

Jefferson Lab Save/Restore Systems

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Date
Conference Name

Controls Group

Overview

- **Operations Save/Restore**
- **IOC Save/Restore**
- **IOC Crash Recovery**
- **Warm Reboot Save/Restore**
- **Weaknesses of Save/Restore**

Operations Save/Restore Tool

- **TCL program originally written by a crew chief Bruce Dunham now maintained by Joan Sage**
- **Utilizes the channel access Client “Burt” to interface to the control system. Burt is a tool created at APS and stands for “Back Up and Restore Tool”**
- **Operators select area and/or devices to save and restore Process Variables**
- **Names of devices to save are kept in “Request Files”:
ASCII files containing PV names**
- **A save performed on a request file creates another ASCII file called a “Snap” file. This file can be restored at a later time.**



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Burt Request File

RO MMSARC1E

MQB1S08.BDL

MQB1S08.FUG1

MQB1S07.BDL

MQB1S07.FUG1

MQB1S10.BDL

MQB1S10.FUG1

MQB1S09.BDL

MQB1S09.FUG1



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Burt Snap File Header

--- Start BURT header

Time: Wed Oct 30 11:45:00 2002

Login ID: higgins (Scott Higgins,,)

Eff UID: 581

Group ID: 106

Keywords: key

Comments: " A:5 B:4 C:3 E:495 Example save for EPICS Meeting "

Type: Absolute

Directory /usr/user4/mccops/opsusers/VueMenus

Req File: /usr/user4/mccops/burt/reqfile/ARC1quad.req

--- End BURT header



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Burt Snap File Signals

RO MMSARC1E 1 550.68

MQB1S08.BDL 1 419.06

MQB1S08.FUG1 1 1.0

MQB1S07.BDL 1 -517.35

MQB1S07.FUG1 1 1.0



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Operational Save Interface

Save and Restore (v2.4)

Execute Area-Selection Options Help

Saved Areas

arc1quad

Snapshot Date and Time

Save Number

Comments (Mandatory)

A:5 B:4 C:3 E:495 Example save for EPICS Meeting

Go Speed Low Med High

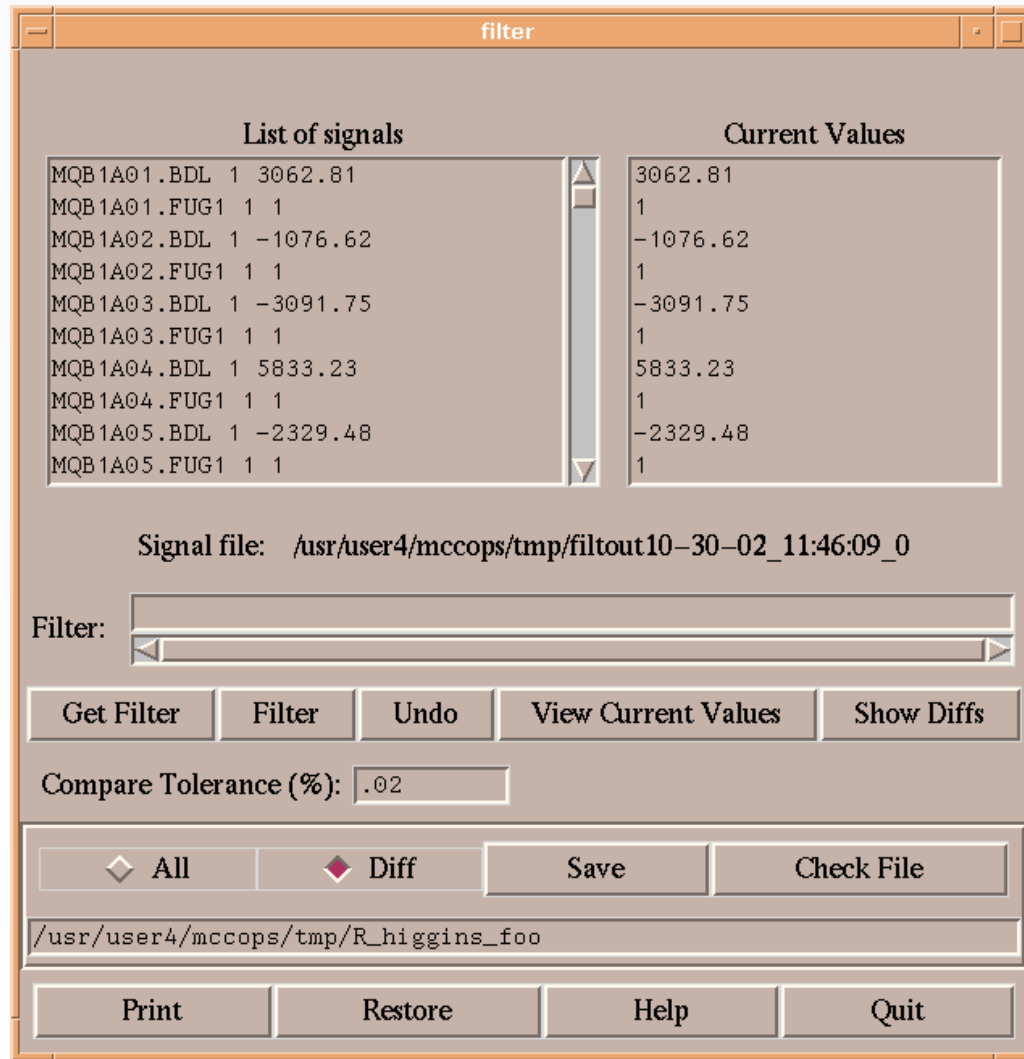
Operational Restore Interface

Save and Restore (v2.4)

Execute Area-Selection Options Help

Selected Areas	#	User	Date	Time	Area	Comments
arc1quad	1823	zkursun	10-08-02	00:02:21	GUNmod	A:Pass 2 B:Pass 3 C:Pass 1 Ene
	1824	ludwig	10-08-02	08:45:14	GUNmod	INJ after tune to tighten spot
	1825	kellyk	10-08-02	11:10:07	GUNmod	Save of injector setup. tuned
	1826	kellyk	10-10-02	14:38:32	GUNmod	CW Inj allsave before Injector
	1827	spraggin	10-10-02	17:36:59	halla	A:Pass 2 B:Pass 3 C:Pass 1 Ene
	1828	kellyk	10-11-02	13:12:22	BPMrel	Relative BPM positions that pr
	1829	southern	10-14-02	10:12:25	GUNmod	A:Pass 2 B:Pass 3 C:Pass 1 Ene
	1830	southern	10-14-02	10:48:19	GUNmod	A:Pass 2 B:Pass 3 C:Pass 1 Ene
	1831	lreyno	10-16-02	17:31:58	GUNmod	A:Pass 5 B:Pass 3 C:Pass 1 Ene
	1832	bob	10-16-02	18:27:09	ALL-RF	A:Pass 5 B:Pass 3 C:Pass 1 Ene
	1833	lreyno	10-17-02	23:33:13	GUNmod	Do not restore from this set u
	1834	kellyk	10-20-02	13:54:49	ALL-Ma	A:Pass 5 B:Pass 3 C:Pass 4 Ene
	1835	carlino	10-22-02	15:42:49	hallc	A:Pass 5 B:Pass 3 C:Pass 4 Ene
	1836	zkursun	10-22-02	21:01:59	halla	A:Pass 5 B:Pass 3 C:Pass 4 Ene
	1837	roman	10-24-02	13:23:35	halla	partial save for Hall A energy
	1838	lehmann	10-24-02	15:18:11	ALL-Ma	A:Pass 5 B:Pass 3 C:Pass 4 Ene
	1839	ywang	10-26-02	23:15:25	hallc	Hall C off center postion prio
1840	davidg	10-27-02	15:36:48	GUNmod	A:Pass 5 B:Pass 4 C:Pass 3 Ene	
1841	ywang	10-29-02	18:46:17	hallc	A:Pass 5 B:Pass 4 C:Pass 3 Ene	
1842	epps	10-30-02	10:56:59	arc1 M	A:5 B:4 C:3 E:495 TEST OF AUTO	
1843	higgins	10-30-02	11:05:58	arc1qu	A:Pass 5 B:Pass 4 C:Pass 3 Ene	
1844	higgins	10-30-02	11:44:58	arc1qu	A:5 B:4 C:3 E:495 Example save	

Operational Restore Filter



The screenshot shows a window titled "filter" with two columns: "List of signals" and "Current Values". The "List of signals" column contains a list of signals with their IDs and values. The "Current Values" column shows the current values for each signal. Below the columns, there is a "Signal file:" field with the path "/usr/user4/mccops/tmp/filtout10-30-02_11:46:09_0". A "Filter:" field is empty. Below the filter field are buttons: "Get Filter", "Filter", "Undo", "View Current Values", and "Show Diffs". A "Compare Tolerance (%):" field contains ".02". Below this are buttons: "All", "Diff", "Save", and "Check File". A text field contains the path "/usr/user4/mccops/tmp/R_higgins_foo". At the bottom are buttons: "Print", "Restore", "Help", and "Quit".

Signal	Current Value
MQB1A01.BDL 1	3062.81
MQB1A01.FUG1 1 1	1
MQB1A02.BDL 1	-1076.62
MQB1A02.FUG1 1 1	1
MQB1A03.BDL 1	-3091.75
MQB1A03.FUG1 1 1	1
MQB1A04.BDL 1	5833.23
MQB1A04.FUG1 1 1	1
MQB1A05.BDL 1	-2329.48
MQB1A05.FUG1 1 1	1

Signal file: /usr/user4/mccops/tmp/filtout10-30-02_11:46:09_0

Filter:

Get Filter Filter Undo View Current Values Show Diffs

Compare Tolerance (%): .02

◇ All ◆ Diff Save Check File

/usr/user4/mccops/tmp/R_higgins_foo

Print Restore Help Quit

IOC Save/Restore

- **Scripts to save/restore operational PVs for rebooting an IOC**
- **Utilizes Burt to interface to the control system**
- **Each EPICS application programmer maintains a list of PV names to save in a burt request file**
- **Some applications have a snap file that is maintained to load operational parameters after a reboot**

IOC Save/Restore Screen

IOC_O_SEE_status.adl

SEE IOC Status and Reboot Control

(1) SAVE (2) REBOOT (3) RESTORE

		Rack	Last Save	Last Restore		Reboot reason	Reboot	Last Reboot	
Injector	iocse11	IN03B05-19	1EOct02 16:26:57	18Oct02 17:30:13	1535665	Reboot reason	Reboot	18Oct02 17:29:49	iocse11
	iocse12	IN03B08-17	22Oct02 10:06:01	22Oct02 10:26:20	1216592	Reboot reason	Reboot	22Oct02 10:07:43	iocse12
	iocse1E	IN03B11-??	22Oct02 10:06:02	22Oct02 10:26:50	1216613	Reboot reason	Reboot	22Oct02 10:07:47	iocse1E
North Linac	iocse1	NL01B15-10	1EOct02 10:47:39	16Oct02 17:03:29	1701009	Reboot reason	Reboot	16Oct02 16:50:40	iocse1
	iocse7	NL15B11-23	1EOct02 11:48:56	16Oct02 17:03:44	1704203	Reboot reason	Reboot	16Oct02 16:52:11	iocse7
	iocseE	NL27B13-16	1EOct02 10:51:38	16Oct02 17:04:10	1702377	Reboot reason	Reboot	16Oct02 16:52:35	iocseE
East Arc South Linac	iocse7	E201B05-12	01Nov02 10:03:37	01Nov02 11:30:50	344138	Reboot reason	Reboot	01Nov02 11:28:51	iocse7
	iocse4	SL01B11-16	22Oct02 14:00:30	22Oct02 14:04:52	1111439	Reboot reason	Reboot	23Oct02 14:03:11	iocse4
	iocseE	SL15B11-25	1EOct02 10:52:16	16Oct02 17:05:09	1702745	Reboot reason	Reboot	16Oct02 16:53:03	iocseE
West Arc Hall A	iocseF	SL27B12-16	1EOct02 10:52:43	16Oct02 17:05:27	1707084	Reboot reason	Reboot	16Oct02 16:53:15	iocseF
	iocse1E	W201B07-16	25Oct02 10:46:30	25Oct02 11:04:02	954088	Reboot reason	Reboot	25Oct02 11:03:06	iocse1E
	iocseE	BS03B05-08	1EOct02 10:53:26	16Oct02 17:06:05	1710640	Reboot reason	Reboot	16Oct02 16:53:51	iocseE
Hall B	iocseC	BS03B05-17	2EOct02 21:16:34	16Oct02 17:06:24	1710282	Reboot reason	Reboot	16Oct02 16:59:58	iocseC
	iocse10	HA01Z07-16	1EOct02 10:54:08	16Oct02 17:06:43	1710605	Reboot reason	Reboot	16Oct02 16:54:16	iocse10
	iocse1E	BS03B06-16	22Oct02 13:46:52	22Oct02 13:46:13	1203333	Reboot reason	Reboot	22Oct02 13:48:45	iocse1E
Hall C	iocse1F	BS03B06-27	22Oct02 13:47:23	22Oct02 13:46:35	1203349	Reboot reason	Reboot	22Oct02 13:48:59	iocse1F
	iocse14	BS04B04-27	1EOct02 10:54:58	16Oct02 17:07:38	1710284	Reboot reason	Reboot	16Oct02 16:59:52	iocse14
	iocse17	HC01Z07	1EOct02 10:55:19	16Oct02 17:07:55	1710474	Reboot reason	Reboot	16Oct02 16:56:43	iocse17
	iocse1C	BS04B05	1EOct02 10:55:40	16Oct02 17:08:10	1710455	Reboot reason	Reboot	16Oct02 16:56:52	iocse1C
	iocse2C	HC01Z18	2EOct02 16:53:13	04Nov02 21:25:46	49243	Reboot reason	Reboot	04Nov02 21:23:51	iocse2C

Beam Stopper must be inserted before reboot of iocse2 or iocsb4

[*] rack door is locked, key in keyswitch

--> remote reset switch for this ioc is on counting house 2nd floor in rack CH03C05

When the ioc is in save setting mode or restore setting mode, you will see this colored box highlighted behind the date of the last save or last restore.

Indicates that a restore has not been successful since the last reboot.



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Example of an IOC Save

```
higgins from opfb1 Requests Saving Settings for IOC: se11
Saving parameters for IOC: se11
-----
Saving settings for : bpmsee
-> Preparing to save see bpm parameters -- press return to continue
Done saving parameters for ioc: se11, report any error messages
-n to the crew chief -- press return to continue
█
```

IOC Crash Recovery

- **Perform hourly saves of burt request files for each Operational IOC**
- **Tcl interface to select which burt snap file to restore**
- **User can select restore files from the previous 24 hours**
- **Restore files have logged information showing the success of the saves**

IOC Crash Recovery Interface

IOC RECOVER

System Recover for iocfel1

iocfel1 rebootdate : 16:52:0 21Oct02

	Hour	Time	Date	Error Logsize
◇	12	12:01	Oct 30	0
◇	11	11:01	Oct 30	0
◇	10	10:01	Oct 30	0
◇	09	09:01	Oct 30	0
◇	08	08:01	Oct 30	0
◇	07	07:01	Oct 30	0
◇	06	06:01	Oct 30	0
◇	05	05:01	Oct 30	0
◇	04	04:01	Oct 30	0
◇	03	03:01	Oct 30	0
◇	02	02:01	Oct 30	0
◇	01	01:01	Oct 30	0
◇	00	00:01	Oct 30	0
◇	23	23:01	Oct 29	0
◇	22	22:01	Oct 29	0
◇	21	21:01	Oct 29	0
◇	20	20:01	Oct 29	0
◇	19	19:01	Oct 29	0
◇	18	18:01	Oct 29	0
◇	17	17:01	Oct 29	0
◇	16	16:01	Oct 29	0
◇	15	15:01	Oct 29	0
◇	14	14:01	Oct 29	0
◇	13	13:01	Oct 29	0
◇	Normal Save	10:20	Oct 21	

MORE HELP RESTORE QUIT

Warm Reboot Save/Restore

Goal: Reboot IOC without affecting operations

- **Accomplished through a combination of EPICS database design and the IOC Save/Restore System**

Example:

- **All magnet PVs saved before a reboot**
- **After a reboot the records writing to DACs are initialized disabled**
- **Magnet PVs are restored and overwrite the initial “0” current setpoints with the saved operational setpoint**



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Weaknesses of Save/Restore System

- **Maintaining our burt request files**
- **Each application developer maintains request files—
Sometimes for multiple tools**
- **Managing burt snapfiles**
- **Difficulty handling device name changes, device removals, and device additions.**
- **No central location for managing all of the save and restore signal names and files. A relational database could help manage our save and restore systems**

Despite these weaknesses our implemented save/restore system works and has improved control system reliability



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