1.00 MC		See last name for Revictanings
1.00 MC	tation 2 - 1st Article (Half Period Assembly) ASSEMBLY STEP	See last page for Rev changes COMMENTS
	C fit-up pre-check and surface insulation	
		The full assembly layout of the mating MC's can be found in Table 1 and Figure 3
		below. Some of this effort may be done before the half period assembly activity
Ty	ype-C coil with its interfacing Period Type-C coil.	begins.
2.00 Pro	re-measurement of MCHP Type A, B and C coils flanges	See MCHP component designation in Table 1 of this document.
		MCHP Assembly Dimensional Control Plan: NCSX-PLAN-HPADC-00
		The acceptance criterion is .005" RMS deviation in alignment to the set of tooling
		balls. With a successful alignment a set of global fiducial monuments will have
jac	cks, "A" flange (datum "D") down and rack the "A" coil into	been established. Subsequent alignments of the laser tracker will be to the global
L	s proper shape.	monument
	can the "B" flange (datum E) and the MC shell VV boss	
	terface. Measure tooling balls emove Type-A coil from stand and move to holding area.	
	bllow the steps defined in Section 2 of the Metrology Plan for	The acceptance criterion is .005" RMS deviation in alignment to the set of conical
		seats. With a successful alignment a set of global fiducial monuments will have
		been established. Subsequent alignments of the laser tracker will be to the global
	s proper shape.	monument
		Flange measurement is needed for the A side (only) for the Type-B coil.
	emove Type-B coil from stand and store coil.	
		The acceptance criterion is .005" RMS deviation in alignment to the set of conical
		seats. With a successful alignment a set of global fiducial monuments will have been established. Subsequent alignments of the laser tracker will be to the global
		monument
		Flange measurement is needed for the A side (only) for the Type-C coil.
	emove Type-C coil from stand and store coil.	. J
3.00 Sh	him sizing / preparations	Metrology procedure covering Station 2:
	sing flange measurement of the coils, define the A/B shim	This is a back office calculation where shim thickness is predetermined based on
	ickness.	the scanned flange surface data.
	ompress alumina coated shims and sort by thickness the nim set that will be installed on the MCHP.	Care must be taken when handling alumina shims to mitigate any possible surface contamination conditions.
		Metrology procedure covering Station 2:
	stall MCHP fixtures and metrology equipment.	o o.o.g, p. ooo aa o oo oo g o aa o o
4.01 Ins	stali MCnP lixtures and metrology equipment.	
4.02 Pe	erform metrology set-up and checks	
4.02 Pe 5.00 Pro	erform metrology set-up and checks re-assemble A-A	THIS STEP HAS BEEN ELIMINATED
4.02 Pe 5.00 Pro	erform metrology set-up and checks re-assemble A-A -B modular coil assembly	See MCHP component designation in Table 1 of this document.
4.02 Pe 5.00 Pro	erform metrology set-up and checks re-assemble A-A -B modular coil assembly	See MCHP component designation in Table 1 of this document. MCHP Assembly Dimensional Control Plan: NCSX-PLAN-HPADC-00
4.02 Pe 5.00 Pr 6.00 A-I	erform metrology set-up and checks re-assemble A-A -B modular coil assembly	See MCHP component designation in Table 1 of this document. MCHP Assembly Dimensional Control Plan: NCSX-PLAN-HPADC-00 Reference Drawings: SE140-003 a
4.02 Pe 5.00 Pr 6.00 A-1 6.01 Fo	erform metrology set-up and checks re-assemble A-A -B modular coil assembly bllow the steps defined in Section 2 of the Metrology Plan for icking coils, lower the Type-A modular coil onto the jacks,	See MCHP component designation in Table 1 of this document. MCHP Assembly Dimensional Control Plan: NCSX-PLAN-HPADC-00 Reference Drawings: SE140-003 a The acceptance criterion is .005" RMS deviation in alignment to the set of tooling balls. With a successful alignment a set of global fiducial monuments will have
4.02 Pe 5.00 Pro 6.00 A-1 6.01 Fo rac "A"	erform metrology set-up and checks re-assemble A-A -B modular coil assembly bllow the steps defined in Section 2 of the Metrology Plan for cking coils, lower the Type-A modular coil onto the jacks, in flange (datum "D") down and rack the "A" coil into its	See MCHP component designation in Table 1 of this document. MCHP Assembly Dimensional Control Plan: NCSX-PLAN-HPADC-00 Reference Drawings: SE140-003 a The acceptance criterion is .005" RMS deviation in alignment to the set of tooling balls. With a successful alignment a set of global fiducial monuments will have been established. Subsequent alignments of the laser tracker will be to the global
6.01 Fo rac "A'	erform metrology set-up and checks re-assemble A-A -B modular coil assembly billow the steps defined in Section 2 of the Metrology Plan for cking coils, lower the Type-A modular coil onto the jacks, "flange (datum "D") down and rack the "A" coil into its oper shape.	See MCHP component designation in Table 1 of this document. MCHP Assembly Dimensional Control Plan: NCSX-PLAN-HPADC-00 Reference Drawings: SE140-003 a The acceptance criterion is .005" RMS deviation in alignment to the set of tooling balls. With a successful alignment a set of global fiducial monuments will have been established. Subsequent alignments of the laser tracker will be to the global monument
6.01 Fo rac "A"	erform metrology set-up and checks re-assemble A-A -B modular coil assembly collow the steps defined in Section 2 of the Metrology Plan for locking coils, lower the Type-A modular coil onto the jacks, "flange (datum "D") down and rack the "A" coil into its looper shape. sing the Type-A (B-flange) inboard shim template mark the	See MCHP component designation in Table 1 of this document. MCHP Assembly Dimensional Control Plan: NCSX-PLAN-HPADC-00 Reference Drawings: SE140-003 a The acceptance criterion is .005" RMS deviation in alignment to the set of tooling balls. With a successful alignment a set of global fiducial monuments will have been established. Subsequent alignments of the laser tracker will be to the global monument Use a thin equivalent washer of the puck diameter (or some other method) to
6.01 Fo rac "A" 6.02 Us no:	erform metrology set-up and checks re-assemble A-A -B modular coil assembly collow the steps defined in Section 2 of the Metrology Plan for icking coils, lower the Type-A modular coil onto the jacks, "flange (datum "D") down and rack the "A" coil into its oper shape. sing the Type-A (B-flange) inboard shim template mark the ose shim locations and puck locations. Remove the	See MCHP component designation in Table 1 of this document. MCHP Assembly Dimensional Control Plan: NCSX-PLAN-HPADC-00 Reference Drawings: SE140-003 a The acceptance criterion is .005" RMS deviation in alignment to the set of tooling balls. With a successful alignment a set of global fiducial monuments will have been established. Subsequent alignments of the laser tracker will be to the global monument Use a thin equivalent washer of the puck diameter (or some other method) to provide a positional "feel" to allow measuring puck height in the A -B installed
6.02 Pe 5.00 Pr 6.00 A-1 6.01 Fo rac "A" 6.02 Us no:	erform metrology set-up and checks re-assemble A-A -B modular coil assembly collow the steps defined in Section 2 of the Metrology Plan for acking coils, lower the Type-A modular coil onto the jacks, or flange (datum "D") down and rack the "A" coil into its coper shape. sing the Type-A (B-flange) inboard shim template mark the access shim locations and puck locations. Remove the implate.	See MCHP component designation in Table 1 of this document. MCHP Assembly Dimensional Control Plan: NCSX-PLAN-HPADC-00 Reference Drawings: SE140-003 a The acceptance criterion is .005" RMS deviation in alignment to the set of tooling balls. With a successful alignment a set of global fiducial monuments will have been established. Subsequent alignments of the laser tracker will be to the global monument Use a thin equivalent washer of the puck diameter (or some other method) to provide a positional "feel" to allow measuring puck height in the A -B installed position.
6.01 Fo rac "A" 6.02 Us no: ten 6.03 Pla 6.04 Pla	erform metrology set-up and checks re-assemble A-A -B modular coil assembly collow the steps defined in Section 2 of the Metrology Plan for acking coils, lower the Type-A modular coil onto the jacks, and are the "A" coil into its accoper shape. sing the Type-A (B-flange) inboard shim template mark the cose shim locations and puck locations. Remove the mplate. lace an initial set of alumina shims (4-8) on the Type-A coil lace unfilled shim bags in the wing areas	See MCHP component designation in Table 1 of this document. MCHP Assembly Dimensional Control Plan: NCSX-PLAN-HPADC-00 Reference Drawings: SE140-003 a The acceptance criterion is .005" RMS deviation in alignment to the set of tooling balls. With a successful alignment a set of global fiducial monuments will have been established. Subsequent alignments of the laser tracker will be to the global monument Use a thin equivalent washer of the puck diameter (or some other method) to provide a positional "feel" to allow measuring puck height in the A -B installed
6.02 Pe 5.00 Pr 6.00 A-I 6.01 Fo rac "A" 6.02 Us no: ten 6.03 Pla 6.04 Pla 6.05 Lo	erform metrology set-up and checks re-assemble A-A -B modular coil assembly collow the steps defined in Section 2 of the Metrology Plan for acking coils, lower the Type-A modular coil onto the jacks, respectively for the first state of th	See MCHP component designation in Table 1 of this document. MCHP Assembly Dimensional Control Plan: NCSX-PLAN-HPADC-00 Reference Drawings: SE140-003 a The acceptance criterion is .005" RMS deviation in alignment to the set of tooling balls. With a successful alignment a set of global fiducial monuments will have been established. Subsequent alignments of the laser tracker will be to the global monument Use a thin equivalent washer of the puck diameter (or some other method) to provide a positional "feel" to allow measuring puck height in the A -B installed position.
6.01 Fo rac "A" 6.02 Us no: ten 6.03 Pla 6.04 Pla 6.05 Lo 6.06 Ins	erform metrology set-up and checks re-assemble A-A -B modular coil assembly collow the steps defined in Section 2 of the Metrology Plan for acking coils, lower the Type-A modular coil onto the jacks, reper shape. sing the Type-A (B-flange) inboard shim template mark the cose shim locations and puck locations. Remove the mplate. lace an initial set of alumina shims (4-8) on the Type-A coil lace unfilled shim bags in the wing areas over the mating "B" coil into position. stall the jack screws and dial indicators for horizontal	See MCHP component designation in Table 1 of this document. MCHP Assembly Dimensional Control Plan: NCSX-PLAN-HPADC-00 Reference Drawings: SE140-003 a The acceptance criterion is .005" RMS deviation in alignment to the set of tooling balls. With a successful alignment a set of global fiducial monuments will have been established. Subsequent alignments of the laser tracker will be to the global monument Use a thin equivalent washer of the puck diameter (or some other method) to provide a positional "feel" to allow measuring puck height in the A -B installed position.
6.01 Fo rac "A" 6.02 Us no: ten 6.03 Pla 6.04 Pla 6.05 Lo 6.06 Ins	erform metrology set-up and checks re-assemble A-A -B modular coil assembly collow the steps defined in Section 2 of the Metrology Plan for acking coils, lower the Type-A modular coil onto the jacks, reper shape. sing the Type-A (B-flange) inboard shim template mark the ose shim locations and puck locations. Remove the mplate. lace an initial set of alumina shims (4-8) on the Type-A coil lace unfilled shim bags in the wing areas ower the mating "B" coil into position. stall the jack screws and dial indicators for horizontal ositioning.	See MCHP component designation in Table 1 of this document. MCHP Assembly Dimensional Control Plan: NCSX-PLAN-HPADC-00 Reference Drawings: SE140-003 a The acceptance criterion is .005" RMS deviation in alignment to the set of tooling balls. With a successful alignment a set of global fiducial monuments will have been established. Subsequent alignments of the laser tracker will be to the global monument Use a thin equivalent washer of the puck diameter (or some other method) to provide a positional "feel" to allow measuring puck height in the A -B installed position.
6.02 Pe 5.00 Pr 6.00 A-I 6.01 Fo rac "A" 6.02 Us no: ter 6.03 Pla 6.04 Pla 6.05 Lo 6.06 Ins po: 6.07 Us	erform metrology set-up and checks re-assemble A-A -B modular coil assembly collow the steps defined in Section 2 of the Metrology Plan for acking coils, lower the Type-A modular coil onto the jacks, respectively for the following the Type-A (B-flange) inboard shim template mark the cose shim locations and puck locations. Remove the miplate. lace an initial set of alumina shims (4-8) on the Type-A coil lace unfilled shim bags in the wing areas over the mating "B" coil into position. stall the jack screws and dial indicators for horizontal ositioning. sing three selected monuments on the "B" coil, position the	See MCHP component designation in Table 1 of this document. MCHP Assembly Dimensional Control Plan: NCSX-PLAN-HPADC-00 Reference Drawings: SE140-003 a The acceptance criterion is .005" RMS deviation in alignment to the set of tooling balls. With a successful alignment a set of global fiducial monuments will have been established. Subsequent alignments of the laser tracker will be to the global monument Use a thin equivalent washer of the puck diameter (or some other method) to provide a positional "feel" to allow measuring puck height in the A -B installed position.
6.02 Pe 5.00 Pr 6.00 A-I 6.01 Fo rac "A" 6.02 Us ten 6.03 Pla 6.04 Pla 6.05 Lo 6.06 Ins po 6.07 Us coi	erform metrology set-up and checks re-assemble A-A -B modular coil assembly collow the steps defined in Section 2 of the Metrology Plan for acking coils, lower the Type-A modular coil onto the jacks, reper shape. sing the Type-A (B-flange) inboard shim template mark the cose shim locations and puck locations. Remove the mplate. lace an initial set of alumina shims (4-8) on the Type-A coil lace unfilled shim bags in the wing areas cover the mating "B" coil into position. stall the jack screws and dial indicators for horizontal ositioning. sing three selected monuments on the "B" coil, position the bil within ±.002" normal to the mating flanges and within	See MCHP component designation in Table 1 of this document. MCHP Assembly Dimensional Control Plan: NCSX-PLAN-HPADC-00 Reference Drawings: SE140-003 a The acceptance criterion is .005" RMS deviation in alignment to the set of tooling balls. With a successful alignment a set of global fiducial monuments will have been established. Subsequent alignments of the laser tracker will be to the global monument Use a thin equivalent washer of the puck diameter (or some other method) to provide a positional "feel" to allow measuring puck height in the A -B installed position.
6.01 Fo rac "A" 6.02 Us no: ten 6.03 Pla 6.04 Pla 6.05 Lo: 6.06 Ins po: 6.07 Us coi ±.0	erform metrology set-up and checks re-assemble A-A -B modular coil assembly collow the steps defined in Section 2 of the Metrology Plan for taking coils, lower the Type-A modular coil onto the jacks, in flange (datum "D") down and rack the "A" coil into its coper shape. sing the Type-A (B-flange) inboard shim template mark the cose shim locations and puck locations. Remove the implate. lace an initial set of alumina shims (4-8) on the Type-A coil lace an initial set of alumina shims (4-8) on the Type-A coil lace unfilled shim bags in the wing areas over the mating "B" coil into position. stall the jack screws and dial indicators for horizontal ositioning. sing three selected monuments on the "B" coil, position the bil within ±.002" normal to the mating flanges and within 060" horizontally.	See MCHP component designation in Table 1 of this document. MCHP Assembly Dimensional Control Plan: NCSX-PLAN-HPADC-00 Reference Drawings: SE140-003 a The acceptance criterion is .005" RMS deviation in alignment to the set of tooling balls. With a successful alignment a set of global fiducial monuments will have been established. Subsequent alignments of the laser tracker will be to the global monument Use a thin equivalent washer of the puck diameter (or some other method) to provide a positional "feel" to allow measuring puck height in the A -B installed position.
6.01 Fo 6.02 Us 6.03 Pla 6.04 Pla 6.05 Lor 6.06 Ins 6.07 Us 6.07 Us 6.08 Ins	erform metrology set-up and checks re-assemble A-A -B modular coil assembly collow the steps defined in Section 2 of the Metrology Plan for acking coils, lower the Type-A modular coil onto the jacks, reper shape. sing the Type-A (B-flange) inboard shim template mark the cose shim locations and puck locations. Remove the mplate. lace an initial set of alumina shims (4-8) on the Type-A coil lace unfilled shim bags in the wing areas cover the mating "B" coil into position. stall the jack screws and dial indicators for horizontal ositioning. sing three selected monuments on the "B" coil, position the bil within ±.002" normal to the mating flanges and within	See MCHP component designation in Table 1 of this document. MCHP Assembly Dimensional Control Plan: NCSX-PLAN-HPADC-00 Reference Drawings: SE140-003 a The acceptance criterion is .005" RMS deviation in alignment to the set of tooling balls. With a successful alignment a set of global fiducial monuments will have been established. Subsequent alignments of the laser tracker will be to the global monument Use a thin equivalent washer of the puck diameter (or some other method) to provide a positional "feel" to allow measuring puck height in the A -B installed position.
6.02 Pe 6.01 Fo 6.02 Us 6.03 Pic 6.04 Pic 6.05 Lo 6.06 Ins 90 6.07 Us 6.08 Ins 90 6.09 Ma	erform metrology set-up and checks re-assemble A-A -B modular coil assembly collow the steps defined in Section 2 of the Metrology Plan for acking coils, lower the Type-A modular coil onto the jacks, in flange (datum "D") down and rack the "A" coil into its according to the Type-A (B-flange) inboard shim template mark the according to the Type-A (B-flange) inboard shim template mark the according to the Type-A (B-flange) inboard shim template mark the according to the Type-A coil according to the template. Idea an initial set of alumina shims (4-8) on the Type-A coil according "B" coil into position. In the pack screws and dial indicators for horizontal according three selected monuments on the "B" coil, position the coil within ±.002" normal to the mating flanges and within 060" horizontally. It is the remaining alumina coated shims; install studs, upernuts, and torque to 50% of final value. In the remaining alumina coated shims; install studs, upernuts, and torque to 50% of final value.	See MCHP component designation in Table 1 of this document. MCHP Assembly Dimensional Control Plan: NCSX-PLAN-HPADC-00 Reference Drawings: SE140-003 a The acceptance criterion is .005" RMS deviation in alignment to the set of tooling balls. With a successful alignment a set of global fiducial monuments will have been established. Subsequent alignments of the laser tracker will be to the global monument Use a thin equivalent washer of the puck diameter (or some other method) to provide a positional "feel" to allow measuring puck height in the A -B installed position.
6.01 Fo 6.02 Us 6.03 Pic 6.04 Pic 6.05 Lo 6.06 Ins pos 6.07 Us coi 6.08 Ins sul 6.09 Ma	erform metrology set-up and checks re-assemble A-A -B modular coil assembly collow the steps defined in Section 2 of the Metrology Plan for acking coils, lower the Type-A modular coil onto the jacks, in flange (datum "D") down and rack the "A" coil into its roper shape. sing the Type-A (B-flange) inboard shim template mark the access shim locations and puck locations. Remove the implate. Idace an initial set of alumina shims (4-8) on the Type-A coil acce unfilled shim bags in the wing areas access the mating "B" coil into position. Istall the jack screws and dial indicators for horizontal accessioning. Istall the jack screws and dial indicators for horizontal access the selected monuments on the "B" coil, position the coil within ±.002" normal to the mating flanges and within 060" horizontally. Istall the remaining alumina coated shims; install studs, appernuts, and torque to 50% of final value. Is ake a hand "wiggle" test (rotate on bolt) on all shims to ake sure that they are tight. If a loose shim is found back off	See MCHP component designation in Table 1 of this document. MCHP Assembly Dimensional Control Plan: NCSX-PLAN-HPADC-00 Reference Drawings: SE140-003 a The acceptance criterion is .005" RMS deviation in alignment to the set of tooling balls. With a successful alignment a set of global fiducial monuments will have been established. Subsequent alignments of the laser tracker will be to the global monument Use a thin equivalent washer of the puck diameter (or some other method) to provide a positional "feel" to allow measuring puck height in the A -B installed position.
6.02 Pe 5.00 Pr 6.00 A-1 6.01 Fo rac "A" 6.02 Us 6.03 Pla 6.04 Pla 6.05 Lo 6.06 Ins poi 6.07 Us coi 6.08 Ins sul 6.09 Ma ma on	erform metrology set-up and checks re-assemble A-A -B modular coil assembly collow the steps defined in Section 2 of the Metrology Plan for acking coils, lower the Type-A modular coil onto the jacks, reflange (datum "D") down and rack the "A" coil into its roper shape. sing the Type-A (B-flange) inboard shim template mark the access shim locations and puck locations. Remove the emplate. Idace an initial set of alumina shims (4-8) on the Type-A coil acce unfilled shim bags in the wing areas access the mating "B" coil into position. Istall the jack screws and dial indicators for horizontal accessioning. Istall the jack screws and dial indicators for horizontal access the selected monuments on the "B" coil, position the coil within ±.002" normal to the mating flanges and within 060" horizontally. Istall the remaining alumina coated shims; install studs, upernuts, and torque to 50% of final value. Istall the access and torque to 50% of final value. Istall the remaining alumina coated shims in stole access the sure that they are tight. If a loose shim is found back off a sufficient adjacent bolts to allow a replacement shim to be	See MCHP component designation in Table 1 of this document. MCHP Assembly Dimensional Control Plan: NCSX-PLAN-HPADC-00 Reference Drawings: SE140-003 a The acceptance criterion is .005" RMS deviation in alignment to the set of tooling balls. With a successful alignment a set of global fiducial monuments will have been established. Subsequent alignments of the laser tracker will be to the global monument Use a thin equivalent washer of the puck diameter (or some other method) to provide a positional "feel" to allow measuring puck height in the A -B installed position.
6.02 Pe 5.00 Pr 6.00 A-1 6.01 Fo rac "A" 6.02 Us no: ten 6.03 Pla 6.04 Pla 6.05 Lo 6.06 Ins po: 6.07 Us coi 6.08 Ins sul 6.09 Ma ma on ins	erform metrology set-up and checks re-assemble A-A -B modular coil assembly collow the steps defined in Section 2 of the Metrology Plan for acking coils, lower the Type-A modular coil onto the jacks, in flange (datum "D") down and rack the "A" coil into its roper shape. sing the Type-A (B-flange) inboard shim template mark the asse shim locations and puck locations. Remove the implate. Idace an initial set of alumina shims (4-8) on the Type-A coil ace unfilled shim bags in the wing areas assement the mating "B" coil into position. stall the jack screws and dial indicators for horizontal assistioning. sing three selected monuments on the "B" coil, position the coil within ±.002" normal to the mating flanges and within 060" horizontally. stall the remaining alumina coated shims; install studs, upernuts, and torque to 50% of final value. ake a hand "wiggle" test (rotate on bolt) on all shims to ake sure that they are tight. If a loose shim is found back off a sufficient adjacent bolts to allow a replacement shim to be serted. Tighten bolt and recheck.	See MCHP component designation in Table 1 of this document. MCHP Assembly Dimensional Control Plan: NCSX-PLAN-HPADC-00 Reference Drawings: SE140-003 a The acceptance criterion is .005" RMS deviation in alignment to the set of tooling balls. With a successful alignment a set of global fiducial monuments will have been established. Subsequent alignments of the laser tracker will be to the global monument Use a thin equivalent washer of the puck diameter (or some other method) to provide a positional "feel" to allow measuring puck height in the A -B installed position. See document XXXX for shim size and location.
6.00 A-1 6.00 A-1 6.01 Fo rac "A" 6.02 Us 6.03 Pla 6.04 Pla 6.05 Lo 6.06 Ins 6.07 Us coi 6.08 Ins go 6.09 Ma ma on ins 6.10 Aft	erform metrology set-up and checks re-assemble A-A -B modular coil assembly collow the steps defined in Section 2 of the Metrology Plan for acking coils, lower the Type-A modular coil onto the jacks, in flange (datum "D") down and rack the "A" coil into its roper shape. sing the Type-A (B-flange) inboard shim template mark the asse shim locations and puck locations. Remove the implate. Idace an initial set of alumina shims (4-8) on the Type-A coil ace an initial set of alumina shims (4-8) on the Type-A coil ace unfilled shim bags in the wing areas ower the mating "B" coil into position. stall the jack screws and dial indicators for horizontal assitioning. sing three selected monuments on the "B" coil, position the boil within ±.002" normal to the mating flanges and within 060" horizontally. stall the remaining alumina coated shims; install studs, upernuts, and torque to 50% of final value. ake a hand "wiggle" test (rotate on bolt) on all shims to ake sure that they are tight. If a loose shim is found back off in sufficient adjacent bolts to allow a replacement shim to be serted. Tighten bolt and recheck.	See MCHP component designation in Table 1 of this document. MCHP Assembly Dimensional Control Plan: NCSX-PLAN-HPADC-00 Reference Drawings: SE140-003 a The acceptance criterion is .005" RMS deviation in alignment to the set of tooling balls. With a successful alignment a set of global fiducial monuments will have been established. Subsequent alignments of the laser tracker will be to the global monument Use a thin equivalent washer of the puck diameter (or some other method) to provide a positional "feel" to allow measuring puck height in the A -B installed position. See document XXXX for shim size and location. All monuments shall be within .007" (true distance) of their desired position. Adjust
6.02 Pe 6.01 Fo rac "A" 6.02 Us 6.03 Pia 6.04 Pia 6.05 Lo 6.06 Ins po: 6.07 Us coi ±.0 6.08 Ins sul 6.09 Ma ma on ins 6.10 Aft	erform metrology set-up and checks re-assemble A-A -B modular coil assembly collow the steps defined in Section 2 of the Metrology Plan for acking coils, lower the Type-A modular coil onto the jacks, in flange (datum "D") down and rack the "A" coil into its roper shape. sing the Type-A (B-flange) inboard shim template mark the asse shim locations and puck locations. Remove the implate. Indee an initial set of alumina shims (4-8) on the Type-A coil ace an initial set of alumina shims (4-8) on the Type-A coil ace unfilled shim bags in the wing areas as ower the mating "B" coil into position. It is the jack screws and dial indicators for horizontal assitioning. Is ing three selected monuments on the "B" coil, position the coil within ±.002" normal to the mating flanges and within 060" horizontally. It is the remaining alumina coated shims; install studs, upernuts, and torque to 50% of final value. In ake a hand "wiggle" test (rotate on bolt) on all shims to ake sure that they are tight. If a loose shim is found back off a sufficient adjacent bolts to allow a replacement shim to be serted. Tighten bolt and recheck. Iter tightening, measure the position of all monuments per e Dimensional Control Plan, following steps 2.3.3 through	See MCHP component designation in Table 1 of this document. MCHP Assembly Dimensional Control Plan: NCSX-PLAN-HPADC-00 Reference Drawings: SE140-003 a The acceptance criterion is .005" RMS deviation in alignment to the set of tooling balls. With a successful alignment a set of global fiducial monuments will have been established. Subsequent alignments of the laser tracker will be to the global monument Use a thin equivalent washer of the puck diameter (or some other method) to provide a positional "feel" to allow measuring puck height in the A -B installed position. See document XXXX for shim size and location.
6.02 Us 6.03 Pic 6.04 Pic 6.05 Lor 6.06 Ins 6.07 Us 6.07 Us 6.08 Ins sul 6.09 Ma ma on inst 6.10 Aft the	erform metrology set-up and checks re-assemble A-A -B modular coil assembly collow the steps defined in Section 2 of the Metrology Plan for acking coils, lower the Type-A modular coil onto the jacks, in flange (datum "D") down and rack the "A" coil into its roper shape. sing the Type-A (B-flange) inboard shim template mark the asse shim locations and puck locations. Remove the implate. Idace an initial set of alumina shims (4-8) on the Type-A coil ace an initial set of alumina shims (4-8) on the Type-A coil ace unfilled shim bags in the wing areas ower the mating "B" coil into position. stall the jack screws and dial indicators for horizontal assitioning. sing three selected monuments on the "B" coil, position the boil within ±.002" normal to the mating flanges and within 060" horizontally. stall the remaining alumina coated shims; install studs, upernuts, and torque to 50% of final value. ake a hand "wiggle" test (rotate on bolt) on all shims to ake sure that they are tight. If a loose shim is found back off in sufficient adjacent bolts to allow a replacement shim to be serted. Tighten bolt and recheck.	See MCHP component designation in Table 1 of this document. MCHP Assembly Dimensional Control Plan: NCSX-PLAN-HPADC-00 Reference Drawings: SE140-003 a The acceptance criterion is .005" RMS deviation in alignment to the set of tooling balls. With a successful alignment a set of global fiducial monuments will have been established. Subsequent alignments of the laser tracker will be to the global monument Use a thin equivalent washer of the puck diameter (or some other method) to provide a positional "feel" to allow measuring puck height in the A -B installed position. See document XXXX for shim size and location. All monuments shall be within .007" (true distance) of their desired position. Adjust
6.02 Us 6.03 Pic 6.04 Pic 6.05 Lor 6.06 Ins 6.07 Us 6.08 Ins sul 6.09 Ma 6.09 Ma 6.10 Aft the 6.11 Me the	erform metrology set-up and checks re-assemble A-A -B modular coil assembly collow the steps defined in Section 2 of the Metrology Plan for taking coils, lower the Type-A modular coil onto the jacks, in flange (datum "D") down and rack the "A" coil into its oper shape. Sing the Type-A (B-flange) inboard shim template mark the ose shim locations and puck locations. Remove the implate. Independent of alumina shims (4-8) on the Type-A coil lace unfilled shim bags in the wing areas ower the mating "B" coil into position. Stall the jack screws and dial indicators for horizontal ositioning. Sing three selected monuments on the "B" coil, position the oil within ±.002" normal to the mating flanges and within 060" horizontally. Stall the remaining alumina coated shims; install studs, upernuts, and torque to 50% of final value. Aske a hand "wiggle" test (rotate on bolt) on all shims to ake sure that they are tight. If a loose shim is found back off in sufficient adjacent bolts to allow a replacement shim to be serted. Tighten bolt and recheck. Ifter tightening, measure the position of all monuments per e Dimensional Control Plan, following steps 2.3.3 through 3.7.	See MCHP component designation in Table 1 of this document. MCHP Assembly Dimensional Control Plan: NCSX-PLAN-HPADC-00 Reference Drawings: SE140-003 a The acceptance criterion is .005" RMS deviation in alignment to the set of tooling balls. With a successful alignment a set of global fiducial monuments will have been established. Subsequent alignments of the laser tracker will be to the global monument Use a thin equivalent washer of the puck diameter (or some other method) to provide a positional "feel" to allow measuring puck height in the A -B installed position. See document XXXX for shim size and location. All monuments shall be within .007" (true distance) of their desired position. Adjust

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	Station 2 - 1st Article (Hair Period Assembly)	See last page for Rev changes
NO.	ASSEMBLY STEP	COMMENTS
6.12	Unfasten bolts and raise the "B" coil in height to remove the	
	puck locating rings and install all nose shims with the properly	
	sized pucks. Use temporary shims to support the Type-B flex	
	shims.	
6.13	"Lightly" tack weld the nose flex shims to the perspective "A"	
	and "B" coils.	
6.14	Unfasten all bolts and remove the "B" coil and place it on a	
0	separate fixture, with the Type-B coil side "A" flange (datum	
	•	
	"D") facing up.	
6.15	Recheck the part alignment of the "A" coil to make sure it is	
	still within alignment and then weld all Type-A flex shims to the	
	plasma side, following the weld sequence plan.	
6.16	After welding the "A" coil nose shims recheck alignment to	The acceptance criterion is OOF" DMC deviction in alignment to the cot of tooling
0.10		The acceptance criterion is .005" RMS deviation in alignment to the set of tooling
	determine if the part still meets the metrology acceptance	balls.
	criterion.	
6.17	Time needs to be allocated for a back office assessment of	If Control Plan acceptance criterion is not met project input is needed to determine
	the part after welding.	how to proceed.
6 1 8	On the separate fixture measure the "B" fiducials to establish	now to proceed.
	•	
	a reference coordinate system prior to welding the "B" coil	
1	nose shims.	
6.19	With the successful "A" coil weld operation, weld all Type-B (A	
	flange) flex shims to the plasma side, following the weld	
	sequence plan.	
6 20	After welding the "B" coil nose shims recheck the part to	Align to measurements of 6.18. Acceptance criterion is RMS .le004". Project
0.20		
		input is required in the event of failure.
6.21	Time needs to be allocated for a back office assessment of	If Control Plan acceptance criterion is not met project input is needed to determine
	the part after welding.	how to proceed.
6.22	Remove alumina shims as necessary except for the (4-8)	
_	initial locating shims on the Type-A coil in designated	
	locations for the initial alignment of the mating coil.	
0.00		
	Lower the mating "B" coil into position.	
6.24	Using three selected monuments on the "B" coil, position the	An accuracy of ±.002" or better in each direction is expected and required for this
	coil accurately in the horizontal plane.	step.
	Raise the "B" coil slightly and install the remaining alumina	
0.23		
	coated shims; install Fuji paper on all outboard shims, install	
	studs, supernuts, and torque to 50% of final value.	
6.26	Make a hand "wiggle" test (rotate on bolt) on all shims to	
	make sure that they are tight. If a loose shim is found back off	
	on sufficient adjacent bolts to allow a replacement shim to be	
	inserted. Tighten bolt and recheck.	
6.27	After tightening, measure the position of all monuments per	All monuments should be within .007" (true distance) of their desired position.
	the Dimensional Control Plan, following steps 2.3.3 through	
	2.3.7.	
6.28	Unfasten the bolts, lift the "B" coil enough to remove the Fuji	
	paper, and examine the load sharing. At the same time, the	
	"back office" will analyze the measurements of the monument	
	positions. A revised set of shim thicknesses, to provide	
	adequate load s	
6.20		
0.29	If a revised set of shims is required, install the new shims and	
	Fuji paper. Lower and reposition the "B" coil. Repeat steps	
	4.26 thru 4.28.	
6.30	With a successful Fuji load pattern, unfasten the bolts, lift the	Send the Fuji paper test shims out to be cleaned.
	"B" coil enough to remove the Fuji paper and initial shims.	
1	Install an equivalent set of alumina coated shims without Fuji	
1		
	paper, install studs, supernuts, and torque to 50% of final	
1	value. Recheck alignment.	
6.31	If the above step does not fall within .007" or less then loosen	All monuments shall be within .007" (true distance) of their desired position. Adjust
1	all studs, adjust shims locally. Re-torque all studs to 50%.	shims until this criterion is met.
1	2, 2, 2 2	
6 22	One hale at a time remove the superput. Using the acceptus	This appraisances he done consurrently at different leastions if in as dains the
0.32	•	This operation can be done concurrently at different locations if in so doing the
	gage slid onto the stud define the hole eccentricity. Select	part does not move.
	bushing and machine to match required eccentricity. Install	
	bushing. Replace nut and tighten back to 50% and recheck	
	alignment.	
6 22		All manuments shall be within 007" (true distance) of their desired nestrices
	After super bolt tightening, measure the position of all	All monuments shall be within .007" (true distance) of their desired position.
1	monuments per the Dimensional Control Plan, following steps	
1	2.3.3 through 2.3.7.	

	Station 2 - 1st Article (Half Period Assembly)	See last page for Rev changes
NO.	ASSEMBLY STEP	COMMENTS
6.34	Install wing support hardware	Assume three welded chair supports with nut-plates on each wing
	Load the wing support hardware to pre-weld condition.	
6.36	Tighten all bolts to their final torque.	
	After tightening hardware, measure the position of all	All monuments shall be within .010" (true distance) of their theoretical position.
	monuments per the Dimensional Control Plan, following steps	
	2.3.3 through 2.3.7.	
6.38	Weld the A / B nose region solenoid side following the weld	
	procedure.	
	Measure the positions of all monuments per the process	All monuments shall be within .015" (true distance) of their desired position.
0.55	defined in the Metrology Plan, steps 2.3.3 through 2.3.7.	All mondments shall be within .010 (true distance) of their desired position.
6.40	Review the above results with Back Office. Adjust wing	
	,	
	supports if needed to meet alignment requirements	
	Identify, if possible, a set of monuments that have moved less	
	than .005" from their original positions. The alignment that will	
	be necessary for mating to the "C" coil will use monuments	
	from among this set.	
	Fill all lose bushings with Stycast 2850FT	
6.43	Scan the "B" flange (datum "E") of the "B" coil, for the purpose	
	of defining the shim thickness for the mating to the "C" coil.	
	Save the measurement file and back it up.	
6.44	Using the "B" flange (datum "E") measurement of the Type-B	
	coil and the earlier "A" flange (datum "E") measurement of the	the scanned flange surface data.
	Type-C coil, define all B/C flange shim thickness.	
6.45	Compress alumina coated shims and sort by thickness the	Care must be taken when handling alumina shims to mitigate any possible surface
	shim set that will be installed on the B/C interface.	contamination conditions.
7.00	(A-B) to C modular coil assembly (MCHP)	See MCHP component designation in Table 1 of this document.
	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	MCHP Assembly Dimensional Control Plan: NCSX-PLAN-HPADC-00
		Reference Drawings: SE140-003 a
7.01	Bolt the "A" coil to its fixture and lift the (A-B) coil, along with	
7.01	the fixture, onto another wedge with its top surface tilted at 20	
	degrees from horizontal. Bolt the fixtures together.	
7.02	Select a subset of monuments identified in step 4.38 that will	
	be used for the initial alignment in this next phase of half	
7.03	Align to the set of monuments selected in 5.02. Acceptance	
7.04	criterion is .005" RMS deviation.	
	Establish a set of global monuments, including three positions	
	on the fixture and five on the building.	
7.05	Using the Type-B (B-flange) inboard shim template mark the	Use a thin equivalent washer of the puck diameter (or some other method) to
	nose shim locations and puck locations. Remove the	provide a positional "feel" to allow measuring puck height in the A -B installed
	template.	position.
7.06	Place an initial set of alumina shims (4-8) on the Type-B coil	See document XXXX for shim size and location.
	in designated locations for the initial alignment of the mating	
	coil.	
7.07	Place unfilled shim bags in the wing areas	
	Lower the mating "C" coil into position.	
	Install the jack screws and dial indicators for horizontal	
1.09	positioning.	
7 10	Using three selected monuments on the "C" coil, position the	An accuracy of .002" is expected and required.
10	coil accurately in the Z-direction and within .002" in the X - Y	7 th according of 1002 to expected and required.
	plane.	
7 1 1	Install the remaining alumina coated shims; install studs,	
	supernuts, and torque to 50% of final value.	
	Make a hand "wiggle" test (rotate on bolt) on all shims to	
	make sure that they are tight. If a loose shim is found back off	
1	, ,	
	on sufficient adjacent bolts to allow a replacement shim to be	
7.40	inserted. Tighten bolt and recheck.	All manufacto shall be within 045" (true distance) of their desired as a title. Addition
	After tightening, measure the position of all monuments per	All monuments shall be within .015" (true distance) of their desired position. Adjust
	the Dimensional Control Plan, following steps 2.3.3 through	shims until this criterion is met.
	2.3.7.	
	Measure the shim puck height (at a number of points around	
1	the puck surface) at each of the nose shim puck locations. Use the data to define each puck height.	
		1

	Station 2 - 1st Article (Half Period Assembly)	See last page for Rev changes
NO.	ASSEMBLY STEP	COMMENTS
7.15	Unfasten bolts and raise the "C" coil in height to remove the	
	puck locating rings and install all nose shims with the properly	
	sized pucks. Use temporary shims to support the Type-C flex	
7.16	shims.	
7.16	"Lightly" tack weld the nose flex shims to the perspective "B" and "C" coils.	
7.17	Unfasten all bolts and remove the "C" coil and place it on a	
7,	separate fixture, with the Type-C coil side "A" flange (datum	
	"D") facing up.	
7.18	Recheck the part alignment of the "A / B" coil to make sure it	RMS deviation .005" or less is the acceptance criterion. Consult Dimensional
	is still within alignment and then weld all Type-B flex shims to	Control if this criterion is not met.
	the plasma side, following the weld sequence plan.	
7.19	After welding the "B" coil nose shims recheck alignment to	RMS deviation .005" or less is the acceptance criterion. Consult Dimensional
	determine if the part still meets the metrology acceptance	Control if this criterion is not met.
7.00	criterion.	If Control Dian accordance evitarion is not made was investigated in accordant to determine
	Time needs to be allocated for a back office assessment of the part after welding.	If Control Plan acceptance criterion is not met project input is needed to determine how to proceed.
	On the separate fixture measure the "C" fiducials to establish	Inow to proceed.
	a reference coordinate system prior to welding the "C" coil	
	nose shims.	
7.22	With the successful "A / B" coil weld operation, weld all Type-	
	C (A-flange) flex shims to the plasma side, following the weld	
	sequence plan.	
7.23	After welding the "C" coil nose shims recheck the part to	RMS deviation .004" or less is the acceptance criterion. Consult Dimensional
	determine if it still meets the metrology acceptance criterion.	Control if this criterion is not met.
7.04	T	100 - 151
7.24	Time needs to be allocated for a back office assessment of the part after welding.	If Control Plan acceptance criterion is not met project input is needed to determine how to proceed.
7.05	Remove alumina shims as necessary except for the (4-8)	now to proceed.
	initial locating shims on the Type-B coil in designated	
	locations for the initial alignment of the mating coil.	
	Lower the mating "C" coil into position.	
7.27	Using three selected monuments on the "C" coil, position the	An accuracy of .002" or better is expected and required for this step.
	coil accurately in the X -Y plane.	
7.28	Raise the "C" coil slightly and install the remaining alumina	
	coated shims; install Fuji paper on all outboard shims, install	
	studs, supernuts, and torque to 50% of final value.	
7.29	Make a hand "wiggle" test (rotate on bolt) on all shims to	
	make sure that they are tight. If a loose shim is found back of	
	on sufficient adjacent bolts to allow a replacement shim to be inserted. Tighten bolt and recheck.	
	After tightening, measure the position of all monuments per	All monuments shall be within .015" (true distance) of their desired position.
	the Dimensional Control Plan, following steps 2.3.3 through	The monaments shall be within 1.0 to (the distance) of their desired position.
	2.3.7.	
7.31	Unfasten the bolts, lift the "C" coil enough to remove the Fuji	
	paper, and examine the load sharing. At the same time, the	
	"back office" will analyze the measurements of the monument	
	positions. A revised set of shim thicknesses, to provide	
	adequate load sharing and dimensional accuracy, will be	
	generated if required.	
7.32	If a revised set of shims is required, install the new shims and	
	Fuji paper. Lower and reposition the "C" coil. Repeat steps 7.29 thru 7.31.	
7 33	With a successful Fuji load pattern, unfasten the bolts, lift the	Send the Fuji paper test shims out to be cleaned.
7.55	"C" coil enough to remove the Fuji paper and initial shims.	dend the ruji paper test shims out to be cleaned.
	Install an equivalent set of alumina coated shims without Fuji	
	paper, install studs, supernuts, and torque to 50% of final	
	value. Recheck alignment.	
7.34	If the above step does not fall within .015" or less then loosen	Repeat until the desired tolerance is met.
	all studs, adjust shims locally. Re-torque all studs to 50%.	
7.6-		
7.35	One hole at a time, remove the supernut. Using the eccentric	
	gage slid onto the stud define the hole eccentricity. Select	part does not move.
	bushing and machine to match required eccentricity. Install bushing. Replace nut and tighten back to 50% and recheck	
	alignment.	
ı l		<u> </u>

NO.		See last page for Rev changes
	ASSEMBLY STEP	COMMENTS
7.36	After super bolt tightening (50 % value), measure the position	All monuments shall be within .015" (true distance) of their desired position.
	of all monuments per the Dimensional Control Plan, following	
	steps 2.3.3 through 2.3.7.	
7.37	Install wing support hardware	Assume three welded chair supports with nut-plates on each wing
	Load support hardware to pre-weld condition.	
	Tighten all bolts to their final torque.	
	After tightening hardware, measure the position of all	All monuments shall be within .017" (true distance) of their desired position.
	monuments per the Dimensional Control Plan, following steps	
	2.3.3 through 2.3.7.	
7.41	Weld the B / C nose region solenoid side following the weld	
1	procedure.	
7.42	Measure the positions of all monuments per the process	All monuments shall be within .020" (true distance) of their desired position.
	defined in the Metrology Plan, steps 2.3.3 through 2.3.7.	
	Back office of above results and adjust wing supports if	
	needed to meet alignment requirements	
	Fill all lose bushings with Stycast 2850FT	
	Inflate all wing shim bags	CHANGED FROM TACK WELD INBD WELDED SHIMS
	Fill all wing bladders and cure	
	Install trim coil	MOVED TO STATION 5
	Complete local service and interface details	
	Install all wing support bladders between wing surfaces (A/B,	This work is now done earlier in the Station 2
	B/C) and on the C wing (MCHP - Right Side only)	
10.02	Make local service runs/connections on the shell of each MC.	Jim Chrzanowski will make service connections across the poloidal breaks. All
1 4		remaining services will be done in Station 5.
	Inject sealant compound to fill in all shim spaces in order to	
	prevent VV/MC insulation from falling out.	
	Final measurements / transfer completed MCHP to	Reference drawing: xxxxxxx
	holding area	
	Using tension tester measure bolt length on all tension	
I	fasteners and record the results.	
11.02	Mark part for identification	Part identification should indicate the period and subparts (ex. MCHP - Left Side
		C1/B1/A!)
	Install base supports.	See figure 5 for base supports.
	Remove from stand and measure weight of completed	
I	assembly	
	Move to holding area.	1

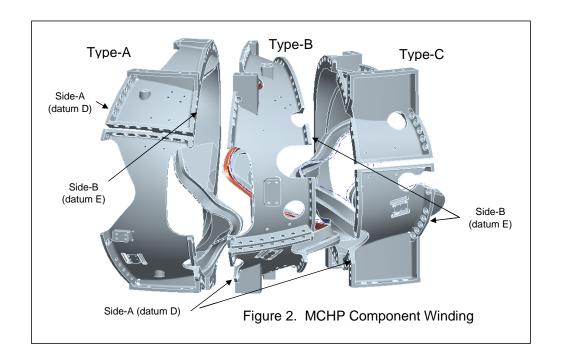
Table 1.0 Period Assembly Make-up

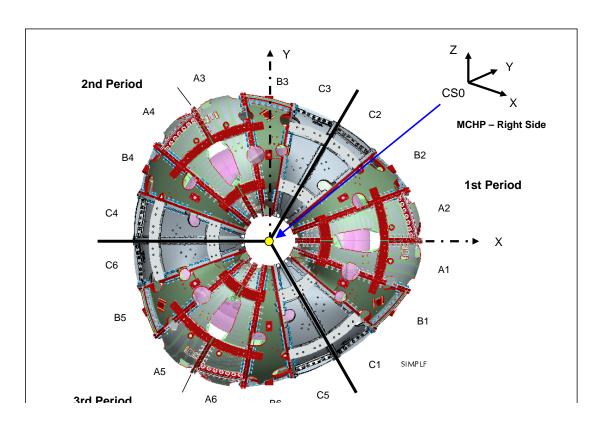
Period 1: MCHP – Left Side MCHP - Right Side C1 / B1 / A1 A2 / B2 / C2 Period 2: MCHP – Left Side MCHP - Right Side C3 / B3 / A3 A4 / B4 / C4

Period 3: MCHP – Left Side MCHP - Right Side

C6 / B5 / A5 A6/B6/C5

COMMENTS

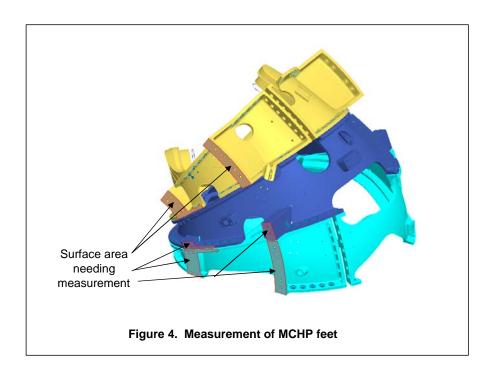


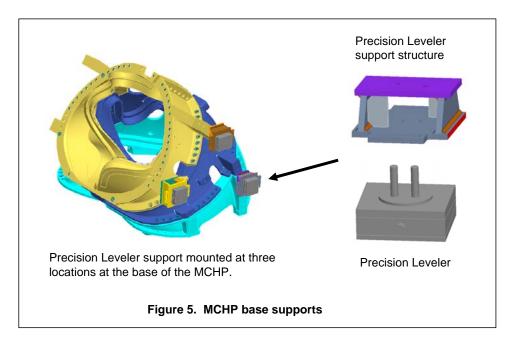


Station 2 - 1st Article (Half Period Assembly)

ASSEMBLY STEP NO. COMMENTS 3rd Period A6

Figure 3. MC arrangement for the full machine assembly





Change in 9.3

Station 2 - 1st Article (Half Period Assembly)

See last page for Rev changes

NO. ASSEMBLY STEP COMMENTS

1 Includes Bob Ellis's final dimensional control inputs (highlighted in red).

Change in Rev 9.2:

1 Revised Step 6.07 to relax X-Y positioning; eliminated Steps 6.34, 6.35, 7.37 and 7.38 all dealing with the wing supports.

Change in Rev 9.1:

1 Added Steps 6.40, 6.45 and 7.43

Change in Rev 9:

1 Updated sequence plan for Station 2 to meet final welded nose approach

Change in Rev 8:

1 Updated sequence plan for Station 2 to meet welded nose approach and following Dimensional Control Plan: NCSX-PLAN-HPADC-00-dC

Change in Rev 7:

1 Updated sequence plan per Ron's schedule: NCSX Prelimary CP Sched 20070531

Change from Rev 4:

- 1 Developed a Station 2 1st article sequence plan that includes the addition of metal shims and Fuji paper to use for shim qualification test.
- 2 Reintroduced the A A pre-fit up to establish a success oriented full period installation operation.
- 3 Added a shim sizing / preparation step
- 4 Developed a Station 2 Production article sequence plan that excludes Fuji paper and installs all alumina coated shims on the first pass.

Change from Rev 3:

- 1 The Pre-assemble A-A (old step 4.0) has been eliminated in favor of alignment of separate MCHP.
- 2 Fuji paper will no longer be included in the installation process although it may be used on the first MCHP article (separate plan).
- 3 Alumina coated shims with close tolerance bolt hole installed on first pass.
- 4 Assembly tolerance increase to .010" from .007" in (A-B) to C fit-up.

	Station 2 - Production Article (Half Period Assem	
NO.	ASSEMBLY STEP	COMMENTS
	MC fit-up pre-check and surface insulation	
1.01		The full assembly layout of the mating MC's can be found in Table 1 and Figure 3
		below. Some of this effort may be done before the half period assembly activity
	Type-C coil with its interfacing Period Type-C coil.	begins.
2.00	December of MOUD Town A. D. and O. and C. and C.	One MOUR annual designation in Table 4 of this decreased
	j	See MCHP component designation in Table 1 of this document.
	plus interfacing Type-A coil flange	MCHP Assembly Dimensional Control Plan: NCSX-PLAN-HPADC-00 The acceptance criterion is .005" RMS deviation in alignment to the set of tooling
2.01	racking coils and lower the Type-A modular coil onto the	balls. With a successful alignment a set of global fiducial monuments will have
	jacks, "A" flange (datum "D") down and rack the "A" coil into	been established. Subsequent alignments of the laser tracker will be to the global
	its proper shape.	monument
2 02	Scan the "B" flange (datum E) and the MC shell VV boss	monument
2.02	interface. Measure tooling balls	
2.03	Remove Type-A coil from stand and move to holding area.	
	Follow the steps defined in Section 2 of the Metrology Plan for	The acceptance criterion is .005" RMS deviation in alignment to the set of conical
	racking coils and lower the Type-B modular coil onto the	seats. With a successful alignment a set of global fiducial monuments will have
	jacks, "B" flange (datum "E") down and rack the "B" coil into	been established. Subsequent alignments of the laser tracker will be to the global
	its proper shape.	monument
2.05	Scan the "A" flange (datum D). Measure Tooling Balls	Flange measurement is needed for the A side (only) for the Type-B coil.
	Remove Type-B coil from stand and store coil.	
2.07	Follow the steps defined in Section 2 of the Metrology Plan for	
	racking coils and lower the Type-C modular coil onto the	seats. With a successful alignment a set of global fiducial monuments will have
	jacks, "B" flange (datum "E") down and rack the "C" coil into	been established. Subsequent alignments of the laser tracker will be to the global
	its proper shape.	monument
2.08	Scan the "A" flange (datum D). Measure tooling balls.	Flange measurement is needed for the A side (only) for the Type-C coil.
	Remove Type-C coil from stand and store coil.	Matural and muse and the province Station 2:
3.00	Shim sizing / preparations Using flange measurement of the coils, define the A/B shim	Metrology procedure covering Station 2:
3.01		This is a back office calculation where shim thickness is predetermined based on the scanned flange surface data.
3 03	thickness. Compress alumina coated shims and sort by thickness the	Care must be taken when handling alumina shims to mitigate any possible surface
3.02	shim set that will be installed on the MCHP.	contamination conditions.
4.00	Pre-Installation Station 2 set-up	Metrology procedure covering Station 2:
	Install MCHP fixtures and metrology equipment.	monoregy processing outlier =:
	Perform metrology set-up and checks	
	Pre-assemble A-A	THIS STEP HAS BEEN ELIMINATED
6.00	A-B modular coil assembly	See MCHP component designation in Table 1 of this document.
		MCHP Assembly Dimensional Control Plan: NCSX-PLAN-HPADC-00
1		Reference Drawings: SE140-003 a
6.01		The acceptance criterion is .005" RMS deviation in alignment to the set oftooling
6.01	racking coils, lower the Type-A modular coil onto the jacks,	The acceptance criterion is .005" RMS deviation in alignment to the set oftooling balls. With a successful alignment a set of global fiducial monuments will have
6.01	racking coils, lower the Type-A modular coil onto the jacks, "A" flange (datum "D") down and rack the "A" coil into its	The acceptance criterion is .005" RMS deviation in alignment to the set oftooling balls. With a successful alignment a set of global fiducial monuments will have been established. Subsequent alignments of the laser tracker will be to the global
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6.02	racking coils, lower the Type-A modular coil onto the jacks, "A" flange (datum "D") down and rack the "A" coil into its proper shape. Using the Type-A (B-flange) inboard shim template mark the nose shim locations and puck locations. Remove the template.	The acceptance criterion is .005" RMS deviation in alignment to the set oftooling balls. With a successful alignment a set of global fiducial monuments will have been established. Subsequent alignments of the laser tracker will be to the global monument Use a thin equivalent washer of the puck diameter (or some other method) to provide a positional "feel" to allow measuring puck height in the A -B installed position.
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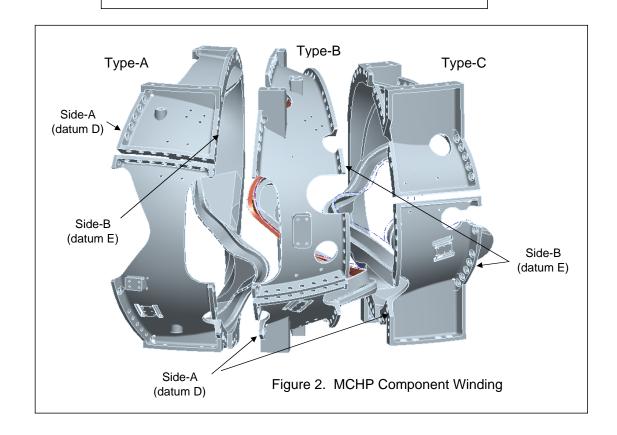
Moasure the shim puck height (at a number of points around the puck surface) at each of the nose shim puck locations. Use the data to define each puck height. 6.12 Unfasten bolts and raise the "B" coil in height to remove the puck locating rings and install all nose shims with the properly sized pucks. Use temporary shims to support the Type-B flex shims. 6.13 "Lightly" tack weld the nose flex shims to the perspective "A" and "B" coils. 6.14 Unfasten all bolts and remove the "B" coil and place it on a separate fixture, with the Type-B coil side "A" flange (datum)	COMMENTS
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· ·	
separate fixture, with the Type-B coil side "A" flange (datum	
"D") facing up.	
6.15 Recheck the part alignment of the "A" coil to make sure it is	
still within alignment and then weld all Type-A flex shims to the	
plasma side, following the weld sequence plan.	
	e criterion is .005" RMS deviation in alignment to the set of tooling
determine if the part still meets the metrology acceptance balls.	o official to 1000 Trivio deviation in angliment to the oot of teening
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criterion.	
	acceptance criterion is not met project input is needed to determine
the part after welding. how to procee	
6.18 On the separate fixture measure the "B" fiducials to establish	
a reference coordinate system prior to welding the "B" coil	
nose shims.	
6.19 With the successful "A" coil weld operation, weld all Type-B (A	
flange) flex shims to the plasma side, following the weld	
sequence plan.	
	rements of 4.18. The acceptance criterion is .004" RMS deviation in
	e set of tooling balls.
	acceptance criterion is not met project input is needed to determine
the part after welding. how to procee	<u> </u>
6.22 Remove alumina shims as necessary except for the (4-8)	
initial locating shims on the Type-A coil in designated	
locations for the initial alignment of the mating coil.	
6.23 Lower the mating "B" coil into position.	
	000" or bottor is expected and required for this stan
	.002" or better is expected and required for this step.
coil within ±.002" in the x, y, and z directions.	
6.25 Raise the "B" coil slightly and install the remaining alumina	
coated shims; install studs, supernuts, and torque to 50% of	
final value.	
6.26 Make a hand "wiggle" test (rotate on bolt) on all shims to	
make sure that they are tight. If a loose shim is found back off	
on sufficient adjacent bolts to allow a replacement shim to be	
inserted. Tighten bolt and recheck.	
	shall be within .007" (true distance) of their desired position.
S.E. Face agriceming, measure the position of all monuments per All monuments	onan so within .oor (true distance) of their desired position.
the Dimensional Control Plan, following stone 2.2.2 through	
the Dimensional Control Plan, following steps 2.3.3 through	
2.3.7	desired televines is uset
2.3.7. 6.28 If the above step does not fall within .007" or less then loosen Repeat until the	e desired tolerance is met.
2.3.7	e desired tolerance is met.
6.28 If the above step does not fall within .007" or less then loosen all studs, adjust shims locally. Re-torque all studs to 50%.	
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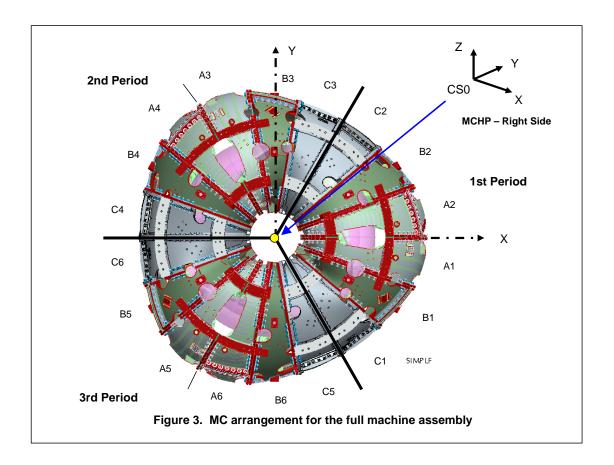
	Station 2 - Production Article (Half Period Assem	
NO.	ASSEMBLY STEP	COMMENTS
6.37	Back office of above results and adjust wing supports if	
	needed to meet alignment requirements	
	Identify, if possible, a set of monuments that have moved less	
	than .005" from their original positions. The alignment that will	
	be necessary for mating to the "C" coil will use monuments	
0.00	from among this set.	
6.39	Fill all lose bushings with Stycast 2850FT	
6.40	Scan the "B" flange (datum "E") of the "B" coil, for the purpose	
	of defining the shim thickness for the mating to the "C" coil.	
6 41	Save the measurement file and back it up.	This is a back office calculation where shim thickness is predetermined based on
0.41	coil and the earlier "A" flange (datum "E") measurement of the	
	Type-C coil, define all B/C flange shim thickness.	the scanned hange surface data.
6.42	Compress alumina coated shims and sort by thickness the	
	shim set that will be installed on the B/C interface.	
	(A-B) to C modular coil assembly (MCHP)	See MCHP component designation in Table 1 of this document.
		MCHP Assembly Dimensional Control Plan: NCSX-PLAN-HPADC-00
		Reference Drawings: SE140-003 a
7.01	Bolt the "A" coil to its fixture and lift the (A-B) coil, along with	
	the fixture, onto another wedge with its top surface tilted at 20	
	degrees from horizontal. Bolt the fixtures together.	
	Select a subset of monuments identified in step 4.38 that will	
1	be used for the initial alignment in this next phase of half	
	period assembly.	TI CONTROL OF THE CON
7.03	Align to the set of monuments selected in 5.02. Acceptance	The acceptance criterion is .005" RMS deviation in alignment to the set of tooling
7.04	criterion is .005" RMS deviation.	balls.
7.04	Establish a set of global monuments, including three positions on the fixture and five on the building.	
7.05	Using the Type-B (B-flange) inboard shim template mark the	Use a thin equivalent washer of the puck diameter (or some other method) to
7.03	nose shim locations and puck locations. Remove the	provide a positional "feel" to allow measuring puck height in the A -B installed
	template.	position.
7.06	Place an initial set of alumina shims (4-8) on the Type-B coil	See document XXXX for shim size and location.
	in designated locations for the initial alignment of the mating	0.20 4.00 4.00 4.00 6.00 6.00 6.00 6.00 6.0
	coil.	
7.07	Place unfilled shim bags in the wing areas	
7.08	Lower the mating "C" coil into position.	
	Install the jack screws and dial indicators for horizontal	
	positioning.	
7.10	Using three selected monuments on the "C" coil, position the	An accuracy of .002" is expected and required.
	coil within ±.002" normal to the plane of the mating flanges	
	and within ±.060" in the plane of the mating flanges.	
7.11	Install the remaining alumina coated shims; install studs,	
7.40	supernuts, and torque to 50% of final value.	
	Make a hand "wiggle" test (rotate on bolt) on all shims to	
	make sure that they are tight. If a loose shim is found back off on sufficient adjacent bolts to allow a replacement shim to be	
	inserted. Tighten bolt and recheck.	
7 13	After tightening, measure the position of all monuments per	All monuments shall be within .015" (true distance) of their desired position.
	the Dimensional Control Plan, following steps 2.3.3 through	the monanto shall be within to to the distance, of their desired position.
	2.3.7.	
	Measure the shim puck height (at a number of points around	
	the puck surface) at each of the nose shim puck locations.	
	Use the data to define each puck height.	
7.15	Unfasten bolts and raise the "C" coil in height to remove the	
	puck locating rings and install all nose shims with the properly	
	sized pucks. Use temporary shims to support the Type-C flex	
	shims.	
7.16	"Lightly" tack weld the nose flex shims to the perspective "B"	
	and "C" coils.	
7.17	Unfasten all bolts and remove the "C" coil and place it on a	
	separate fixture, with the Type-C coil side "A" flange (datum	
7.40	"D") facing up.	The accordance enterior is COST PMO 4 1 2 2 2 2 2 2 2 2 2 2 2
7.18	Recheck the part alignment of the "A / B" coil to make sure it	The acceptance criterion is .005" RMS deviation in alignment to the set of tooling
	is still within alignment and then weld all Type-B flex shims to	balls. Consult Dimensionl Control if this criterion is not met.
1	the plasma side, following the weld sequence plan.	

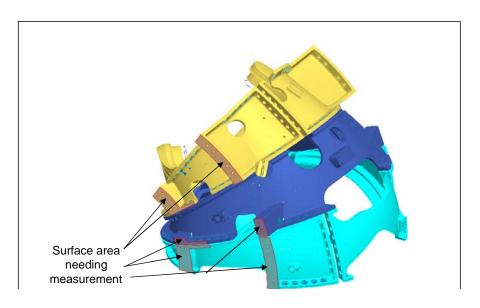
	Station 2 - Production Article (Half Period Assem	See last page for Rev changes
NO.	ASSEMBLY STEP	COMMENTS
	After welding the "B" coil nose shims recheck alignment to determine if the part still meets the metrology acceptance	The acceptance criterion is .005" RMS deviation in alignment to the set of tooling balls. Consult Dimensionl Control if this criterion is not met.
7.20	criterion. Time needs to be allocated for a back office assessment of	If Control Plan acceptance criterion is not met project input is needed to determine
	the part after welding.	how to proceed.
	On the separate fixture measure the "C" fiducials to establish a reference coordinate system prior to welding the "C" coil nose shims.	
7 22	With the successful "A / B" coil weld operation, weld all Type-	
1.22	C (A-flange) flex shims to the plasma side, following the weld sequence plan.	
7.23	After welding the "C" coil nose shims recheck the part to determine if it still meets the metrology acceptance criterion.	The acceptance criterion is .004" RMS deviation in alignment to the set of tooling balls. Consult Dimensionl Control if this criterion is not met.
7.24	Time needs to be allocated for a back office assessment of	If Control Plan acceptance criterion is not met project input is needed to determine
	the part after welding.	how to proceed.
	Remove alumina shims as necessary except for the (4-8)	
	initial locating shims on the Type-B coil in designated	
	locations for the initial alignment of the mating coil.	
	Lower the mating "C" coil into position.	
7.27	Using three selected monuments on the "B" coil, position the coil within ±.002" in the x, y, and z directions.	An accuracy of .002" or better is expected and required for this step.
7.28	Raise the "C" coil slightly and install the remaining alumina	
	coated shims; install studs, supernuts, and torque to 50% of final value.	
7.29	Make a hand "wiggle" test (rotate on bolt) on all shims to	
	make sure that they are tight. If a loose shim is found back off	
	on sufficient adjacent bolts to allow a replacement shim to be inserted. Tighten bolt and recheck.	
	After tightening, measure the position of all monuments per	All monuments shall be within .015" (true distance) of their desired position.
	the Dimensional Control Plan, following steps 2.3.3 through 2.3.7.	
7.31	If the above step does not fall within .015" or less then loosen all studs, adjust shims locally. Re-torque all studs to 50%.	Repeat until the desired tolerance is met.
	One hole at a time, remove the supernut. Using the eccentric gage slid onto the stud define the hole eccentricity. Select bushing and machine to match required eccentricity. Install bushing. Replace nut and tighten back to 50% and recheck alignment.	This operation can be done concurrently at different locations if in so doing the part does not move.
	After super bolt tightening, measure the position of all monuments per the Dimensional Control Plan, following steps	All monuments shall be within .015" (true distance) of their desired position.
	2.3.3 through 2.3.7.	
	Install wing support hardware	Assume three welded chair supports with nut-plates on each wing
7.35	Load support hardware to pre-weld condition.	
	Tighten all bolts to their final torque.	All manuments shall be within .017" (true distance) of their desired position
	After tightening hardware, measure the position of all monuments per the Dimensional Control Plan, following steps 2.3.3 through 2.3.7.	All monuments shall be within .017" (true distance) of their desired position.
	Weld the B / C nose region solenoid side following the weld procedure.	
7.39	Measure the positions of all monuments per the process defined in the Metrology Plan, steps 2.3.3 through 2.3.7.	All monuments shall be within .020" (true distance) of their desired position.
7.40	Back office of above results and adjust wing supports if needed to meet alignment requirements	
7.41	Fill all lose bushings with Stycast 2850FT	
8.00	Inflate all wing shim bags	CHANGED FROM TACK WELD INBD WELDED SHIMS
	Fill all wing bladders and cure	
9.00	Install trim coil	MOVED TO STATION 5
	Complete local service and interface details	
10.01	Install all wing support bladders between wing surfaces (A/B, B/C) and on the C wing (MCHP - Right Side only).	This work is now done earlier in the Station 2
10.02	Make local service runs/connections on the shell of each MC.	Jim Chrzanowski will make service connections across the poloidal breaks. All remaining services will be done in Station 5.
10.03	Inject sealant compound to fill in all shim spaces in order to prevent VV/MC insulation from falling out.	Tomaning Scretces will be done in Gration 3.

NO.	ASSEMBLY STEP	COMMENTS
11.00	Final measurements / transfer completed MCHP to	Reference drawing: xxxxxxx
	holding area	
11.01	Measure the tooling balls on all coils. Save the data file and	The maximum deviation from the "realigned" points should be .020" or less. If the
	back it up. Print reports of all alignments used, and	deviation is greater that .020", Project input is needed to determine how to
	nonconformance reports, and keep with run copies of the	proceed.
	assembly procedure.	
11.02	Install or identify three primary fiducials that will be used in	
	positioning the Period in Station 3.	
11.03	Scan the "B" flange of Type-C coil as well as the interfacing	
	base support feet (see Figure 4). Record the results.	
	Using tension tester measure bolt length on all tension	
	fasteners and record the results.	
11.05	Mark part for identification	Part identification should indicate the period and subparts (ex. MCHP - Left Side
		C1/B1/A!)
	Install base supports.	See figure 5 for base supports.
11.07	Remove from stand and measure weight of completed	
	assembly	
11.08	Move to holding area.	

Table 1.0 Period Assembly Make-up

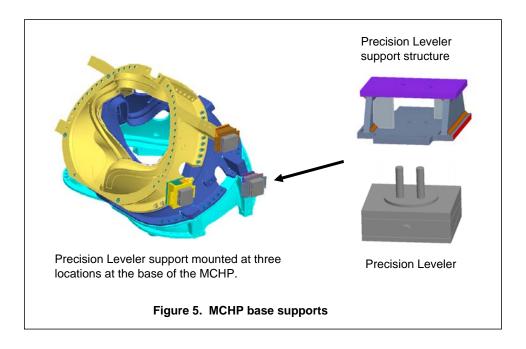






NO. ASSEMBLY STEP COMMENTS

Figure 4. Measurement of MCHP feet



Change in 9.3

1 Includes Bob Ellis's final dimensional control inputs (highlighted in red).

Change in Rev 9.2:

1 Revised Step 6.07 to relax X-Y positioning; eliminated Steps 6.31, 6.32, 7.34 and 7.35 all dealing with the wing supports.

Change in Rev 9.1:

1 Added Steps 6.37, 6.43 and 7.40

Change in Rev 9:

1 Updated sequence plan for Station 2 to meet final welded nose approach

Change in Rev 8:

1 Updated sequence plan for Station 2 to meet welded nose approach and following Dimensional Control Plan: NCSX-PLAN-HPADC-00-dC

Change in Rev 7:

1 Updated sequence plan per Ron's schedule: NCSX Prelimary CP Sched 20070531

Change from Rev 4:

- 1 Developed a Station 2 1st article sequence plan that includes the addition of metal shims and Fuji paper to use for shim qualification test.
- 2 Reintroduced the A A pre-fit up to establish a success oriented full period installation operation.
- 3 Added a shim sizing / preparation step
- 4 Developed a Station 2 Production article sequence plan that excludes Fuji paper and installs all alumina coated shims on the first pass.

Change from Rev 3:

- 1 The Pre-assemble A-A (old step 4.0) has been eliminated in favor of alignment of separate MCHP.
- 2 Fuji paper will no longer be included in the installation process although it may be used on the first MCHP article (separate plan).
- 3 Alumina coated shims with close tolerance bolt hole installed on first pass.
- 4 Assembly tolerance increase to .010" from .007" in (A-B) to C fit-up.