Application Note CTAN #265

The Application Note is pertinent to the AC Drives

A Replacement Solution from DigitAx to Unidrive Classic

speed / torque applications

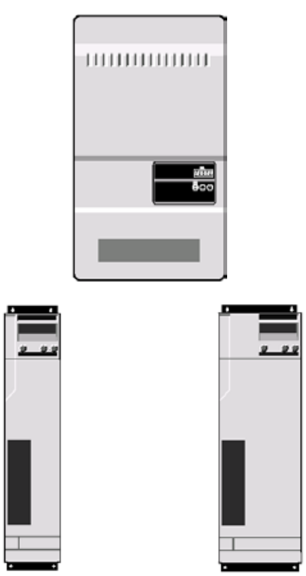
The DigitAx was a fully digital drive AC Servo drive designed for use on wide supply range from 380 to 460 at 50/60 Hz featuring a 3-phase IGBT output bridge with a sinusoidal PWM output characteristic. A motor mounted resolver interface was standard.

AC Servo motors and matching drives are used in both profiled motion and speed/torque applications.

This Application note describes the replacement of a DigitAx with a Unidrive Classic in a speed/torque application. These are common in coating and metering applications, where the low torque “ripple” and precise speed control of the motor / drive combination is of primary interest.

AC Servo Motor(s) used in speed/torque applications provide whatever torque is required so to satisfy a given production rate, and are sized for the nominal continuous torque capability of the motor (i.e. for horsepower). The Drive is sized to match the motor with a lower current reserve needed, typically as low as 125%. The Unidrive Classic Version 3, fitted with a UD53 issue-2 can replace a DigitAx in these applications.

This Application Note assumes that you have an AC-Servo motor (typically a member of the DutyMax DS series) fitted with a resolver (2 pole and 3:1 transformation ratio) and a DigitAx DB140 to DB22000 or DigitAx DBE140 to DBE22000 that is configured and working. This document will be of some use in a profiled motion retro-fit, but is focused on speed / torque (horsepower based) applications.



DigitAx Size 1, 2 and 3

Unidrive Size 1, 2 and 3

Evaluating the present Installation

Evaluate the present installation to confirm that this is a speed / torque (i.e. horsepower based) application of the servomotor and DigitAx (as opposed to a motion application). If this is a motion application, refer to the Application notes that deal with these cases. Choose the replacement Unidrive Model.

- Use CTFile and make permanent record of the present DigitAx parameters. See Appendix A for guidance in getting CTFile installed and connected to the DigitAx to be evaluated.
- Evaluate the present nominal and peak current requirements. The intent here is to verify that the original servomotor and DigitAx was sized based on the nominal current available from the DigitAx. Inspect Parameter 42 and Parameter 45 versus the rated peak current of the DigitAx. This is the simplest way to determine what the DigitAx was set up to deliver to the motor, and to pick out a replacement Unidrive Classic.
- Check parameter b07 Ramps enable to see if it is TRUE (equal to a value of "1"). Speed / torque applications usually have this set (but not always).
- Inspect Parameter 40 for torque demand requirements of the load. This is displayed in a 0 to 100% (of rated DigitAx peak current) and at a much lower update rate than what is possible with an oscilloscope.
- Confirm that Terminal 16 "Analog Out" is configured to display clamped current demand (b12=0 and b13=0) study the motor current demand with a oscilloscope. This can give a more accurate picture of the actual currents required, as opposed to the amount of current that is available.
- Inspect bit 48 and / or Parameter 80 for the absence of operating in the $i^{2x}t$ region. If this is happening, either you have a motion application, the AC Servo motor / DigitAx is undersize or not delivering rated torque / current (for some reason). Do not overlook the possibility that the load has changed since the original installation. Changes due to bearing friction increasing or gearbox friction increasing could cause a motor / drive to enter the I^2xt region. Figure out what is the case and correct before proceeding.

Cross Reference The table below shows the cross-reference from DigitAx to Unidrive Classic, sized for continuous output motor current at 6.0 kHz switching frequency, typical for speed / torque applications.

DigitAx Model	Nominal Motor I	Peak Motor I	Unidrive Model	Continuous Motor I	Peak Motor I
DBE 140	2.8 amp	5.6 amp	UNI 1402	2.8 amp	4.9 amp
DBE 220	4.4 amp	8.8 amp	UNI 1404	5.6 amp	9.8 amp
DBE 420	8.5 amp	17.0 amp	UNI 1405	8.5 amp	16.6 amp
DBE 600	13.0 amp	26.0 amp	UNI 2401 *	12.0 amp	21.0 amp
DBE 750	16.0 amp	32.0 amp	UNI 2402	16.0 amp	28.0 amp
DBE 1100 note 1	26.0 amp	39.0 amp	UNI 2403 * UNI 3401	18.2 amp 34.0 amp	43.8 amp 59.5 amp
DBE 1500	32.0 amp	48.0 amp	UNI 3401	34.0 amp	59.5 amp
DBE 2200	48.0 amp	72.0 amp	UNI 3405 *	46.0 amp	80.5 amp

Note: 6.0 kHz recommended on Unidrive Classic in Servo Mode to avoid spurious OI.AC trips
* Replacement rating bit less than original
note 1 This model is worst match at recommended 6 kHz switching frequency, choice is a smaller or larger unit

Control Terminal Connections

Step 1 - Evaluate the present DigitAx input and output for the present terminal analog and digital control connections. The intention of this step is to determine the product features that were being used by the DigitAx. This will then permit generating a revised wiring diagram as well as the configuration needed to support these requirements with the replacement Unidrive Classic configured in AC Servo Mode.

DigitAx Input / Output control connections used in all applications

Focus first on the minimal connections needed on all DigitAx installation, and then inspect the other connections to determine what extra interface functions are being used. The minimal Input / Output connections are the ones needed to do the initial set-up and servo phasing test on the replacement Unidrive Classic.

1. Determine if an internal thermistor is being used for motor thermal protection. *Inspect **CON B** for the presence on a resistor* (typically 470 ohms) between **CON B2** (I/O 0V) and **CON B1** (Ext Trip (thermistor) / External trip level). Confirm that **b56 = 1** to confirm the use of a motor thermistor temperature sensor. Note that the other wire for the thermistor will be on **CON B3** (+24 VDC supply). Use an ohmmeter to determine exact wire (if necessary), because more than one conductor will be landed on **CON B3** (+24 VDC supply), if the motor thermistor feature is being used.

2. Locate the Drive Enable digital input on **CON B14.**

3. Locate any analog connections to terminals **CON B9** (Analog Ref inverting) and / or **CON B10** (Analog Ref non-inverting). Inspect **b6** to determine if this is a speed signal (**b6 = 0**) or a torque signal (**b6 = 1**). These inputs can be used for operation from a dedicated positional controller or a simple speed potentiometer.

   Note that the lack of any analog inputs at **CON B9** or **CON B10** will usually mean that the Programmable digital speed reference(s) (**Pr1**, **Pr2**, **Pr3** and / or **Pr4**) are being used for the speed targets, and that digital input connections at **CON B4** and / or **CON B5** are being used for any reference selection being done.

Locate any analog connections to terminals **CON B11** (Analog 0v), **CON B12** (-10.0 VDC supply) and / or **CON B13** (+10.0 VDC supply). These are often used as a supply for a speed potentiometer.

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4. Locate the Drive OK digital output at **CON B15**.

5. Locate the resolver connections at **CON B18** (shield), **CON B20** (COS Lo), **CON B21** (COS Hi), **CON B22** (SIN Lo), **CON B23** (SIN Hi), **CON B24** (Excitation Lo), and **CON B25** (Excitation Hi).

Any digital input connections present at **CON B4**, **CON B5, CON B6** and digital output connections present at **CON B7** and **CON B8** and any analog output connection at **CON B16** and **CON B17** are not needed for the servo phasing test and the initial setup.

Any connections to **CON C** are Encoder simulation outputs derived from the resolver signals. These are usually used with a dedicated motion controller.

The simplest case of an analog speed potentiometer configuration will be illustrated in the initial setup section of this guide. Once this is working, getting a dedicated motion controller should be straightforward, if not necessarily “easy”.

Main power connection cross reference

Step 2 **-** Locate the following conductors for AC Supply, Output to the Motor, and any Braking resistor and / or DC Bus connection(s) present and move them from the DigitAx to the Unidrive Classic. Use the chart for the appropriate DigitAx model. Note that the Unidrive separates the AC Supply ground (circled ground symbol) from the motor ground (standard ground symbol).

Main power connector for DBE140 and DBE220

DigitAx Pin (from)	DigitAx Function	Unidrive Pin (to)	Unidrive Function	Type	Notes
U	Phase U	V *	Phase U	Out	Output to motor
V	Phase V	U *	Phase V	Out	Output to motor
W	Phase W	W	Phase W	Out	Output to motor
Y	AC Supply MOV network ground	NA	NA		Connected to safety -ground terminal
L1	Phase L1	L1	Phase L1	In	AC Supply
L2	Phase L2	L2	Phase L2	In	AC Supply
L3	Phase L3	L3	Phase L3	In	AC Supply
Safety-ground stud	AC supply ground wire	Circled ground (heat-sink)	AC supply ground		from AC Supply ground service
Safety-ground stud	Motor ground wire	Ground connection	Motor ground	In **	to motor conduit box

* Unidrive output phasing known to be different than the DigitAx, correct here
** Input (return) for the PWM output switching transients

Braking resistor connector for DBE140 and DBE220

DigitAx Pin (from)	DigitAx Function	Unidrive Pin (to)	Unidrive Function	Type	Notes
1	+ DC bus	**+**	+ DC bus / braking resistor	Out	+ DC Bus / external brake resistor
3	Internal braking resistor	na	na	na	Not Available
5	Ext / Int braking resistor	•	External Braking resistor	Out	Controlled output
7	- DC Bus	**-**	- DC Bus	Out	- DC Bus connection

Main power connector for DBE420, DBE600, DBE750 and DBE1100S

DigitAx Pin (from)	DigitAx Function	Unidrive Pin (to)	Unidrive Function	Type	Notes
U	Phase U	V *	Phase U	Out	Output to motor
V	Phase V	U *	Phase V	Out	Output to motor
W	Phase W	W	Phase W	Out	Output to motor
Y	AC Supply MOV network ground	NA	NA		Connected to safety -ground terminal
L1	Phase L1	L1	Phase L1	In	AC Supply
L2	Phase L2	L2	Phase L2	In	AC Supply
L3	Phase L3	L3	Phase L3	In	AC Supply
- DC	DC Bus -	**+**	+ DC bus / braking resistor	Out	+ DC Bus / external brake resistor
BR	External Brake Resistor	•	External Braking resistor	Out	Controlled output
+ DC	DC Bus +	**-**	- DC Bus	Out	- DC Bus connection
Safety-ground stud	AC supply ground wire	Circled ground (heat-sink)	AC supply ground		from AC Supply ground service
Safety-ground stud	Motor ground wire	Ground connection	Motor ground	In **	to motor conduit box

* Unidrive output phasing known to be different than the DigitAx, correct here
** Input (return) for the PWM output switching transients

Upper power connector for DBE1100S, DBE 1500 and DBE 2200

DigitAx Pin (from)	DigitAx Function	Unidrive Pin (to)	Unidrive Function	Type	Notes
DB1	Ext braking resistor	•	External Braking resistor	Out	Controlled output
DB2	+ DC bus	**+**	+ DC bus / braking resistor	Out	+ DC Bus / external brake resistor
PE	Ground	Circled ground	Supply Ground (heat sink)		
L1	Phase L1	L1	Phase L1	In	AC Supply
L2	Phase L2	L2	Phase L2	In	AC Supply
L3	Phase L3	L3	Phase L3	In	AC Supply

Lower power connector for DBE1100S, DBE 1500 and DBE 2200.

DigitAx Pin (from)	DigitAx Function	Unidrive Pin (to)	Unidrive Function	Type	Notes
L11 ***	Choke	NA	NA	Out	- DC (before pre-charge)
L12 ***	Choke	NA	NA	Out	- DC (before pre-charge)
PE	Ground	Ground	Motor Ground	In **	
U	Phase U	U ****	Phase U	Out	Output to motor
V	Phase V	V ****	Phase V	Out	Output to motor
W	Phase W	W	Phase W	Out	Output to motor

**** Unidrive size 3 output phasing not known to be different than these DigitAx models
** Input (return) for the PWM output switching transients
*** Note that Bus choke must be removed; the Unidrive Size 3 has internal DC Bus Choke

Control connection DigitAx to Unidrive Classic cross reference

Step 3 – Make the minimal input / output control terminal connections identified back in *"DigitAx Input / Output control connections used in all applications"*

1. Motor thermistor:
   - **IS** being used for motor thermal protection. - Wire on **CON B1** (Ext Trip (thermistor) / External trip level) move to Unidrive ***Term. 8*** (analog 3). The other conductor to the thermistor moves from **CON B3** (+24 VDC supply) to Unidrive ***Term. 11*** (Analog 0v). All other conductors on **CON B3** (+24 VDC supply) move to Unidrive ***Term. 22*** (+24 VDC supply). Omit any external programming resistor
   - **IS NOT** being used for motor thermal protection - All conductors on **CON B3** (+24 VDC supply) move to Unidrive ***Term. 22*** (+24 VDC supply).

   All conductors on **CON B2** (0v) move to Unidrive ***Term. 23*** (0v Digital I/O)

2. The conductor on **CON B14** (Drive Enable) moves to Unidrive ***Term. 30*** (Drive Enable). Add a jumper from to Unidrive ***Term. 30*** (Drive Enable) to Unidrive ***Term. 27*** (Run Forward).

3. Move any conductors on **CON B9** (Analog Ref inverting) to Unidrive ***Term. 6*** (Analog input 1 inverting) and / or any conductors on **CON B10** to Unidrive ***Term. 5*** (Analog input 1 non-inverting).

   Note: If there are no conductors present on either terminal, connect a test speed pot. (5k, 2 watt, linear taper) to **CON B5** (wiper), **CON B11** (CCW) and **CON B13** (CW) for evaluation.

4. Move any conductors on **CON B11** (Analog 0v) to Unidrive ***Term. 11*** (Analog 0v) and / or any conductors on **CON B13** (+10.0 VDC supply) to Unidrive ***Term. 4*** (+10.0 VDC supply).

   Any conductors **CON B12** (-10.0 VDC supply) will potentially require re-thinking the function of this wire, as the Unidrive does not have a standard minus 10.0 VDC supply external connection.

   For example, if the supply to a speed potentiometer was from the negative supply (**CON B12**), and the wiper landed on the inverting input (**CON B9**), moving this conductor to the positive supply (Unidrive ***Term. 4***) and the wiper to the non-inverting input of Analog input 1 Unidrive ***Term. 5***.

   Note that it is possible to configure the one of the analog outputs as a fixed –10.0 volt DC supply good for up to 5-milliamps of output current.

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5. Move any conductors on **CON B15** (Drive OK) to Unidrive ***Term. 1*** (Status Relay, common). Add a jumper from Unidrive ***Term. 2*** (Status Relay, normally open) to Unidrive ***Term. 22*** (+24 VDC supply).

6. Resolver connections cross index – move conductors from DigitAx to Unidrive UD53 terminal strip:
   - **CON B18** (shield) to Unidrive UD53 ***Term. 54***
   - **CON B20** (COS Lo) to Unidrive UD53 ***Term. 50***
   - **CON B21** (COS Hi) to Unidrive UD53 ***Term. 51***
   - **CON B22** (SIN Lo) to Unidrive UD53 ***Term. 48***
   - **CON B23** (SIN Hi) to Unidrive UD53 ***Term. 49***
   - **CON B24** (EXC Lo) to Unidrive UD53 ***Term. 53***
   - **CON B25** (EXC Hi) to Unidrive UD53 ***Term. 52***

Step 4 – Make the other control connections

Suggestions for conductors on **CON B4**, **CON B5, CON B6, CON B7, CON B8, CON B16** and / or **CON B17** cross-reference:

- **CON B7** (DigitAx Programmable output) to Unidrive ***Term. 24*** (F1 as Digital OUT)
- **CON B8** (DigitAx Programmable output) to Unidrive ***Term. 25*** (F2 as Digital OUT)
- **CON B4** (DigitAx Programmable input) to Unidrive ***Term. 26*** (F3 as Digital IN)
- **CON B5** (DigitAx Programmable input) to Unidrive ***Term. 28*** (F5 Digital IN)
- **CON B6** (DigitAx Programmable input) to Unidrive ***Term. 29*** (F6 Digital IN)
- **CON B16** (DigitAx Analog output) to Unidrive ***Term. 10*** (Analog 2 out)
- **CON B17** (DigitAx Tacho) to Unidrive ***Term. 9*** (Analog 1 out)

A connection to **CON B4,** that is not part of a motor thermal protection network (**b56=0**), still moves to Unidrive ***Terminal 8*** (analog 3). The original function is an adjustable current level trip function. This would have to be built up in the menu 9 "programmable logic" and the menu 12 "threshold logic". This would be unusual in a speed / torque application.

Any connections to **CON C** are Encoder simulation outputs derived from the resolver signals, or a frequency and direction input to the DigitAx. These will be moved to the UD53 Terminal strip and have to be broken out from the original DB9 connector. Cross-reference is:

- **CON C1** (DigitAx A) to Unidrive UD53 ***Term. 40*** (A out)
- **CON C2** (DigitAx /A) to Unidrive UD53 ***Term. 41*** (/A out)
- **CON C3** (DigitAx B) to Unidrive UD53 ***Term. 43*** (B out)
- **CON C4** (DigitAx /B) to Unidrive UD53 ***Term. 44*** (/B out)
- **CON C5** (DigitAx C) to Unidrive UD53 ***Term. 46*** (Z marker out)
- **CON C6** (DigitAx /C) to Unidrive UD53 ***Term. 47*** (/Z marker out)
- **CON C9** (DigitAx 0v Simulated Out) to Unidrive UD53 ***Term. 42*** (0V)

If present, the following will need level conversion from nominal 15-volt single-ended signal levels to the required 5-volt differential levels and routed to the Unidrive 15-pin D-sub shell encoder connection: A DB-to-TB converter may be useful here.

- **CON C7** (DigitAx Freq in, reference) to Unidrive Encoder pin 1 via non-inverting out from converter
  CON C7 (DigitAx Freq in, reference) to Unidrive Encoder pin 2 via inverting out from converter

- **CON C8** (DigitAx Freq in, direction) to Unidrive Encoder pin 3 via non-inverting out from converter
  CON C8 (DigitAx Freq in, direction) to Unidrive Encoder pin 4 via non-inverting out from converter

Note that any shield or 0v connection that was part of a shielded wire connecting to **CON C7** or **CON C8** (and originally connected to the DigitAx **CON C9**) will need to be connected to Unidrive Encoder pin 14, not Unidrive UD53 ***Term. 42*** (0v). These are not needed for initial setup, and will be considered later.

Step 5 – Connections complete. At this time installation should be ready for the application of power and the configuration of the Unidrive. Proceed to "Preliminary Unidrive / UD53 setup"

Preliminary Unidrive / UD53 setup

Temporarily pull the two small control terminal strips (Terminals 1 to 11 and Terminals 21 to 31) from the Unidrive. Leave the connector on the UD53 resolver module connected. Apply power to the Unidrive and perform the following preliminary configuration.

Unidrive ships in an open loop configuration and must be set up for Servo mode.

- Set parameter #0.00 to a value of 1253 to unlock the drive
- Set parameter #0.48 to Servo mode, then press the red "RESET" stop / reset to make the mode change

Satisfy Unidrive standard security.

- Set parameter #0.00 to a value of 149 to unlock menu navigation on the drive keypad

Check and set the following Unidrive Parameters

- **#1.06 = 3000** Max RPM (or inspect DigitAx P99)
- **#2.01 = 1** Ramp Enable (inspect DigitAx b07, but set anyway even if b07=0, will fix later)
- **#2.11 = 2.0** Fwd Accel (or inspect DigitAx P09)
- **#2.15 = 2.0** Fwd Decel (or inspect DigitAx P11)
- **#2.22 = 2.0** Rev Accel (or inspect DigitAx P10)
- **#2.25 = 2.0** Rev Decel (or inspect DigitAx P12)
- **#3.08 = 3200** Overspeed trip (or inspect DigitAx P99 set to P59 * 1.25)
- **#5.07 = default** Motor Amps (or inspect DigitAx P45 set to P45 / 100 * DigitAx peak current rating)
- **#4.07 = 125.0** Sym Curr Lim (or inspect DigitAx P42 set to P42 / P45 *100)
- **#4.14 = 7.0** Thermal TC (or inspect DigitAx P55 and / or see Appendix D)
- **#5.11 = 6 poles** Motor poles (or inspect DigitAx 95)
- **#5.18 = 6kHz** Switching freq. (6.0 kHz recommended for Unidrive Classic in Servo Mode)
- **#6.01 = rP** Stop mode (any other mode is probably not a speed / torque application)
- **#6.08 = 1** Hold Zero speed
- **#7.15 = th** Analog 3 as thermistor - ***if motor thermistor present and used***
- **#7.15 = VOLt** Analog 3 as Voltage - ***if motor thermistor not present or used***
- **#8.27 = 1** Positive logic
- **#16.06 = 0** Resolver Simulation source for PG out
- **#16.10 = 0** Resolver 3:1

Check if the following non-minimal connections are present, and configure to a "do-nothing" state:

- Unidrive Term. 24 (F1 as Out, from **CON B7**) set **#8.12=1**, **#8.10=0.00**
- Unidrive Term. 25 (F2 as Out from **CON B8**) set **#8.15=1**, **#8.13=0.00**
- Unidrive Term. 26 (F3 as IN, from **CON B4)** set **#8.18=0**, **#8.10=0.00**
- Unidrive Term. 28 (F5 IN, from **CON B5**) set **#8.21=0.00**
- Unidrive Term. 29 (F6 IN, from **CON B6**) set **#8.23=0.00**

And temporarily separate the Drive Enable from the Run forward function for Phasing offset test:

- Unidrive Term. 27 (F4 IN, jumper from **CON B14**) set **#8.19=0.00**

Store these values. Set parameter **#0.00** to a value of "**1000**" and press the red "**RESET**" button. Observe the value of 1000 change to a value of zero (0).

DigitAx to Unidrive Speed loop dynamic adjustment parameters

Note - These are relevant only if the DigitAx operated in Speed mode (**b6=0**), not in Torque mode (**b6=1)**. The default Unidrive values will be okay for simulated operation with a speed potentiometer, if the unit will need to operate from an external controller

DigitAx parameter	Default value	DigitAx function	Unidrive parameter	Default value	Unidrive function
Pr13	30	Proportional gain range 0 to 255 resolution 1	# 3.10	200	Proportional gain range 1 to 32000 resolution 1
Pr14	30	Derivative gain range 0 to 128 resolution 1	#3.12	0	Derivative gain range 1 to 32000 resolution 1
Pr15	30	Integral gain range 0 to 255 resolution 1	# 3.11	100	Integral gain range 1 to 32000 resolution 1
Pr7	1	Speed loop bandwidth limit 1, 2, 3, 4, 5, 6 or 7 **1**=320 Hz, **7**=5 Hz	#3.30	0 ms	Speed feedback filter range 0 to 10.0 resolution 0.1 ms similar in function

Restore the control connections by plugging terminal strips ***"1-to-11"*** and ***"21-to-31"*** back into the Unidrive.

Verify that the resolver is working by observing **#16.03**. The value should count up smoothly to a value of 16383 and roll over ***in one motor revolution*** when turning the motor shaft clock-wise. This will only happen if the wiring is correct **and the resolver is a 2-pole design**. Note that DigitAx and Unidrive Classic support 2-pole resolver(s) ***only***.

If the basic operation is okay, perform the servo-phasing test. See **Appendix B** "Unidrive Classic Servo Phasing Test Procedure w/ UD53 and Resolver"

Once the Phasing test is complete, the Servo motor and drive are ready to be evaluated and optimized as a velocity regulator, or simply inspected, if the drive operates in torque mode with an external controller.

Restore the "Run forward" function to input Unidrive **Term. 27** (F4 IN, jumper from **CON B14**) for normal operation by setting **#8.19=6.30** and set **0.00 = 1000** then "**RESET**" to save the drive parameters.

At this point, the Unidrive and servomotor is configured as a speed regulator with a speed potentiometer (or a test speed potentiometer) and can be run up to speed to confirm nominal operation.

From this point, the motor and drive are operable, and the Unidrive configuration will need to be completed for the actual machine. Remove the test speed potentiometer and restore any analog reference connections that were substituted by the test reference. If the ramps were originally disabled (DigitAx **b07=0**), set Unidrive parameter **#2.01 = 0**.and save the parameters. See "Where to go from here" for some ideas on finishing up the retrofit.

Where to go from here

- If this was a analog speed application (**b6=0**) with no use of simulated encoder feedback, much of the work is probably done by this point. See the following section for some additional help with some of the non-minimal digital and analog output configuration.

- If this was an analog torque application (**b6=1**), analog input 1 must now be configured to route the signal into the Unidrive as a torque reference. Any needed simulated encoder feedback will have to be configured for proper PPR, routed from the UD53 to the motion controller and confirmed for proper operation

  Note that many motion applications are very demanding of the quality of the analog input hardware. An external motion controller controlling a DigitAx in torque mode may require the use of a UD78.

- Not a lot of information has been included it this Application Note covering the non-minimal digital inputs or stopping with an orientation option. “Preset speed selection” from the digital input logic is straightforward to configure, as is “Direction limit switch operation” of the Unidrive classic. The programmable digital input configured as “stop” input behaves like a preset speed selection, with a target of zero speed selected when asserted.

  Consult the User guides for the Unidrive and the DigitAx to finish any needed configuration not covered by this guide.

Questions: Ask the author??

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Partial configuration for some of the DigitAx non-minimal outputs

CON B7 DigitAx programmable digital out to Unidrive Term. 24 cross-reference *(F1 as Out)*

DigitAx Pr30	DigitAx Function	Unidrive # 8.10	Unidrive # 8.12	Unidrive # 8.11	Unidrive Function
0	b89 I^2t alarm	#10.17	1	0	Motor I overload alarm
1	b91 temp pre-alarm	#18.31	1	0	Use #7.04 and menu 12
2	b84 over current trip	#10.02	1	1	Drive OK, inverted exact status NA as bit
3	b38 present direction	10.14	1	1	Running in Rev, inverted
4	b41 zero speed *	10.03	1	0	Zero speed
5	b42 at speed	10.06	1	0	At speed
6	b48 speed loop saturated	#10.09	1	0	Current limit active exact status NA
7	b4 drive enable status	10.02	1	0	Drive Running exact status NA as bit
8	b95 brake resistor O.L.	#18.32	1	0	Use #10.39 and menu 12

CON B8 DigitAx programmable digital out to Unidrive Term. 25 cross-reference *(F2 as Out)*

DigitAx Pr31	DigitAx Function	Unidrive # 8.13 (source)	Unidrive # 8.12 (output)	Unidrive # 8.14 (invert)	Unidrive Function
0	b89 I^2t alarm	#10.17	1	0	Motor I overload alarm
1	b91 temp pre-alarm	#18.33	1	0	Use #7.04 and menu 12
2	b84 over current trip	#10.02	1	1	Drive OK, inverted exact status NA as bit
3	b38 present direction	10.14	1	1	Running in Rev, inverted
4	b41 zero speed *	10.03	1	0	Zero speed
5	b42 at speed	10.06	1	0	At speed
6	b48 speed loop saturated	#10.09	1	0	Current limit active exact status NA
7	b4 drive enable status	10.02	1	0	Drive Running exact status NA as bit
8	b95 brake resistor O.L.	#18.34	1	0	Use #10.39 and menu 12

Note Some of the DigitAx status bits do not have exact Unidrive bit equivalents.

CON B16 DigitAx programmable analog out to Unidrive Term. 10 cross-reference *(Analog Out 2)*

DigitAx b12	DigitAx b13	Unidrive # 7.22 (source)	Unidrive # 7.23 (scaleing)	Unidrive # 7.24 (mode)	Unidrive Function
0	0	4.04	1.000	VOLt	Motor current demand
0	1	3.01	1.000	VOLt	Final speed demand (post ramp)
1	x	4.01	1.000	VOLt	Motor current magnitude

CON B17 DigitAx programmable analog out to Unidrive Term. 11 cross-reference *(Analog Out 1)*

- #7.19 = #3.01
- #7.20 = 1.000
- #7.21 = VOLt

Note: There is a difference between the DigitAx and the Unidrive Classic with respect to the scaling and the bandwidth of the Analog outputs described. These are the closest functional assignments available in the Unidrive Classic, and can serve as a starting point.

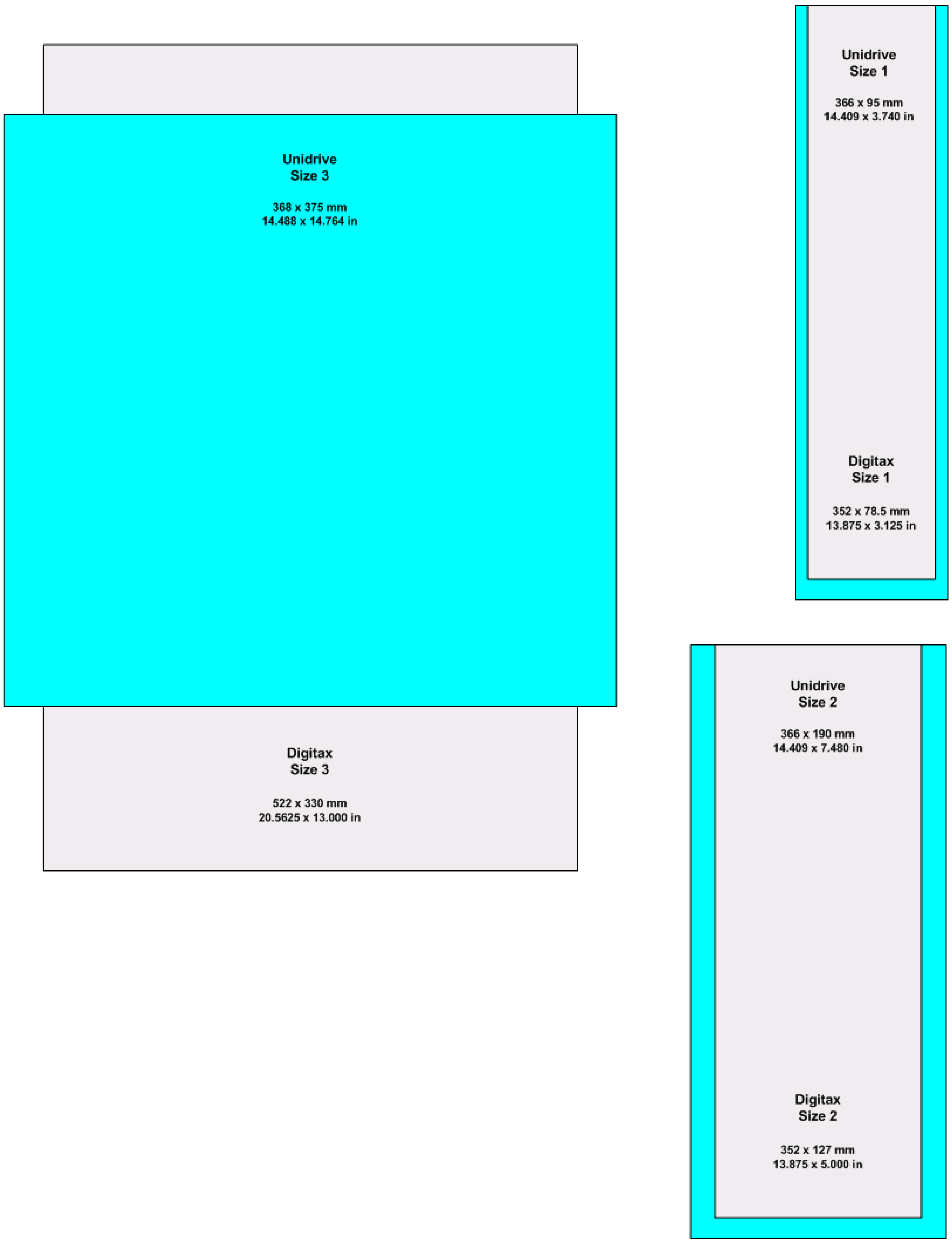
Illustrations and diagrams

Under
Construction

Insert
power and
control
connection
diagrams
here

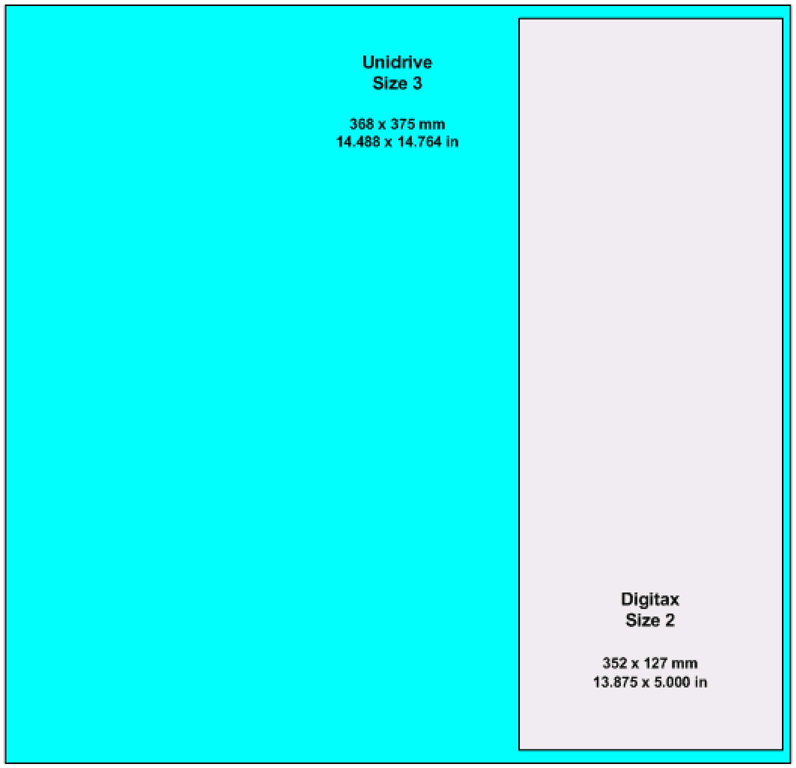
Illustrations and diagrams

Digitax to Unidrive panel area "footprint" comparison



Illustrations and diagrams

Digitax to Unidrive panel area "footprint" comparison

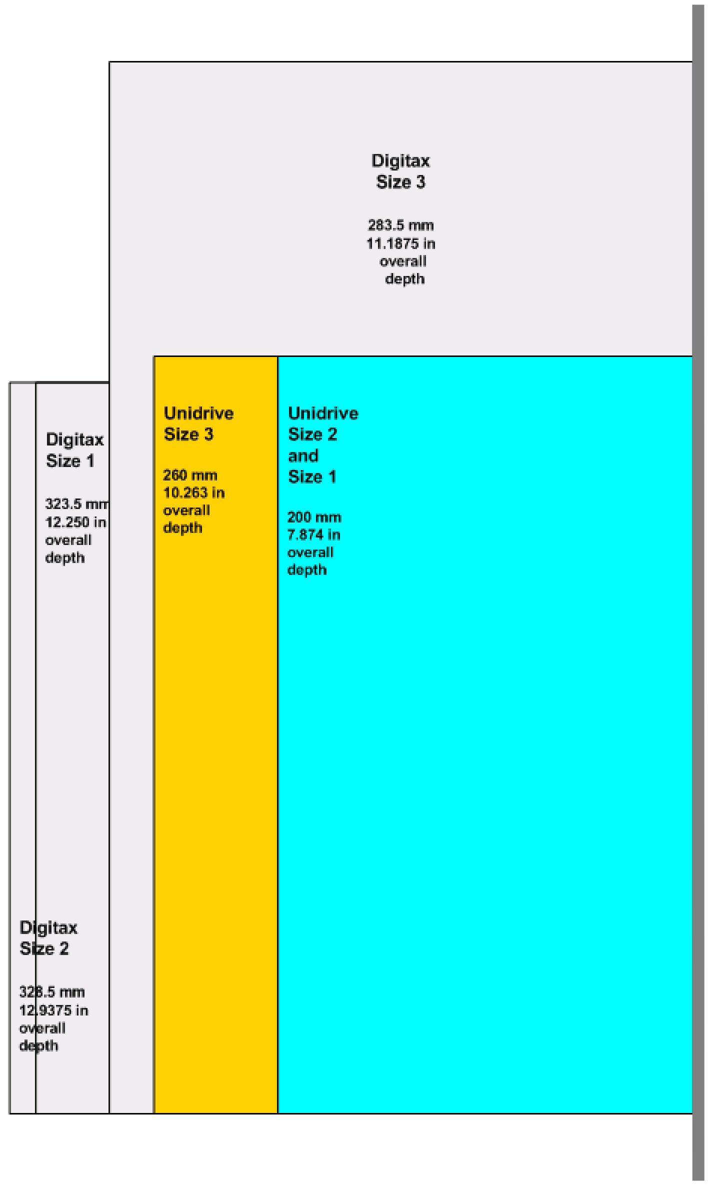


Digitax Size 2 replaced with Unidrive Classic Size 3

This "worst case" scenario would result if the DBE 1100S was matched to a motor requiring more than 18.2 amps continuous, and was to be replaced with a Unidrive Classic. The DBE 1100S is good to 26.0 amps continuous, so the UNI 3401 would be needed for a motor ranging from above 18.2 amps to 26.0 amps. The UNI 2403 is good for the 16.0 amp to 18.2 amp portion of the range of a DBE 1100S.

Illustrations and diagrams

DigitAx versus Unidrive Classic overall depth comparison



Panel depth should not be an issue when replacing the DigitAx with the Unidrive Classic. The Unidrive Classic models size one through size three all require less enclosure depth than any of the DigitAx modes.

Appendix A - Getting CTFile version 4.13 going on Win 2k / XP Pro

- Choose a suitable PC. CTFile installs from a floppy and runs as a 'real mode" program requiring at least one serial port that is supported in the PC BIOS with a standard COM 1, COM 2, COM 3 or COM 4 configuration.

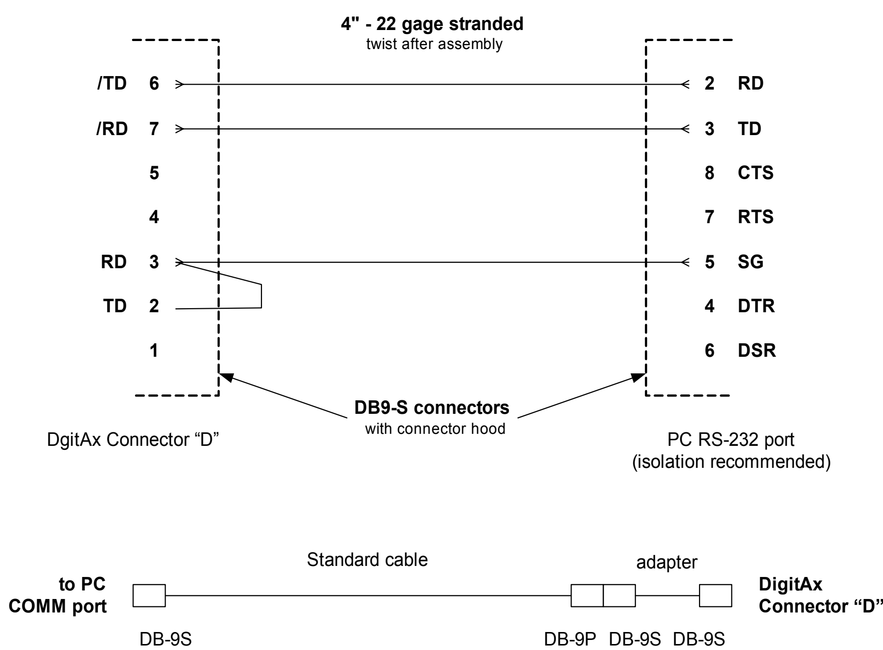
  True "legacy free" PC(s) that do not have a serial port on-board are not going to have BIOS support for such ports, and (in general) are not going to usable with CTFile. A personal computer "designed" for the newer 32 bit versions of Windows (Windows 2000 and Windows XP) may not have "real mode" support for the serial port, even if the port is present. Best advice here is to make sure that the port configured as COM 1 (at base I/O 03F8 and IRQ 4) or COM 2 (at base I/O 03E8 and IRQ 3).

  CTFile version 4.13 has been tested on "legacy" PC(s) with Microsoft Operation Systems from DOS 6.22, Windows 3.1, Windows 95 (gold distribution and OSR2.1) Windows 98, Windows 98 SE, Windows ME, Windows 2000 Professional (SP2, SP3 and SP4), and Windows XP Pro (SP1).

- Prepare the installation media. CTFile v4.13 installs from a floppy, only. The following files will be present on the install floppy:

  INSTALL.EXE
  INST.EXE
  INST2.EXE

- Run "INSTALL.EXE" to begin the program installation. Accept the default choices of the program. This will result in the program being installed on the PC's first hard drive in a folder (subdirectory) "CTFILE".
- Using the Windows Explorer, locate the main program executable (CTFILE.EXE) in the "C:\CTFILE" folder. This may be easier to do if the "Hide extensions for known file types" is unchecked (…Folder Options…View Tab…). Copy and paste a shortcut to the desktop
- "Double click" on the shortcut to start the program.
- Connect the PC serial port to the DigitAx connector "D" using a DigitAx communication cable, as shown in the next diagram. Go on-line to the DigitAx, and save the configuration to disk, and print hardcopy for reference



DigitAx RS-485 to RS-232 adapter
(isolation recommended at RS-232 port)

Appendix B – Unidrive Classic Servo Phasing Test Procedure w/ UD53 and Resolver

Instructions

The offset position required at parameter **#16.09** is in different units than the offset maintained at **Pr16** in the DigitAx. An offset phasing test will be required, and is included for reference. After step 2 completes without any errors, do the test two more times (total of 3 times without any errors or trips) and confirm that **#3.28** is consistent.

Note: This test is normally done with the motor uncoupled from the load and parameter **#5.27=0** (default). With parameter **#5.27=1**, the phasing test can be attempted with the load connected, and only if it cannot run to completion, must the load be uncoupled (and **#5.27** set back to "**0**"). This is useful for a retrofit.

Step 1 - Verify wiring of resolver channels. Define CW rotation of the motor shaft, from the flange side, with increasing counts.

To verify this, do the following:

A. Disable the drive.
B. Navigate the keypad to display parameter. **# 16.03**
C. Turn the shaft clockwise and verify that the encoder counts increase (count up) to 16383 and rollover in 1 motor revolution.

D. If the counts decrease, the COS LO and COS HI (51) channels should be swapped, then repeat A through C.

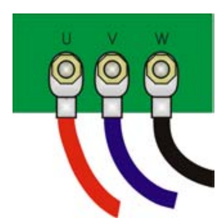
Step 2 - Verify wiring of motor power cables. Define CW rotation of the motor with a positive drive command. The phasing test of the Unidrive will give a CW rotation during the test.

To verify this, complete the following steps:

A. Verify that the motor is free of any load.
B. Navigate the keypad to display parameter **#0.40**
C. Set the parameter to 1.
D. Enable the drive. The phasing test will command the motor to move one rev CW. It will also reset the parameter to 0. Note the value of parameter **#3.28**

E. If the motor moves in the CCW direction, the motor power is wired incorrectly. Swap the U and V phases and repeat A through D.

NOTE: Encoder phasing trip 7 [**ENC.PH7**] is the only phasing trip expected with resolver feedback, if the motor moves clockwise. Swap the SIN and COS pairs and repeat A through D if this error trip code is observed.



Appendix C- MX to DigitAx cross reference

Emerson Motion Control brand-labeled the DigitAx as the EMC MX Servo Drive. The MX was usually matched to the EMC BLM series of servomotors. The following table cross-references the EMC MX and the BLM motor they were matched to, and the DigitAx that crosses to that MX model. Treat these versions as a DigitAx the purpose of retrofitting. Note that many of EMC versions of the DigitAx these were motion applications, not speed / torque applications.

Emerson MX model	CT DigitAx Model	BLM Motor Model
MX-280-E	DBE-140	BLM/E-316
MX-280-E	DBE-140	BLM-340
MX-440-E	DBE-220	BLM/E-455
MX-440-E	DBE-220	BLM/E-490
MX-850-E	DBE-420	BLM/E-490
MX-850-E	DBE-420	BLM/E-4120
MX850-E	DBE-420	BLM-6120
MX-1300-E	DBE-600	BLM-6200
MX-1600-E	DBE-750	BLM-6300
MX-2600-E	DBE-1100S	BLM-6400
MX-2600-E	DBE-1100S	BLM-8500
MX-3200-E	DBE-1500	BLM-6400
MX-3200-E	DBE-1500	BLM-8500
MX-3200-E	DBE-1500	BLM-8800
MX-4800-E	DBE-2200	BLM-8800
MX-4800-E	DBE-2200	BLM-81000

Appendix D - DutyMax DS Servo motor Thermal Time Constant vrs. UM versions

DS frame size	DS Thermal T. C.	Applies to CT DigitAx Model	UM Thermal T. C.
75 DS A	5.0 sec	DBE140, DBE220	1315 sec
75 DS B	5.5 sec	DBE140, DBE220	1431 sec
75 DS C	6.0 sec	DBE140, DBE220	1500 sec
75 DS D	6.0 sec	DBE140, DBE220	1587 sec
95 DS A	6.0 sec	DBE 140, DBE220, DBE420	1422 sec
95 DS B	6.0 sec	DBE 140, DBE220, DBE420	1618 sec
95 DS C	6.5 sec	DBE 140, DBE220, DBE420	1800 sec
95 DS D	6.5 sec	DBE 140, DBE220, DBE420	1997 sec
95 DS E	7.0 sec	DBE 140, DBE220, DBE420	2178 sec
115 DS A	7.0 sec	DBE 140, DBE220, DBE420, DBE600, DBE750	1436 sec
115 DS B	7.0 sec	DBE 140, DBE220, DBE420, DBE600, DBE750	1614 sec
115 DS C	7.5 sec	DBE 140, DBE220, DBE420, DBE600, DBE750	1792 sec
115 DS D	8.0 sec	DBE 140, DBE220, DBE420, DBE600, DBE750	1980 sec
115 DS E	8.0 sec	DBE 140, DBE220, DBE420, DBE600, DBE750	2158 sec
142 DS A	8.0 sec	DBE220, DBE420, DBE600, DBE750	2093 sec
142 DS B	8.0 sec	DBE220, DBE420, DBE600, DBE750	2316 sec
142 DS C	8.5 sec	DBE220, DBE420, DBE600, DBE750	2548 sec
142 DS D	9.0 sec	DBE220, DBE420, DBE600, DBE750	2700 sec
142 DS E	9.5 sec	DBE220, DBE420, DBE600, DBE750	3003 sec

These CT Dynamics servomotors were widely matched to the DigitAx and sold all over the world. The Unidrive uses a different thermal model than the DigitAx. The CT Dynamics UM servomotors are designed for the Unidrive, and the thermal time constants published are for the Unidrive thermal model. This side-by side comparison for the different values for the same servo frame size could be useful.