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. One of the following messages is reported):

   `Deadband too narrow to compensate, .....but should function and Drum Cal: Deadband offset value (doff) set to zero` - if the deadband is less than dfrict (the amount of signal required to move the drum from a stationary position) but greater than zero.
   In this case, the drum amp can still be used even though the drum cal routine could not compensate for the deadband of that drum amp. (It does not need replacement or manual adjustment of its offset potentiometer.)

`.....deadband too narrow, replace or adjust drum amp` and **`Drum Cal: Deadband offset value (doff) set to zero`** - if the drum won't settle (deadband zero or no deadband at all).
In this case, you need to either replace the drum amp or adjust the offset potentiometer, as described in section 3.2.

`Drum Cal: complete, new deadband offset = <#>` - if a new doff was determined.
In this case, 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.

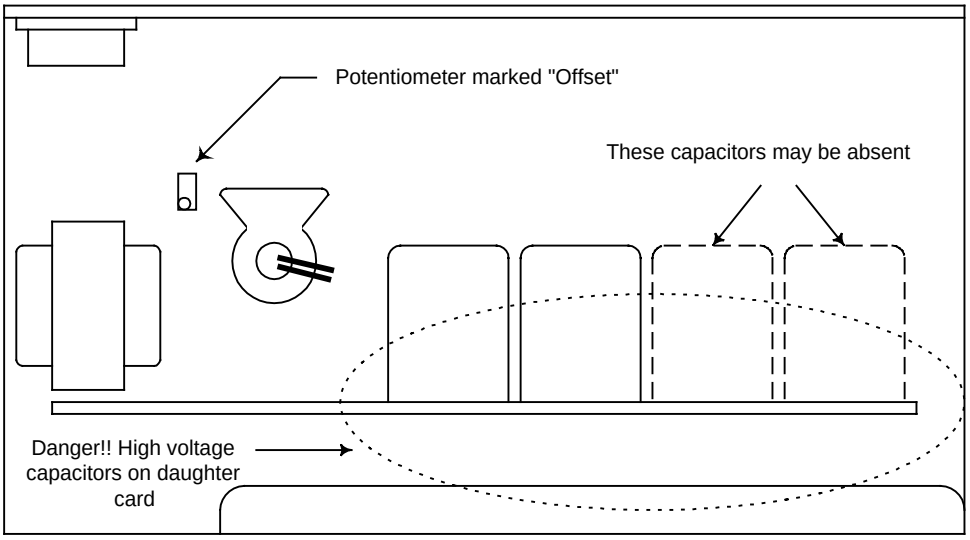


Figure 1 - Offset Adjustment Potentiometer Location

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). Once 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 (VLFs) 20 (TS)	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.

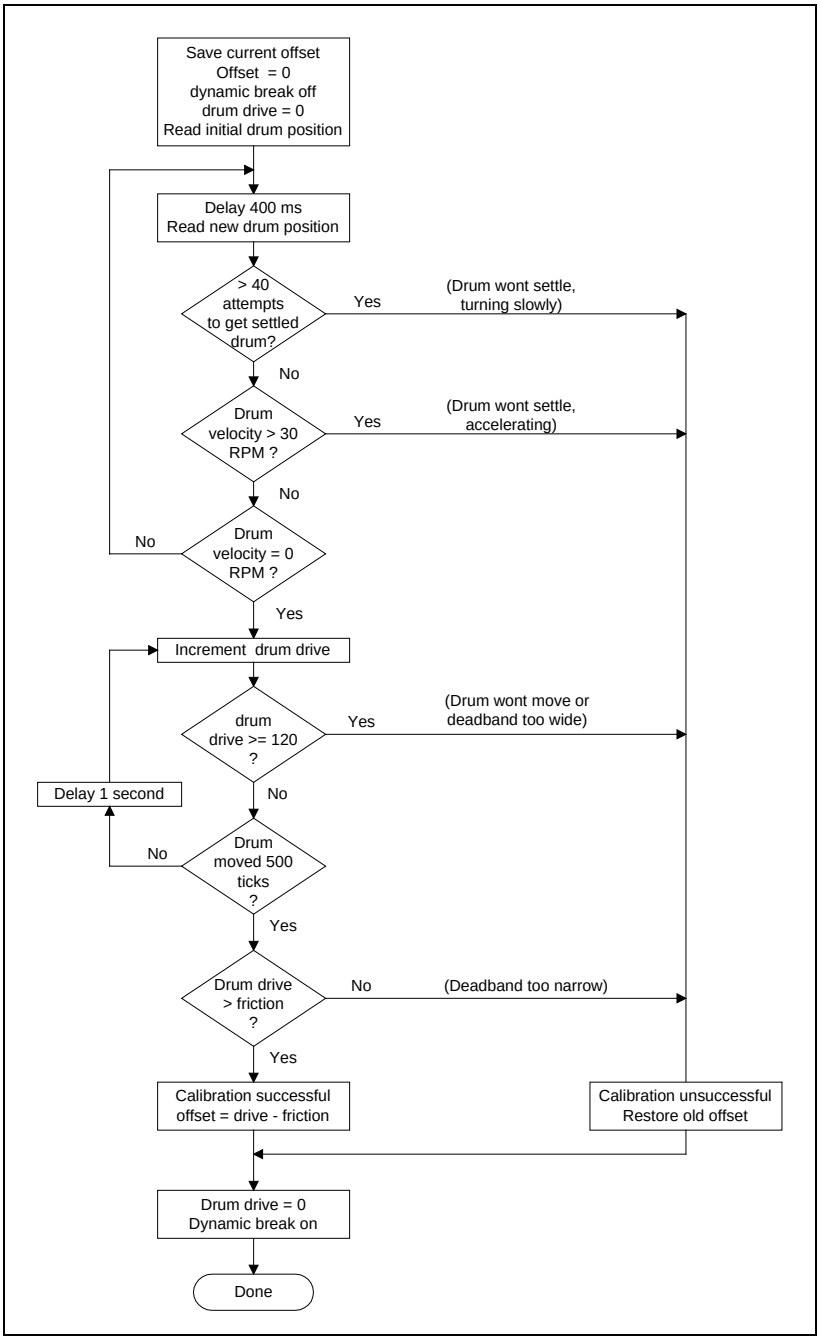


Figure 2 - Drum Calibration Routine Flow Chart