

MEMORANDUM

DATE: October 15, 2012

TO: ISC team
FROM: Daniel Sigg
SUBJECT: Modifications to the common mode boards
Refer to: LIGO- E1200907-v1

As a result of the one arm test a number of changes need to be propagated to all other ALS end station boards. The common mode boards are described in a [wiki](#). The modifications affect the transfer functions for the laser locking and the cavity locking. It adds low pass filtering to suppress PZT resonances and it fixes a gain in the slow controls readback. As a consequence the previously identical ALS boards are now split into two types: LL (laser locking) and ALS (cavity locking). The actual boards are [D040180-E](#).

ALS Laser Locking (LL type)

(S/N S1102631, S1102641, S1102636, S1102638, S1102640, S1102642, S1102639, S1102647, S1102644)

Change 1:

The fast monitor read back to the EtherCAT slow controls should change to be unity gain rather than 10.

R271 → 0 Ω

R272 → NL (not loaded)

Change 2:

The common generic filter is changed to a double pole 100kHz/Q=0.85. This is to suppress the PZT resonance around 250kHz-300kHz.

R129 → 2.67 kΩ

R130 → 1.30 kΩ

R131 → 0

R132 → 0

C207 → 1.5 nF

C206 → 470 pF

Change 3:

The common compensation was changed to a pole at 1.35 Hz and a zero at 4 kHz. The DC gain is still 40 dB, but the high frequency gain is now -30 dB.

R70 → 40.2 Ω

C121 → 1 μ F

Change 4:

An additional notch filter at the PZT resonance of the NPRO laser may be required. This resonance was found to be at 287.55 kHz for the laser used in the one arm test. It is expected that the other Prometheus laser will be very similar.

Fast option → Daughterboard “PZT Notch for Higher Frequencies”, D1201404
Tune notch to specific laser, if necessary.

ALS Cavity Locking (ALS type)

(S/N S1102630, S1102632, S1102635, S1102637, S1102645, S1102633, S1102643, S1102646, S1102634)

Change 5:

The fast monitor read back to the EtherCAT slow controls should change to be unity gain rather than 10.

R271 → 0 Ω

R272 → NL (not loaded)

Change 6A (S/N S1102637 only):

S/N S1102637 has been modified to account for the fact that the green cavity pole is expected to be around 600Hz for the one arm test (up from 200 Hz). Therefore, the common compensation was modified to be a 40Hz/600Hz pole/zero pair. This needs to be fully upgraded to 6B with the final ETM.

R68 → 3.60 k Ω

R70 → 4.53 k Ω

Change 6B:

The common compensation filter should to be a 40Hz/200Hz pole/zero pair.

R68 → 3.60 k Ω

R69 → 18.0 k Ω

R70 → 4.53 k Ω

C121 → 220 nF

Change 7:

The first boost filter was changed to a 100Hz/1kHz pole/zero pair, so it can be engaged.

C118 → 1 μ F

R77 → 165 Ω

IMC Cavity Locking (MC type)

(S/N S1102626, S1102628, S1102627, S1102629, S1102625)

Change 8:

The fast monitor read back to the EtherCAT slow controls should change to be unity gain rather than 10.

R271 → 0 Ω

R272 → NL (not loaded)

Interferometer Common Mode (CM type)

(S/N S1102621, S1102620, S1102622, S1102623, S1102624)

Change 9:

The fast monitor read back to the EtherCAT slow controls should change to be unity gain rather than 10.

R271 → 0 Ω

R272 → NL (not loaded)

BOM (for 3 ifo):

Qty	Item	Distributor	Description
26	541-0.0ACT-ND	Digi-Key	R271, 0
26			R272, NL
8	RR12Q40.2DCT-ND	Digi-Key	R70, 40.2 Ω
8	WA2A105F	RTI	C121, 1 μ F
8	RG20P2.7KBCT-ND	Digi-Key	R129, 2.70 k Ω
8	RG20P1.3KBCT-ND	Digi-Key	R130, 1.30 k Ω
8	541-0.0ACT-ND	Digi-Key	R131, 0
8	541-0.0ACT-ND	Digi-Key	R132, 0
8	81-GRM2165C1H152FA01	Mouser	C207, 1.5 nF
8	81-GRM215C1H471FA01D	Mouser	C206, 470 pF
9	P3.6KDACT-ND	Digi-Key	R68, 3.60 k Ω
8	P18KDACT-ND	Digi-Key	R69, 18.0 k Ω
9	P4.53KDACT-ND	Digi-Key	R70, 4.53 k Ω
8	WA2A224F	RTI	C121, 220 nF
8	P165DACT-ND	Digi-Key	R77, 165 Ω
8	WA2A105F	RTI	C118, 1 μ F
9	D1201404-v1	LIGO	Fast option daughterboard