

Booster/Storage Ring/Beamlines
Access Control and Interlock System (ACIS)
Validation and Verification Procedure
7.7.39.11 Rev. 10

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1.0 PURPOSE

The objective is to validate and verify the operation of the Access Control and Interlock System (ACIS) within specifications as outlined in “Booster/Storage Ring/Beamlines Access Control and Interlock System (ACIS) PLC Component Manual” [1].

This document will be expanded in the future to include validation and verification of the existing linac and, as such, will be considered the “machine” ACIS validation and verification.

A separate procedure will be created for each beamline. The boundary between machine and beamline ACIS is defined in section 2.3.1, “Beamline ACIS/Machine ACIS interface”, of the “Booster/Storage Ring/Beamlines Access Control and Interlock System (ACIS) PLC Component Manual” [1].

2.0 BACKGROUND

The CLS has adopted a two-level redundant lock-up system for the booster, storage ring and beam line huts. The system consists of a hard-wired 24 Vdc system and a programmable logic controller (PLC) input-output system. Fundamentally, all lock-up areas operate in the same manner, each having its own emergency off switches, gate and door switches as well as station push button switches.

In a given zone, there is one required and one or more dependent areas. The required area is the first in a zone that must be locked before all the others. Dependent areas are those that can be locked only after a previous (or required) area has been locked. If a required area is broken, all subsequent dependent areas must also drop out. For example, Area 6.1 must be locked up before Area 6.2 (see "LINAC, LTB1, BR1 & SR1 – ACCESS CONTROL AND EMERGENCY OFF SYSTEM LAYOUT" [2]). If 6.1 loses lockup, so does 6.2.

2.1 Testing Philosophy

The overriding approach to the methodology is a meticulous and exhaustive series of tests to ensure that the system operates as required.

Each device (switch, button, flashing light) will be tested independently to verify its operation and that it has been properly mapped to its assigned function in the system. The areas and zones will each be tested, rather than verifying one area and assuming that it represents the others. Their behaviour as individual units will first be confirmed and then their interaction with each other will be tested. This hierarchical and comprehensive approach is appropriate for a process so vital to the safety of employees, users, visitors and the public at large. It provides a means of breaking verification up in to suitably small units that test scripts will be simple and prevent the introduction of errors.

Each area will be visited in turn to verify that the zones behave as expected during the course of normal operation and that it loses lockup status under given circumstances. Further testing of the lockup system includes the interruption of a lockup in progress.

3.0 APPLICATION REQUIREMENTS

3.1 Context

This document contains the testing philosophy and procedures for ACIS, predominantly for the PLC side of the circuit. The hard-wired system verification is detailed in the “Booster Ring Verification Procedure” [3] and “Storage Ring Verification Procedure” [4].

While the lockup system for the linac and linac to booster transfer line (zones 1-5) is controlled by a different system, covered in “Linac/LTB1 Access Control Interlock System” [5], it is necessary due to the nature of the system for this document to give consideration to zones 1-5.

3.2 Personnel Qualification

CLSI HSE personnel not involved in the design and implementation shall conduct the verification and validation of the system. The tests require two personnel (referred to hereinafter as inspector 1 and inspector 2). The procedure takes place in Radiological-Controlled Areas (RCA) and Industrial-Controlled Areas (ICA). Inspectors must have received both the General Radiation Training (GRT) and General Industrial Training (GIT) as outlined in 8.7.1.1 “Canadian Light Source – Facility Access” [6] to enter these areas.

In cases where the radiation sources are being tested (i.e. BR/SR RF), appropriate personnel from Operations, Controls and Instrumentation or Engineering and Technical Services will be identified by managers of those groups to assist the inspection team with verifying system response, if required.

3.3 Supervision and Verification

The Health, Safety and Environment (HSE) manager or designate will supervise the execution of the procedure, acting either as inspector 1 or inspector 2 or simply in a supervisory capacity.

3.4 General Precautions, Limitations and Constraints

This procedure involves an individual being present in a lockup area after it has been engaged. The individual must retain the relevant zone lockup key at all times while performing this test.

3.5 Prerequisites

Verification and Validation may take place after the system has been turned over from the design team.

3.6 Personnel Protection Equipment

Any verification and validation that requires personnel to enter designated construction zones requires observance of appropriate work site apparel (i.e. safe footwear, eye protection, hard hats, etc) in accordance with CLS guidelines [7]. As noted in section

3.2, inspectors are expected already to be familiar with precautions for entering these areas.

3.7 Equipment, Materials and Supplies

For most testing, at least two individuals are required and for the sake of convenience, wireless radio communications is recommended. A personal Thermo-Luminescent Device (TLD) must be worn at all times.

Other equipment includes:

- A voltmeter
- A timer, watch or stopwatch
- Pertinent drawings referenced in section 4.2, and
- Copies of the checklists in section 6.0.
- Lockup Zone spare keys
- Security Access Card
- Forklift

3.8 Termination Criteria

When a fault is detected, it is at the discretion of the HSE overseer to continue with the verification and validation procedure. Any fault, however, requires that the entire procedure be conducted from the beginning after the fault has been corrected.

4.0 REFERENCE MATERIAL

4.1 Glossary

The following terms appear in the attached checklists. The checklists are arranged with the devices to be verified along the left-hand side and events across the top. The top row indicates the “stage” of the lockup procedure in which the various I/O points are checked.

Note: In some cases the outputs are not yet wired in, so verification and validation is obtained by observing the indicator lights on the output module. The failsafe features of the PLC modules interpret any open circuit as a wire break. In order to prevent incorrect indication of a failure, assigned but unused outputs are connected to a dummy load, typically a 24Vdc LED.

The devices to be observed are:

Note – Text in quotes is the module label.

STN# N Light is the indicator lamp on lockup station N that shows whether the button has been pressed. Device status can be verified visually.

Knn is a relay (see drawings “ACCESS CONTROL AND INTERLOCK SYSTEM BOOSTER – ZONE 6 & 7” [8] and “STORAGE RING LOCKUP RELAY PANEL – P2406.1-05” [9]), which indicates when the area specified or the device indicated in brackets has been locked or energized, respectively. Verification of device status at the panel requires the use of a voltmeter. A 1 or 0 on the checklist signifies the presence or absence of a 24 VDC signal, respectively.

Note – For the above 2 device types, the first time the output is enabled, both device operation and mapping are verified, similar to the input mapping verification of section 5.1. For example, the first time LUS# 1 in area 6.1 is pressed the LUS# 1 light is observed at the station itself and at the output module (PLC2400.01-01 Module: 5 Channel 1). Once the operation and mapping of the output devices has been confirmed, subsequent verification of output status for the PLC is required at the appropriate PLC module only. For convenience, the points where both device and output verification are to take place has been shaded on the checklists.

ZLL (All) are the Zone Lockup Lights. Device status can be verified visually. Refer to “LOCK UP LIGHTS, LOCK UP JUNCTION BOXES, LOCK UP KEY BOXES, LOCK UP HORNS & PUBLIC ADDRESS SPEAKERS” [10] for device locations and numbers

EOSn.n – is the emergency off switch signal for area n.n. This signal indicates an “OK” status. Its absence indicates either an emergency condition or system failure. Since the device output mapping was verified as part of the input mapping validation, it is not required in this instance.

Linac Gun/RF (Beamstop Out) is the state of the linac injection system when BST0003-03 is out (or passing beam). Verifying its status will require deferring to operational staff.

Linac Gun/RF (Beamstop In) is the state of the linac injection system when BST0003-03 is in (or blocking beam). Verifying its status will require deferring to operational staff.

Note – The beam stop, BST0003-03, is positioned via an EPICS screen in the control room.

BOOSTER RF refers to the radiation source for BR1. Verifying its status may require deferring to operational staff.

STORAGE RING RF is the radiation source for storing beam in SR1. Verifying its status may require deferring to operational staff.

Linac Triggers/RF refers to the interlock that disabled the gun triggers and linac RF sections.

The states are defined as follows:

Before Lockup is a check of the inputs and outputs prior to initiating the lockup procedure.

STN# N is after having depressed the button at lockup station N.

Exit Gate (Gn) denotes the state of the system after having exited an area via gate n.

ZBB (Gnn and Gmm) test takes place under a normal lockup. In this test, the Zone Bypass Button (ZBB) is held while an inspector opens Gates nn and mm, the exit gates for the two areas making up the zone. The ZBB needs to be held while the I/O is being verified.

[G | D]NN (n.n) is the gate or door that is to be opened to compromise area n.n.

EOS n.n is the test that verifies the operation of the Emergency Off Switches area n.n. Because the EOS chain drives a single input and considering that each individual device was verified in section 5.2, it is only necessary to activate one of the EOSs for an area to verify operation.

ZBB ([G | D]nn) tests to verify that opening a door or gate other than that specified as the exit gate for a given area will drop the lockout for that area. The Zone Bypass Button (ZBB) is held while gate or door nn is opened. The area lockup needs to be completed again before the next ZBB test in this section.

SHIELD (SHLD n.n) is similar to the EOS n.n test above. The test involves locking an area and opening and closing a shielding door. As with the EOS n.n test above, it is only necessary to open one shield door for a given area.

REQUIRED AREA verifies proper handling of dependent and required areas. In this test, a dependent area and its required area are secured. The required area is compromised to verify that the dependent area also loses its lockout. For example, area 6.2 is dependent on area 6.1. Both are secured and area 6.1 is entered by inspector 1 while inspector 2 holds the ZBB. Area 6.1 compromised via breaking gate G22. The status of area 6.2 is then verified.

Area Timer (Ns) n.n is the situation where the area timer runs out before area n.n is locked up. To simulate such a situation, any number of the lockup stations can be pressed except for the last one (because it starts the exit timer), and waiting N seconds which is sufficiently long enough for the timer to run out. A watch or timer is used to accurately test the area timer.

To verify that the area timer intervals are set as indicated, the inspector watching the I/O modules starts timing when the first lockup station is pressed. When the lockup station output signal goes off, timing is stopped and verified. If the duration is greater than the specification, a non-conformance is submitted [14].

After timeout, the various outputs are checked.

Exit Timer (Ns) n.n is similar to the area timer. It is the situation where the Exit Timer expires before the inspector has left area n.n. The test is accomplished by activating all the lockup stations in an area and holding the exit gate open for N seconds. When the exit timer has expired the testing party checks the noted I/O points. A watch or timer is used to accurately test the area timer.

To verify that the exit timer intervals are set as indicated, the inspector watching the I/O modules starts timing when the last lockup station is pressed. When the lockup station output signal goes off, timing is stopped and verified. If the duration is greater than the specification by more than two seconds, a non-conformance is submitted [14].

Multi-Exit n.n defines the state where the exit gate is opened and closed more than once. Area n.n is locked up as per the procedure. When the final lockup station is pushed, the gate is opened and closed (without exiting) then opened and closed again before the exit timer has expired. At this point, the I/O levels are verified.

LUS Out of Seq. n.n is the condition where the lockup stations are not visited in the prescribed path. Any lockup station is pressed in area n.n, except for the first. Device status is then verified.

[G | D]NN (n.n) STN# M validates that an in-process lockup will be reset by opening gate or door NN. The test is for area n.n and is to be performed after having pushed STN# M in the lockup process. For example, G23 (6.1) STN# 1 specifies to open gate 23 after having pressed STN# 1 in the lockup procedure to verify area 6.1. Because this gate is an area boundary, another test has been provided specifying that gate 23 is opened after having pressed STN# 4 to verify area 6.2.

EOS (n.n) takes place when an EOS is activated. Only one test is required here because we have verified that the process can be interrupted at any stage of the lockup procedure via the previous step. To perform this test any EOS is pressed in area n.n after having activated STN# N.

SHIELD n.n a lockup station is pressed and then a shield door opened and closed. As with the EOS n.n test above, it is only necessary to activate one shield door for a given area.

Area Out of Seq. simply tests that a dependent area lockup can not commence before the required area is locked. All gates and doors are closed in the dependent area and the required area is left in the unlocked condition. If the lamp in the first LUS for that area remains off when the button is pressed, the area can not be locked out of sequence.

Zone 1 Lockup is after zone 1 has been locked up.

Zone 2 Lockup is after zone 2 has been locked up.

Zone 3 Lockup is after zone 3 has been locked up.

Zone 4 Lockup is after zone 4 has been locked up.

Zone 5 Lockup is after zone 5 has been locked up.

Zone 6 Lockup is after zone 6 has been locked up.

Zone 7 Lockup is after zone 7 has been locked up.

Zone 8 Lockup is after zone 8 has been locked up.

Zone 9 Lockup is after zone 9 has been locked up.

Injection Permit = 0/1 is provided by the beamline which disallows injection when the beamline front-end safety shutters are open. To disable injection (Injection = 0), lock any beamline hutch and make up the ready chain to allow the safety shutters to open. Unlocking the hutch or resetting CLS Enable in the control room will close the beamline front-end safety shutters.

Radiation Source Permit = 0/1 is a signal from the beamlines chain that inhibits (“0”) or permits (“1”) the linac, BR1 RF and SR1 RF to operate. To set Radiation Source to inhibit (“0”) a major fault needs to be caused in a beamline hutch (refer to beamline verification and validation for details).

Note – The following tests may be accomplished by opening the zone entrance gate without pressing the zone bypass button. The control room keys are left in place and spare keys are issued from HSE to unlock the gates in question. The ACIS spare lockup keys must be signed out and approved by the HSE Manager or designate. HSE is responsible for assigning the keys and ensuring that they are returned to the designated safety system key cabinet before turning the machine back over to operations.

Zone 1 is the compromise of zone 1.

Zone 2 is the compromise of zone 2.

Zone 3 is the compromise of zone 3.

Zone 4 is the compromise of zone 4.

Zone 5 is the compromise of zone 5.

Zone 6 is the compromise of zone 6.

Zone 7 is the compromise of zone 7.

Zone 8 is the compromise of zone 8.

Zone 9 is the compromise of zone 9.

4.2 Supporting Documents

1. “Booster/Storage Ring/Beamlines Access Control and Interlock System (ACIS) PLC Component Manual”, 7.9.39.4, Rev 3
2. “LINAC, LTB1, BR1, & SR1 ACCESS CONTROL AND EMERGENCY OFF SYSTEM LAYOUT”, RAD/0039405, Rev. 11
3. “Booster Ring Verification Procedure”, 3.7.37.2 Rev. 1
4. “Storage Ring Verification Procedure”, 5.7.37.2, Rev. 0
5. “Linac/LTB1 Access Control Interlock System”, 1.2.37.2 Rev. 0
6. “Canadian Light Source – Facility Access”, 8.7.1.1, Rev. 0
7. “Personal Protective Equipment Implementation Guide”, 11.1.11.2. Rev 2
8. “ACCESS CONTROL AND INTERLOCK SYSTEM BOOSTER ZONE 6 & 7”, /ACCL/EE/INTK/EMER/0055525, Rev. 2
9. “STORAGE RING LOCKUP RELAY PANEL – P2406.1-05”, /ACCL/EE/PROT/LOCK/0066632, Rev 1.

10. "BR1-SR1 ACCESS CONTROL AND INTERLOCK SYSTEM – LOCK UP LIGHTS, LOCK UP JUNCTION BOXES, LOCK UP KEY BOXES, LOCK UP HORNS & PUBLIC ADDRESS SPEAKERS", /RAD/0039430, Rev. 3
11. "Booster Lockup Procedure", 3.7.37.1, Rev. 1
12. "Storage Ring Lockup Procedure, 5.7.52.1, Rev 2
13. "BR1-SR1 ACCESS CONTROL AND INTERLOCK SYSTEM –EMERGENCY OFF STATIONS, LOCK UP STATIONS, ZONE BY-PASS BUTTONS, DOOR INTERLOCK SWITCHES", /RAD/0039410, Rev. 2
14. "Non-Conformance Reporting and Tracking Procedure", 0.7.91.2, Rev 2.
15. "BOOSTER/STORAGE RING TOP OF SHIELDING EQUIPMENT LAYOUT", /BLDG/EE/0050706, Rev. 30
16. "Linac – LTB1 Lockup Procedure", 2.7.37.2, Rev.2
17. "Access Control and Interlock System PLC1021.4-01 Control Room", ACCL/EE/PROT/LOCK/0066607 Rev 6.
18. "ACIS Control Room P1021.3-16 Wiring Schematic", ACCL/EE/PRO/LOCK/0055537 Rev 15
19. "LTB1 (SSH0003-01 & SSH0003-02) Safety Shutters Wiring Diagram", LTB1/EE/PROT/CTL/0153986, Rev 0

5.0 PROCEDURE

Note - The following procedures make extensive use of the Booster and Storage Ring Lockup Procedures [11][12], drawing 0039405 [2], “EMERGENCY OFF STATIONS, LOCK UP STATIONS, ZONE BY-PASS BUTTONS, DOOR INTERLOCK SWITCHES” [13] and the checklists in section 6.0.

Note – For each failure, an incident is entered into the automated problem tracking system [14] detailing the nature, cause and resolution of the failure. The incident number issued by the system is listed in the summary report of section 6.17

5.1 Software Version Record

- a) Inspector 1 or 2: RECORD the Version (from the revision control system) and the signature (as recorded by the development environment) of the PLC software in the table below.

Software Version	PLC Signature

5.2 Input Mapping and Emergency Off Verification

Note – Refer to checklists in sections 6.1 to 6.2.

5.2.1 Pre-inspection.

- a) Inspector 1 or 2: Fill in the module and channel numbers for each device in the checklists. Where an EOS has a grey checkbox, include both input and output module and channel numbers as follows: “i=input number o= output number”. For example, the module column for EOS6.2 would have “i=7 o=4” and the channel column would show “i=1 o=1”.

5.2.2 Verification

- a) Inspector 1: Locate and proceed to the I/O racks for the ring in question (PLC2400.1-01 for the booster or as indicated on the checklist for the storage ring).

Note – Rack locations are shown on “BOOSTER/STORAGE RING TOP OF SHIELDING EQUIPMENT LAYOUT” [15].

- b) Inspector 1: Check that the labels on the input modules match those indicated in brackets on the checklist.
- c) Inspector 1: Indicate label verification by placing a check in the “Channel Labeled” column.
- d) Inspector 2: Visit each device listed on the checklist

Note – It is not necessary to examine each device in the order it appears.

- e) Inspector 2: Assess proper installation/mounting of the device (i.e. not held in place with tape, tie wraps, no wiring outside of conduit or cabinets, etc).
 - f) Inspector 2: Indicate that the device has been properly installed by placing a check in the “Installed” column.
 - g) Inspector 2: Verify that the device is properly labeled. Indicate correct labeling of the device by placing a check mark in the “Device Labeled” column.
- IF the device is an EOS and the checkbox is grey
THEN
 - Before activating the emergency off verify that there is a 24Vdc signal on P2400.1-03 for the booster or at the panel indicated for the storage ring at the point indicated below:

Area	Hardwire	PLC
EOS 6.1	TB1-13	TB6-27
EOS 6.2	TB1-41	TB6-41
EOS 7.1	TB2-27	TB4-43
EOS 7.2	TB3-13	TB1-43
EOS 8.1	P2404.1-04 TB1-6	P2406.1-05 TB3-41
EOS 8.2	P2406.1-04 TB1-6	P2406.1-05 TB4-13

EOS 9.1	P2408.1-04 TB1-6	P2406.1-05 TB4-27
EOS 9.2	P2406.3-04 TB1-6	P2406.1-05 TB4-41

- Activate the EOS and verify that the signal is no longer present.
 - Ensure that the proper output channel is off at the output module.
 - Proceed to the control room and verify that the horn is activated and that the appropriate EOS indicators are lit.
- h) Inspector 2: Toggle the device in question (i.e. open/close the associated door or gate, activate/reset the emergency off switch (EOS) or press/release the lockup station (LUS) button).

Note – Although all the EOSs of a given area map to a single I/O point, each individual switch must be visited and tested to verify that it is in the correct chain before checking the associated columns.

- i) Inspector 1: Verify that the appropriate indicator light blinks on and off. Indicate proper channel mapping by placing a check over top of the associated Module and Channel values for the device.
- j) In the event that an incorrect channel is found to be blinking, make a note of it in the non-conformance report.
- k) Inspector 1 & 2: Print your names, date the checklist and initial where indicated.

5.3 Area Procedures

Note - For the following steps refer to the Booster and Storage Ring Lockup Procedure [11] [12] and drawing 0039405 [2].

5.3.1 Normal lockup.

Note – Refer to checklist in sections 6.7, 6.9, 6.11 and 6.13.

Note – This section refers to all of the steps between the “Normal Lockup” and “Area Compromise Test” banners of the checklist.

- a) Inspector 1: Locate and proceed to R2400.1-01 for the booster or the rack and/or panel indicated on the checklist for the storage ring:

Note – Panel locations are shown on “BOOSTER/STORAGE RING TOP OF SHIELDING EQUIPMENT LAYOUT” [15].

- b) Inspector 1: Verify that each output along the left-hand side is in the state indicated in the “BEFORE LOCKUP” column, placing a check over the state to indicate compliance.
- c) Inspector 2: Conduct a lockup in accordance with the lockup procedure [11] or [12] advising Inspector 1 as each step identified across the top of the checklist is performed.

Note - The area or exit timers may expire while the various devices are being verified. In this case restart the area lockup.

- d) Inspector 1: FOR each stage of the lockup identified across the top of the checklist
- REPETITIVELY
- Verify the status of the output channels
 - IF the corresponding checklist box is grey
- THEN
- Verify that the output channel label corresponds to the text in quotes on the checklist
 - IF the device is not an EOS
- THEN
- Have Inspector 2 verify the status of the field device.

Note – Inspector 1: For the Zone Bypass Buttons (ZBB), hold the button in question. After Inspector 2 has opened and closed both area exit gates, release the button and return to the panel to verify output status.

Note – In order to check the field devices during lockup, Inspector 2 may need to open the exit gate as if to leave and close it again without leaving the area.

Note – It may occasionally be necessary for Inspector 1 to verify field device status such as those in the control room.

5.3.2 Area Compromise Test

Note – Refer to checklist in sections 6.7, 6.9, 6.11 and 6.13.

Note – This section refers to all of the steps to the right of “Area Compromise Test” banner of the checklist.

- a) Inspector 2: FOR each column in the Area Compromise Test

REPETITIVELY

- Lock up the area under test in accordance with the lockup procedure [11] or [12].
- Compromise the area using the method indicated.
- Return the device to its previous state to ensure that the lockup status is not re-established.
- Tell Inspector 1 to verify device status.

Note – Inspector 1: For the Zone Bypass Buttons (ZBB), hold the button in question. After Inspector 2 compromises the system and returns the device to its previous (lockup) state, release the button and return to the panel to verify output status.

- b) Indicate the devices that have passed both the Normal Lockup and Area Compromise Tests by placing a check mark in the leftmost (first) column of the checklist.
- c) Inspector1 & 2: Print your names, date the checklist and initial where indicated.

5.3.3 In Progress Interruptions

Note – Refer to checklist in sections 6.8, 6.10, 6.12 and 6.14.

- a) Inspector 2: FOR each column in the In Progress Interruption Test

REPETITIVELY

- Initiate a lockup in accordance with the lockup procedure [11] or [12].
- Interrupt the lockup as indicated (refer to glossary in section 4.1 for more detail).

Note – Inspector 1: For the doors and gates stand by the portal in question and compromise the lockup at the stage indicated and return the device to its previous state, before returning to the panel to verify system status.

- b) Indicate the devices that have passed the In Progress Interruptions Tests by placing a check mark to the left of the device the leftmost (first) column of the checklist.

- c) Inspector1 and Inspector 2: Print your names, date the checklist and initial where indicated.

5.4 Section Procedures

Note – Refer to checklist in section 6.15.

Note – The input mapping and area tests (sections 5.2 and 5.3) must be completed before performing this procedure.

Note – Refer to the design note for the PLC [1], module and channel where these points are to be checked.

Note – Locking the booster section requires the lockup of zone 5. Refer to the “Linac – LTB1 Lockup Procedure” [16] for details.

5.4.1 Normal Lockup

Note – This section refers to all of the steps between the “Normal” and “Comp” banners of the checklist.

Note – Before starting this section of the procedure make sure that all areas of zones 1-9 are unlocked.

Note – Verification of the status of the radiation sources will require deferring to operational staff. It is up to the inspectors to challenge the assertions until they are satisfied of the state of the components.

- a) Inspector 2: Perform the lockups of the various zones as shown in the checklists (refer to the Booster or Storage Ring Lockup Procedure [11] [12] and Linac – LTB1 Lockup Procedure [16]).
- b) Inspector 1: As each stage is completed as indicated by the checklist, verify the status of the various radiation sources and that they cannot be enabled if disabled indicated by a “1” and “0”, respectively.

5.4.2 Compromise Test

Note – The entire lockup of zones 1-9 must be performed before beginning these tests. After each test, the section must be locked again and the keys turned on in the control room before the next, allowing enough time for the all-clear horns to finish.

Note – To truly verify that the area compromise is interlocking the radiation sources, the control room keys must be left in place. To compromise an area, open the zone entrance for that area using the spare key for that door. Issuing these keys and ensuring their return to safe storage is the responsibility of the HSE department.

- a) Inspector 2: FOR each section

REPETITIVELY

- Lockup the zones in accordance with the Booster or Storage Ring Lockup Procedure [11] [12] and Linac – LTB1 Lockup Procedure [16].

- Compromise the zone by opening a door or gate into it without holding the zone bypass button (ZBB).
- b) Inspector 1: As each stage is completed as indicated by the checklist, verify the status of the various radiation sources and that they cannot be enabled if disabled indicated by a "1" and "0", respectively.
- c) Inspector 1 & 2: Print your names, date the checklist and initial where indicated.

6.0 Attachments/Forms

6.1 Input Device Mapping and Emergency Off Checklist for Zone 6

Area 6.1					
Device	Module	Channel	Channel Labelled	Installed	Device Labelled
EOS1303-01 (EOS6.1)					
EOS1303-02 (EOS6.1)					
EOS1305-01 (EOS6.1)					
EOS1304-02 (EOS6.1)					
EOS1304-01 (EOS6.1)					
SWDI1303-01/02 (G22)					
SWDI1410-01/02 (D42)					
SWDI1500-07/08 (D20)					
SWDI1304-01/02 (G23)					
LUS1303-01 (LUS 6.1)					
LUS1304-01 (LUS 6.2)					
LUS1304-02 (LUS 6.3)					
Area 6.2					
Device	Module	Channel	Channel Labelled	Installed	Device Labelled
EOS1304-03 (EOS6.2)					
EOS1304-04 (EOS6.2)					
EOS1304-05 (EOS6.2)					
EOS1304-06 (EOS6.2)					
SWDI1304-03/04 (G19)					
SWDI1500-05/06 (G24)					
LUS1304-03 (LUS 6.4)					
LUS1304-04 (LUS 6.5)					
LUS1304-06 (LUS 6.6)					
ZBB1500-02 (ZBB6)					
All Zone 6 Devices Verified	Inspector 1 (Print)		Signature		
	Inspector 2 (Print)		Signature		
Date: _____					

6.2 Input Device Mapping and Emergency Off Checklist for Zone 7

Area 7.1					
Device	Module	Channel	Channel Labelled	Installed	Device Labelled
EOS1301-02 (EOS7.1)					
EOS1302-01 (EOS7.1)					
EOS1302-02 (EOS7.1)					
SWDI1304-05/06 (G20)					
SWDI1501-05/06 (D18)					
SWDI1500-03/04 (D19)					
SWDI1302-01/02 (G25)					
LUS1301-01 (LUS 7.1)					
LUS1302-05 (LUS 7.2)					
Area 7.2					
Device	Module	Channel	Channel Labelled	Installed	Device Labelled
EOS1302-03 (EOS7.2)					
EOS1302-04 (EOS7.2)					
EOS1302-05 (EOS7.2)					
EOS1302-06 (EOS7.2)					
EOS1302-07 (EOS7.2)					
EOS1302-08 (EOS7.2)					
SWDI1500-01/02 (G26)					
LUS1302-02 (LUS 7.3)					
LUS1302-03 (LUS 7.5)					
LUS1302-04 (LUS 7.4)					
ZBB1500-01 (ZBB7)					
All Zone 7 Devices Verified	Inspector 1 (Print)		Signature		
	Inspector 2 (Print)		Signature		
Date: _____					

6.3 Input Device Mapping and Emergency Off Checklist for Area 8.1

Area 8.1 (R2404.1-01)					
Device	Module	Channel	Channel Labelled	Installed	Device Labelled
EOS1400-01 (EOS8.1)					
EOS1400-02 (EOS8.1)					
EOS1401-01 (EOS8.1)					
EOS1411-02 (EOS8.1)					
EOS1411-04 (EOS8.1)					
SWDI1610-04 (SHD 8.1)					
SWDI1611-02 (SHD 8.1)					
SWDI1611-04 (SHD 8.1)					
SWDI1400-03/04 (SHD 8.1)					
SWDI1411-02 (G27)					
SWDI1400-02 (G28)					
LUS1400-01 (LUS 8.1)					
LUS1400-02 (LUS 8.2)					
All Area 8.1 Devices Verified	Inspector 1 (Print)		Signature		
Date: _____	Inspector 2 (Print)		Signature		

6.4 Input Device Mapping and Emergency Off Checklist for Area 8.2

Area 8.2 (R2406.1-01)					
Device	Module	Channel	Channel Labelled	Installed	Device Labelled
EOS1401-02 (EOS8.2)					
EOS1401-03 (EOS8.2)					
EOS1402-01 (EOS8.2)					
EOS1402-02 (EOS8.2)					
EOS1403-01 (EOS8.2)					
EOS1403-02 (EOS8.2)					
EOS1404-01 (EOS8.2)					
EOS1404-02 (EOS8.2)					
EOS1404-03 (EOS8.2)					
EOS1404-04 (EOS8.2)					
SWDI1601-02 (SHD 8.2)					
SWDI1602-02 (SHD 8.2)					
SWDI1602-04 (SHD 8.2)					
SWDI1603-02 (SHD 8.2)					
SWDI1603-04 (SHD 8.2)					
SWDI1502-04 (SHD 8.2)					
SWDI1502-02 (G30)					
SWDI1405-02 (G29)					
LUS1404-01 (LUS 8.3)					
LUS1403-01 (LUS 8.4)					
LUS1402-01 (LUS 8.5)					
LUS1401-01 (LUS 8.6)					
ZBB1502-01 (ZBB8)					
All Area 8.2 Devices Verified	Inspector 1 (Print)		Signature		
Date: _____	Inspector 2 (Print)		Signature		

6.5 Input Device Mapping and Emergency Off Checklist for Area 9.1

Area 9.1 (R2408.1-02)					
Device	Module	Channel	Channel Labelled	Installed	Device Labelled
EOS1411-01 (EOS9.1)					
EOS1411-03 (EOS9.1)					
EOS1410-02 (EOS9.1)					
EOS1410-01 (EOS9.1)					
EOS1409-03 (EOS9.1)					
EOS1409-02 (EOS9.1)					
EOS1409-01 (EOS9.1)					
EOS1408-03 (EOS9.1)					
EOS1408-02 (EOS9.1)					
EOS1408-01 (EOS9.1)					
SWDI1610-02 (SHD 9.1)					
SWDI1609-04 (SHD 9.1)					
SWDI1609-02 (SHD 9.1)					
SWDI1608-04 (SHD 9.1)					
SWDI1608-02 (SHD 9.1)					
SWDI1607-04 (SHD 9.1)					
SWDI1607-02 (SHD 9.1)					
SWDI1410-02 (D42)					
SWDI1408-02 (G31)					
LUS1411-01 (LUS 9.1)					
LUS1409-01 (LUS 9.2)					
LUS1408-02 (LUS 9.3)					
All Area 9.1 Devices Verified	Inspector 1 (Print)		Signature		
Date: _____	Inspector 2 (Print)		Signature		

6.6 Input Device Mapping and Emergency Off Checklist for Area 9.2

Area 9.2 (R2406.3-01)					
Device	Module	Channel	Channel Labelled	Installed	Device Labelled
EOS1407-03 (EOS9.2)					
EOS1407-02 (EOS9.2)					
EOS1407-01 (EOS9.2)					
EOS1406-03 (EOS9.2)					
EOS1406-02 (EOS9.2)					
EOS1406-01 (EOS9.2)					
EOS1405-03 (EOS9.2)					
EOS1405-02 (EOS9.2)					
EOS1405-01 (EOS9.2)					
SWDI1606-04 (SHD 9.2)					
SWDI1606-02 (SHD 9.2)					
SWDI1605-04 (SHD 9.2)					
SWDI1605-02 (SHD 9.2)					
SWDI1604-04 (SHD 9.2)					
SWDI1604-02 (SHD 9.2)					
SWDI1501-04 (SHD 9.2)					
SWDI1501-02 (G32)					
LUS1405-01 (LUS 9.4)					
LUS1406-01 (LUS 9.5)					
LUS1408-01 (LUS 9.6)					
ZBB1501-01 (ZBB9)					
All Area 9.2 Devices Verified	Inspector 1 (Print)		Signature		
Date: _____	Inspector 2 (Print)		Signature		

6.7 Normal and Compromise Checklist for Zone 6

Zone 6 (Normal and Compromise Tests)

STAGE DEVICE	BEFORE LOCKUP	STN# 1	STN# 2	STN# 3	EXIT GATE (G23)	STN# 4	STN# 5	STN# 6	EXIT GATE (G24)	ZBB (G23 and G24)																	
											G24 (6.2)	G19 (6.2)	G23 (6.1)	D20 (6.1)	D42 (6.1)	G22 (6.1)	EOS 6.1	EOS 6.2	ZBB (G19)	ZBB (D20)	ZBB (D42)	ZBB (G22)	ZBB (EOS 6.1)	ZBB (EOS 6.2)	REQUIRED AREA		
STN# 1 Light ("LUS6.1")	0	1								1																	
STN# 2 Light ("LUS6.2")	0	0	1							1											0	0					
STN# 3 Light ("LUS6.3")	0	0	0	1						1											0	0					
STN# 4 Light ("LUS6.4")	0	0			0	1				1										0							
STN# 5 Light ("LUS6.5")	0	0					0	1		1										0							
STN# 6 Light ("LUS6.6")	0	0						0	1	1										0							
K13 ("A6.1" - TB5-13)	0	0		0	1					1				0	0	0	0	0	1	1	0	0	0	0	0	1	0
K14 ("A6.2" - TB5-27)	0	0				0	0		0	1	1			0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zone Lockup Lights	0	0				0	0		0	1	1			0						0	0				0	0	0
"EOS6.1"	1					1				1	1						1	1						1	1	1	
"EOS6.2"	1					1				1	1						1	1						1	1	1	

INSPECTOR (Print): _____
 INSPECTOR (Print): _____

Initials: _____
 Initials: _____

Date: _____
 Date: _____

6.9 Normal and Compromise Checklist for Zone 7

Zone 7 (Normal and Compromise Tests)

STAGE DEVICE	BEFORE LOCKUP	STN# 1	STN# 2	EXIT GATE (G25)	STN# 3	STN# 4	STN# 5	EXIT GATE (G26)	ZBB (G25 and G26)	Area Compromise															
										G26 (7.2)	G22 (7.2)	G25 (7.1)	D18 (7.1)	D19 (7.1)	G20 (7.1)	EOS 7.1	EOS 7.2	ZBB (G22)	ZBB (D18)	ZBB (D19)	ZBB (G20)	ZBB (EOS 7.1)	ZBB (EOS 7.2)	REQUIRED AREA	
STN# 1 Light ("LUS7.1")	0	1							1			0							0				0	1	0
STN# 2 Light ("LUS7.2")	0	0	1						1			0							0				0	1	0
STN# 3 Light ("LUS7.3")	0			0	1				1		0							0				0	0	0	0
STN# 4 Light ("LUS7.4")	0				0	1			1		0							0				0	0	0	0
STN# 5 Light ("LUS7.5")	0					0	1		1		0							0				0	0	0	0
K15 ("A7.1" - TB5-41)	0	0	0	1					1		1		0	0	0	0	1	1	0	0	0	0	1	0	0
K16 ("A7.2" - TB6-13)	0	0		0	0			0	1	1			0	0	0	0	0	0	0	0	0	0	0	0	0
Zone Lockup Lights	0	0		0	0			0	1	1			0					0			0	0	0	0	0
"EOS7.1"	1			1				1	1							1	1					1	1	1	1
"EOS7.2"	1			1				1	1							1	1					1	1	1	1

INSPECTOR (Print): _____
 INSPECTOR (Print): _____

Initials: _____
 Initials: _____

Date: _____
 Date: _____

6.10 In Progress Interruptions Checklist for Zone 7

Zone 7 (In Progress Interruptions)

STAGE DEVICE	Interruptions	AREA TIMER 7.1 (60s)	AREA TIMER 7.2 (60s)	EXIT TIMER 7.1 (10s)	EXIT TIMER 7.2 (10s)	MULTI-EXIT 7.1	MULTI-EXIT 7.2	LUS OUT OF SEQ. 7.1	LUS OUT OF SEQ. 7.2	G20 (7.1) STN# 1	D18 (7.1) STN# 1	D19 (7.1) STN# 2	G25 (7.1) STN# 1	G25 (7.2) STN# 3	G26 (7.2) STN #4	G22 (7.2) STN# 5	EOS (7.1) STN# 1	EOS (7.2) STN# 4	AREA OUT OF SEQ.																			
STN# 1 Light ("LUS7.1")		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
STN# 2 Light ("LUS7.2")		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
STN# 3 Light ("LUS7.3")		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
STN# 4 Light ("LUS7.4")		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
STN# 5 Light ("LUS7.5")		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
K15 ("A7.1" - TB5-41)		0	1	0	1	0	1	0	1	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
K16 ("A7.2" - TB6-13)		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
"EOS7.1"																	0	1																				
"EOS7.2"																	1	0																				

INSPECTOR (Print): _____
 INSPECTOR (Print): _____

Initials: _____
 Initials: _____

Date: _____
 Date: _____

6.13 Normal and Compromise Checklist for Zone 9

Zone 9 (Normal and Compromise Tests)

RACK	STAGE DEVICE	Normal Lockup							Area Compromise																			
		BEFORE LOCKUP	STN# 1	STN# 2	STN# 3	EXIT GATE (G31)	STN# 4	STN# 5	STN# 6	EXIT GATE (G32)	ZBB (G31 and G32)	G32 (9.2)	G29 (9.2)	D33 (9.2)	G31 (9.1)	G27 (9.1)	D42 (9.1)	EOS 9.1	EOS 9.2	ZBB (G29)	ZBB (D33)	ZBB (D42)	ZBB (G27)	ZBB (EOS 9.1)	ZBB (EOS 9.2)	SHIELD (SHLD 9.1)	SHIELD (SHLD 9.2)	REQUIRED AREA
R2408.1-01	STN# 1 Light ("LUS9.1")	0	1							1				0								0		0	1	0	1	0
R2408.1-01	STN# 2 Light ("LUS9.2")	0	0	1						1				0								0		0	1	0	1	0
R2408.1-01	STN# 3 Light ("LUS9.3")	0		0	1					1				0								0		0	1	0	1	0
R2406.3-01	STN# 4 Light ("LUS9.4")	0				0	1			1		0	0	0						0				0	0	0	0	0
R2406.3-01	STN# 5 Light ("LUS9.5")	0						0	1			0	0	0						0				0	0	0	0	0
R2406.3-01	STN# 6 Light ("LUS9.6")	0								0	1		0	0						0				0	0	0	0	0
R2406.1-01	K15 ("A9.1" - TB3-13)	0	0	0	0	1				1		1	1	0	0	0	0	1	1	1	0	0	0	0	1	0	1	0
R2406.1-01	K16 ("A9.2" - TB3-27)	0	0			0	0			0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Zone Lockup Lights	0	0			0	0			0	1	1	1	0		0	0	0	0	0	0	0	0	0	0	0	0	0
R2406.1-01	"EOS9.1"	1				1				1	1	1	1				1	1						1	1	1	1	1
R2406.1-01	"EOS9.2"	1				1				1	1	1	1				1	1						1	1	1	1	1

INSPECTOR (Print): _____
 INSPECTOR (Print): _____

Initials: _____
 Initials: _____

Date: _____
 Date: _____

6.15 Section Checklist for Booster and Storage Rings

Section (Normal and Compromise Tests for PLC)

STAGE DEVICE	Normal											Comp										
	BEFORE LOCKUP	ZONE 1 LOCKUP	ZONE 2A LOCKUP	ZONE 2B LOCKUP	ZONE 3 LOCKUP	ZONE 4 LOCKUP	ZONE 5 LOCKUP	ZONE 6 LOCKUP	ZONE 7 LOCKUP	ZONE 8 LOCKUP	ZONE 9 LOCKUP	ZONE 1	ZONE 2A	ZONE 2B	ZONE 3	ZONE 4	ZONE 5	ZONE 6	ZONE 7	ZONE 8	ZONE 9	
LINAC SECTION																						
Linac Gun/RF (Beamstop Out)	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Linac Gun/RF (Beamstop In)	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1
BOOSTER RING SECTION																						
BOOSTER RF	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	1	1	
STORAGE RING SECTION																						
STORAGE RING RF	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	0	0	

INSPECTOR (Print): _____
 INSPECTOR (Print): _____

Initials: _____ Date: _____
 Initials: _____ Date: _____

6.16 LTB Safety Shutters (SSH0003--01 & 02) Verification

WARNING – The safety shutters present a pinch hazard. Ensure personnel are clear of the shutters before operating.

- a) Inspector 2: VERIFY:
 - a. LTB SSHs and limit switches are installed correctly and labeled _____
 - b. LTB SSHs have a “Pinch Hazard” sticker on each _____
- b) Inspector 1: At P1021.4-16, VERIFY:
 - a. K3, K6 & K8 are on _____
 - b. K4, K5 & K7 are off _____

WARNING – Do not open or attempt to open the safety shutters unless specifically directed for the duration of this test. Inspector 2 is advised to be alert for any movement of the shutters.

- c) Inspector 2: ACTIVATE the switches on the safety shutters as indicated in the table below using a device such as a screwdriver.

WARNING – PINCH HAZARD. DO NOT USE ANY PART OF YOUR BODY TO DEPRESS THE LIMIT SWITCHES.

- d) Inspector 1: VERIFY the status of the devices in P1021.4-16 by placing a check in the corresponding box of the tables below.

SSH0003-01	SSH0003-02	P1021.4-16	
LS1	LS1	K5	K7
DISENGAGED	DISENGAGED	0	0
DISENGAGED	ENGAGED	0	1
ENGAGED	DISENGAGED	1	0
ENGAGED	ENGAGED	1	1

(SSH0003-01)		(SSH0003-02)		P1021.4-16	
LS1	LS2	LS1	LS2	K3	K4
DISENGAGED	DISENGAGED	DISENGAGED	DISENGAGED	1	0
DISENGAGED	DISENGAGED	DISENGAGED	ENGAGED	0	0
DISENGAGED	DISENGAGED	ENGAGED	DISENGAGED	0	0
DISENGAGED	DISENGAGED	ENGAGED	ENGAGED	0	0

DISENGAGED	ENGAGED	DISENGAGED	DISENGAGED	0	0
DISENGAGED	ENGAGED	DISENGAGED	ENGAGED	0	0
DISENGAGED	ENGAGED	ENGAGED	DISENGAGED	0	0
DISENGAGED	ENGAGED	ENGAGED	ENGAGED	0	0
ENGAGED	DISENGAGED	DISENGAGED	DISENGAGED	0	0
ENGAGED	DISENGAGED	DISENGAGED	ENGAGED	0	0
ENGAGED	DISENGAGED	ENGAGED	DISENGAGED	0	0
ENGAGED	DISENGAGED	ENGAGED	ENGAGED	0	0
ENGAGED	ENGAGED	DISENGAGED	DISENGAGED	0	0
ENGAGED	ENGAGED	DISENGAGED	ENGAGED	0	0
ENGAGED	ENGAGED	ENGAGED	DISENGAGED	0	0
ENGAGED	ENGAGED	ENGAGED	ENGAGED	0	0

e) Inspector 1: OPEN LTB Safety Shutters.

f) Inspector 1: At P1021.4-16, VERIFY:

a. K3, K6 & K8 are off _____

b. K4, K5 & K7 are on _____

WARNING – Do not close or attempt to close the safety shutters for the duration of this test. Inspector 2 is advised to be alert for any movement of the shutters.

g) Inspector 2: ACTIVATE the switches on the safety shutters as indicated in the tables below using a device such as a screwdriver.

WARNING – PINCH HAZARD. DO NOT USE ANY PART OF YOUR BODY TO DEPRESS THE LIMIT SWITCHES.

h) Inspector 1: VERIFY the status of the devices in P1021.4-16 by placing a check in the corresponding box of the tables below.

SSH0003-01	SSH0003-02	P1021.4-16	
LS3	LS3	K6	K8
DISENGAGED	DISENGAGED	0	0
DISENGAGED	ENGAGED	0	1
ENGAGED	DISENGAGED	1	0
ENGAGED	ENGAGED	1	1

(SSH0003-01)		(SSH0003-02)		P1021.4-16	
LS3	LS4	LS3	LS4	K3	K4

DISENGAGED	DISENGAGED	DISENGAGED	DISENGAGED	0	1
DISENGAGED	DISENGAGED	DISENGAGED	ENGAGED	0	0
DISENGAGED	DISENGAGED	ENGAGED	DISENGAGED	0	0
DISENGAGED	DISENGAGED	ENGAGED	ENGAGED	0	0
DISENGAGED	ENGAGED	DISENGAGED	DISENGAGED	0	0
DISENGAGED	ENGAGED	DISENGAGED	ENGAGED	0	0
DISENGAGED	ENGAGED	ENGAGED	DISENGAGED	0	0
DISENGAGED	ENGAGED	ENGAGED	ENGAGED	0	0
ENGAGED	DISENGAGED	DISENGAGED	DISENGAGED	0	0
ENGAGED	DISENGAGED	DISENGAGED	ENGAGED	0	0
ENGAGED	DISENGAGED	ENGAGED	DISENGAGED	0	0
ENGAGED	DISENGAGED	ENGAGED	ENGAGED	0	0
ENGAGED	ENGAGED	DISENGAGED	DISENGAGED	0	0
ENGAGED	ENGAGED	DISENGAGED	ENGAGED	0	0
ENGAGED	ENGAGED	ENGAGED	DISENGAGED	0	0
ENGAGED	ENGAGED	ENGAGED	ENGAGED	0	0

- i) Inspector 2: ACTIVATE SWx of P1021.4-16 as indicated in the table below.
- j) Inspector 1: VERIFY the status of the devices in P1021.4-16 by placing a check in the corresponding box of the table below.

P1021.4-16				
SW2	SW3	SW8	SW9	K4
0	0	0	0	1
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0

1	0	1	0	0
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	0

- k) Inspector 1 or 2: CLOSE the safety shutters.
- l) Inspector 2: ACTIVATE the switches P1021.4-16 as indicated in the tables below.
- m) Inspector 1: VERIFY the status of the devices in P1021.4-16 by placing a check in the corresponding box of the tables below.

P1021.4-16				
SW5	SW6	SW11	SW12	K3
0	0	0	0	1
0	0	0	1	0
0	0	1	0	0
0	0	1	1	0
0	1	0	0	0
0	1	0	1	0
0	1	1	0	0
0	1	1	1	0
1	0	0	0	0
1	0	0	1	0
1	0	1	0	0
1	0	1	1	0
1	1	0	0	0
1	1	0	1	0
1	1	1	0	0
1	1	1	1	0

Cc: HSE Manager
CLS Files