Drum torque test

Context

VLF Platesetter
VLF Trendsetter
ThermoFlex
3244 Platesetter
3244 Trendsetter
Trendsetter 3230 (TS4 Version)

Background

This procedure is used to test the drum drive amplifier.

Tools

No special tools required.

Notes

The "drum spin <value> C" command does not require an encoder at all, but it does require the feedback tach signal from the drum drive amp. If this is noisy, it could cause a problem.

The "Drum Torque <value>" command will not work if the encoder does not detect an index pulse once per revolution. It does not require the feedback tach signal from the drum drive amp and does not use the encoder for tracking.

To check the index pulse, type "drum" then turn the drum through one full turn and type "drum" again; it will tell you if an index has been detected. (The index pulse resets a hardware register in xilinx - DanH)

Steps

1. For 5080 or 5880 engines, clamp a plate (any size) on the drum.

   The balance weights are positioned to balance the TEC mass when they are on the drum. See Notes on drum balancing.

   The 3244 engine is balanced when the TEC clamps are on the backbone. Perform the test without a plate clamped to the drum

2. Idle the drum using this command:
   `drum idle`

   Ensure that the drum is free from any obstructions and can be spun easily by hand.



WARNING:
The `drum torque` command should only be issued during this test. If there is a problem or failure of the drive system, it can cause the drum to spin uncontrollably or “run away”. Be ready to press abort switch to remove power from the system if the drum becomes uncontrollable

3. Enter this command:
   `drum torque 0`

   The drum should not move at this point.

   If the drum spins, stop the drum with this command:
   `drum stop`

   or press the abort switch. Replace the drum drive amplifier (13-3591) as the amplifier has no dead band.

4. Enter this command:
   `drum torque 15` (5080 and 5880 engines)
   `drum torque 10` (3244 engine)

   The drum should not be able to maintain speed or accelerate at this torque setting. If it does, replace the drum drive amplifier.

5. Increase the torque setting in increments of 5 up to a maximum of 40 (wait five seconds after each torque change) until the drum rotates one full revolution.

6. Once one full revolution has been completed, stop the drum using this command:
   `drum stop`

   If the drum spins within the range of setting of 15 to 40, the drive amplifier is OK.

7. If the drum does not turn at a setting of 40, calibrate the main drive amp:

   a) Make sure that the drum module firmware is 1.09 or later:
      `list version`

   b) Calibrate the drive amp:
      `drum cal`

   c) This starts the auto-calibration process. An error message is displayed if the calibration fails. In case of failure, perform a manual hardware calibration of the drum drive amp (see CTP Firmware Drum Amplifier Dead-Band Calibration http://intranet.creo.com/support/docs/733176aa.PDF) or replace the main drive amplifier.

8. Spin the drum with this command:
   `drum spin 70` (5080 and 5880 engines)
   `drum spin 60` (3244 engine)

9. When the drum has reached its final speed, enter this command:
   `plot on`

   If there are no problems after 5 minutes, the PLL is able to track the drum motion and the drive amplifier is OK. If not, replace the drive amplifier.

See also

General VLF drum drive, Encoder and PLL troubleshooting
http://intranet.creo.com/support/html/VLF_Trendsetter/troubles.htm

CTP Firmware Drum Amplifier Dead-Band Calibration (73-3176AA, http://intranet.creo.com/support/docs/733176aa.PDF)

Notes

Drum balance (5080/5880 engines)

Drum balance should be activated for this procedure. If the balance weights are disabled and the drive amplifier or encoder setup is marginal, it may cause an error. If the balance is disabled because it was causing problems, the weights must be manually positioned to perform the tests.

Marginal drum amp or encoder problems are most likely to occur after a

machine reset, or after the operator has removed a plate from the drum and repositioned the TEC clamps at the park bars. Small plates result in the TEC clamps being placed approximately opposite to the LEC clamps. The balance weights are then placed opposite the TEC clamps, i.e., near the TEC park position. If the plate is removed by the operator for some reason, the operator must reposition the TEC clamps at the park position. The combined imbalance of TEC clamps and the balance weights positioned at or near the TEC park position may be too large to allow the drum drive to recover the weights without issuing an error.

To recover from this situation manually (not with the diagnostics terminal), move the balance weights to a static position, or move them exactly opposite the TEC clamps park position. Put the LEC down and move the center of the bronze weights at each end to be facing straight up.

Creo Products Inc.

CTP Firmware
Drum Amplifier Dead-Band Calibration

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1. SCOPE

The purpose of this document is to describe the Drum Amplifier Calibration procedure. It is relevant to both the Platesetter and Scanner Drum Servo System.

CTP/Scanner Firmware Drum modules 1.09 and later perform drum calibration using the new command **drum cal**. If you are unsure of what drum calibration is and what it is expected to accomplish please read Section 5 - "Amplifier Calibration Theory". To check if the firmware has this drum module type **list version** at the diagnostic prompt and check the drum module software version it should read 1.09 or higher

2. USING THE "DRUM CAL" COMMAND

The **drum cal** command is issued through the diagnostic monitor. Therefore, be sure to exit the Allegro and workstation Software and unload any plates before proceeding.

The following procedure should be used for calibrating the drum amplifier:

1. Initialize the machine, check that the trailing edge clamps are off the drum.
2. Issue the command DRUM INIT to ensure that the drum amplifier has been initialized.

   Type: **drum init**
3. Ensure that the Drum Amplifier is up to operating temperature (the machine should be running for about an hour before proceeding).
4. Issue the DRUM CAL command

   Type: **drum cal**
5. Wait for the firmware command to finish
6. If you receive the message (example only):

   Drum Cal: complete, new deadband offset = 21 (5.25%)
   ***** State message: Drum command (23) Complete**

   then proceed to step 7.

If you receive the message:

Drum Cal: can't complete, deadband too narrow
***** State message: Drum command (23) Complete**
Drum Cal: Keeping previous deadband value of 21

or….

Drum Cal: waiting for drum to settle...
Drum Cal: unsuccessful, drum won't settle)
***** State message: Drum command (23) Complete**

the drum Amplifier offset is too small or negative, do not proceed to step 7, drum amp must be replaced or readjusted. This can be accomplished by tuning the amplifier offset which is discussed in section 3.2

7. The calibration was successful. Save the dead-band offset by typing:

   nvs save drum doff

3. DRUM AMPLIFIER OFFSET ADJUSTMENT

Warning: High Voltage is Present inside the Drum Amplifier!! Only Trained Service Engineers should perform this Adjustment.

Allow the unit to discharge the high voltage capacitors for 1 hour before proceeding.

3.1 Required Tools

The following tools are required to perform this adjustment:

#2 Phillips screw driver
Potentiometer adjustment tool (Non-Conductive)
Torque Seal™ or nail polish.
1/16” Allen key (for 13-3591 only)

3.2 Adjusting the Offset Potentiometer

1. Remove the Drum Drive Amplifier (15-3114,15-3115,13-3591) from the Platesetter.

2. Remove the #2 Phillips screw and cover from the drive (also remove the two 1/16” hex screws for the 13-3591).

3. Locate the potentiometer shown in Fig. 1.0 below and break away any Torque Seal™ from the potentiometer screw head.

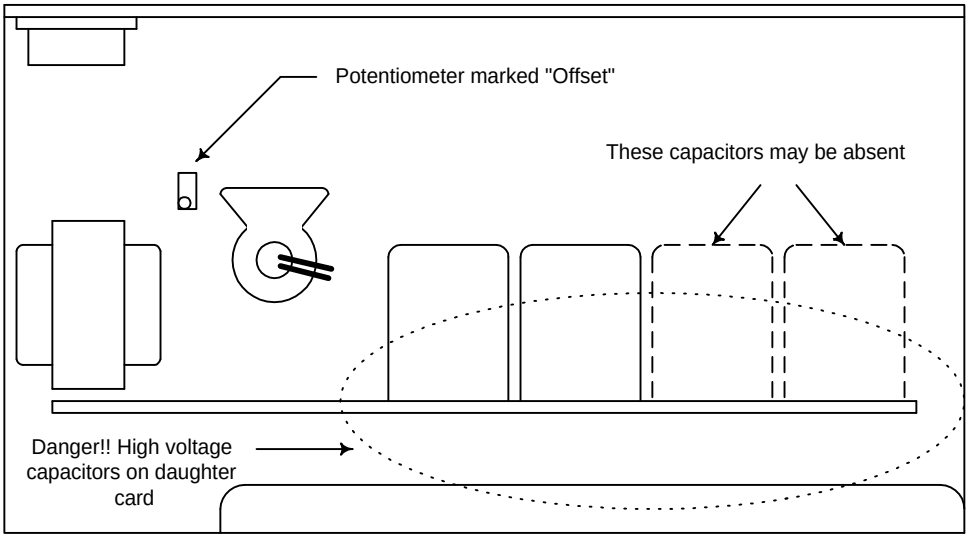


Figure 1 - Offset Adjustment Potentiometer Location

4. Turn the potentiometer 1/8 turn counter clockwise and re-install the unit into the machine then power up the machine with the cover still removed.
5. Wait one half hour for the temperature inside the amplifier to stabilize.
6. Perform the Drum Cal command, as outlined in Section 4.0. If the routine does not complete successfully it will be necessary to adjust the potentiometer again. If the routine completes correctly then proceed to step 8.
7. To make subsequent adjustments quickly turn off the machine and adjust the potentiometer in 1/8 turns then turn the machine back on and repeat the drum cal procedure. Repeat as required.
8. Once the unit passes the drum cal procedure then remove the unit and after allowing one hour for the Capacitors to discharge, reinstall the cover and retaining screw.

If you cannot adjust the unit then replace it with a new unit.

4. AMPLIFIER CALIBRATION THEORY

An ideal drum servo amplifier with a signal input of zero would not move the drum. Input signals greater than zero would cause drum movement to begin . A drum amplifier with this characteristics is said to exhibit “zero dead-band” in its control input signal. Practically, such ideal drum amplifiers do not exist. Instead, one of the following conditions is seen:

1. The dead-band is greater than zero. In this case, the drum does not move until a significant amount of control signal is applied. The size of this signal is called *positive* dead-band.
2. The dead-band is less than zero. In this case, the drum is theoretically in motion regardless of what signal is present. This condition is known as *negative* dead-band. In practice, system friction and/or dynamic braking will usually prevent the drum from moving when this condition exists.

The calibration procedure measures *positive* dead-band. To do this, it must first ensure the drum remains stationary with dynamic braking off. (If this can’t be achieved the amplifier is exhibiting *negative* dead-band and the amplifier adjustments described in section 2 will be necessary before the calibration procedure can succeed). One the drum is stationary the signal to the amplifier is increased until drum movement is detected. The amount of signal required to move the drum is the “static” dead-band value and is the sum of two components:

1. Drum amplifier dead-band. This is the amount of signal that must be sent to the drum amplifier before any drive signal appears at drum motor.
2. Starting friction dead-band. This is the amount of signal beyond amplifier dead-band required to overcome “starting” friction and move the drum.

The ultimate purpose of the drum calibration procedure is to determine the drum amplifier dead-band and compensate for it when controlling drum speed during imaging. To determine this value, the starting friction value is subtracted from the static value.

The starting friction value is a positive integer stored in the NVS memory of the CTP machine and determined during manufacturing. Starting friction occurs only when attempting to move the drum from a stationary position. When the drum is spinning during imaging starting friction has already been overcome and has no effect. The starting friction value is only used during calibration.

Two new NVS parameters have been introduced for the DRUM CAL command.

Drum NVS parameter name	Description	Units	Default	Range
doff	Drive signal required to overcome *positive* drum amplifier dead-band. This is the value that is determined by the drum cal command.	us/2	0	0 - 119
dfrict	Starting friction for a given drum servo system. (This value does not normally need adjustment).	us/2	33	0 - 50

If the calibration procedure is successful the current RAM copy of the **doff** NVS parameter is updated and will remain in effect until after the next power cycle. This value is not permanently written to NVS memory. If desired, the user must do this manually as described in section 2.

The NVS parameter **dfrict** may be changed if it has been determined incorrect or requires adjustment over time. If this value is changed, the user must manually save it in NVS memory so that it will be in effect on future drum cal commands. This parameter is saved using the following monitor command.

nvs save drum dfrict

The figure 2 on the following page contains a flow chart illustrating how the calibration proceeds when the **drum cal** command is entered at the monitor.

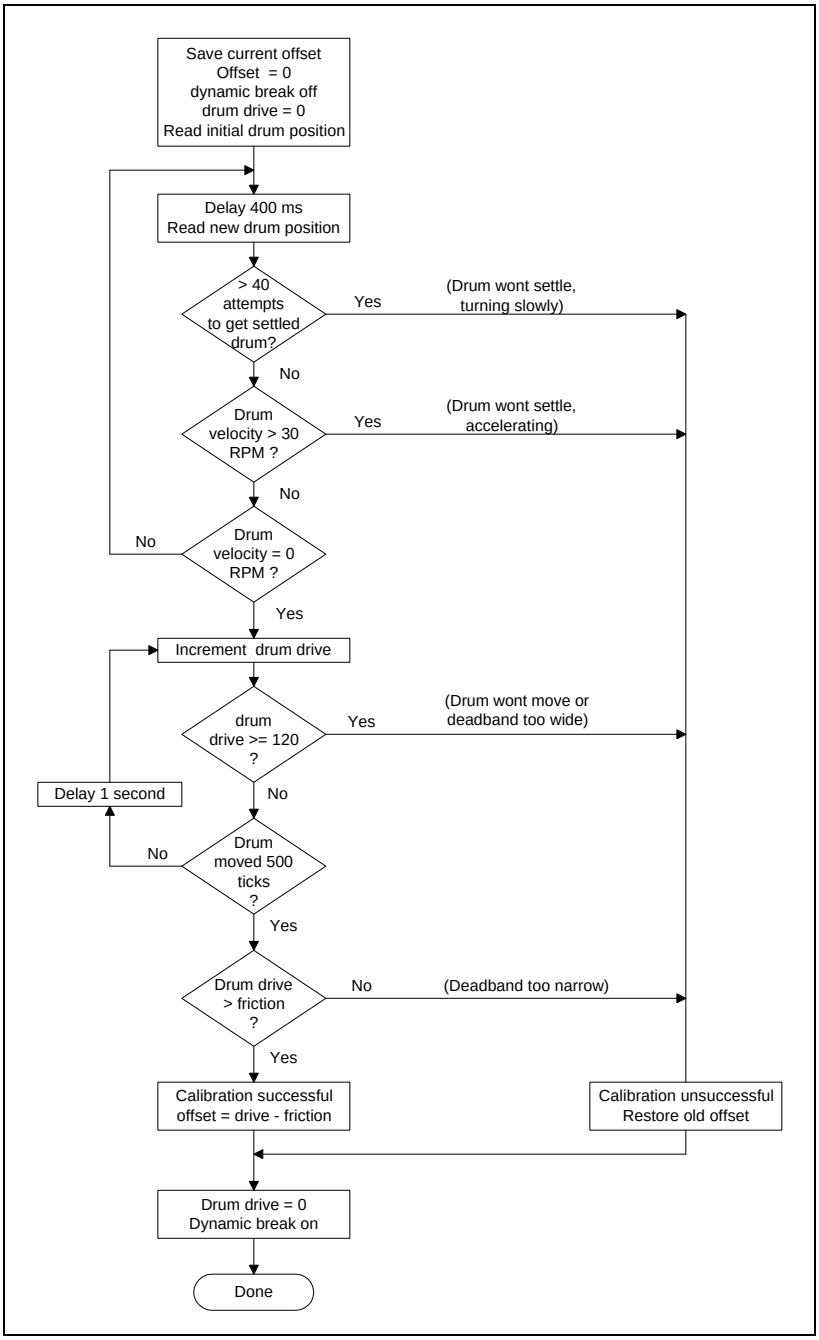


Figure 2 - Drum Calibration Routine Flow Chart