HIRES Upgrade Installation Plan

1 Map old HIRES; initial set-up
   1.1 Record position of old dewar, measure distance between field flattener & camera mirror, note shims on hard pads
   1.2 Note & record settings of all (three) micrometer positioners: inspect micrometer belts
   1.3 Note configuration & attachment of darkslide
   1.4 Tag and label all wiring, conduits, & plumbing connected to footlocker & dewar
   1.5 Perform Optical Alignment Procedure Step 1
   1.6 Install cross disperser (XD) alignment telescope & perform Optical Alignment Procedure Step 2
   1.7 Install & position Hextek lasers, mirror assemblies & establish targets (see Optical Alignment Procedure Step 3)

2 Perform Optical Alignment Procedure Step 4

3 Remove Hextek mirror & insert Hextek (HT) alignment scope (see Optical Alignment Procedure Step 5)

4 Establish benchmark(s) on mirror mount, measure position of old dewar, note & record readings (see Optical Alignment Procedure Step 6)

5 Remove old dewar – Optical Alignment Procedure Step 7
   5.1 Disconnect LN2 auto fill line
   5.2 Disconnect LN2 vent line
   5.3 Disconnect ion pump

6 Perform Optical Alignment Procedure Step 8

7 Remove old footlocker
   7.1 Disconnect cooling lines
   7.2 Unplug connectors at interface plate
   7.3 Unplug fiber optics connections inside
   7.4 Unplug cables from electronics box
   7.5 **Disconnect and remove controller (EE folks)**
   7.6 **Disconnect and remove other electronics (EE folks)**

8 Remove fiber optic bulkhead fitting from footlocker

9 Reinstall Hextek and perform Optical Alignment Procedure Step 9

10 Remove Hextek mirror & install Hextek alignment telescope (see Optical Alignment Procedure Step 10)

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1 This plan refers to the Optical Alignment Sequence (OAS), make certain this procedure follows the steps outlined by the OAS
11 Confirm/establish alignment/optical path

12 Install new dewar – Optical Alignment Procedure Step 11
   12.1 Install LN2 overflow pan
   12.2 Attach LN2 auto fill line
   12.3 Attach LN2 vent line
   12.4 Connect ion pump

13 Align and adjust new dewar with alignment telescope; measure, note & record values to mirror mount benchmarks (see Optical Alignment Procedure Step 12)

14 Remove Hextek alignment scope & install Hextek mirror (Optical Alignment Procedure Step 13)

15 Perform additional alignments and adjustments as necessary

16 Remove cross disperser alignment scope

17 Install new footlocker
   17.1 Place and prepare unistrut
   17.2 Install footlocker frame (with heat-exchanger, plenum, & coolant lines)
   17.3 Install lower dewar side panel
   17.4 Assemble electronics box cable pipe
   17.5 Adjust and install lower panel; install drain hose
   17.6 Connect top panel and fiber optic bulkhead fitting
   17.7 Install controller (EE folks)
   17.8 Install auxiliary box; connect plenum to lower brace
   17.9 Complete fiber optic connections (EE folks)
   17.10 Connect ground wire circuitry (EE folks)
   17.11 Complete all connections between electronics box & footlocker (EE folks)
   17.12 Install remaining panels
   17.13 Connect coolant lines

18 Perform Optical Alignment Procedure Step 14

19 Modify darkslide

20 Seal, tape, & flock critical/reflective surfaces

21 Additional wiring and electrical connections

22 Perform Optical Alignment Procedure Steps 15, 16, & 17

23 Remove old field flattener from old dewar and pack in carrying case; to be sent out for further testing and inspection of Sol Gel coating

24 Perform Optical Alignment Procedure Step 18 - remove lasers, mirror assemblies, & targets as necessary. But if at all possible, leave these in place temporarily.

25 (After reviewing new photo inventory) take additional photos as necessary
Loose Ends & Questions

1 Metal blank or glass to replace window on old dewar?
2 Label/mark hard points if removal is necessary for modification/shimming
3 Square mirror on Z Gauge plate with center mark, cross hairs; 2" OD min.
4 Test lasers at 32 F
5 Check with Grant regarding:
   5.1 Available parking space within HIRES
   5.2 Dehumidifier
6 Fab spare Hextek wrench
7 Check alignment of alignment telescopes
8 Order Bimba cylinders
9 What to do with old cabling – leave rolled up near connectors?
Tool, Fixture, & Equipment List

1. Spare camera mirror mount & alignment telescope (aka HT scope) Shipped
2. Alignment scope for cross disperser alignment fixture & mirror (aka XD scope) Shipped
3. Micrometers, standard set [Jeff]
4. Z-Gauge brackets & plate (H-9575) [Terry]
5. Dewar face measurement/alignment fixture [Terry]
6. Hextek mirror/mount crane [Keck]
7. Unistrut [Jeff]
8. Shims for support collar hard pads [Jeff] – GFC to make drawing
9. Box for old field flattener – not needed at this time; window to remain on dewar for now
10. Hand winch [Jeff]
11. Assorted/standard tools, supplies [Jeff]
12. Fastener/hardware [Jeff]
13. Hardware for fiber optic conduit termination at footlocker – will use what on existing footlocker
14. Flocking [Jeff]
15. Tape [Jeff]
16. Tie wraps [Jeff]
17. Curtain clips/clamps [Jeff]
18. Digital camera – will take Canon from engineering [GFC]
19. Walkie-talkies; 7 (qty) needed [Ted]
20. Work plan [GFC]
21. Engineering notes [GFC]
22. Fittings assortment for coolant lines; nipples [Jeff]
23. Smart level [Jeff]
24. Vernstar lasers (3 qty, min.; better to take 6 or more) [Jeff]
25. HIRES photo album [GFC]
26. Jack’s tech report [GFC]
27. Darkslide components; spacers, new cone ring; 2” air cylinder (qty 2) [Jeff] – GFC to order (ordered 12/02/03)
28. Dehumidifier (if not available at Keck) – [GFC, Dave]
29. Poly filter masks [Jeff]
30. Tyvek suits & utility caps [Jeff]
31. Nitrile gloves [Jeff]
32 Clean room wipes [Jeff]
33 Head lamps (LED type) [Jeff]
34 Dial gages for Hextek adjustment screws [Jeff]
35 High quality graph paper, with high contrast lines and durable surface [GFC]
36 Set of colored pencils [GFC]
37 Hardboards (qty 3) with scribed axes for referencing graph paper [GFC/Jeff]
38 Extra diode lasers, mounts, small flat mirrors on adjustable mounts [Jeff]
Boxes, Crates, Items to Ship

1. *Spare camera mirror mount & alignment telescope* - shipped
2. *Cross disperser mirror & mount* - shipped
3. Dewar – crate W-08
4. Footlocker – custom built – will contain:
   4.1 CCD Controller
   4.2 Footlocker Interface Chassis
5. VME Crate
6. Miscellaneous equipment may ship with VME crate
Optical Alignment Procedure

Steve Vogt

Definitions:

XDAT  alignment telescope mounted on cross disperser stage
HTAT  alignment telescope mounted on spare Hextek mirror mount
  L1  front camera lens (bi-convex)
  L2  rear camera lens (meniscus)
  CM  camera mirror
OFF  old field flattener (on existing HIRES dewar at summit)
NFF  new field flattener
DM  dewar mirror - flat alignment mirror on front of new dewar
DLx DL1, DL2, DL3 diode lasers 1 thru 3 mounted on CM
Fx  F1-F3 – mirror flats that reflect DL1-DL3 to T1-T3
Tx  targets T1-T3 onto which reflected beams from DL1-DL3 land respectively
Nx  N1-N3 tip/tilt adjustment nuts on rear of CM (to be defined in CAD model)
  L  distance from CM to old field flattener (OFF)
  L’ distance from CM to DM (note: to DM, not to NFF)

Steps

1. Bring HIRES to nominal focus with Decker D5 and Th-Ar lamp; verify with foc.pro. Measure distance (L) from camera mirror to old field flattener and record along with camera focus stage setting at nominal HIRES focus.

2. Mount alignment telescope on cross disperser stage (XDAT) - pickup axis of L1,L2 using 3 out of the 4 surfaces (or as many as we can see); compare with HIRES installation notes. L1/L2 surfaces should align to within TBD. Steve Vogt wants this step first because of concern the entire frame may bend when unloaded by the cross disperser removal.

3. Mount diode lasers (DL1-DL3) on camera mirror (CM). Set up mirror flats (F1-F3) and reflect laser beams to conveniently placed targets (T1-T3). Note target positions as "pre-retrofit" references. Targets should be high quality graph paper with "markable" surface.

4. Remove and replace Hextek camera mirror (CM) a few times; log repeatability of targets’ (T1-T3) pre-retrofit positions.

5. Remove camera mirror (CM) and replace with Hextek alignment telescope (HTAT).

6. Pickup existing HIRES dewar lens (field flattener) with Hextek alignment telescope (HTAT) and note alignment (in case of need to re-install old dewar).

7. Remove old dewar, noting any shims etc.

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2 This procedure addresses the alignment aspects of the installation in detail
8 Check alignment of cross disperser alignment telescope (XDAT) with Hextek alignment telescope (HTAT) - should be within TBD (about as good as we will have gotten back here in the optical lab at pre-ship). If cross disperser alignment telescope (XDAT) does not align well with Hextek alignment telescope (HTAT), adjust both as necessary to pickup best axis compromise for L1 and L2. (Note: if this becomes necessary, all prior alignment info for old dewar would be lost at this point).

9 Reinstall camera mirror (CM) - note pre-retrofit alignment with cross disperser alignment telescope (XDAT) - adjust camera mirror (CM) for best alignment using adjustment nuts (N1-N3). Note new target positions (now called the "zero point" positions).

10 Remove camera mirror (CM) and reinstall Hextek alignment telescope (HTAT).

11 Install new dewar - adjust focus stage/shims to establish proper distance (L') from camera mirror to the dewar mirror (DM); get focus stage approximately centered on range.

12 Tip/tilt/center new dewar as required observing center mark and reflection from dewar mirror (DM) with Hextek alignment telescope (HTAT).

13 Reinstall camera mirror (CM) - verify that targets are still at "zero points".

14 Power up new dewar.

15 Bring camera to optical focus using focus stage and Decker D5 +Th-Ar lamp source. Shim stage again if necessary to get focus near mid-range of stage (or use camera mirror adjustment nuts to piston Hextek, holding targets at zero points?).

16 Run detailed imagery tests varying camera mirror (CM) tip/tilt via adjustment nuts (N1-N3) and targets to map tip/tilt space.

17 Set camera mirror (CM) tip/tilt at best compromise position and lock down. Record new distance (L') from Hextek to dewar mirror.

18 Remove lasers, mirror flats, and targets as required. But leave everything up for a while if possible, just in case some testing or realignment is necessary in the near future.

Optical alignment is now complete.