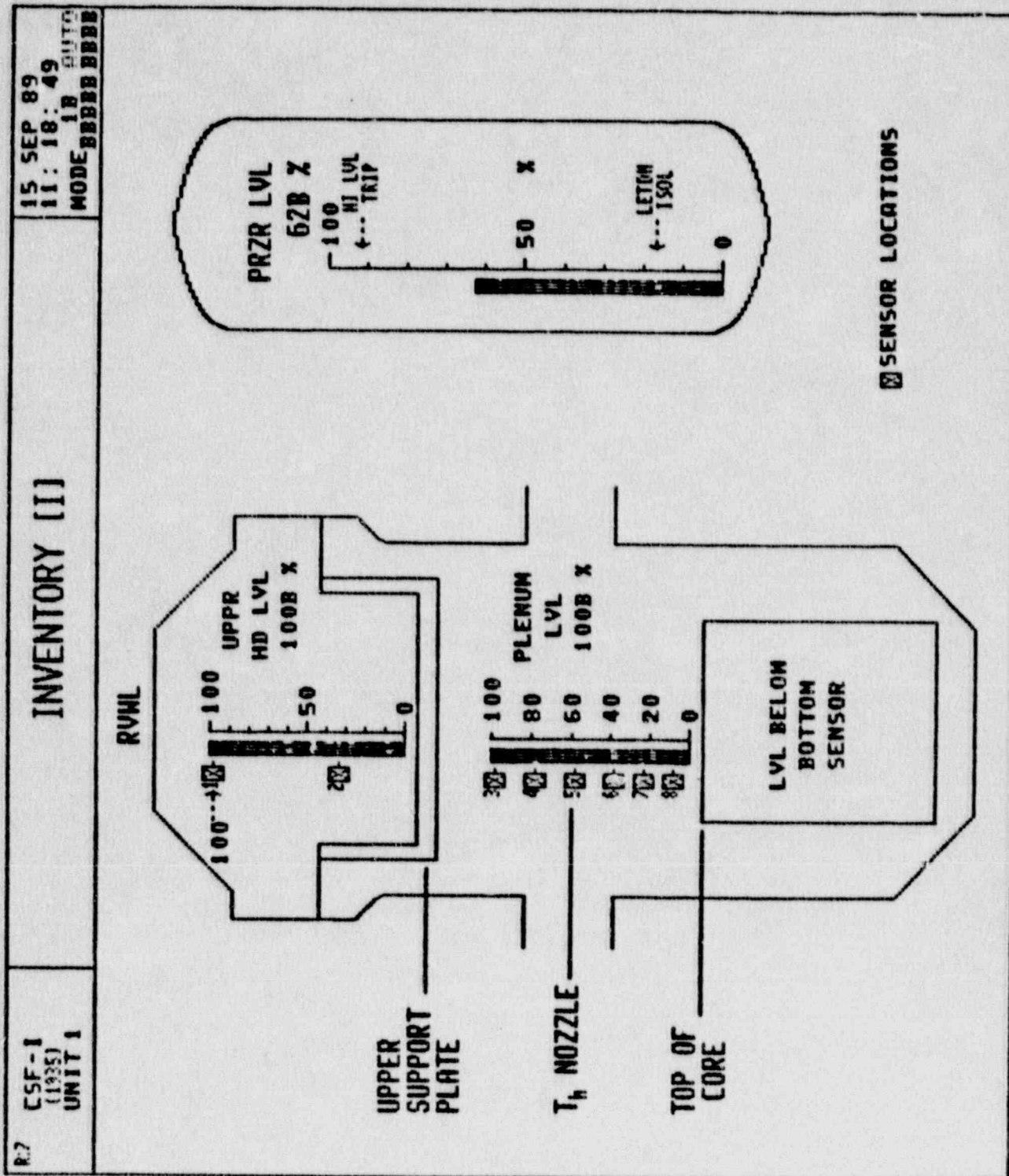
FIGURE I-4  
TOP-C DISPLAY

FIGURE I-5  
TYPICAL MID-LEVEL DISPLAY



S C H P Z I A R

SYS OR

## DESCRIPTION OF KEYBOARD MODIFICATIONS

### Keyboard Modifications for Radioactivity Status Safety Function Displays

The addition of the two radioactivity status displays, normal radioactivity status [NRAD] and critical radioactivity status [CRAD], discussed in Attachment I, resulted in modifications to the keyboards and keypads associated with the Emergency Response Facilities Data Acquisition and Display System (ERFDADS) cathode ray tubes (CRT).

The function keys on the keyboards and keypads are closely linked to the displays. The normal safety functions (NSF) and critical safety functions (CSF) have one top level display each. The operator can select the top level display via a single keystroke by pressing the "TOP" key. The computer selects the NSF or CSF top level display based on the status of the reactor trip breakers. In a similar manner, the operator can select the mid-level displays via a single keystroke. The function keys are labeled "S" for Subcriticality, "C" for Core Cooling, "H" for Heat Sink, "P" for Integrity, "Z" for Containment, and "I" for Inventory. Again the computer selects the appropriate NSF or CSF display based on the status of the reactor trip breakers. A seventh mid-level function key, "R" for Radioactivity, has been added to both the keyboards and keypads. This function key allows the operator to call up the appropriate Radioactivity Status display by single keystroke access.

The revised keyboard and keypad layouts are shown on Figures II-1 and II-2, respectively.

The mid-level function key "R" is located on the keyboards to the right of function key "I". The seven mid-level function keys are located together at the top left of the keyboards.

The mid-level function key "R" is located on the keypads to the right of function key "I". The seven mid-level function keys are located within the top two rows of the left face of the keypads.

### Keyboard Modifications for Permanent Display of Safety Status Indication

The SPDS has also been modified to permanently display the safety status boxes on one of the SPDS consoles. There are six ERFDADS CRTs in the Control Room (See Figure II-3). Software and hardware changes have been implemented to allow the continuous display of information from which the safety status of the plant can be assessed. The left ERFDADS CRT located on the front of

Operator Console CC020 has been designated as the SPDS Display and has been restricted to access only displays containing the safety status indicators. These safety status indicators are provided in the left bottom corner of each display (See Attachment I).

Access to this CRT is possible via the two keyboards provided on the two consoles. Keys on these keyboards have been color-coded to show the keys that are operational when accessing this dedicated CRT. If a display not containing the safety status indicators is requested on this CRT, the CRT will not respond and will maintain the current display until an allowed display (i.e., ERFDADS display containing safety status indicators) is requested.

SHIFT	TOP	S	C	H	PANS	RC-CV	NI-11	SI-RH	CC-EW	AF-C5	ALARM PAGE	ALARM ACK	SYNCR POKE	PAGE POKE	PAGE UP	PAGE DOWN	XCU	SMA	RECALL	ENTER	HOME	CLEAR	KEY
DES	MENU	P	Z	I	R	SP-2R	PT	MS-FW	ELEC	HWAC	PHTRW	ALARM RESET	TAB BACK	TAB FORWARD	PAGE LEFT	PAGE RIGHT	YAT	SME	LCH	MCOPY	LOGIN	DISPLY	FC CF

DEL	!	1	2	3	4	5	6	7	8	9	0	=	-	ABORT	RECOPY	ZOOM		
	Q	W	E	R	T	Y	U	I	O	P	[	]	{	}	OP	PCD	PLD	REVT
	A	S	D	F	G	H	J	K	L	;	'	^	~					
SHIFT	/	Z	X	C	V	B	N	M	<	>	.	?	/	SHIFT	LOCK			

SELECT CALL JOURNAL	SELECT CALL JOURNAL	SELECT CALL JOURNAL
ABC 1	DE 2	FG 3
H 4	IJK 5	LNN 6
OP 7	R 8	ST 9
—	VWZ 0	-

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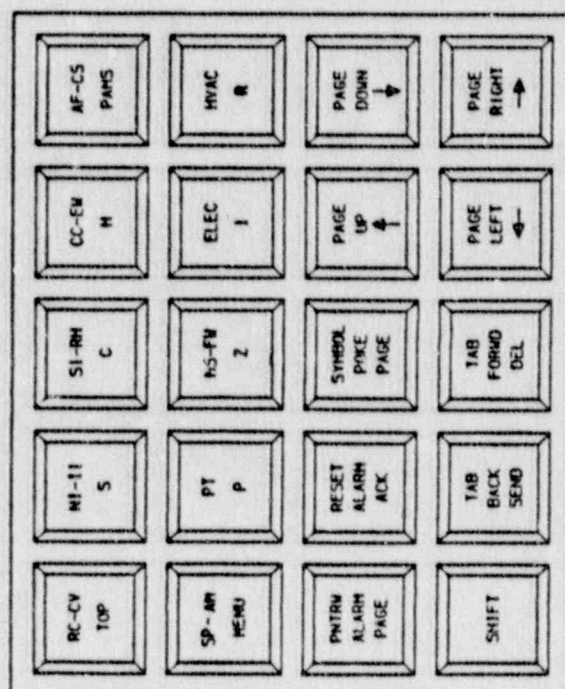
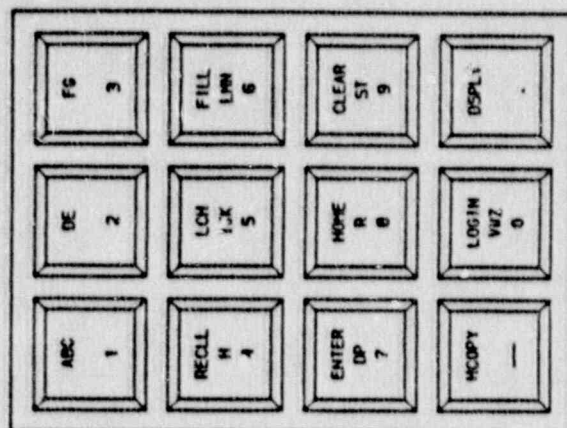


FIGURE II-2  
FUNCTION KEYPAD

