PCA MACRO & RTS Library

Version 1 3/1/95

Version 2 3/6/95

Version 3 5/24/95

Version 4 6/20/95

Version 5 8/4/95

August 4th 1995

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1.0 Section 1.0

This section is a dummy so the following can insert easily into the FOT manual.

1.1 RTS & Macro Libraries

The building of a library of desired configurations is the starting point for the actual task of constructing real command sequences for both RTS's and MACROS. These desired configuration are developed using the PCA Configuration Editor Program. The configuration are then pieced together and time gaps added if necessary using the SOF DTL Time Line Editor. The constructed RTS's and MACRO's are then stored in a library since they have been designed in such a way that they should prove useful in building any additional MACRO's later in the mission.

1.1.1 Onboard RTS's

RTS's are expanded on the spacecraft so they must be known in advance by the MOC. The MOC will examine daily activity plans to identify any included RTS's and they will ensure that the required RTS's are already on-board or else up-load them in advance of being needed.

Since PCA only have a few RTS's it is assumed that the first 3 shown below will always be present on-board.

RTS	Function
PCA_SAA_Entry	Set all PCU HV's to low command "0000"
PCA_SAA_Exit	Set all PCU HV's to observing values (see change macro below for current observing levels)
PCA_HV_off	Emergency safeing. Powers all PCU HV's to "0000", waits 5 seconds and then turns all HV's OFF
PCA_SAA_Entry_Dummy	A "dummy" SAA entry RTS that just changes the HRM value to an unusual value as a marker
PCA_SAA_Exit_Dummy	A "dummy" SAA exit RTS that just restores the HRM to the default value 8200 c/s

1.1.2 MACROS (RTS's) In The SOC

MACRO's are built in the same way as RTS's but named MACRO's exist as a separate set of selection options. The MACRO's are expanded on the ground by the SOC who substitute the included configurations at the specified times before the complete time line is converted to CCSDS command packets. Macro's therefore appear in the Daily Activity Plan (DAP) as a string of Absolute Time Sequence (ATS) commands. Within the SOF system MACROS can call other MACROS.

The Following sections indicate the provided functions which naturally fall into several groups. A subset of these will also be converted into STOL procedures.

1.1.2.1 Relay Control MACRO's - total of 30

MACRO MNEMONIC	FUNCTION
PCU_n_LVPS_Relay_off	Turns PCU n LVPS relay OFF (n = 1 to 5)
PCU_n_LVPS_Relay_on	Turns PCU n LVPS relay ON (n = 1 to 5)
PCU_n_XeHV_Relay_off	Turns PCU n Xe High Voltage relay OFF (n = 1 to 5)
PCU_n_XeHV_Relay_on	Turns PCU n Xe High Voltage relay ON (n = 1 to 5)
PCU_n_PrHV_Relay_off	Turns PCU n Pr High Voltage relay OFF (n = 1 to 5)
PCU_n_PrHV_Relay_on	Turns PCU n Pr High Voltage relay ON (n = 1 to 5)

All relay commands have a 1 second delay before each event.

1.1.2.2 High Voltage ON/OFF Control MACRO's - total of 20

MACRO MNEMONIC	FUNCTION
PCU_n_XeHV_off	Turns PCU n Xe High Voltage OFF (n = 1 to 5)
PCU_n_XeHV_on	Turns PCU n Xe High Voltage ON (n = 1 to 5)
PCU_n_PrHV_off	Turns PCU n Pr High Voltage OFF (n = 1 to 5)
PCU_n_PrHV_on	Turns PCU n Pr High Voltage ON (n = 1 to 5)

There is a 10 second delay after each voltage change.

1.1.2.3 System ON MACRO's - total of 18

MACRO MNEMONIC	FUNCTION
PCU_n_Power_on	Turns PCU n power ON - all 3 relays (n = 1 to 5)
PCA_Power_on	Turns PCA power ON - all 3 relays, all PCU's
PCU_n_HVs_lowU	For PCU n sets Xe & Pr HV's to "0000". Then turns both HV cmd. bits to ON. Assumes relays already ON. (n = 1 to 5)
PCA_HVs_lowU	For entire PCA sets Xe & Pr HV's to "0000". Then turns all HV cmd. bits to ON. Assumes relays already ON
PCU_n_HVs_typical	For PCU n sets Xe to "1000" & Pr to "1100". Assumes voltage commands are already at "0000". (n = 1 to 5)
PCA_HVs_typical	For entire PCA sets Xe to "1000" & Pr to "1100". Assumes voltage commands are already at "0000"

There are 1 second delays before each relay event and 10 second delays after HV changes.

1.1.2.4 System Power-Up MACRO's - total of 24

MACRO MNEMONIC	FUNCTION
PCU_n_start_A_part1	For PCU n basic power up from all relays OFF assuming A side clock. Includes parameter setup. (n = 1 to 5)
PCU_n_start_B_part1	For PCU n basic power up from all relays OFF assuming B side clock. Includes parameter setup. (n = 1 to 5)
PCU_n_start_AB_part2	For PCU n sets HV's to "0000" and then ON. (n = 1 to 5)
PCU_n_start_AB_part3	For PCU n sets HV's to operating levels. (n = 1 to 5)
PCA_start_A_part1	For PCA basic power up from all relays OFF assuming A side clock. Includes parameter setup. (n = 1 to 5)
PCA_start_B_part1	For PCA basic power up from all relays OFF assuming B side clock. Includes parameter setup. (n = 1 to 5)
PCA_start_AB_part2	For PCA sets HV's to "0000" and then ON. (n = 1 to 5)
PCA_start_AB_part3	For PCAsets HV's to operating levels. (n = 1 to 5)

For flexibility these turn on sequences are divided into 3 parts. These can be chained together if required. The A & B side clock options are needed since a powered up PCU will turn itself off if it fails to detect the incoming 1 Hz spacecraft clock pulses.

1.1.2.5 System OFF MACRO's - total of 29

MACRO MNEMONIC	FUNCTION
PCU_n_Shutdown	Turns PCU n completely OFF from typical HV settings down to all relays OFF (n = 1 to 5)
PCA_Shutdown	Turns entire PCA completely OFF from typical HV settings down to all relays OFF
PCU_n_HVs_off	Commands PCU n from typical HV settings down to both HV's OFF but with all relays still ON (n = 1 to 5)
PCA_HVs_off	Commands entire PCA from typical HV settings down to all HV's OFF but with all relays still ON
PCU_n_HVs_lowD	Commands PCU n from typical HV settings down to level "0000" with both HV's still ON (n = 1 to 5)
PCA_HVs_lowD	Commands entire PCA from typical HV settings down to levels "0000" with all HV's still ON
PCU_n_XeHV_low	Commands PCU n from typical Xe HV setting down to level "0000" with Xe HV still ON (n = 1 to 5)
PCU_n_PrHV_low	Commands PCU n from typical Pr HV setting down to level "0000" with Pr HV still ON (n = 1 to 5)
PCA_HVsoff_fast	Commands entire PCA to all HV's OFF in one hit. No turn down stages. Relays stay ON

1.1.2.6 System Changing (setup) MACRO's - total of 11

MACRO MNEMONIC	FUNCTION
PCU_n_Setup	Set PCU n to operating situation. All disc. levels (L1 - R3, Vx, Vp, Al) &VLE setting (n = 1 to 5)
PCU_n_HVs_obs	Set PCU n to current observing HV settings (n = 1 to 5)
PCA_HVs_obs	Set PCA to current observing HV settings. This is the same as the standard SAA exit RTS

1.1.2.7 Discriminator Control MACRO's - total of 8

MACRO MNEMONIC	FUNCTION
PCA_DISC_low	Sets all PCA discriminators to low setting
PCA_DISC_med	Sets all PCA discriminators to medium setting
PCA_DISC_high	Sets all PCA discriminators to high setting
PCA_DISC_off	Sets all PCA discriminators to off
PCA_VLE_0	Sets all PCA VLE window to level 0
PCA_VLE_1	Sets all PCA VLE window to level 1
PCA_VLE_2	Sets all PCA VLE window to level 2
PCA_VLE_3	Sets all PCA VLE window to level 3

1.1.2.8 Test Pulse Generator (TPG) Mono Mode Test MACRO's - total of 6

MACRO MNEMONIC	FUNCTION
PCU_n_TPGmono	Test of PCU n in TPG mono mode for 64 seconds integration each discriminator (L1 - R3, Vx, Vp, Al) (n = 1 to 5)
PCA_TPGmono	Test of entire PCA in TPG mono mode for 64 seconds integration each discriminator (L1 - R3, Vx, Vp, Al). All PCU's done in parallel

1.1.2.9 Test Pulse Generator (TPG) Ramp Mode Test MACRO's - total of 36

MACRO MNEMONIC	FUNCTION
PCU_n_TPGrampN	Tests PCU n for low, medium & high discriminator settings for all anode signals (L1 - R3, Vx, Vp & Alpha) using the TPG in ramp mode. 128 seconds for each integration. There are 5 parts (N) so that each part takes ~ 13 minutes (N = A , B, C, D, E) & (n = 1 to 5)
PCU_n_TPGramp	Similar to previous but combines sets of 5 MACROS (A , B, C, D, E) into a single MACRO call. Takes ~ 58 minutes (n = 1 to 5)
PCA_TPGrampN	Tests entire PCA for low, medium & high discriminator settings for all anode signals (L1 - R3, Vx, Vp & Alpha) using the TPG in ramp mode. 128 seconds for each integration. There are 5 parts (N) so that each part takes ~ 13 minutes (N = A , B, C, D, E)
PCA_TPGramp	Similar to previous but combines all 5 MACROS (A , B, C, D, E) into a single MACRO call. Takes ~ 58 minutes

1.1.2.10 Test Pulse Generator (TPG) VLE Window Test MACRO's - total of 5

MACRO MNEMONIC	FUNCTION
PCA_TPGvle_0to3	Tests all PCA VLE settings (0-3) using the TPG in ramp mode (leaves VLE at default level 2)
PCA_TPGvle_0	Tests PCA at VLE settings 0 using the TPG in ramp mode (leaves VLE at default level 2)
PCA_TPGvle_1	Tests PCA at VLE settings 1 using the TPG in ramp mode (leaves VLE at default level 2)
PCA_TPGvle_2	Tests PCA at VLE settings 2 using the TPG in ramp mode (leaves VLE at default level 2)
PCA_TPGvle_3	Tests PCA at VLE settings 3 using the TPG in ramp mode (leaves VLE at default level 2)

1.1.2.11 HRM Control & Veto / Veto Inhibit Tests MACRO's - total of 14

MACRO MNEMONIC	FUNCTION
PCU_n_HRMveto	Test of PCU n HRM veto & inhibit. Performed by using the TPG in mono mode and lowering the HRM value to initiate a veto event (n = 1 to 5)
PCA_HRMveto	Test of entire PCA HRM veto & inhibit. Performed by using the TPG in mono mode and lowering the HRM values to initiate veto events. All PCU's done in parallel
PCU_n_HRMveto_short	Test of PCU n HRM veto. Performed by using the TPG in mono mode and lowering the HRM value to initiate a veto event (n = 1 to 5). A "short" test
PCA_HRM_8K	Sets all PCU's to HRM value of 8,200 c/s (x 8 in cmd)
PCA_HRM_16K	Sets all PCU's to HRM value of 16,000 c/s
PCA_HRM_24K	Sets all PCU's to HRM value of 24,000 c/s
PCA_HRM_32K	Sets all PCU's to HRM value of 32,000 c/s
PCA_HRM_40K	Sets all PCU's to HRM value of 40,000 c/s
PCA_HRM_48K	Sets all PCU's to HRM value of 48,000 c/s
PCA_HRM_56K	Sets all PCU's to HRM value of 56,000 c/s
PCA_HRM_64K	Sets all PCU's to HRM value of 64,000 c/s

1.1.2.12 HV Veto &Veto Inhibit Control MACRO's - total of 32

MACRO MNEMONIC	FUNCTION
PCU_n_HRMveto_active	Sets PCU n HRM HV veto active
PCU_n_HRMveto_inhibit	Inhibits PCU n HRM HV veto
PCA_RATEveto_active	Sets PCA HRM HV veto active
PCA_RATEveto_inhibit	Inhibits PCA HRM HV veto
PCU_n_PPSveto_active	Sets PCU n 1 PPS HV veto active
PCU_n_PPSveto_inhibit	Inhibits PCU n 1 PPS HV veto
PCU_n_RATEveto_active	Sets PCU n Rate HV veto active
PCU_n_RATEveto_inhibit	Inhibits PCU n Rate HV veto

1.1.2.13 Diagnostic Test MACRO's - total of 6

MACRO MNEMONIC	FUNCTION
PCU_n_Diag	Test of PCU n diagnostic commands. Only a small subset of the many possible commands are tested (n = 1 to 5)
PCA_Diag	Test of entire PCA using diagnostic commands. Only a small subset of the many possible commands are tested. All PCU's done in parallel

1.1.2.14 Miscellaneous Test MACRO's - total of TBD

MACRO MNEMONIC	FUNCTION
PCU_n_TPGinit	Initializes PCU n for TPG tests. The same as PCU_n_HVs_off (n = 1 to 5)
PCU_n_TPGrest	Restores PCU n to observing status after TPG tests. The same as the sequence of MACRO's PCU_n_HVs_lowU PCU_n_HVs_typical PCU_n_ HVs_obs (n = 1 to 5)
PCA_TPGinit	Initializes entire PCU for TPG tests. The same as PCA_HVs_off All PCU's done in parallel
PCA_TPGrest	Restores entire PCA to observing status after TPG tests. The same as the sequence of MACRO's PCA_HVs_lowU PCA_HVs_typical PCA_HVs_obs All PCU's done in parallel
PCU_n_Side_A	Sets PCU n to A side clock
PCA_Side_A	Sets entire PCA to A side clock
PCU_n_Side_B	Sets PCU n to B side clock
PCA_Side_B	Sets entire PCA to B side clock
TBD	

1.1.2.15 SUMMARY

MACRO Family Group	Number Of Macros In Family Group
RTS's	5
Relay Control	30
High Voltage Control	20
System ON	18
System Power-Up	24
System OFF	29
System Changing (setup)	11
Discriminator Control	8
Test Pulse Generator (TPG) Mono Test	6
Test Pulse Generator (TPG) Ramp Test	36
Test Pulse Generator (TPG) VLE Window Test	5
HRM Control & Veto / Veto Inhibit Tests	19
HV Veto & Veto Inhibit Control	32
Diagnostic Test	6
Miscellaneous	24+