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## Solar Tracker: Brusag (INTRA) Switch-Out Notes for ARCS at AIS

### I. Purpose:

This document describes the procedure for re-attaching INTRA flanges, setting up and testing INTRA and replacement of existing INTRA with a spare unit.

### II. Cautions and Hazards:

- Store loose hardware/equipment in safe places so damage or loss is avoided.
- Familiarize yourself with these procedures and make sure you have the tools and personnel available.
- Locate INTRA photographs to familiarize yourself with the hardware.

### III. Requirements:

- Silicone vacuum grease.
- Metric Hex wrench set.
- Rags for cleaning up grease if necessary.
- #1 Phillips Screwdriver.
- Computer or terminal.
- Terminal cable.
- 24 V power supply and wires.
- Manual – MAN(TRK)-003.
- Site latitude.
- Site longitude.
- Site altitude.
- Clock set to UT and accurate within 1 second.
- Cutters for cable ties.
- American Hex wrench set.
- Small flat screwdriver.
- 8-10 cable ties.
- A HELPER.

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#### IV. Procedure:

##### A. Re-attaching Flanges on INTRA:

1. Setup tracker on sturdy bench.
2. Use Phillips screwdriver to remove 12 small screws securing top cover (mostly square) of INTRA. Screw in 2 (two) 10-32 screws opposite each other into threaded holes on the cover and use these screws to lift off the top cover.
3. Grease seals with high vacuum silicone grease. Don't overdo, but just enough to get a light coating on them.
4. The flanges and respective locations on the tracker can be seen on photographs. Unfasten bolts in flange positions, make sure mating surfaces are clean of dirt and debris, and position flanges into place and install bolts. A 5 MM hex wrench is needed to do this. They are pinned so you can't put them on in the wrong orientation. Tighten the bolts in a criss-cross pattern until they are fairly tight (not gorilla tight).
  - East flange- identified by optical sensor and cable. Cable needs to be run inside horizontal axis and plugged in to circuit card on the interior of the INTRA. Pay particular attention to the orientation of the connector. When it is in place, you will feel a slight click as it reaches its full destination.
  - West flange- identified by the two tapped holes on the flat spot on the circumference of the flange.
  - Bottom flange- has only a flat spot on the circumference of the flange.
5. Leave the top cover off until unit is installed on Skystand.

##### B. Setting Up and Testing the INTRA Before Mounting on Skystand:

1. You need to locate the spare communication box for the INTRA. It should have an orange cord coming out of it with a brightly finished connector on it. The box itself is gray aluminum roughly 6" square and 4" deep.
2. Install orange cord from spare communication box to connector and plug connector end to circuit card located inside the INTRA below the cover you've removed. Pay particular attention to the orientation of the connector. When it is in place, you'll feel a slight click as it reaches its full destination. Proved 24 Vdc to communication box. OBSERVER CORRECT POLARITY!

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3. Set up your laptop computer or miniature terminal. You'll need an RS232 cable as described (9 pin shown).
  - |                |                       |
|----------------|-----------------------|
| <u>9 pin #</u> | <u>INTRA location</u> |
| 2              | TX                    |
| 3              | RX                    |
| 5              | GND                   |
4. Establish communications and follow directions given on "Manual Translation for Brusag INTRA Tracker" [MAN(TRK)-003.] by Mike Rubes for setup of tracker. You may wish to consult other manuals as well but this one seems to have the most pertinent information.
5. You should now have latitude, longitude, altitude and correct time information entered into the INTRA. Be sure the values are saved. You should now be ready to remove the existing INTRA and replace it with the one you just set up.
6. Set the INTRA to 0 degrees on azimuth and elevation.

**C. Removal of Existing INTRA:**

1. Cut cable ties to free cables attached to INTRA system.
2. Remove the shaded PSP and NIP with ventilators and set them aside somewhere stable and safe.
3. Remove circular plate located under where the PSP or PIR was located. The correct plate is the one located closest to the INTRA. There are three (3) 2 mm small hex bolts to remove. Lift off plate and cork gasket underneath, paying particular attention how to reposition plate and cover.
4. Use 3 mm hex wrench to remove the 2 small hex bolts on the flat area of the West flange, that anchors the shading arm bracket.
5. Use 3 mm hex wrench to remove the 1 small hex bolt and 2 washers holding the pivot point of the shading arm. Remove the shading arm from the tracker and reinstall the screw with associated washers to remember washer orientation.
6. Use 5 mm hex wrench to remove the 8 hex bolts holding the top platform to the INTRA. Set the plate aside.
7. Use Phillips screwdriver to remove 12 small screws securing top cover (mostly square) of INTRA. Screw in two 10-32 screws opposite each other into threaded holes on the cover and use these screws to lift off the top cover.
8. Look inside cover and remove larger connector (attached to orange cable) from circuit card and feed through base of INTRA. It may be necessary to use the small flat screwdriver to get connector started

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for its removal. This is done so the cord won't be damaged when INTRA is removed from pedestal.

9. Remove smaller connector from circuit card and feed to horizontal axis tube of INTRA.
10. Using a 3/16" hex wrench, remove the instruments (NIP type mounting) from their mounts, then remove this mounting plate from the flange using a 4 mm hex wrench.
11. **FIND ANOTHER PERSON TO HELP FIRST.** Mark the position of the INTRA flange on the pedestal using a 5 mm hex wrench and remove the INTRA.

#### **D. Installation of Replacement INTRA:**

1. Reverse the above procedures to install the existing INTRA.
  - **IMPORTANT:** Make sure the direct pointing instrument mounts are oriented so the instruments, when mounted will be on a horizontal plane with the INTRA elevation set at 0 degrees.
  - **IMPORTANT:** Make sure the INTRA points directly South when it is at 9 degrees. If you marked the pedestal in the procedure just before this, all that needs to be done is to match the marks and reinstall the mounting bolts.
2. Assure the INTRA works and the instruments track accurately by viewing target disks.
  - If small adjustments in instrument elevation are needed, loosen the instrument mounting plates slightly and move them in the right direction. **CAUTION: THIS ONLY WORKS FOR MINOR ADJUSTMENTS** (i.e., the sunlight is very close to being on target) **OTHERWISE ADJUSTMENTS IN TRACKER OFFSET PARAMETERS IS NEEDED.**
  - If small adjustments in instrument azimuth is needed, shims can be added to shift the sunlight right onto the target. **CAUTION: THIS ONLY WORKS FOR MINOR ADJUSTMENTS** (i.e., the sunlight is very close to being on target) **OTHERWISE ADJUSTMENTS IN TRACKER OFFSET PARAMETERS IS NEEDED.**

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**V. References:**

None.

**VI. Attachments:**

None.