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SUPER
VEXTA®

OPERATOR'S MANUAL

MODEL UI215GA
INTELLIGENT STEP MOTOR DRIVER
&
MODEL DP-01
DATA PACK

ORIENTAL MOTOR®
ORIENTAL MOTOR U.S.A. CORPORATION

Manual Number M91UI215GA-3

THANK YOU FOR CHOOSING SUPER VEXTA©

Oriental Motor's reputation for award winning quality and cost-effective products is well known among original equipment manufacturers. Our Vexta and Super Vexta brands of motion control products are built to these same exacting standards and enjoy the same reputation.

Super Vexta's UI215GA Intelligent Step Motor Drivers and DP-01 Data Packs are built with the pride and craftsmanship of a century of manufacturing experience. Oriental Motor's ED Division has engineered and built this product to provide years of trouble free service. Each product is carefully and thoroughly tested prior to shipment to ensure the same high quality you've come to expect from us.

Please read this manual carefully, and use this product according to these instructions. If you have any further questions, please do not hesitate to call Oriental Motor for assistance.

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SUPER VEXTA®

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THE UI215GA INTELLIGENT STEP MOTOR DRIVER

SUPER VEXTA's Intelligent Step Motor Driver combines a high performance unipolar chopper step motor driver and microprocessor intelligence, and is designed to interface easily with Programmable Controllers or other switch-output type controllers (relay contact or open-collector outputs, for example). The UI215GA allows for easy control of speed, distance and acceleration by direct switches or BCD thumbwheel switches. With the use of a DP-01 Data Pack, the UI215GA becomes a single axis preset-indexer, able to repeat exactly the same movement with each new "START" signal. The UI215GA/DP-01 pair can be used stand alone or in parallel with another type of controller. Once a "START" signal is received, the microprocessor in the UI215GA automatically calculates the pulse train profile and then sends the step and direction pulses to the built-in step motor driver.

All of the basic motion control functions have been built-in, including: Index mode, Return to electrical home mode, Continuous running mode (Scan) and Jog mode (one step at a time). With the use of a Programmable Controller, the UI215GA can also execute a Hunt for mechanical home and/or auxiliary home limit switch function.

FEATURES:

*Easily interfaces with Programmable Controllers, or can be operated with simple switch control (SPST, pushbutton, dry contact or open-collector transistor switches).

*Can be used with VEXTA stepping motors for torques from 16.6 oz-in to 174 oz-in, in 1.8° and 0.9° per step for 200, 400 or 800 steps per revolution.

*Two speed ranges with high speed operation up to 5,000 pps to fully utilize the UI215GA's ability to deliver high torque at high speed.

*From 1 to 9,999 steps per index.

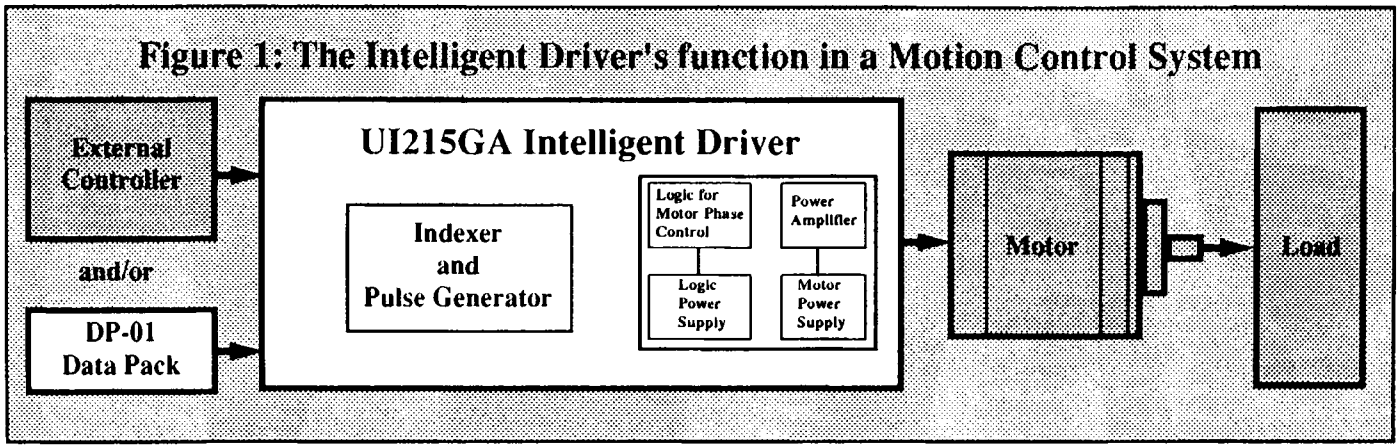
*No complicated programming languages to learn: acceleration, running speed and move lengths can be preset with a DP-01 Data Pack, PLC or any type of switch by the user.

*Easy to set-up, compact in size.

TYPICAL APPLICATIONS:

Cut to length, Transfer machines and material handling, Automating final test, Quality control and other test fixtures, Packaging machines, Automated textile manufacturing and a host of other factory automation or process control applications.

STEP MOTOR-BASED MOTION CONTROL SYSTEM



The basic components of an open loop step motor based motion system are shown in figure 1.

External controller: This is the "intelligent" part of the system. The external controller (e.g. PLC) will usually control other operations of the machine(s) as well as the motion system itself. The PLC can be programmed to respond to inputs from switches or other sensors (i.e. limit switches) and can send operational signals (i.e. operating modes) to the indexer or pulse generator to control the number of steps, the acceleration/deceleration rate, starting speeds and running speeds. The DP-01 Data Pack can be used in place of an external controller to provide all of the motion data for the UI215GA Intelligent Driver.

Indexer/Pulse Generator: A pulse generator is a device that produces pulses and sends them to the driver. The indexer calculates the motion profile from the motion data (i.e. starting speed, running speed, acceleration/deceleration rate and the length of move) supplied by the external controller or DP-01 Data Pack and then sends the pulse train to the driver.

With the UI215GA, all of the important parameters of a motion profile; starting speed, running speed, acceleration/deceleration rate and the length of a move can be set by the user. The UI215GA then takes all of the data that has been set, and by using the built in microprocessor, calculates the step and direction signals (motion profile) to be sent to the driver. See figure 2.

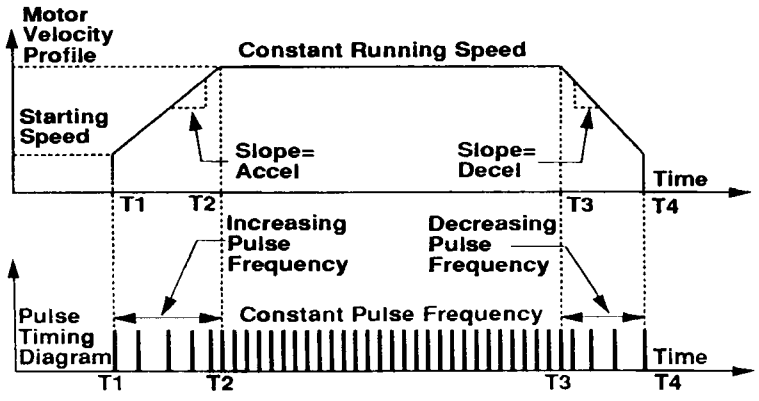


Figure 2: Typical Motion Profile

The UI215GA can also be set to operate in 4 different operating modes. The 4 operating modes are:

1) Index mode - move the number of steps that has been set with each start signal received.
2) Return to Electrical Home mode - return to the original starting point (point where the internal counter is equal to zero).
3) Continuous mode - move continuously until a stop signal.
4) Jog mode - moves 1 step per start signal or 4 pps while the start signal is held "ON" continuously.

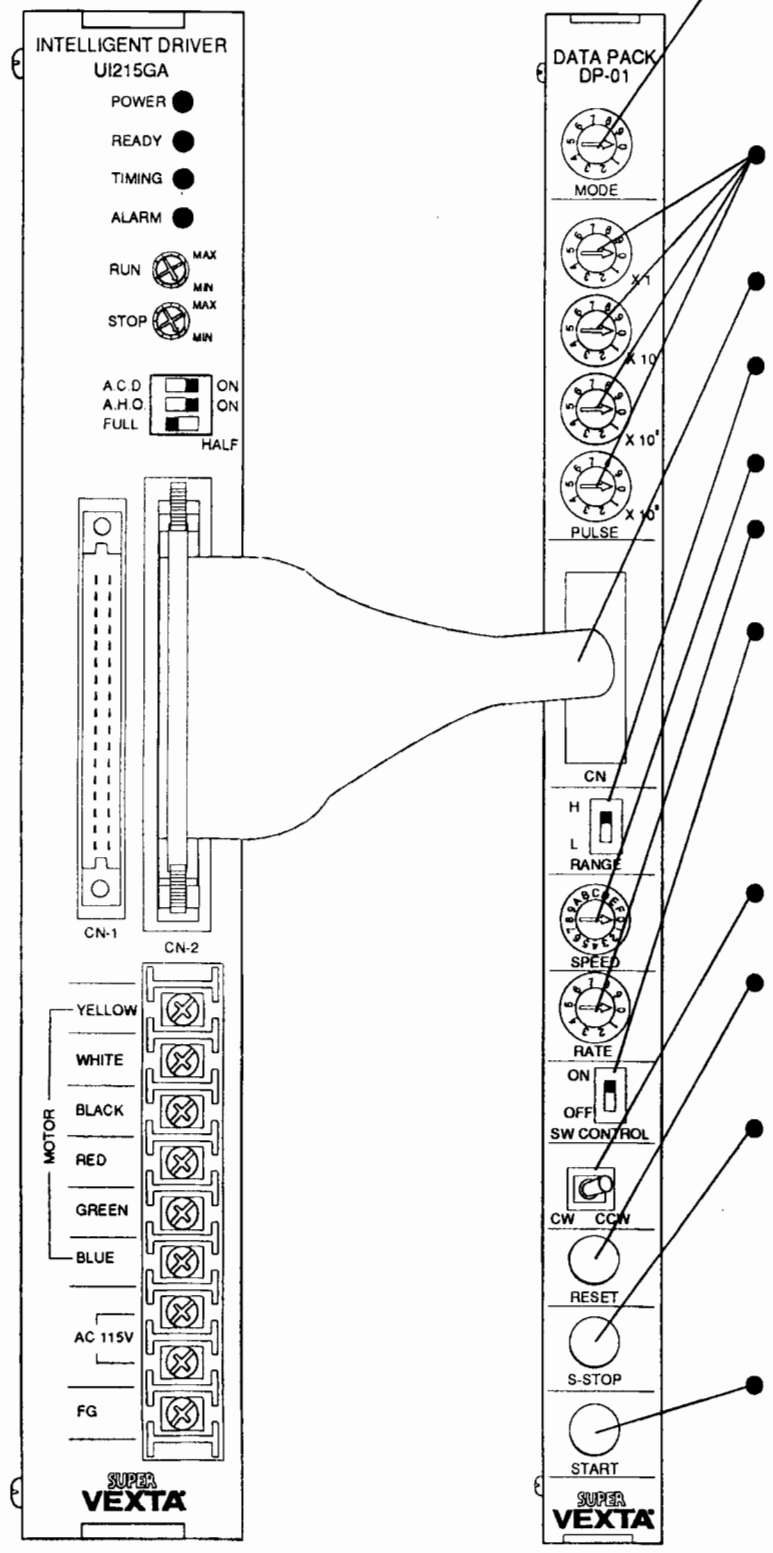
The UI215GA can also perform a Return-to-Mechanical Home Position (limit switch) hunting function with the help of a Programmable Controller.

The Driver: The driver has several sections and functions. Contained in the driver is the logic used to convert the step and direction signals from the indexer into "ON" and "OFF" signals for the motor windings, the power amplifier to amplify the signals from the logic section to useful levels for the motor and the power supplies required for each section.

The Motor: The stepping motor converts the electrical signals from the driver into rotational movements.

The Load: The load is whatever the user wants to move.

UI215GA & DP-01 LAYOUT



Mode (Operating mode)
Index
Return to Electrical Home
Jog
Continuous Running/Home Hunting

Pulse (Number of steps)
Number of steps in index move
0 to 9,999 steps maximum

Special cable/connector
(Included with the DP-01)

Range (Speed range)
High/Low

Speed
Running speed

Rate
Acceleration/Deceleration Rate

SW Control
When in the "Off" position, this disables the CW/CCW, RESET, S-STOP and START switches on the DP-01. This allows these functions to be controlled exclusively by an external controller

CW/CCW
Direction of rotation

Reset
Stops motor motion and resets the internal counter to zero

S-Stop
In the continuous mode the motor will slow down to the base speed.
In the Index and Return modes the motor will decelerate and stop.
The interrupted move will be completed when the next START signal is received

Start
The START signal causes the UI215GA to read all input data lines, calculate the motion profile and then begin the motion. All input switches are ignored (except for RESET and S-STOP) until the move has been completed and the ready light comes "ON"

CONTENTS INCLUDED IN THIS PACKAGE

UI215GA 1 Unit

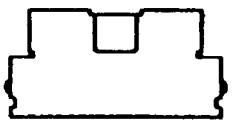


ACCESSORIES:

External Controller Connector (CN1) 1pc PCA-36FES Solder Type Honda Tsushin Kogyo Co., Ltd



External Controller Connector Case 2pc PCA-36LSM Honda Tsushin Kogyo Co., Ltd



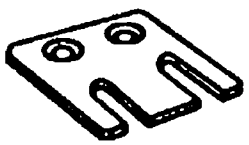
Screw Driver for External Controller Connector Case 1pc



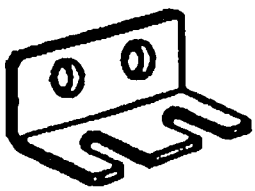
Strain Relief for External Controller Connector 2 sets (6 pieces total)



Mounting Bracket A (Flat) 2pc



Mounting Bracket B (L-shaped) 2pc



Screws 4pc 2x6 M3



Check for any possible damage due to transportation. If any problems are found, contact the distributor or direct sales office from whom you purchased this product.

MOTORS THAT CAN BE USED WITH THE UI215GA

The UI215GA intelligent step motor driver has a maximum current output of 1.25A/phase (2.5A total). Therefore, only the motors listed below are recommended for use with the UI215GA. These motors are recommended due to their winding characteristics. The use of any other motors with the UI215GA driver may damage the driver, the step motor or both.

Motors recommended for use with the UI215GA Intelligent Driver

Motor	Total current (Both phases) (A)	Phase current (A/phase)	Holding Torque (oz-in)	Step Angle (deg)	Motor Size Dia. x Length
PX244-02AA (BA)	1.6	0.8	22.2	1.8°	1.65" x 1.54"
PX245-01AA (BA)	2.4	1.2	31.9	1.8°	1.65" x 1.85"
PH264-01 (B)	2.2	1.1	40.3	1.8°	2.22"ϕ x 1.54"
PH266-01 (B)	2.4	1.2	83.3	1.8°	2.22"ϕ x 2.13"
PH268-21 (B)	2.5	1.25	125	1.8°	2.22"ϕ x 2.99"
PH296-02 (B)	2.5	1.25	174	1.8°	3.27"ϕ x 2.44"
PX244M-01AA (BA)	2.4	1.2	16.6	0.9°	1.65" x 1.54"
PX245M-01AA (BA)	2.4	1.2	23.6	0.9°	1.65" x 1.85"
PH264M-31 (B)	1.7	0.85	25	0.9°	2.22"ϕ x 1.54"
PH265M-31 (B)	2.2	1.1	52.8	0.9°	2.22"ϕ x 2.01"

BINARY CODED DECIMAL (BCD) FORMAT

The Index Data (number of steps in an index mode move) is input to the UI215GA Intelligent Driver in a Binary Coded Decimal (BCD) format. In the BCD format, four data lines are used to represent each decimal digit (1000's, 100's, 10's and 1's). The UI215GA has a maximum of 9,999 steps (4 digits), therefore, 16 data lines are necessary to have complete flexibility when selecting the number of steps in an Index move. Similarly, 4 data lines are required for the Running Speed inputs. By referring to the table below, the correct "ON"/"OFF" combinations can be determined to complete the desired length of move. See the wiring example shown on page 21 for details on selecting a move length of 6,798 steps.

Binary Coded Decimal Format

NUMBER OF STEPS	BINARY CODED DECIMAL (BCD) "ON"/"OFF" COMBINATIONS			
	INDEX DATA 8	INDEX DATA 4	INDEX DATA 2	INDEX DATA 1
0	OFF	OFF	OFF	OFF
1	OFF	OFF	OFF	ON
2	OFF	OFF	ON	OFF
3	OFF	OFF	ON	ON
4	OFF	ON	OFF	OFF
5	OFF	ON	OFF	ON
6	OFF	ON	ON	OFF
7	OFF	ON	ON	ON
8	ON	OFF	OFF	OFF
9	ON	OFF	OFF	ON

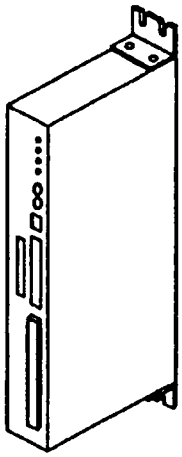
NOTE: A data line is considered "ON" when there is a connection between it and ground.

INSTALLATION

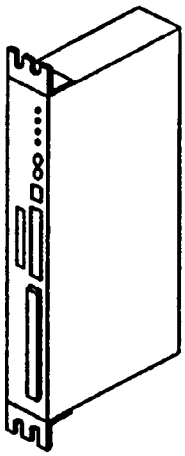
INSTALLING THE MOUNTING BRACKETS

Use the metal brackets and screws provided to install the unit. The UI215GA can be mounted in either a Rear, Front, Side, Bottom or Top mounting configuration as show in the figures below.

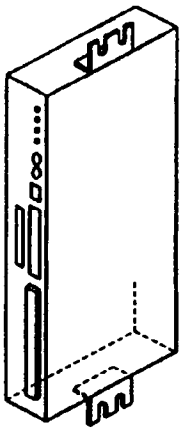
Rear Mounting



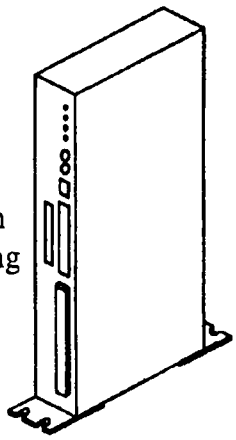
Front Mounting



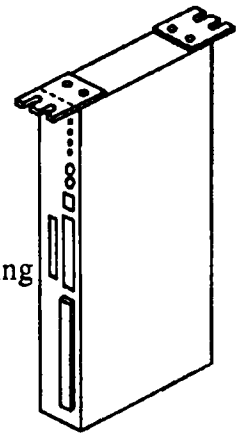
Side Mounting



Bottom Mounting



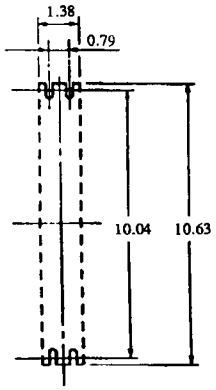
Top Mounting



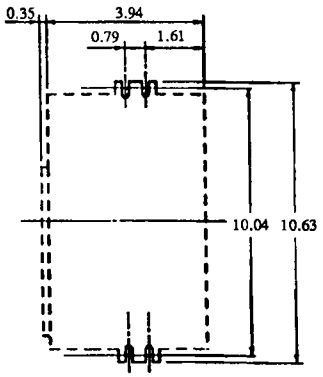
- The UI215GA should be mounted to a metal surface in order to be properly heat sinked.
- Please allow 1in. of free space between the UI215GA and any other equipment when mounting. Note: the DP-01 Data Pack can be mounted flush against the UI215GA.
- Securely attatch the UI215GA to the mounting surface by using all 4 screws that are provided.

Mounting bracket hole drilling dimensions

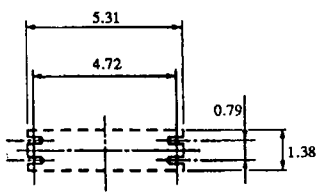
Rear and front Mounting Pattern



Side Mounting Pattern

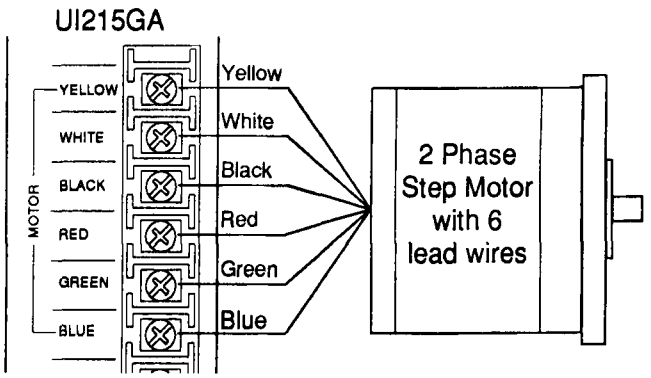


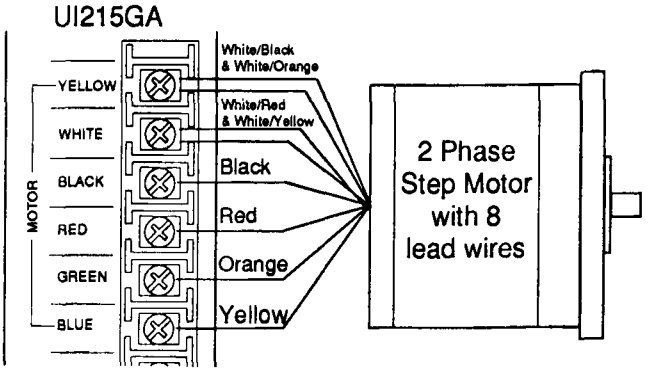
Top and Bottom Mounting Pattern



CONNECTING TO THE MOTOR

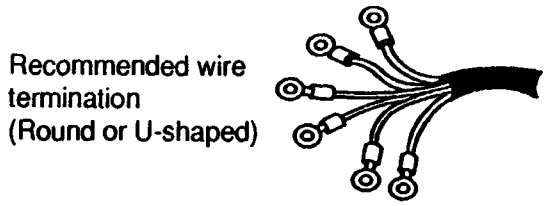
With no power connected to the driver, securely attach the colored motor lead wires to the corresponding terminals on the UI215GA (See the drawings to the right for connecting either a 6 lead or 8 lead wire stepping motor). Motor wiring should be kept as short as possible for best performance. If longer lead wires are required, use at least size AWG 20 wire. Securely connect the wires to the terminal screws and route them away from any signal lines. Completely reinstall the clear plastic shield prior to putting power to the driver.





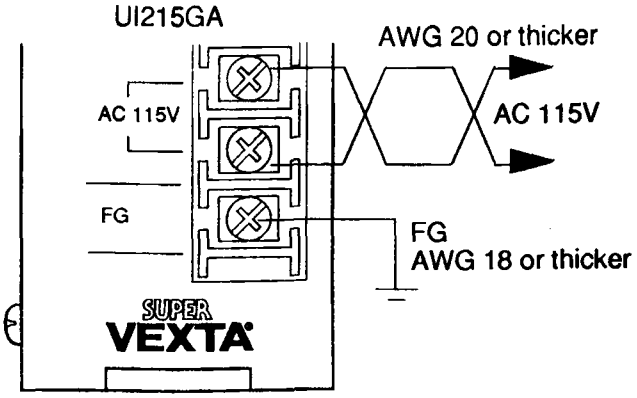
WIRE TERMINATION

Please use a size AWG 20 I.D. type wire termination (round or U-shaped) on the input power and motor lead wires to ensure a proper connection. Make sure that the input power is "OFF" while connecting it to the UI215GA



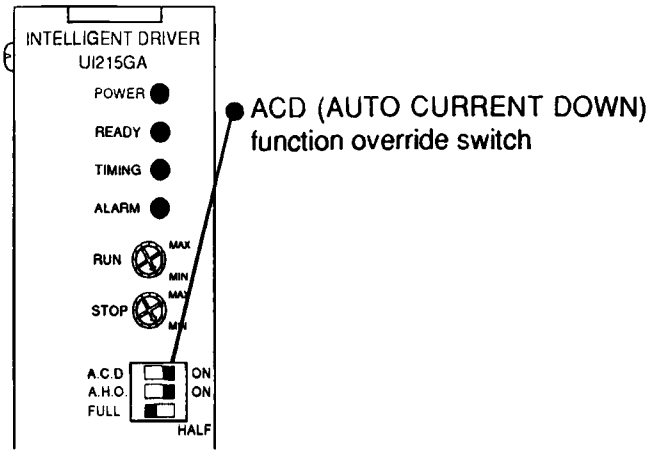
CONNECTING TO THE POWER SOURCE

A power source of 115VAC ±10%, 60HZ, <1.3A is required to operate the UI215GA. Securely attach the wires from the power supply to the terminals marked "AC 115V". Once power is applied, potentially dangerous voltages will be present in the AC power line and wires leading to the motor. Care should be taken to ensure that all exposed metal parts of the connector, wires or terminal strip are electrically insulated to avoid accidental contact. The terminal marked "FG (frame ground)" on the UI215GA must be properly grounded to reduce the chance of electrical shock. Be sure to completely reinstall the clear plastic shield prior to putting power to the driver.



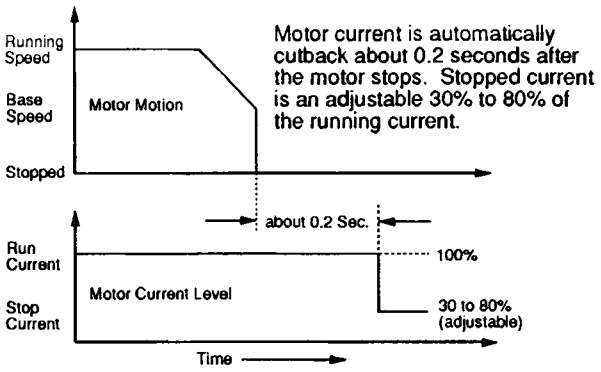
SWITCH SELECTABLE FEATURES

SETTING THE A.C.D. FUNCTION SWITCH:

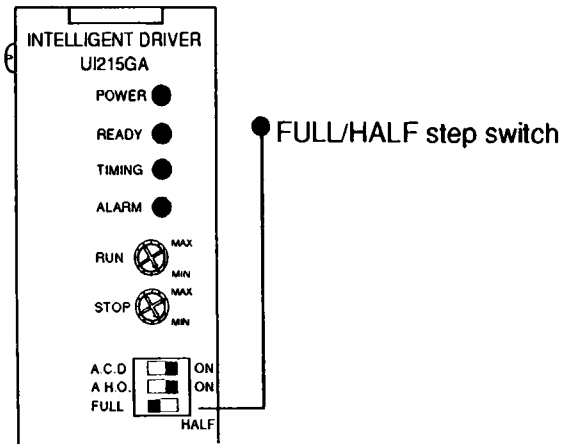


The A.C.D. function turns "ON" or "OFF" the automatic current cutback function that is built into the Intelligent Driver unit. When the A.C.D. switch is in the "ON" position, the motor phase current value will be reduced to between 30% to 80% (adjustable) of the run phase current value after the motor has been stopped for approximately 0.2 seconds. The value of the current cutback can be set by adjusting the STOP potentiometer to the desired value. See pages 10 and 11 for complete instructions on how to set the RUN and STOP current values. A current cutback value of approximately 50% of the run current value is recommended. This function is extremely helpful in reducing the amount of motor heating while the motor is at rest.

When the A.C.D. switch is in the "OFF" position, the auto current down function is completely disabled and the motor phase current will not be reduced. This override capability is very useful when full holding torque is still required to hold the load when the motor is at rest (e.g. motor is moving a weight against the force of a spring or gravity)



SETTING THE FULL/HALF STEP FUNCTION SWITCH:

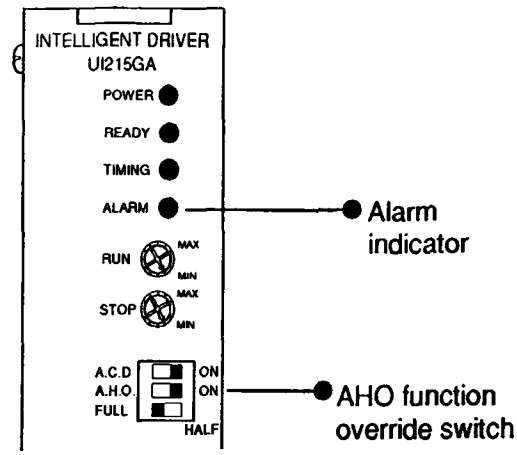


When the FULL/HALF step function switch is in the "FULL" position, the UI215GA Intelligent Driver will move the motor in a "2-phase on" manner resulting in steps of 1.8° for 1.8°/step motors and steps of 0.9° for 0.9°/step motors.

When the FULL/HALF step function switch is in the "HALF" position, the UI215GA Intelligent Driver will move the motor in a "1-2-phase on" manner resulting in steps of 0.9° for 1.8°/step motors and 0.45° for 0.9°/step motors.

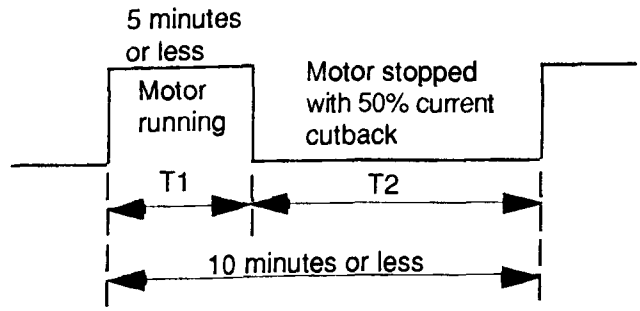
OVERHEAT PROTECTION (AUTOMATIC THERMAL-CUTOUT: AHO)

When the temperature of the heat sink inside the driver reaches approximately 176°F (80°C), the motor output current is automatically shut off, the alarm indicator on the front panel lights up, and the "OVERHEAT ALARM" output signal (Pin #35) is turned "ON" at connector CN1.



In applications where the sudden removal of motor current could pose a safety problem (e.g. motor is moving a weight against the force of gravity or a spring), the AHO switch can be turned to the "OFF" position to disable the function. If the temperature of the internal heat sink reaches 176°F (80°C) while the AHO function switch is "OFF", the alarm indicator on the front panel will still light up and the "OVER-HEAT ALARM" output signal (Pin #35) will still be turned "ON" at connector CN1 even though the AHO function has been disabled. Current to the motor will not be shut off, however.

If an overheat alarm occurs, review the application requirements to make sure that they are within the specifications of the **UI215GA** (Drive duty cycle, ambient temperature, etc.), or apply forced air cooling to the driver.



$$\text{Duty cycle} = \frac{T1}{T1 + T2} \times 100\% \leq 50\%$$

The maximum recommended duty cycle (running time vs. stopped time) for the motor and driver is 50% running, up to a maximum 10 minute cycle, (i.e. up to 50% running would be up to 5 minutes of "ON" time).

The Auto Thermal Cutoff (AHO) function is self resetting. Once the driver has cooled sufficiently, the motor may restart abruptly if the input signal source is still active. **Precautions should be taken to ensure that the system is reset to protect persons and property against unexpected motor activity.**

SETTING THE RUN AND STOP CURRENT LEVELS

SETTING THE RUN CURRENT LEVEL

The UI215GA is shipped with the Run current potentiometer turned all the way down to its minimum. The motor will not run properly in this condition. To make the motor perform properly, make the following adjustments described below.

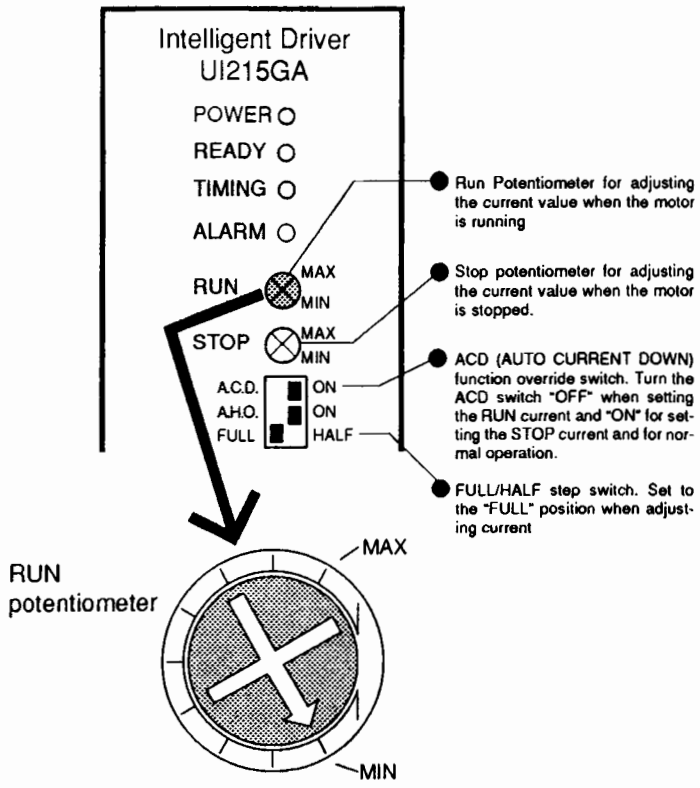
PROCEDURE

(1) Hook up the motor and power as shown in the wiring diagram below. Turn the power "ON". Be sure not to apply any start signals to the UI215GA.

(2) To set the RUN current

For the motors:
PH268-21(B) & PH296-02(B),
set the RUN potentiometer to MAX.
Total Current = 2.5A (1.25 A/phase).

For the motors:
PH266-01(B), PH264-01(B), PX245-01AA(BA), PX244-02AA(BA), PH265M-31(B), PX245M-01AA(BA), PX244M-02AA(BA)
First, turn the ACD switch to the "OFF" position and the FULL/HALF switch to the "FULL" position. Then adjust the RUN potentiometer so that the current measured is equal to double the phase current value of the motor. See table #1 below for the correct phase current value for each motor. (The current should be set to double because with the wiring diagram shown, you are measuring the current in two phases at the same time).



Wiring diagram

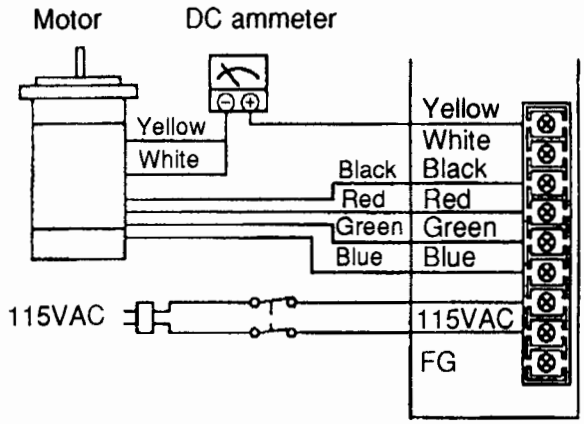
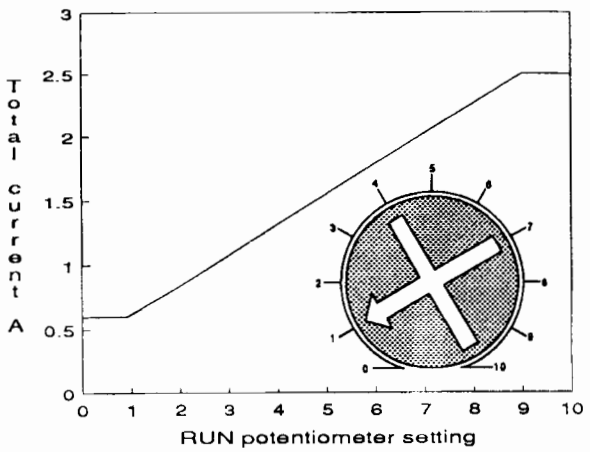


Table 1: Run current/phase values

Motor	Total current (Both phases) (A)	Phase current (A/phase)
PX244-02AA (BA)	1.6	0.8
PX245-01AA (BA)	2.4	1.2
PH264-01(B)	2.2	1.1
PH266-01(B)	2.4	1.2
PH268-21(B)	2.5	1.25
PH296-02 (B)	2.5	1.25
PX244M-01AA (BA)	2.4	1.2
PX245M-01AA (BA)	2.4	1.2
PH264M-31 (B)	1.7	0.85
PH265M-31 (B)	2.2	1.1



Note: This graph is an approximation of the relative potentiometer setting and the RUN current value.

SETTING THE STOP CURRENT LEVEL

After setting the motor running current, turn the ACD function switch to the "ON" position and set the motor stopped current value by using the STOP potentiometer to approximately 1/2 of the running current value. See table #2 below for the correct STOP current values.

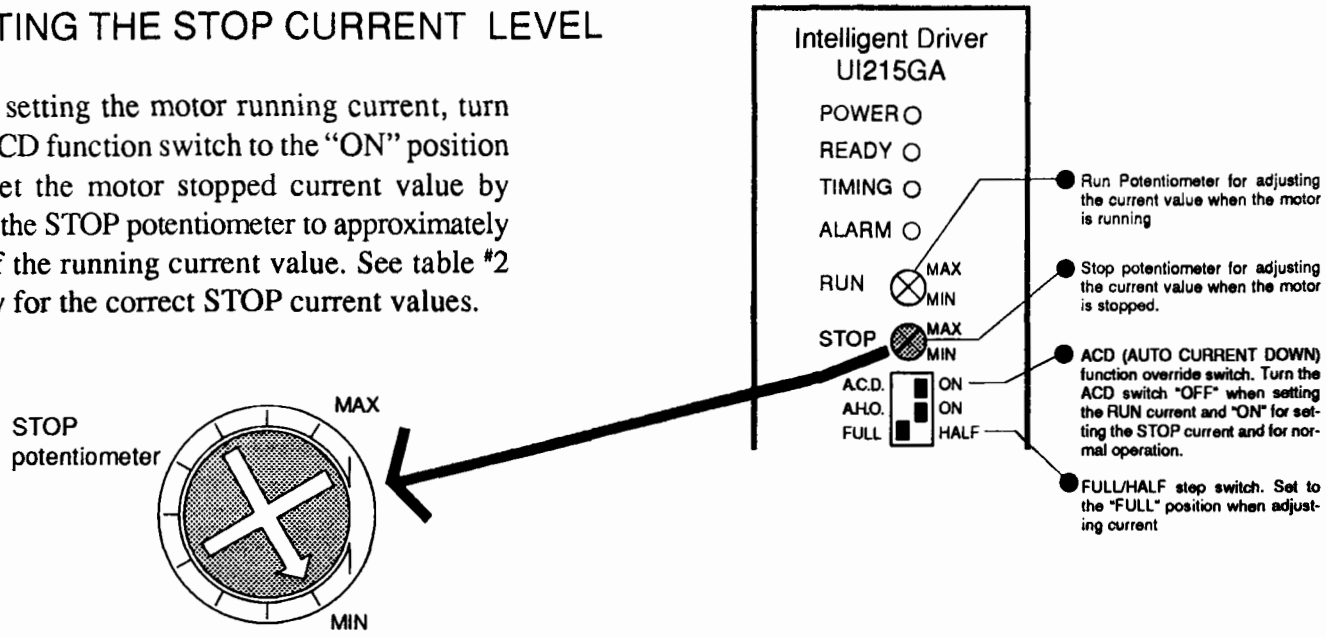
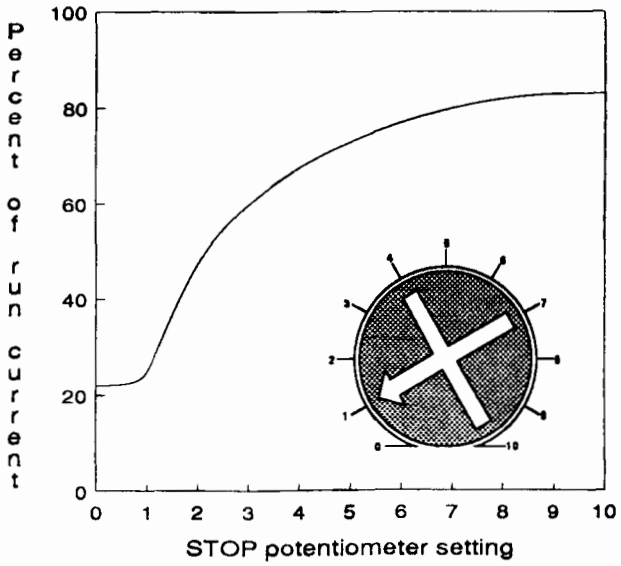
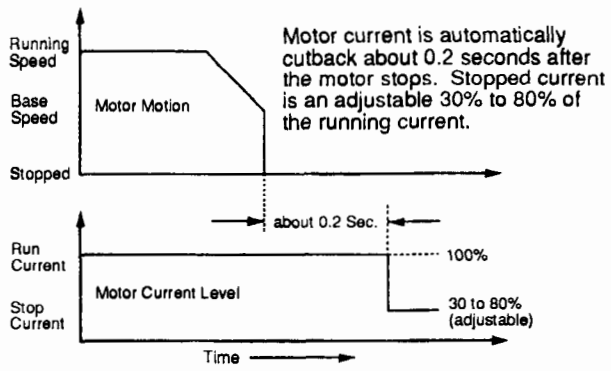


Table 2: Stop current/phase values

Motor	Total current (Both phases) (A)	Phase current (A/phase)
PX244-02AA (BA)	0.8	0.4
PX245-01AA (BA)	1.2	0.6
PH264-01(B)	1.1	0.55
PH266-01(B)	1.2	0.6
PH268-21(B)	1.25	0.625
PH296-02 (B)	1.25	0.625
PX244M-01AA (BA)	1.2	0.6
PX245M-01AA (BA)	1.2	0.6
PH264M-31 (B)	0.85	0.425
PH265M-31 (B)	1.1	0.55



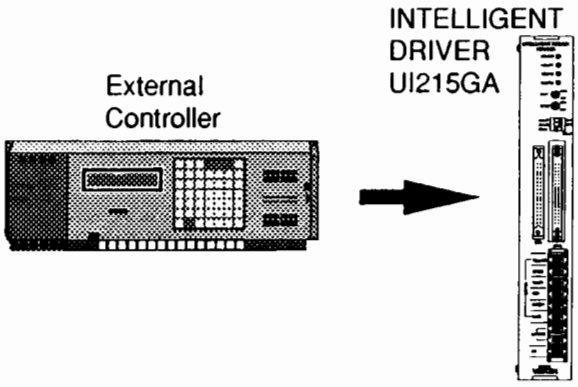


CONTROLLING THE UI215GA INTELLIGENT DRIVER

The UI215GA can be controlled in three main configurations: **1)** Completely controlled by an external controller (e.g. programmable controller), **2)** Completely controlled by the DP-01 Data Pack or **3)** Controlled in parallel by both the DP-01 Data Pack and an external controller. The figures below show the UI215GA Intelligent Driver being controlled in the various configurations.

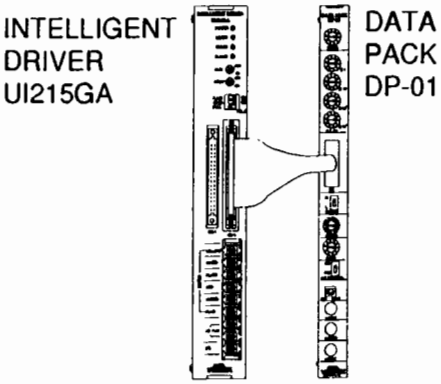
1) Complete External Controller Control

In this configuration, all motion data is input by the external controller (e.g. PLC). The external controller determines the operating mode, the length of the move, the starting and running speeds, the acceleration/deceleration rate, the direction of rotation and when to start, slow down or stop. The DP-01 Data Pack is not required in this configuration to operate the UI215GA. See page 13 for more details.



2) Complete DP-01 Data Pack Control

In this configuration, all of the motion data is set by using the DP-01 Data Pack. The DP-01 can control the UI215GA by simply adjusting the dials or switches on the front panel to the appropriate positions to achieve the desired motion. An external controller is not required in this configuration. See page 24 for more details.

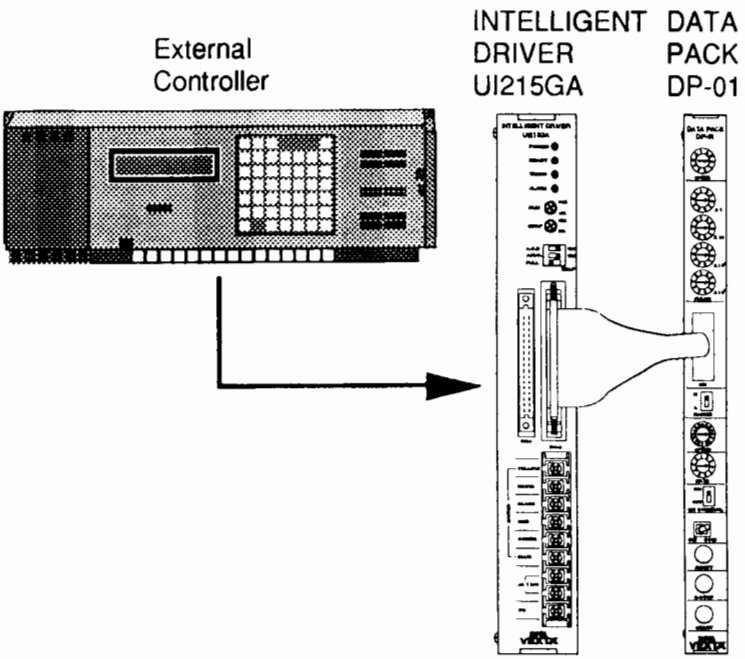


3) Parallel Control

Both the DP-01 Data Pack and an external controller can be used in parallel to control the UI215GA. There are two possible combinations for parallel control:

A) By having the input data (e.g. speed, length, etc.) controlled by an external controller and the command function inputs (i.e. START, S-STOP, etc.) controlled by the DP-01 Data Pack. Note: Be sure that the input data (i.e. mode, pulse, speed and rate) dials are set to the 0 (zero) position.

B) By having the input data controlled by the DP-01 Data Pack and the command function inputs controlled by the external controller. NOTE: If you are using the UI215GA in this configuration, be sure to set the SW CONTROL switch on the DP-01 Data Pack to the "OFF" position. This will disable the CW/CCW, RESET, S-STOP and START switches on the DP-01 Data Pack so that these functions can be controlled exclusively by the external controller.



EXTERNAL CONTROL OF THE UI215GA

The UI215GA can be controlled by an external source such as a Programmable Controller, binary coded decimal (BCD) thumbwheel switches, other dry contact switches or open-collector transistor switches. All of the motion data; starting speed, running speed, acceleration/deceleration rate, direction, length of travel and the operating mode can be set by simply turning "ON" one or any combination of the inputs on CN1 to perform the desired motion. An input is considered to be "ON" when there is a connection made between ground (Pin #31) and the desired input line. A signal that is "ON" will have a voltage level of approximately 0VDC, while a signal that is "OFF" will have a voltage level of approximately 10VDC. If you plan to use the DP-01 Data Pack to control the UI215GA, please turn to page 24 for complete information on how to operate the UI215GA.

Referring to the table on page 14 which describes the input/ouput signals on CN1 and CN2, input lines 1 - 16 are used to set the number of steps in an index move. The speed range is selected on input line #17. Input lines 18 - 21 are used to set the running speed of the move. The acceleration/deceleration rate is set by using input lines #22 and #23. The operating mode input lines are #24 and #25. The "START" signal input line is pin #26. Pin #27 is the decelerate/halt input line. Pin #28 is the "RESET" signal input. Pin #29 is used for the direction of rotation input (CW/CCW). Pin #30 is used for the "ALL WINDINGS OFF" input signal. The common ground for all of the input lines (1 - 30) is located on pin #31.

Also referring to page 10, pins #32 to #36 on CN1are used as outputs to the external controller. Pin #32 is the "READY" signal output. Pin #33 is the "MAGNETIC BRAKE" signal output. The timing signal is located at pin #34 while pin #35 represents the "OVERHEAT ALARM" signal output. Pin #36 is the common emitter transistor type output for lines #32 to #35.

By referring to tables 1 thru 4 on page 15, you can determine which inputs are necessary (turned "ON") to perform the desired motion.

Description of signals....14
Data tables....15
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Setting the motion data....17
Selecting the operating mode....17
Home hunting with the UI215GA and a PLC....19
Improving the accuracy of the home position....20
Selecting the number of steps in an index move....21
Selecting the speed range....21
Selecting the running speed....21
Selecting the acceleration/deceleration rate....22
Using the command functions....22
CW/CCW....22
RESET....22
S-STOP....23
START....23
All windings off (AWO)....23

Description of Signals

An input signal is considered to be "ON" when there is continuity to ground (Pin #31).
An output signal is considered to be "ON" when it is LOW or CLOSED.

Connector CN1 and CN2 Input/Output Signals

Pin # CN 1	Pin # CN 2	Name of Signal	Input/ Output	Function	Note
1	1	INDEX DATA 1	Input	Number of steps = 1	Selected when the photo coupler is "ON"
2	2	INDEX DATA 2	Input	Number of steps = 2	Selected when the photo coupler is "ON"
3	3	INDEX DATA 4	Input	Number of steps = 4	Selected when the photo coupler is "ON"
4	4	INDEX DATA 8	Input	Number of steps = 8	Selected when the photo coupler is "ON"
5	5	INDEX DATA 10	Input	Number of steps = 10	Selected when the photo coupler is "ON"
6	6	INDEX DATA 20	Input	Number of steps = 20	Selected when the photo coupler is "ON"
7	7	INDEX DATA 40	Input	Number of steps = 40	Selected when the photo coupler is "ON"
8	8	INDEX DATA 80	Input	Number of steps = 80	Selected when the photo coupler is "ON"
9	9	INDEX DATA 100	Input	Number of steps = 100	Selected when the photo coupler is "ON"
10	10	INDEX DATA 200	Input	Number of steps = 200	Selected when the photo coupler is "ON"
11	11	INDEX DATA 400	Input	Number of steps = 400	Selected when the photo coupler is "ON"
12	12	INDEX DATA 800	Input	Number of steps = 800	Selected when the photo coupler is "ON"
13	13	INDEX DATA 1000	Input	Number of steps = 1000	Selected when the photo coupler is "ON"
14	14	INDEX DATA 2000	Input	Number of steps = 2000	Selected when the photo coupler is "ON"
15	15	INDEX DATA 4000	Input	Number of steps = 4000	Selected when the photo coupler is "ON"
16	16	INDEX DATA 8000	Input	Number of steps = 8000	Selected when the photo coupler is "ON"
17	17	SPEED RANGE	Input	Select speed range High or Low	See Table 1
18	18	SPEED DATA 1	Input	Running Speed 1	See Table 2
19	19	SPEED DATA 2	Input	Running Speed 2	See Table 2
20	20	SPEED DATA 4	Input	Running Speed 4	See Table 2
21	21	SPEED DATA 8	Input	Running Speed 8	See Table 2
22	22	RATE 1	Input	Acceleration/Deceleration Rate 1	See Table 3
23	23	RATE 2	Input	Acceleration/Deceleration Rate 2	See Table 3
24	24	MODE 1	Input	Operating Mode 1	See Table 4
25	25	MODE 2	Input	Operation Mode 2	See Table 4
26	26	START	Input	Start Signal	Move starts on the leading edge of signal
27	27	SLOW DOWN/STOP	Input	Decelerate/Halt signal or Decelerate to base speed signal	Continuous Running Mode: Motor decelerates to base speed; Index and Return Modes: Motor decelerates and stops
28	28	RESET	Input	Emergency stop and counter reset	Motor stops with reset signal
29	29	CW/CCW DIRECTION	Input	CW rotation when the signal is "OFF" and CCW rotation when the signal is "ON"	
30	30	ALL WINDINGS OFF	Input	Turns off the current to the motor windings when the "ALL WINDINGS OFF" signal is "ON"	Removes current for manual positioning of motor, or to reduce motor temperature
31	31	GND*	-----		Common for all input lines
32	-----	READY	Output	Signal is "ON" while the motor is ready to be operated	
33	-----	MAGNETIC BRAKE	Output	Electromagnetic brake "ON" and "OFF" signal	"ON" while the motor is running, "OFF" for fail safe brake
34	-----	TIMING	Output	"Phase Ø" position signal output	"ON" when the motor is in the "Phase Ø" position
35	-----	OVERHEAT ALARM	Output	Output signal is "ON" when the temperature of the driver's internal heat sink reaches approximately 175°F (80°C)	Current to the motor is removed unless the AHO switch is "OFF"
36	-----	COM (EMITTER)*	-----		Common for all output lines

* Connect any external controller such as a programmable controller to CN1.

** Connect the **Data Pack DP-01** (Available separately) to CN2.

Pin numbers 1 thru 31 on CN1 and CN2 are internally connected to the corresponding pins on either connector.

*There is no internal connection between pin #31 (GND for inputs) and pin #36 (COM for outputs).

Table 1: Setting the Speed Range

The Speed Range is designated to be "Low Speed" when the switch is in the "L" position and designated to be "High Speed" when the switch is in the "H" position.

Speed Range	Low Speed	High Speed
Starting speed	50 pps	300 pps
Running speed	50 - 1000 pps (16 rates)	1200 -5000 pps (16 rates)
Accel/Decel rate	0 - 156ms/kpps (4 rates)	0 - 68ms/5kpps (4 rates)

The starting speed (or base speed) is fixed at 50pps in the low speed range, and 300pps in the high speed range and cannot be changed.

Table 2: Setting the Running Speed

Signal / Rate of Speed	Speed Data 8 Pin 21	Speed Data 4 Pin 20	Speed Data 2 Pin 19	Speed Data 1 Pin 18	Speed Range Low speed (pps)	Speed Range High speed (pps)
0	OFF	OFF	OFF	OFF	50	1200
1	OFF	OFF	OFF	ON	75	1400
2	OFF	OFF	ON	OFF	100	1600
3	OFF	OFF	ON	ON	150	1800
4	OFF	ON	OFF	OFF	200	2000
5	OFF	ON	OFF	ON	250	2200
6	OFF	ON	ON	OFF	300	2400
7	OFF	ON	ON	ON	350	2600
8	ON	OFF	OFF	OFF	400	2800
9	ON	OFF	OFF	ON	450	3000
10	ON	OFF	ON	OFF	500	3250
11	ON	OFF	ON	ON	600	3500
12	ON	ON	OFF	OFF	700	3750
13	ON	ON	OFF	ON	800	4000
14	ON	ON	ON	OFF	900	4500
15	ON	ON	ON	ON	1000	5000

Pins 1 through 16 are used for setting the index data (number of steps, 0000 to 9999). They are arranged in binary coded decimal (BCD) format A pin is designated to be "ON" when there is continuity between it and ground (GND= pin #31, see schematic on p.16). This connection to the ground pin can be made through a switch, a transistor, or it can be made directly (hard wired). This makes the **UI215GA** ideally suited for use with programmable controllers.

Table 3: Setting the Acceleration/Deceleration

Signal / Rate	Rate 1 Pin 22	Rate 2 Pin 23	Speed Range Low speed (ms/1000 pps)	Speed Range High speed (ms/5000 pps)	Remark
0	OFF	OFF	110	43	Normal
1	OFF	ON	78	26	Fast
2	ON	OFF	156	68	Slow
3	ON	ON	0	0	Constan

* When rate 3 is selected, there is no acceleration or deceleration. Therefore, the motor will start at the selected running speed. If the running speed is greater than the no load self-starting frequency (marked as fs on the torque-speed curves on pages 36 and 37), the motor will not start.

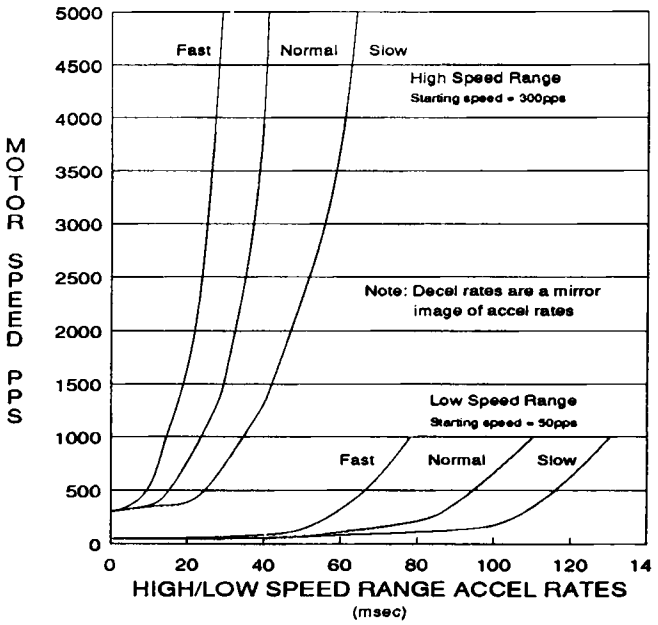


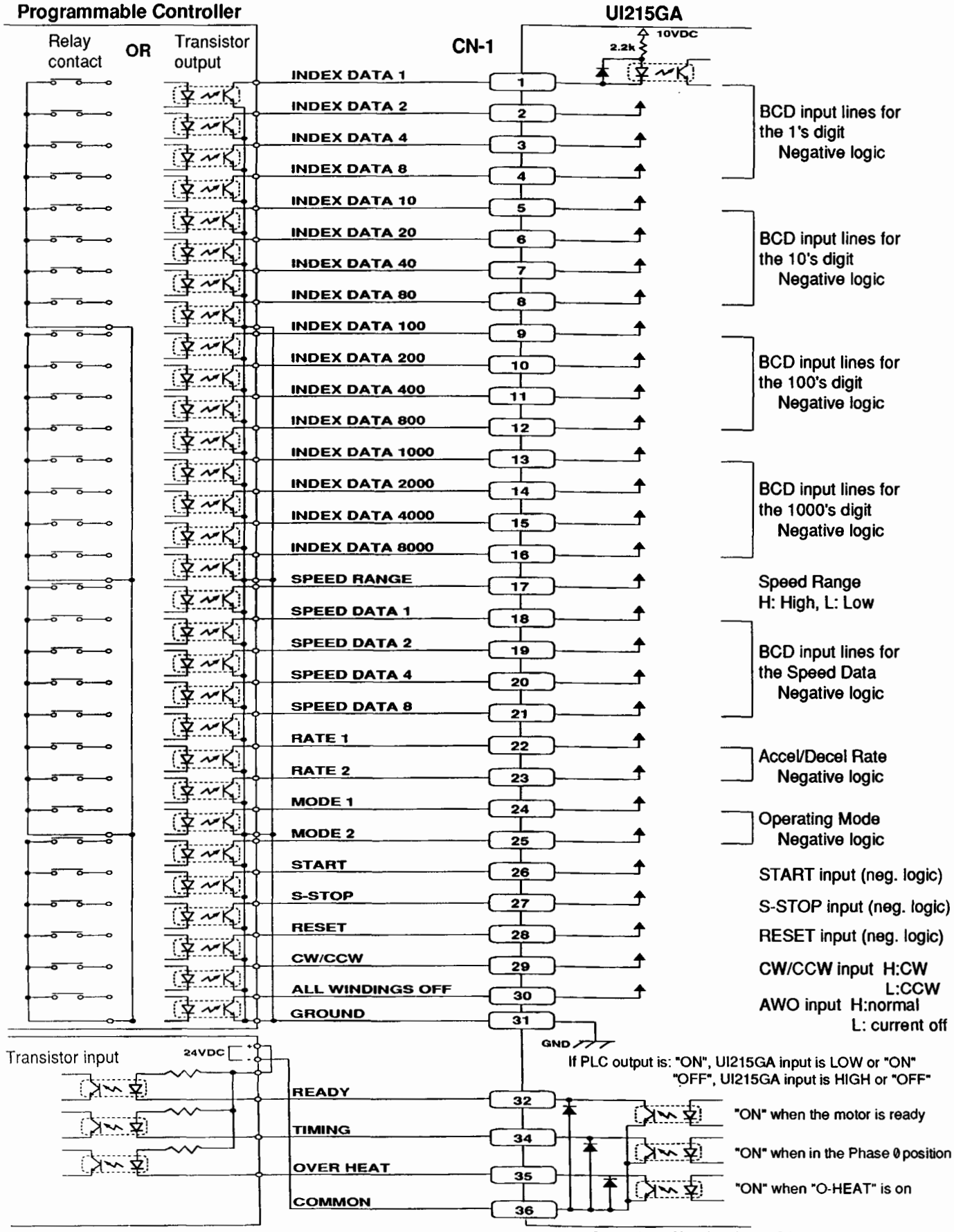
Table 4: Setting the Operating Mode

Signal / Mode	Mode 2 Pin 25	Mode 1 Pin 24	Operating Mode
0	OFF	OFF	Indexing
1	OFF	ON	Return to Electrical Home
2	ON	OFF	Jog
3	ON	ON	Continuous Running

Table 5: Connecting Terminals

Label	Name of terminal	Function	Remark
YELLOW	Motor connection	Motor power lines	Hook up each lead wire to the terminal indicated by the color of lead wire.
WHITE	Motor connection		
BLACK	Motor connection		
RED	Motor connection		
GREEN	Motor connection		
BLUE	Motor connection		
AC 115V	Power source	115VAC ±10% 60Hz	Connect power to the terminal pair
FG	Frame ground		

WIRING THE UI215GA TO A PROGRAMMABLE CONTROLLER



Note: Keep the input data lines at least 3ft. away from the motor lead wires and at least 1ft. away from the input power line. The input data lines should be AWG 24, ≤ 3ft.

See page 40 for voltage and amperage specs.

SETTING THE MOTION DATA

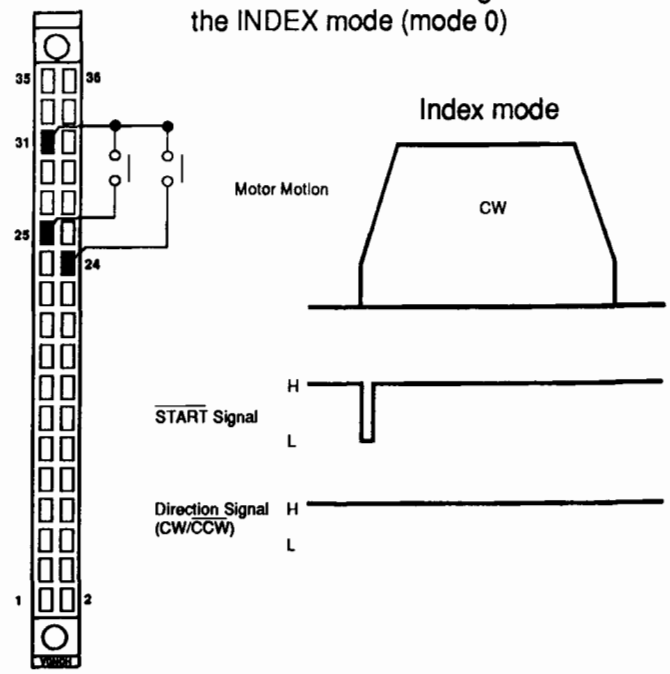
SELECTING THE OPERATING MODE

The UI215GA can operate in four different modes: Index, Return to Electrical Home, Jog and Continuous Running/Mechanical Home Position Hunting modes.

MODE 0 OR INDEX MODE

When a "START" signal is input to pin #26 on CN1 with the mode selection lines (pins #24 and #25) are both "OFF", the UI215GA will read all the data input lines on CN1. The microprocessor will then calculate the pulse train profile and then execute the length of move that was preset. The maximum length for each index move is 9,999 steps. The starting speed (base speed), running speed, acceleration/deceleration rate and the direction of rotation that was preset on CN1 will determine how the motor will rotate. The starting (base) speed is 50pps in the low speed range and 300pps in the high speed range and cannot be changed.

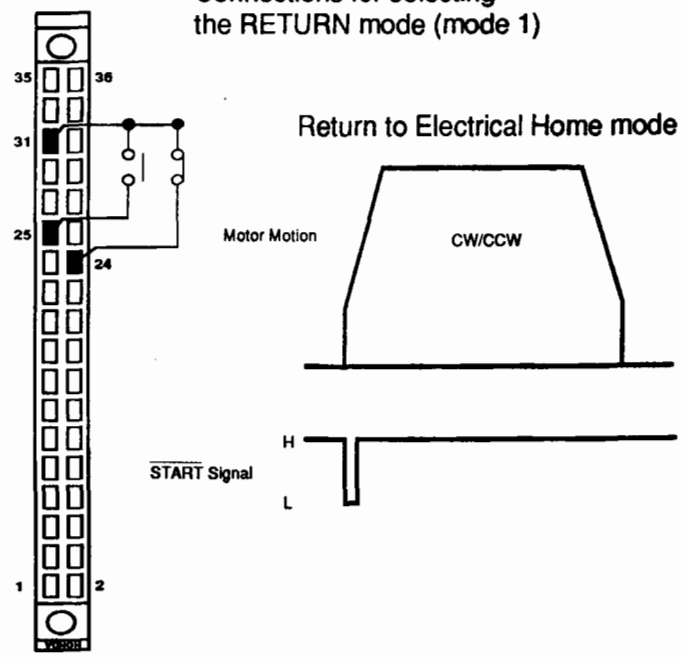
Connections for selecting the INDEX mode (mode 0)



MODE 1 OR RETURN TO ELECTRICAL HOME MODE

The UI215GA's microprocessor has an internal counter that keeps track of its current position relative to its electrical home position each time an index move is completed (the counter is updated only in the index mode). The internal counter is equal to 0 when the UI215GA is in the electrical home position. The internal counter is set to 0 when power is first applied to the UI215GA or when the RESET input line (pin #28) is turned "ON". When the UI215GA is in the Return to Electrical Home mode (pin #24 "ON" and pin #25 "OFF") and a START signal is input (pin #26), the motor will move toward the electrical home position. As the motor nears the home position, it will decelerate and stop when the home position is reached. In other words, the Return to Electrical Home Mode returns the system to its original starting position. If the S-STOP signal is input (pin #27), the motor will decelerate and stop. The move will be completed when the next START signal is input. The maximum number of steps from home that the internal counter can return is ±16,777,216 steps. The speed at which the motor will move toward the home position will be the same as the running speed that is preset on CN1.

Connections for selecting the RETURN mode (mode 1)

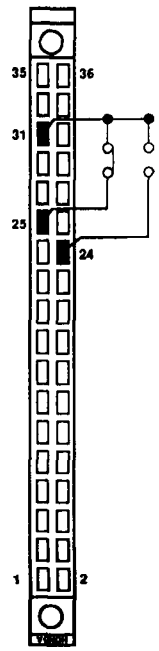


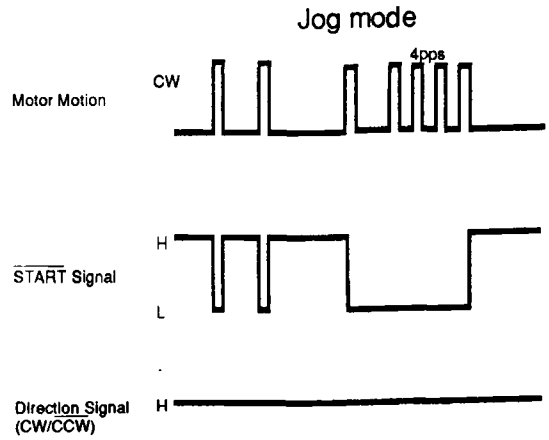
SELECTING THE OPERATING MODE (CONT.)

MODE 2 OR JOG MODE

When the Jog Mode is selected (pin #24 "OFF" and pin #25 "ON") and a START signal is input (pin #26) on CN1, the motor will take 1 step only and then stop. If the "START" signal is input continuously with the Jog Mode selected, the motor will move at approximately 4pps until the "START" signal is released. This mode could be useful when trying to more accurately position a load.

Connections for selecting the JOG mode (mode 2)

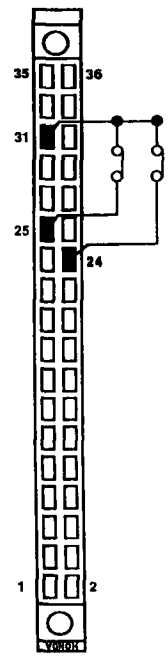


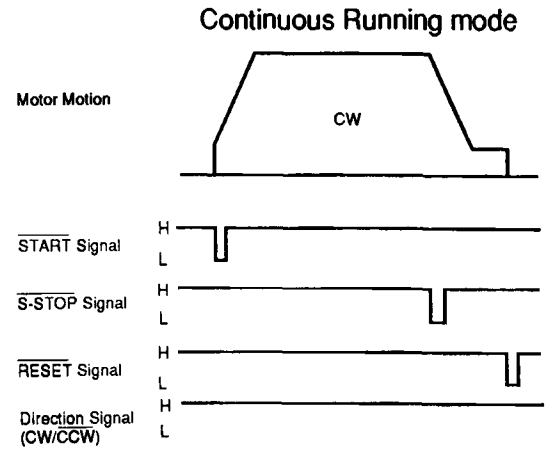


MODE 3 OR CONTINUOUS/ MECHANICAL HOME HUNTING MODE

When the Continuous Mode is selected (both pin #24 and pin #25 "ON") and a START signal is input (pin #26), the motor will run continuously and will not stop until the RESET signal is input (pin #28). If the S-STOP signal is input (pin #27) while the motor is running in the continuous mode, the motor will decelerate to and run at the base speed until told to stop when the RESET signal is input (pin #28). By connecting the S-STOP (pin #27) and RESET (pin #28) pins to a PLC, the UI215GA can hunt for a mechanical home position (limit switch) automatically. See page 19 for more details.

Connections for selecting the CONTINUOUS mode (mode 3)

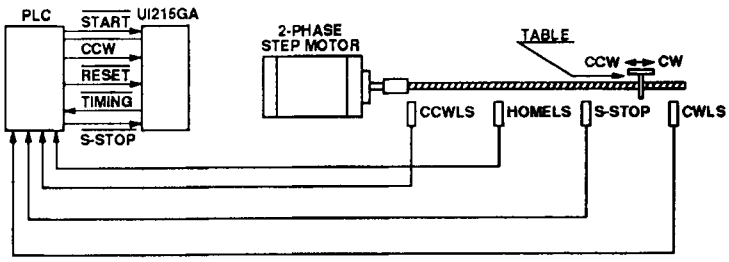




HOME HUNTING WITH THE UI215GA AND A PLC

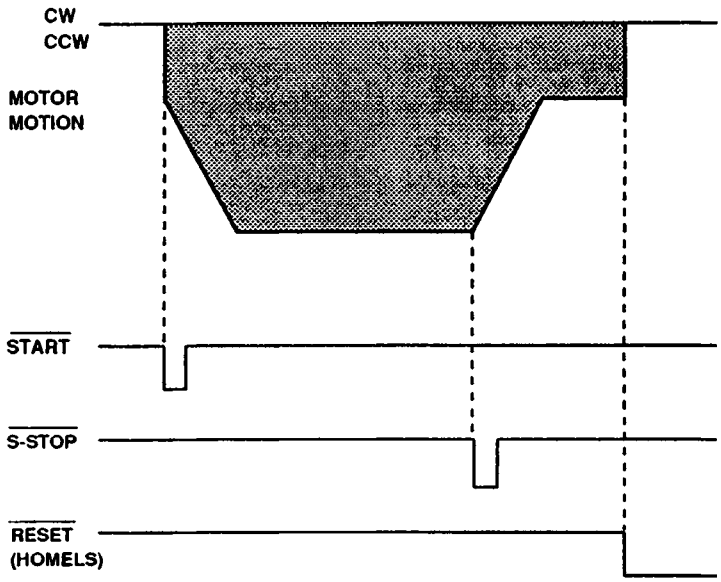
The UI215GA Intelligent Driver can hunt for a mechanical home position limit switch with the help of a programmable controller (PLC). With the UI215GA in the Continuous Running Mode (mode 3), the CCW, S-STOP and RESET (used as the home position limit switch) lines can be used as control lines to a PLC to enable the UI215GA to hunt for a mechanical home position limit switch. A simple method for finding the mechanical home position limit switch is described below.

FINDING THE MECHANICAL HOME POSITION LIMIT SWITCH



When a START signal is input with the UI215GA in the Continuous Running Mode (mode 3) and set to move in the CCW direction, the table will move toward the home limit switch (HOMELS) at the running speed that was preset on the UI215GA. When the table activates the S-STOP switch, it will decelerate to the appropriate base speed until it activates the HOMELS where it will come to a rest.

NOTE #1: After the table has been stopped at the mechanical home position, the RESET input signal must be turned "OFF" or set to "HIGH" before the next START signal is input or the START signal will be ignored.



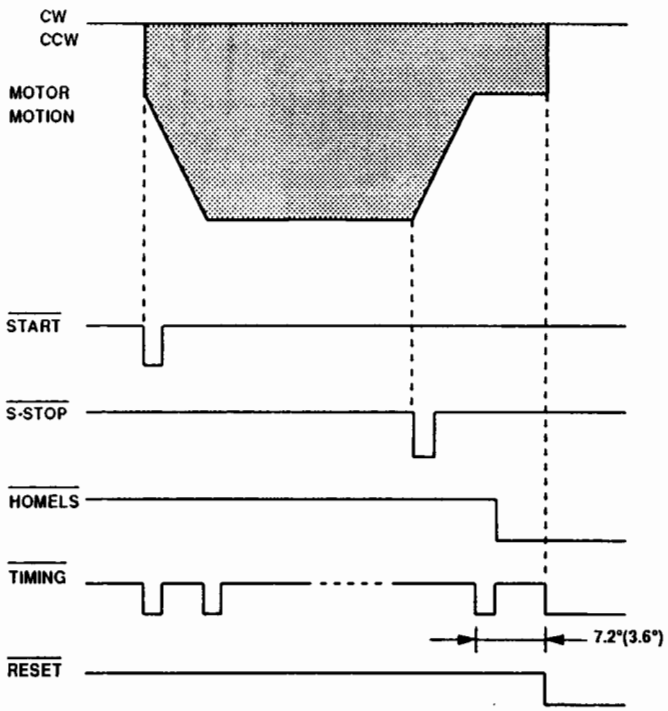
NOTE #2: If you are not using a PLC to control the home hunting function, be sure to locate the HOMELS and S-STOP limit switches outside of the normal operating range. This is necessary because if the HOMELS and S-STOP switches are located inside the normal operating range, the table will stop and/or decelerate each time it activates (passes) the HOMELS or S-STOP switches.

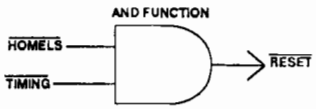
If you are using a PLC to control the mechanical home position limit switch hunting function, the HOMELS and S-STOP switches can be located anywhere in the operating range of the system since the PLC can be instructed to ignore the inputs at certain times.

IMPROVING THE ACCURACY OF THE HOME POSITION

1) HOMELS "AND" TIMING

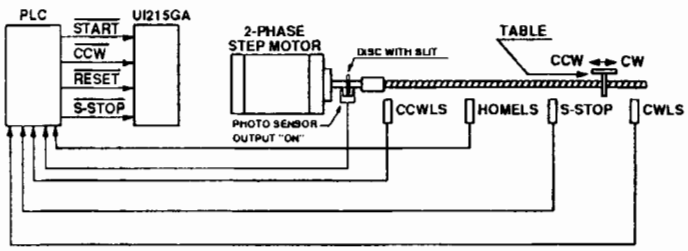
The accuracy of your HOMELS can be improved if you define the mechanical home position to be the logical "AND" of the HOMELS and the TIMING (Phase Ø) output of the UI215GA driver. Since the step motor phase excitation sequence is repeated every four full steps (eight half steps), this signal will be output every 7.2°(3.6° for 0.9°/step motors). When the step motor is in the "Phase Ø" position, the TIMING indicator on the front panel will illuminate and pin #34 on connector CN1 will be turned "ON". The UI215GA will automatically be in the "Phase Ø" position when it is first powered-up. By using the logical "AND" of HOMELS and TIMING, any "dead-band" or "slop" in your switches will be eliminated.

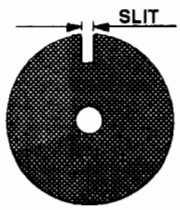


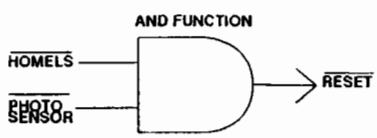


2) HOMELS "AND" PHOTO SENSOR

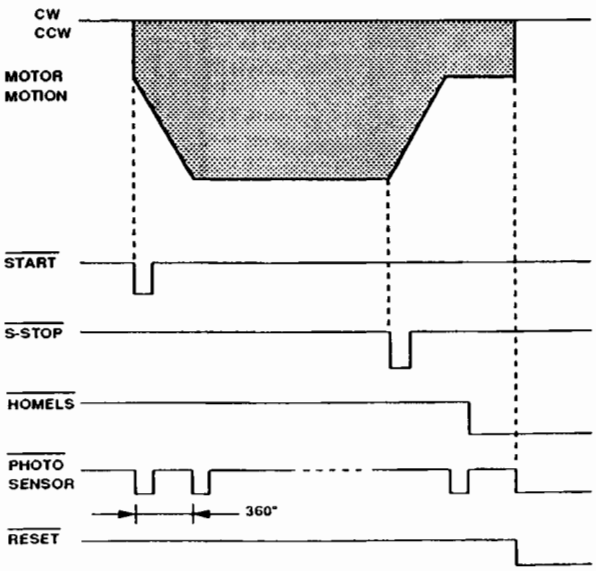
The mechanical home position can also be set more accurately by using the logical "AND" of the HOMELS and PHOTO SENSOR. By cutting a slit into a round, flat disc and using it to turn the photo sensor output "ON" and "OFF", the mechanical home position of your system can be made more accurate by making it the logical "AND" of the HOMELS and the PHOTO SENSOR output.

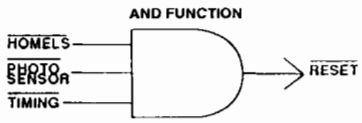






The most accurate positioning method would use the logical "AND" of HOMELS and TIMING and the PHOTO SENSOR. The disc used for the photo sensor should have a slit of 7.2° (3.6°) cut into it for the most accuracy. This method is very effective when used in ballscrew applications.





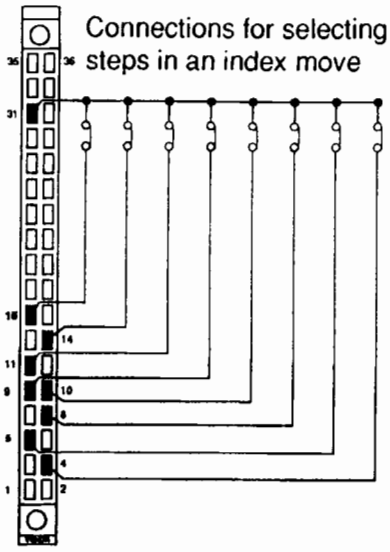
*The slit should be 7.2° for 1.8°/step motors and 3.6° for 0.9°/step motors.

SETTING THE MOTION DATA (CONT.)

SELECTING THE NUMBER OF STEPS IN AN INDEX MOVE

Setting the number of steps in an index move can be done by simply turning "ON" the appropriate inputs on CN-1 to obtain the desired value. The number of steps in an index is expressed in a 4 digit decimal format (BCD) and can be set for between 1 to 9,999 steps maximum (see page 5 for an explanation of BCD). The example to the right shows which input lines need to be turned "ON" to perform a move of 6,798 steps. Pins #15, 14, 11, 10, 9, 8, 5 and 4 need to be turned "ON" to complete select the move. Refer to page 14 for more details.

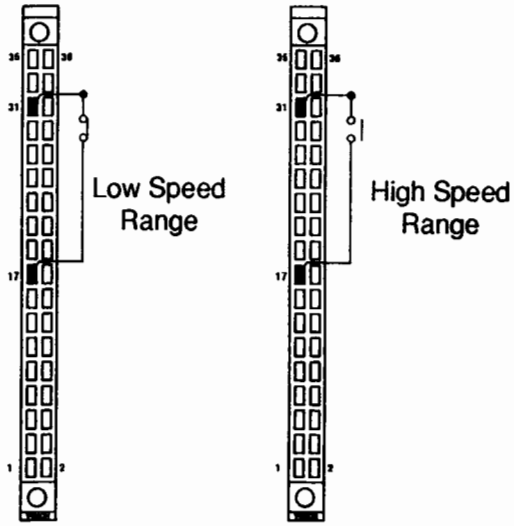
Connections for selecting 6,798 steps in an index move



SELECTING THE SPEED RANGE

Two speed ranges are available and can be selected by turning "ON" or "OFF" pin #17.If pin #17 is "OFF", the UI215GA will run in the high speed range. If pin #17 is "ON", the UI215GA will run in the low speed range. The examples to the right show pin #17 being "ON" or "OFF". The starting speed, running speed and accel/decel rate are all effected by which speed range is selected. Refer to tables #1 and #2 on page 15 for the exact speeds corresponding to each speed range.

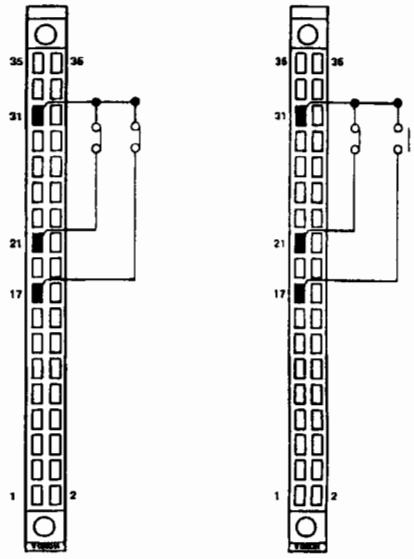
Connections for selecting the speed range



SELECTING THE RUNNING SPEED

There are 16 different running speeds available in each speed range. To select a running speed, first select the appropriate speed range (pin #17) and then select the desired running speed by turning "ON" the appropriate input lines (pins #18 to #21). The corresponding input values ("ON" or"OFF") and speed values are shown in tables #1 and #2 on page 15. The examples to the right show which input lines need to be turned "ON" for running speeds of 400pps and 2800pps, respectively.

Connections for selecting the running speed

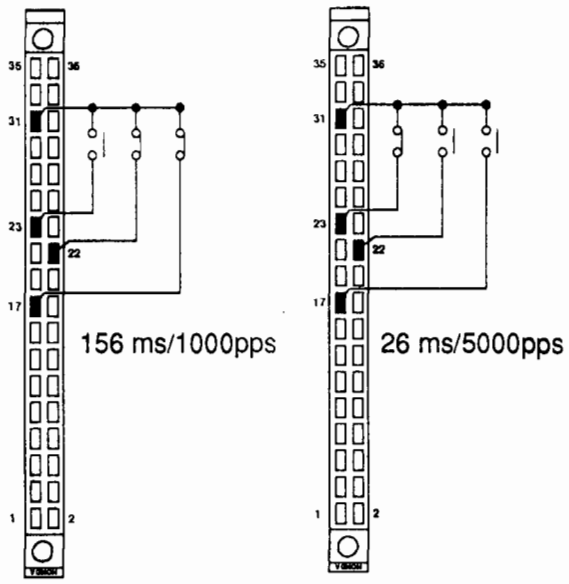


400pps 2800pps

SELECTING THE ACCELERATION/ DECELERATION RATE

There are 4 different accel/decel rates; Normal, Fast, Slow and Constant (i.e. no acceleration) are available in each speed range. To select an accel/decel rate, first select a speed range (pin #17) and then select the desired accel/decel rate by turning "ON" the appropriate input lines (pins #22 and #23). Refer to table #3 on page 15 for the corresponding binary ("ON" or "OFF") values and accel/decel rates. The examples to the right show which input lines need to be turned "ON" for accel/decel rates of 156 ms/1000 pps and 26 ms/5000 pps.

Connections for the acce/decel functions

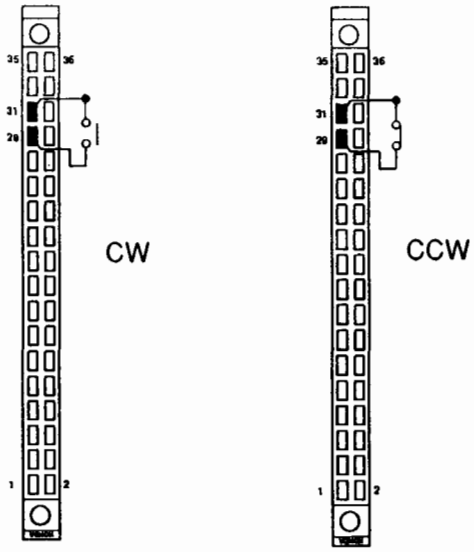


COMMAND FUNCTIONS (CW/$\overline{\text{CCW}}$, RESET, S-STOP, START AND AWO)

CW/$\overline{\text{CCW}}$

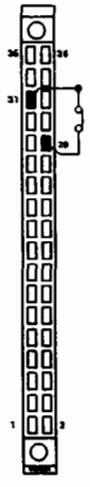
Pin #29 determines the direction of rotation of the motor shaft as viewed from the mounting flange end of the motor. If pin #29 is "OFF", the motor will rotate CW. If pin #29 is "ON", the motor will rotate $\overline{\text{CCW}}$.

Connections for the CW/$\overline{\text{CCW}}$ function



RESET

The RESET input line (pin #28) is used to immediately stop the motor's rotation (i.e for an emergency stop) and to reset the UI215GA's internal counter to zero which is used for returning to the electrical home position. A switch that makes only a momentary contact is generally used for the RESET signal.



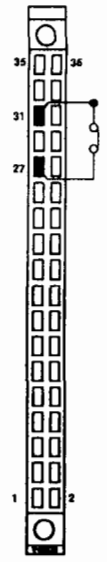
Connection for the RESET function

COMMAND FUNCTIONS (CONT.)

S-STOP

The S-STOP input line (pin #27) is used to slow down and then stop the motor depending on which operating mode (pins #24 and #25) the UI215GA is set to operate in. In the mode 0 (Index) and mode 1 (Return to Electrical Home) operations, the motor will slow down and then stop (see the timing charts on pages 33 and 34). The move will be completed the next time the leading edge of a START signal is seen.

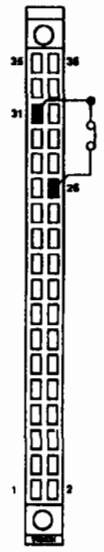
When in mode 3 (Continuous running), the motor will slow down to the appropriate base speed and continue to run at that speed until the RESET signal is input.



Connection for the S-STOP function

START

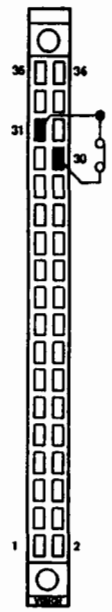
The START input signal (pin #26) is used to begin the motor motion. When the leading edge of the START signal is seen, the microprocessor in the UI215GA will read all of the data input lines (pins #1 to #30) on CN-1 and then calculate the motion profile and then start the motor's motion. When the motor is in motion, all input lines are ignored [except RESET (pin #28) and S-STOP (pin #27)] until the motion has been completed and the READY light (and pin #32) comes "ON". A momentary switch is typically used for this function.



Connection for the START function

ALL WINDINGS OFF (AWO)

The ALL WINDINGS OFF input (pin #30) is used to remove current from the motor windings. This function could be useful for manual positioning of the motor or to help reduce motor temperature while the motor is idle.



Connection for the A.W.O. function

CONTROL OF THE UI215GA WITH THE DP-01 DATA PACK

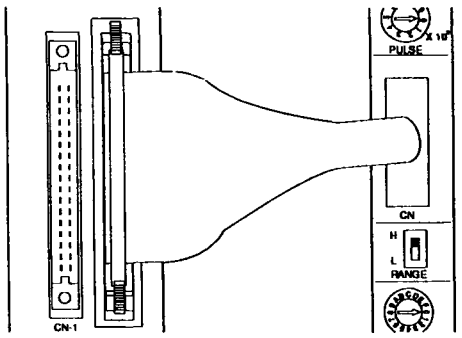
The UI215GA can also be controlled by the DP-01 Data Pack alone to make a complete stand alone motion control system. All of the motion data; starting speed, running speed, acceleration/deceleration rate, direction, length of travel and the operating mode can be set by simply turning the dials or switches on the front panel of the DP-01 Data Pack. If you plan to use a PLC or other type of external controller, please turn to page 13 for complete information on how to operate the UI215GA.

By referring to the tables on page 25, you can determine how to set each dial or switch to perform the desired motion.

Connecting the DP-01 Data Pack to the UI215GA.....24
Data tables.....25
DP-01 Data Pack layout.....26
Setting the motion data.....27
Selecting the operating mode.....27
Selecting the number of steps in an Index move.....28
Selecting the speed range.....28
Selecting the running speed.....28
Selecting the acceleration/deceleration rate.....28
Using the command functions.....29
CW/CCW.....29
RESET.....29
S-STOP.....29
START.....29
SW CONTROL.....29

CONNECTING THE DP-01 DATA PACK TO THE UI215GA

Insert the connector of the DP-01 Data Pack into connector CN2 of the UI215GA with the DP-01 located to the right of the UI215GA as shown in the figure below. The connector will fit securely in only one way. Locate the key on the DP-01 connector and slide it into the slot on CN2 on the UI215GA. Pull the locking tabs into position to secure the connection.



Note: The UI215GA and the DP-01 can be mounted flush against each other.

Table 1: Setting the Speed Range

The Speed Range is designated to be "Low Speed" when the switch is in the "L" position and designated to be "High Speed" when the switch is in the "H" position.

Speed Range	Low Speed	High Speed
Starting speed	50 pps	300 pps
Running speed	50 - 1000 pps (16 rates)	1200 -5000 pps (16 rates)
Accel/Decel rate	0 - 156ms/kpps (4 rates)	0 - 68ms/5kpps (4 rates)

The starting speed (or base speed) is fixed at 50pps in the low speed range, and 300pps in the high speed range and cannot be changed.

Table 2: Setting the Running Speed

Rate of Speed	Speed Range	
	Low speed (pps)	High speed (pps)
0	50	1200
1	75	1400
2	100	1600
3	150	1800
4	200	2000
5	250	2200
6	300	2400
7	350	2600
8	400	2800
9	450	3000
A	500	3250
B	600	3500
C	700	3750
D	800	4000
E	900	4500
F	1000	5000

Table 3: Setting the Acceleration/Deceleration

Rate	Speed Range		Remark
	Low speed (ms/1000 pps)	High speed (ms/5000 pps)	
0	110	43	Normal
1	78	26	Fast
2	156	68	Slow
3	0	0	Constant

* When rate 3 is selected, there is no acceleration or deceleration. Therefore, the motor will start at the selected running speed. If the running speed is greater than the no load self-starting frequency (marked as fs on the torque-speed curves on pages 36 and 37), the motor will not start. **Note: When using the DP-01, there are only four settings while the DP-01 switch has ten settings. Only the first four settings (0 - 3) are valid. Setting the number higher will only repeat the lower numbers, i.e. 4=0, 5=1, 6=2, 7=3, 8=0 and 9=1.**

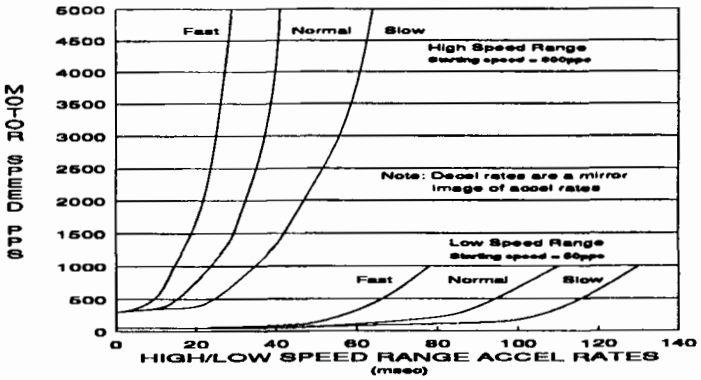


Table 4: Setting the Operating Mode

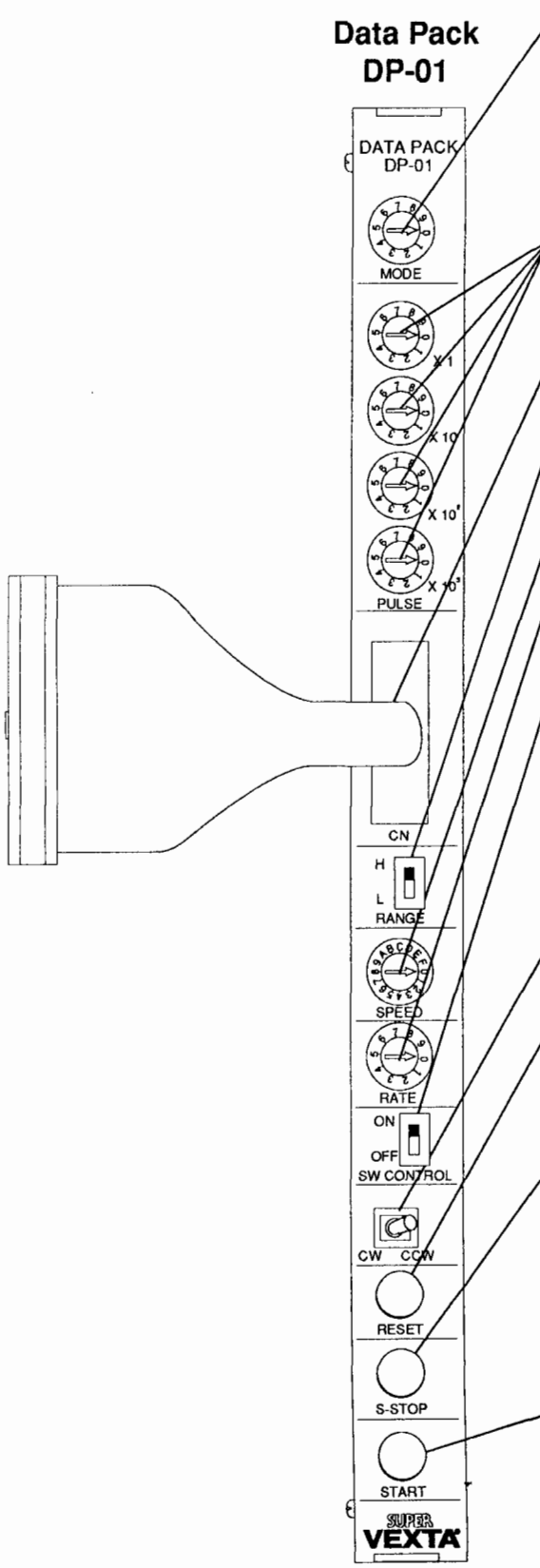
Mode	Operating Mode
0	Indexing
1	Return to Electrical Home
2	Jog
3	Continuous Running

Note: When using the DP-01, there are only four settings while the DP-01 switch has ten settings. Only the first four settings (0 through 3) are valid. Setting the number higher will only repeat the lower numbers, i.e. 4=0, 5=1, 6=2, 7=3, 8=0 and 9=1.

Table 5: Connecting Terminals

Label	Name of terminal	Function	Remark
YELLOW	Motor connection	Motor power lines	Hook up each lead wire to the terminal indicated by the color of lead wire.
WHITE	Motor connection		
BLACK	Motor connection		
RED	Motor connection		
GREEN	Motor connection		
BLUE	Motor connection		
AC 115V	Power source	115VAC ±10% 60Hz	Connect power to the terminal pair
FG	Frame ground		

DP-01 DATA PACK LAYOUT



Mode (Operating mode)
Index
Return to Electrical Home
Jog
Continuous Running/Home Hunting

Pulse (Number of steps)
Number of steps in index move
0 to 9,999 steps maximum

Special cable/connector
(Included with the DP-01)

Range (Speed range)
High/Low

Speed
Running speed

Rate
Acceleration/Deceleration Rate

SW Control
When in the "Off" position, this disables the CW/CCW, RESET, S-STOP and START switches on the DP-01. This allows these functions to be controlled exclusively by an external controller

CW/CCW
Direction of rotation

Reset
Stops motor motion and resets the internal counter to zero

S-Stop
In the continuous mode the motor will slow down to the base speed.
In the Index and Return modes the motor will decelerate and stop.
The interrupted move will be completed when the next START signal is received

Start
The START signal causes the UI215GA to read all input data lines, calculate the motion profile and then begin the motion. All input switches are ignored (except for RESET and S-STOP) until the move has been completed and the ready light comes "ON"

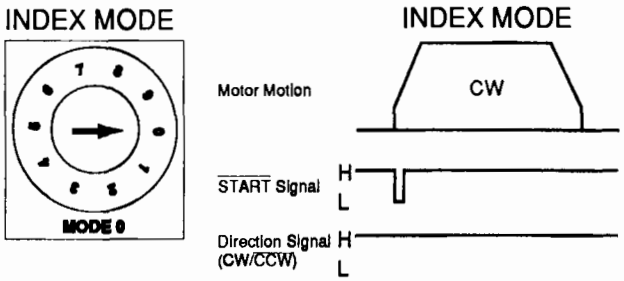
SETTING THE MOTION DATA

SELECTING THE OPERATING MODE

The UI215GA can operate in four different modes: Index, Return to Electrical Home, Jog and Continuous Running/Home Detection modes.

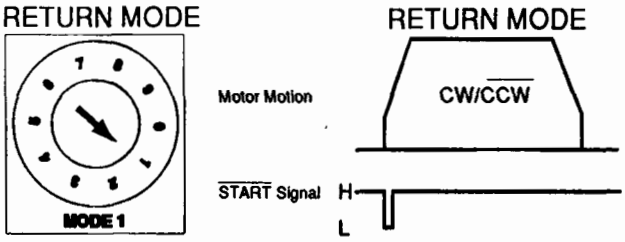
MODE 0 OR INDEX MODE

When the "START" button is depressed, the microprocessor in the UI215GA reads all of data set on the DP-01 Data Pack and calculates the pulse train profile and then executes the number of steps that was preset by the DP-01. The maximum length for each index move is 9,999 steps. The starting speed (base speed), running speed, acceleration/deceleration rate and the direction of rotation that is preset on the DP-01 will determine how the motor will rotate. The starting (base) speed is 50pps in the low speed range and 300pps in the high speed range and cannot be changed.



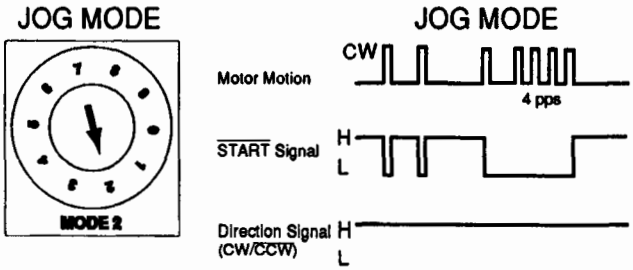
MODE 1 OR RETURN TO ELECTRICAL HOME MODE

The UI215GA's microprocessor has an internal counter that keeps track of its current position relative to its electrical home position. The internal counter is equal to 0 when the UI215GA is in the electrical home position, when power is first applied to the UI215GA. When the RESET button is depressed, the internal counter will be set to 0, which will be the new electrical home position. When the UI215GA is in the Return to Electrical Home mode and the START button is depressed, the motor will move toward the internal home position. As the motor nears the home position, it will decelerate and stop when the home position is reached. The maximum number of steps from home that the internal counter can return is ±16,777,216 steps. The speed at which the motor will move toward the home position will be the same as the running speed that is preset on the DP-01.



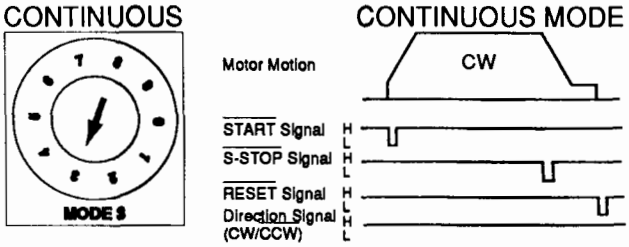
MODE 2 OR JOG MODE

When the Jog Mode is selected and the START button is depressed, the motor will take 1 step only and then stop. When the START button on the DP-01 is depressed continuously with the Jog Mode selected, the motor will move 1 step and move at approximately 4pps until the START signal is released.



MODE 3 OR CONTINUOUS/ MECHANICAL HOME HUNTING MODE

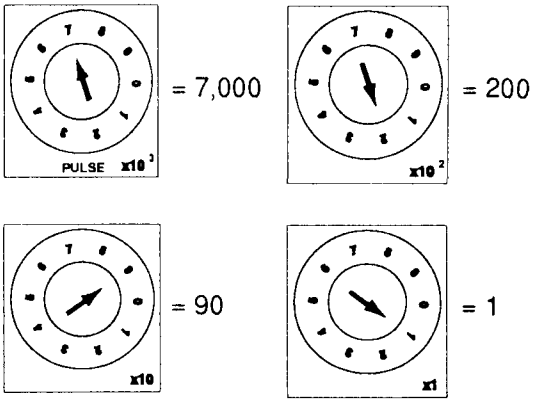
When the Continuous Mode is selected and the START button is depressed, the motor will run continuously and will not stop until the RESET button is depressed. If the S-STOP button is depressed while the motor is running in the continuous mode, the motor will decelerate to and run at the base speed until the RESET button is depressed. Please see page 25 for more information.



Note: Positions 4,5,6,7,8 and 9 on the Mode selector switch repeat positions 0,1,2,3,0 and 1, respectively, and can be ignored.

SELECTING THE NUMBER OF STEPS IN AN INDEX MOVE

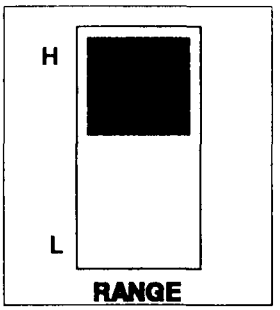
Setting the number of steps in an index move can be done by simply adjusting the four index dials on the front panel of the DP-01 Data Pack to the desired values. The number of steps in an index is expressed in 4 digits in decimal format and can be set for between 1-9,999 steps maximum. Each step will correspond to a shaft rotation of 1.8°(0.9° for M-type) or 0.9°(0.45° for M-type) in the half step mode. Therefore, depending on the motor, either 200, 400 or 800 steps steps will result in one complete shaft revolution. The example to the right shows a move of 7,291 steps.



7,000 + 200 + 90 + 1 = 7,291 steps

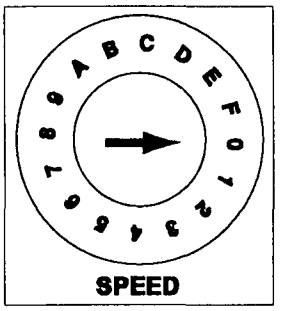
SELECTING THE SPEED RANGE

Two speed ranges are available and can be selected by putting the switch labeled RANGE on the DP-01 Data Pack in the appropriate position. The starting speed, running speed and accel/decel rate are all affected by which speed range is selected. Refer to tables #1 and #2 on page 25 for the exact speeds corresponding to each speed range.



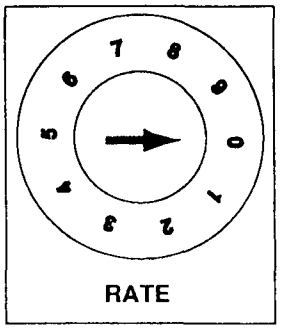
SELECTING THE RUNNING SPEED

There are16 different running speeds available in each speed range. To select a running speed, first select a speed range with the DP-01 and then select the desired running speed by adjusting the dial labeled SPEED on the front panel of the DP-01 to the appropriate position. The corresponding dial position and speed values are shown in tables #1 and #2 on page 25.



SELECTING THE ACCELERATION/ DECELERATION RATE

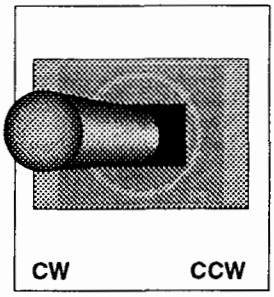
There are 4 different accel/decel rates: Normal, Fast, Slow and Constant (i.e. no acceleration) available in each speed range. To select an accel/decel rate, first select a speed range with the DP-01 and then select the desired accel/decel rate by adjusting the dial labeled RATE on the front panel of the DP-01 to the appropriate position. Refer to tables #1 and #3 on page 25 for the corresponding dial position and accel/decel rate.



COMMAND FUNCTIONS (CW/CCW, RESET, S-STOP, START AND SW CONTROL)

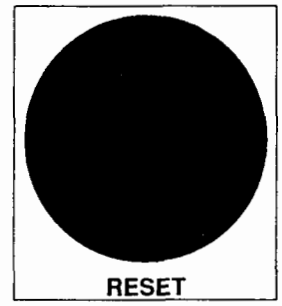
CW/CCW

The position of the CW/CCW switch determines the direction of rotation of the motor shaft as viewed from the mounting flange end of the motor.



RESET

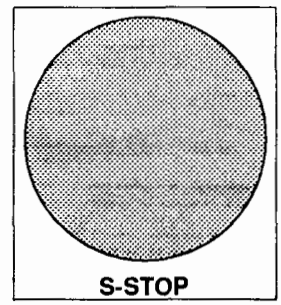
The RESET push-button is used to stop the motor's rotation at any given time and to reset the UI215GA's internal counter to zero.



S-STOP

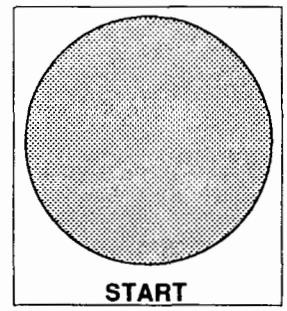
The S-STOP push-button is used to slow down and then stop the motor depending on which mode the DP-01 Data Pack has been set to operate in. In mode 0 (Index) and mode 1 (Return to Electrical Home) positions, the motor will slow down and then stop (See timing charts on pages 33 and 34). The move will be completed the next time the START button is depressed.

When in mode 3 (continuous running), the motor will slow down to the appropriate base speed and continue to run at that speed until the RESET button is depressed.



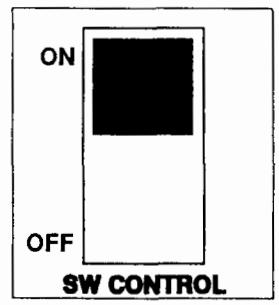
START

The START push-button is used to begin the motor motion. When the START button is depressed, the microprocessor in the UI215GA will read all of the data that has been selected with the DP-01 Data Pack, calculate the motion profile and then start the motor's motion. When the motor is in motion, all data switches are ignored (except RESET and S-STOP) until the motion has been completed and the READY light comes "ON".



SW CONTROL

When the SW CONTROL switch is in the "OFF" position, the CW/CCW, RESET, S-STOP and START switches on DP-01 are disabled. This allows these functions to be controlled exclusively by an external controller. When the switch is in the "ON" position, these functions will operate normally.



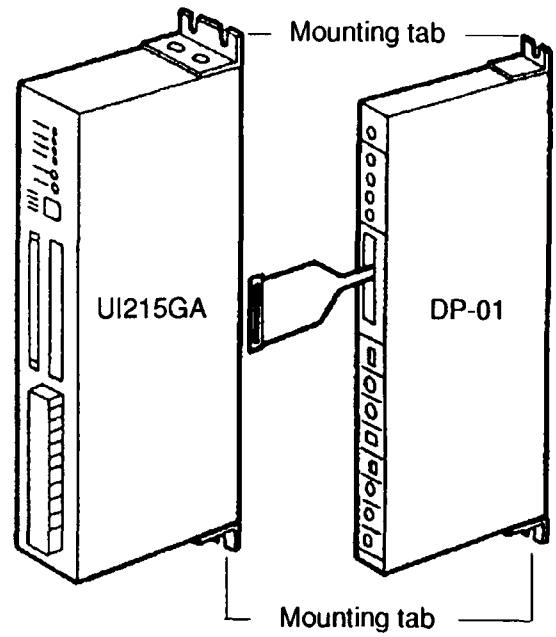
PRECAUTIONS

INSTALLATION OF THE DRIVER

Note: The driver uses natural convection for cooling. Be sure to provide sufficient air flow around the driver.

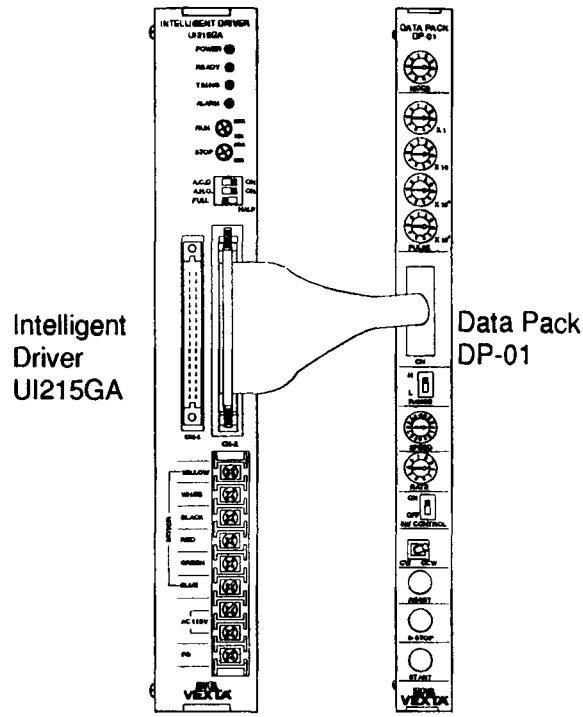
1) Install the driver on a highly heat-conductive base, such as metal, oriented vertically.
2) Keep the driver at least 1 inch away from any vertical obstructions, except for DP-01 which may be mounted flush against the driver.
3) When two or more drivers are installed, install them at least 1 inch away from each other.
4) It is recommended that the 4 screws supplied with the unit be used to install the unit. The use of longer screws may cause damage to the unit.

   *Screws: M3, 0.2 inch (5mm) long flat-head.



Installation of the Data Pack DP-01

1) Be sure to install the Data Pack DP-01 to the right of the UI215GA when facing the front panel of the UI215GA.
2) Attach the Data Pack DP-01 to connector CN2 of the UI215GA by using the special cable/connector.



The UI215GA driver and Data Pack can be installed flush against each other.

TROUBLE SHOOTING THE UI215GA

If you should experience any difficulty in operating the UI215GA Intelligent Driver or DP-01 Data Pack, please refer to the following list of symptoms and causes for a possible solution to your problem. If your problem can not be solved with these suggestions, please feel free to contact your local distributor, local Oriental Motor sales office or the Super Vexta Technical Support Group for further assistance.

MOTOR DOES NOT MOVE	See page
If the power light is "OFF"	
✔ Is the 115VAC power supply connected?	page 7
If the power light is "ON"	
If the READY light is "ON"	
✔ Is the START signal being received?	pages 14, 23, 29
✔ What are the START signal's timing and voltage characteristics?	page 40
If the READY light "OFF"	
✔ Is the START signal being held "ON" continuously?	pages 14, 23, 29
✔ Is the RESET signal "ON"?	pages 14, 22, 29
✔ Is the S-STOP signal "ON"?	pages 14, 23, 29
✔ Is the ALARM indicator "ON"?	pages 9, 14
If the TIMING light is blinking	
✔ Is the Run current level set too low?	page 10
✔ Are the motor lead wires miswired?	page 7

MOTOR OR DRIVER OVERHEATS	See page
If the ALARM light is "ON"	
✔ Is the driver temperature over 80°C?	page 9
✔ Is the motor temperature over 130°C?	page 9
✔ Is the duty cycle too high?	page 9
✔ Is the ambient temperature too high?	page 9
✔ Is the motor heat sinked well enough?	pages 6, 9, 30
✔ Is the Run current level set too high?	page 10
✔ Is the Stop current level set too high?	page 11
✔ Has the A.C.D. function been overridden?	page 8

MOTOR PRODUCES TOO MUCH AUDIBLE NOISE	See page
✔ Try using the HALF-STEP mode.	page 8
✔ Try using a damper.	
✔ Try using a different coupling between the motor and load.	
✔ Set the Run current level to a lower value.	page 10

TROUBLE SHOOTING THE UI215GA (CONT.)

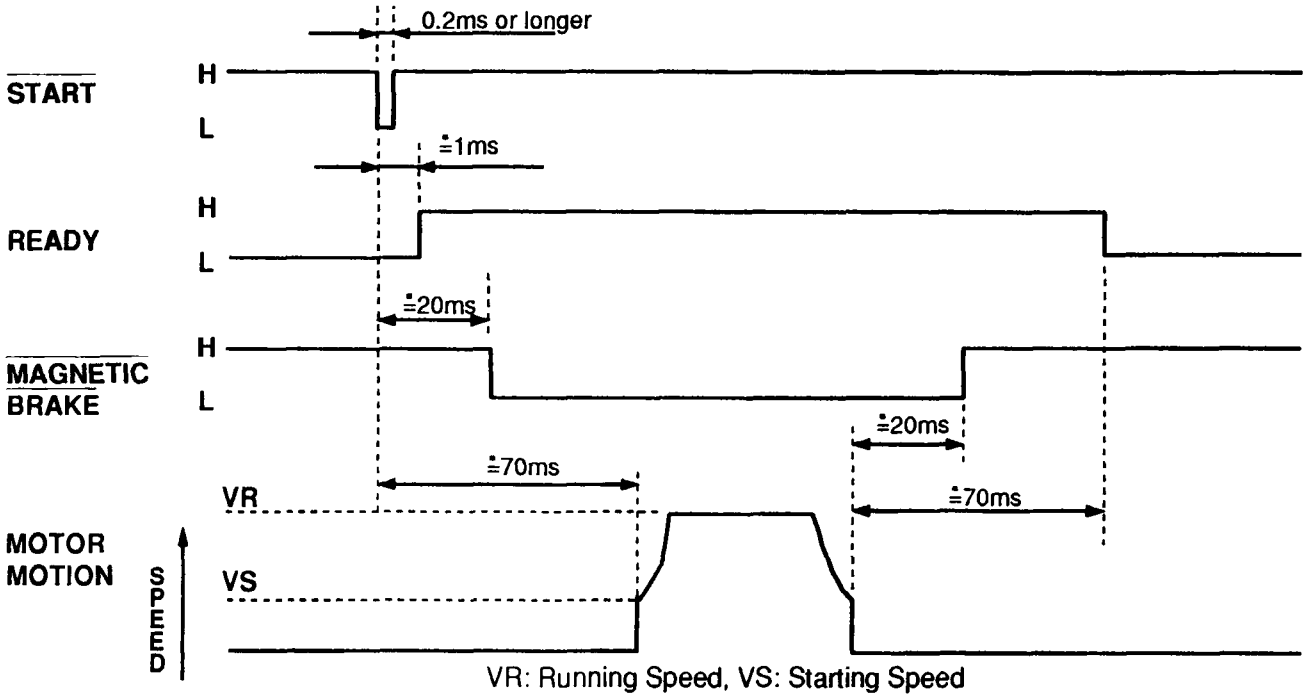
MOTOR DOES NOT MAKE THE DESIRED MOVE	See page
If the motor is not moving far enough	
✔ Is connector CN1 miswired?	page 21
✔ Is connector CN2 not completely connected?	page 24
✔ Were not enough steps set?	pages 14, 21, 28
✔ Is the FULL/HALF step switch in the wrong position?	page 8
✔ Are the motor lead wires miswired?	page 7
✔ Are the motor lead wires too long?	page 7
✔ Is the UI215GA set to the wrong operating mode?	pages 17, 18, 27
✔ Are the RESET, S-STOP, A.H.O. or A.W.O. signals being input at the wrong time?	pages 8, 22, 23
✔ Is the motor moving in the wrong direction?	page 22
✔ Is the Run current set too low?	page 10
✔ What are the Data input signal's timing and voltage characteristics?	page 35
If the motor is making a whining noise while running	
✔ Is the load too large for the motor?	pages 15, 25, 36, 37
✔ Is the starting speed too fast?	pages 15, 21, 25, 28
✔ Is the acceleration rate too fast?	pages 15, 22, 25, 28
✔ Is the running speed too fast?	pages 15, 22, 25, 28
If the DP-01 Data Pack is controlling the UI215GA	
✔ Is the SW CONTROL switch in the "OFF" position?	pages 12, 26, 29
✔ Is the correct data being set?	page 27
If an external controller is controlling the UI215GA	
✔ Are the controllers output signals correct?	pages 12, 40
✔ Is there miswiring between the controller and the UI215GA?	page 16
Is the UI215GA being controlled by both the DP-01 and an external controller?	
✔ Are the DP-01 and the external controller conflicting with each other?	page 12
✔ Is the SW CONTROL switch in the correct position?	pages 12, 26, 29

MOTOR PRODUCES TOO MUCH ELECTRICAL NOISE	See page
✔ Are the signal wires twisted together in pairs?	page 7
✔ Are you using shielded cable?	page 7
✔ Are the data lines located near the input power lines?	page 7
✔ Can you enclose the UI215GA in an EMI protected case?	

SIGNAL TIMING CHARTS

Timing for the Index Mode (Mode 0) move that is completed

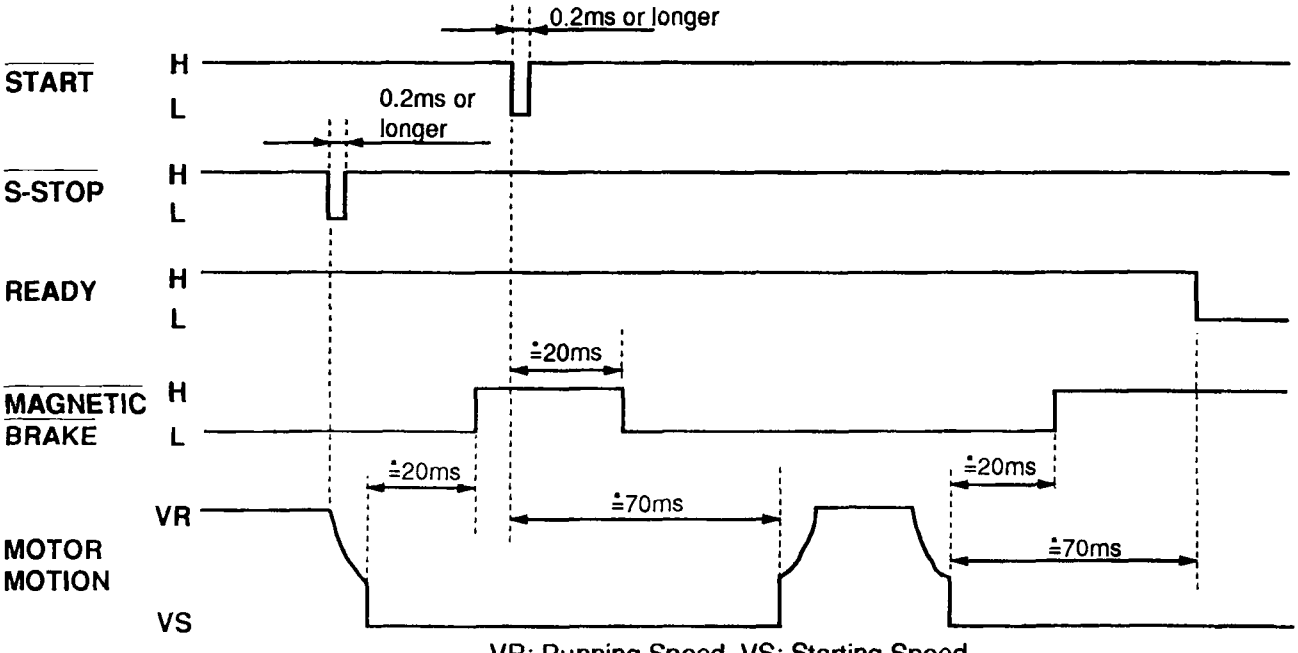
This chart represents the timing for a move with a preset length. Motion does not occur until the leading edge of a "START" signal is seen.



VR: Running Speed, VS: Starting Speed

Timing for the Index Mode (Mode 0) move that is interrupted by a "S-STOP"

This chart represents the timing for a move with a preset length that utilizes the "S-STOP" function. Motion does not occur until the leading edge of a "START" signal is seen.

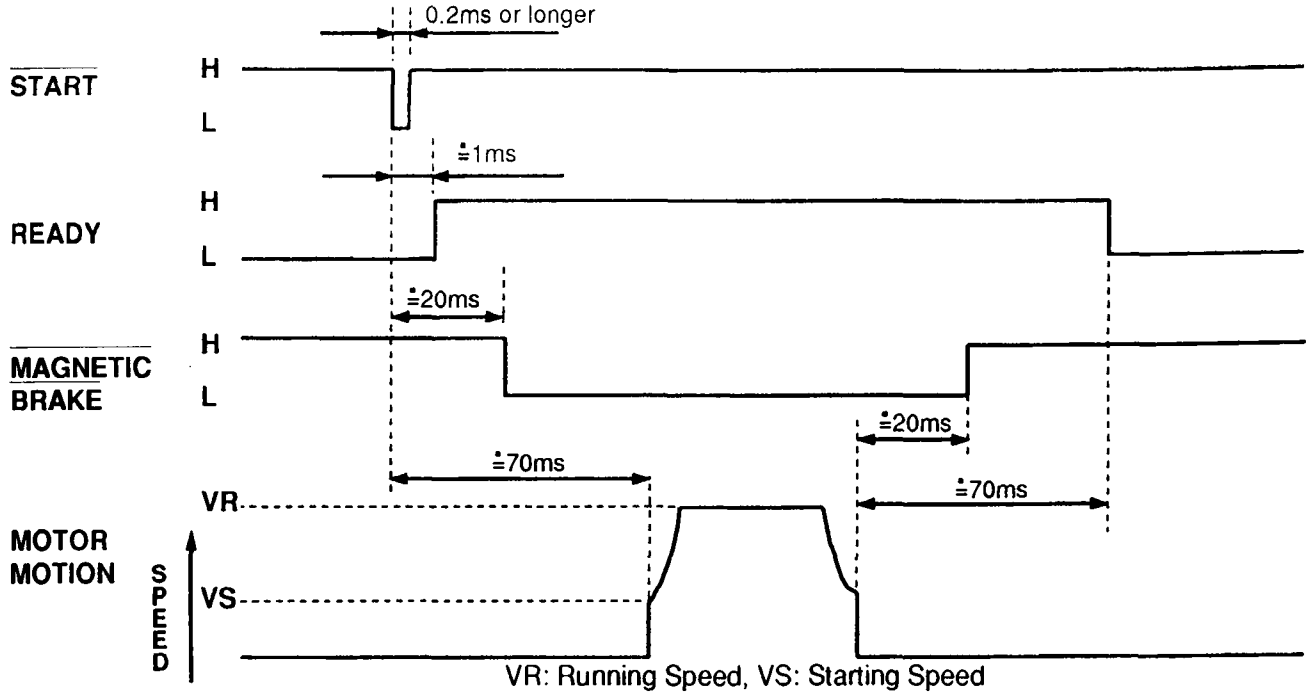


VR: Running Speed, VS: Starting Speed

When in the index mode, if the "S-STOP" signal is input, the motor will slow down and then stop. When the motor comes to rest, the "READY" signal will not go high since the entire move length was not completed. When the next leading edge of a "START" signal is seen, the remainder of the preset move is completed and the motor will stop. The "READY" signal will then go high.

Timing for the Return to Electrical Home Mode (Mode 1)

This chart represents the timing for a move returning to the electrical home position (point where the internal counter = 0). Motion does not occur until the leading edge of a "START" signal is seen.

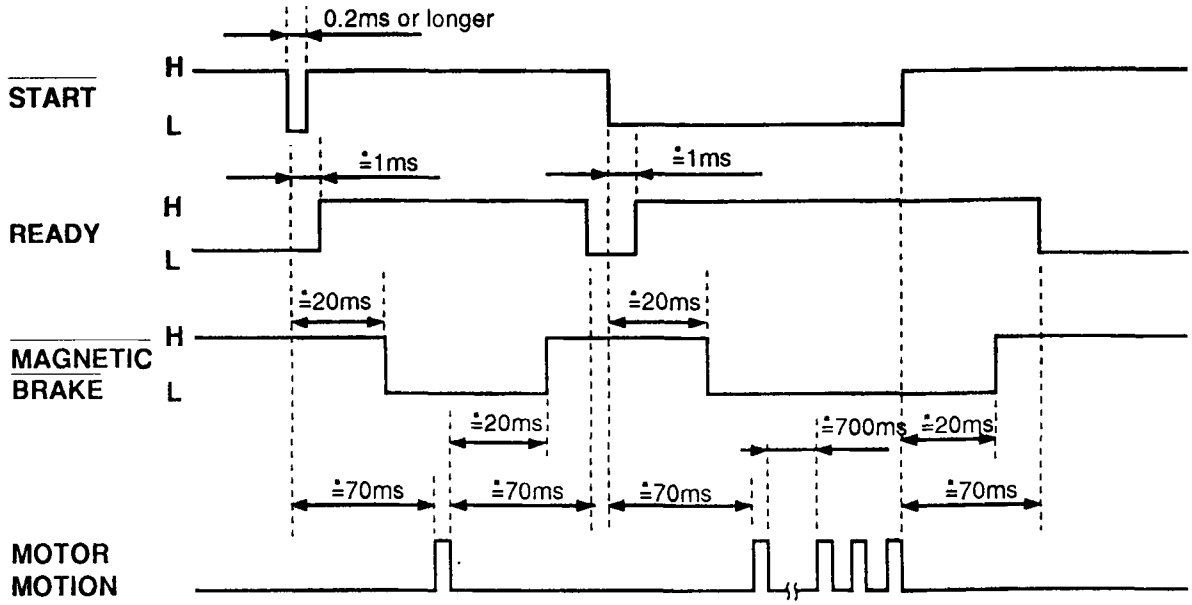


VR: Running Speed, VS: Starting Speed

The timing in the return mode is the same as the timing of the index mode except that the length of the move is determined by the distance from the electrical home point. For the UI215GA to return succesfully to the electrical home point, the maximum distance from the electrical home point is ±16,777,215 steps.

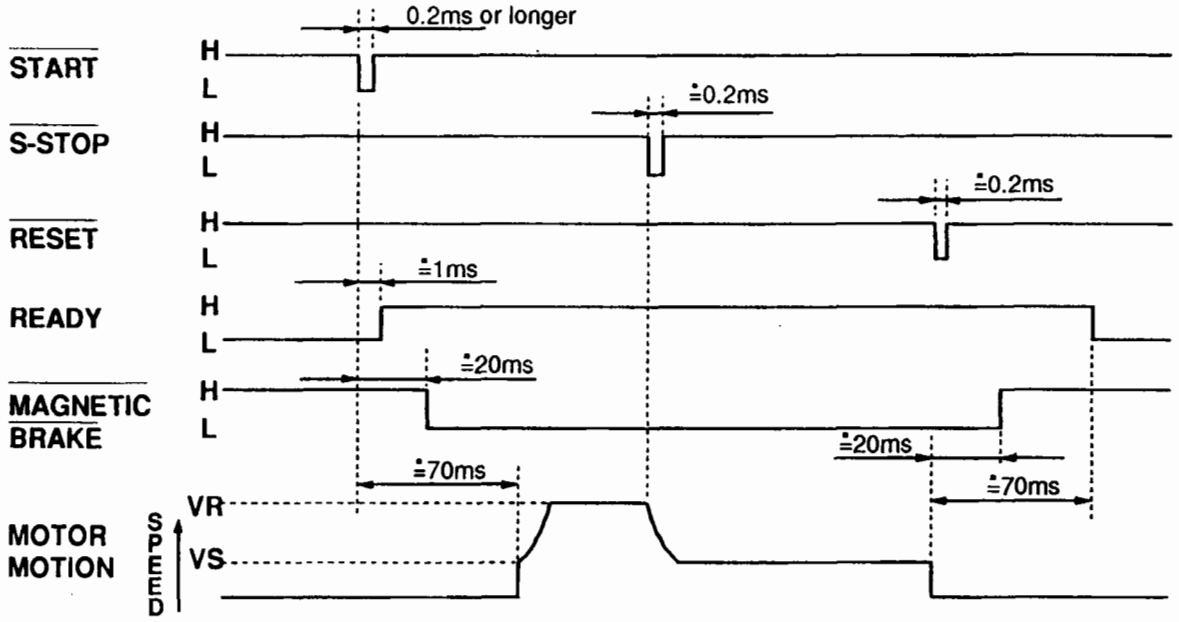
Timing for the Jog Mode (Mode 2)

This chart represents the timing for a move that is jogging (taking one step at a time). The motor will rotate one step each time the leading edge of a "START" signal is seen. If the "START" signal is maintained (held on), the motor will move 1 step and then rotate at a rate of 4pps until the "START" signal is released. This mode could be useful when trying to more accurately position a load.



Timing for the Continuous Running Mode (Mode 3)

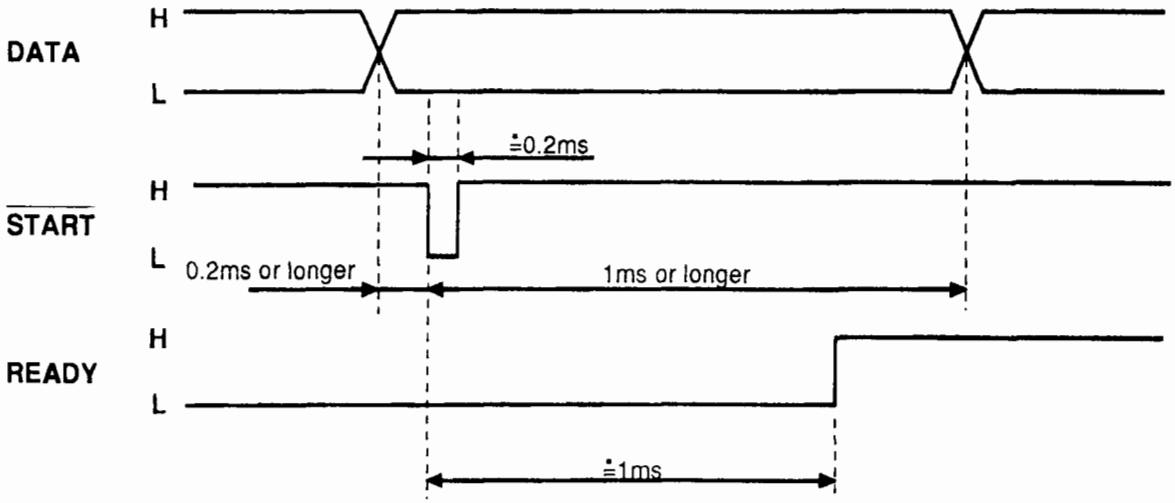
This chart represents the timing for a move that is continuously running (running until instructed to stop). Motion will not occur until the leading edge of a "START" signal is seen. If a "S-STOP" signal is input, the motor will decelerate to the base speed and continue running until a "RESET" signal is input and then stop. The motor will come to an immediate stop if the "RESET" signal is input at anytime while the motor is running.



VR: Running Speed, VS: Starting Speed

Timing for the Data Inputs

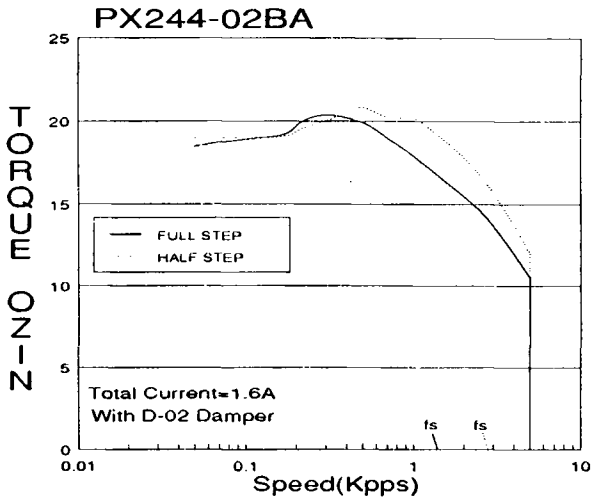
This chart represents the timing required for data inputs to be properly recognized. Motion will not occur until the leading edge of a "START" signal is seen.

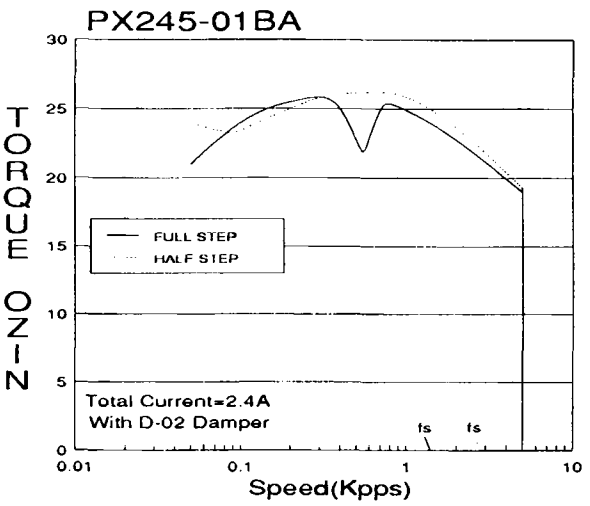


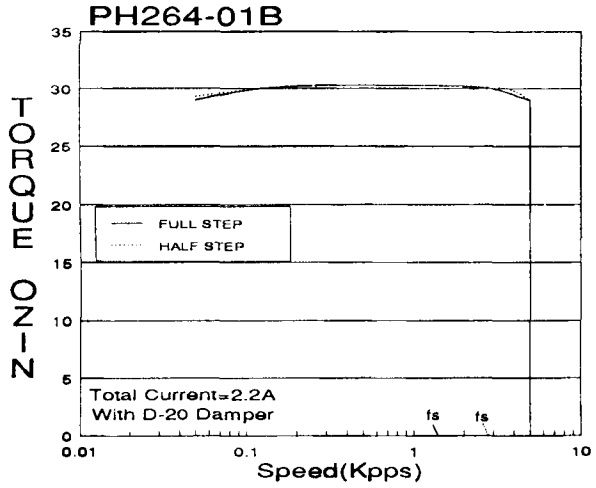
Do not change the input data until at least 1ms has passed after the leading edge of a "START" signal is seen. Input lines 1 thru 25 are used as the data input lines. Lines 1 thru 25 are the same on connectors CN1 and CN2 and are internally connected.

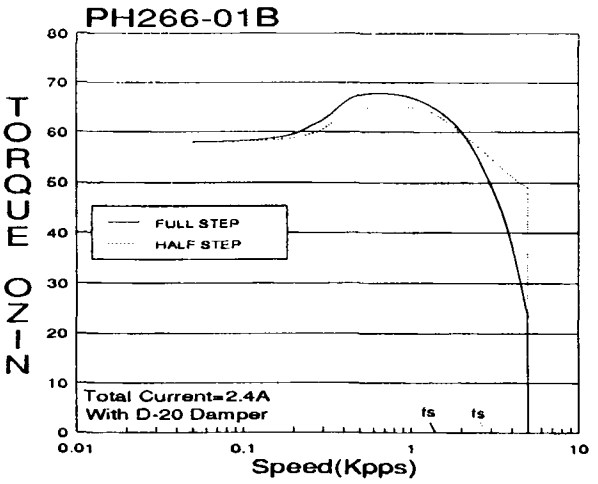
SPEED VS. TORQUE CHARACTERISTICS

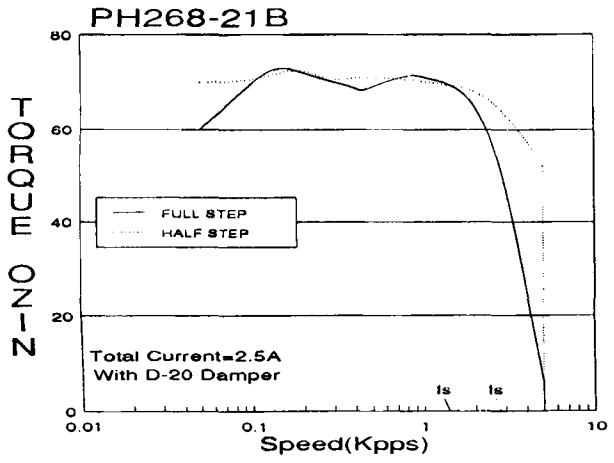
1.8°/step type (200 steps/rev)

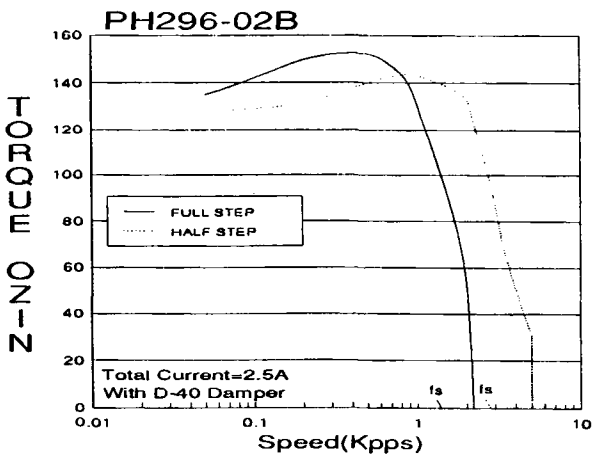










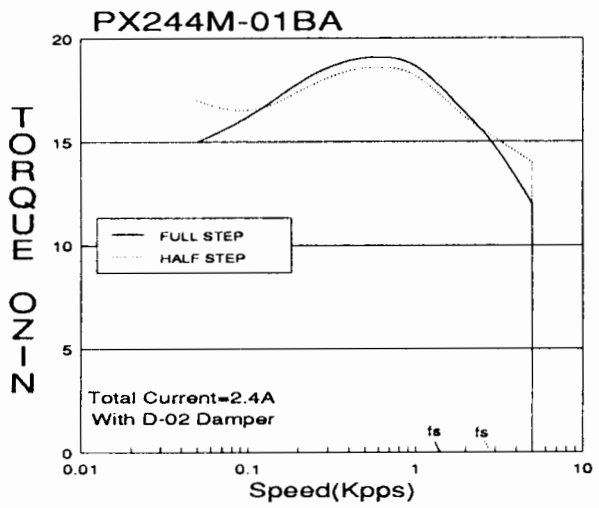


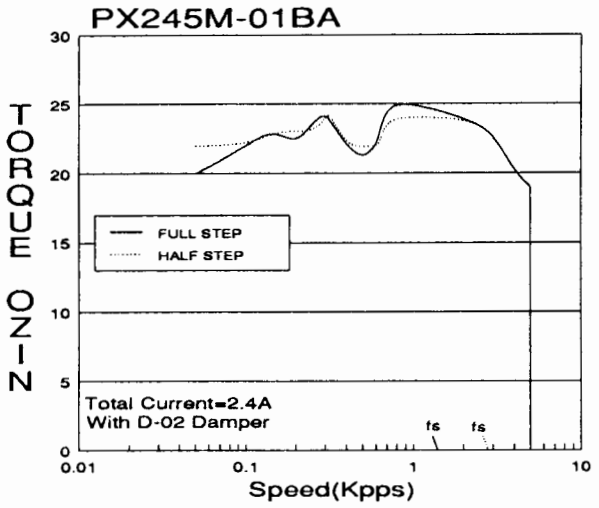
NOTE: Holding torque is reduced while the motor is stopped by the automatic current down (ACD) function. **fs**=No load self starting frequency.

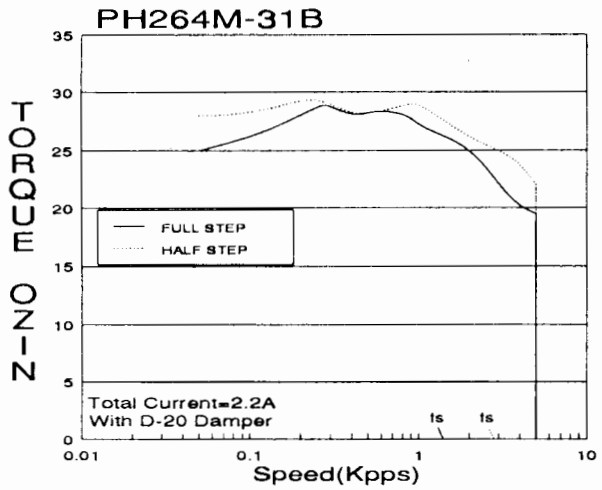
NOTE: To convert pulses per second (pps) to revolutions per minute (rpm), use the following equation;

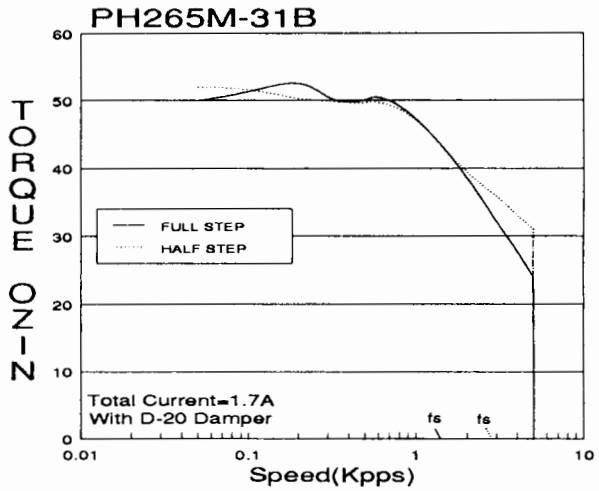
$$\frac{\text{rev}}{\text{min}} = \frac{\text{\# pulses}}{\text{second}} \times \frac{60 \text{ sec.}}{1 \text{ min.}} \times \frac{1 \text{ rev.}}{200 \text{ pulses}}$$

0.9°/step type (400 steps/rev)









NOTE: Holding torque is reduced while the motor is stopped by the automatic current down (ACD) function. fs=No load self starting frequency.

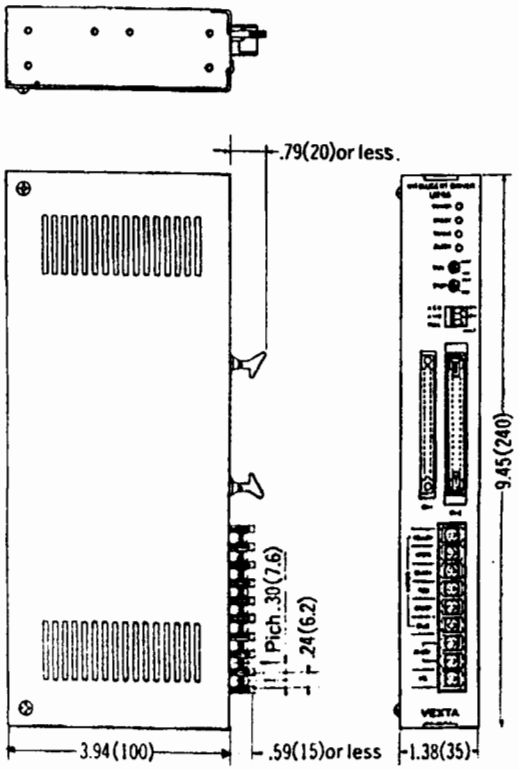
NOTE: To convert pulses per second (pps) to revolutions per minute (rpm), use the following equation;

$$\frac{\text{rev}}{\text{min}} = \frac{\text{\# pulses}}{\text{second}} \times \frac{60 \text{ sec.}}{1 \text{ min.}} \times \frac{1 \text{ rev.}}{400 \text{ pulses}}$$

MECHANICAL DIMENSIONS

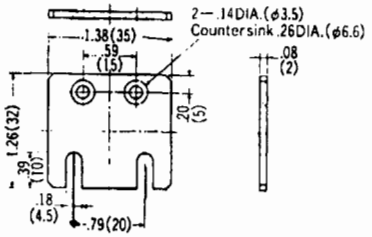
UI215GA

Unit = in(mm)

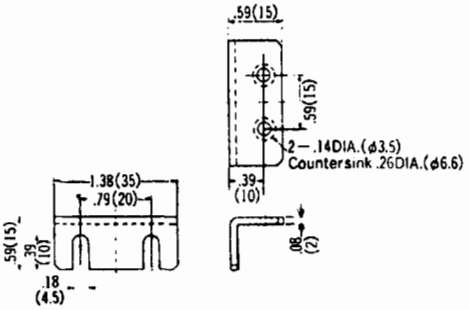


Accessories (included)

· Mounting Bracket A

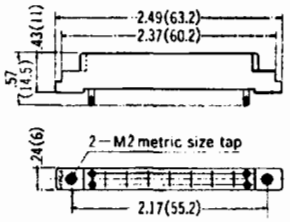


· Mounting Bracket



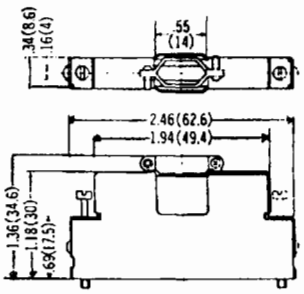
· Female Connector for CN1

PCA-36FES (Honda Tsushin Kogyo Co., Ltd.)
Solder type

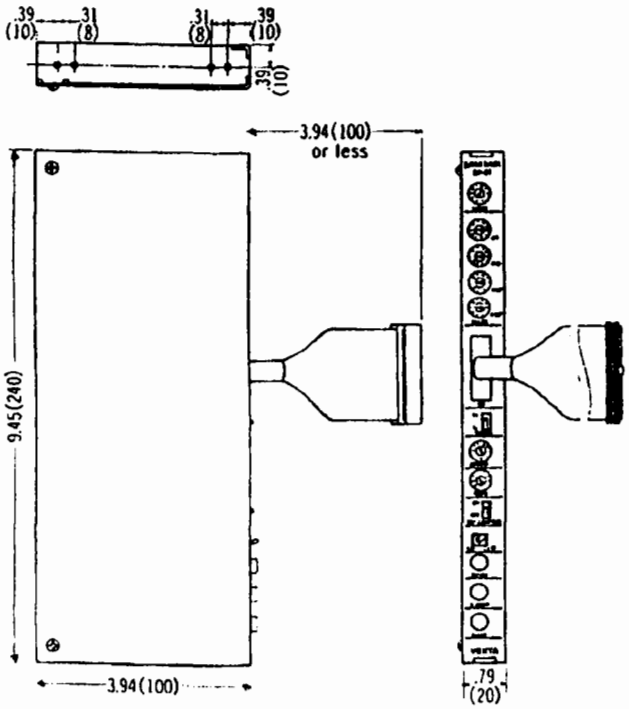


· Case for Female Connector CN1

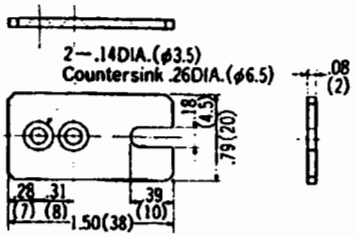
PCA-36LSM (Honda Tsushin Kogyo Co., Ltd.)



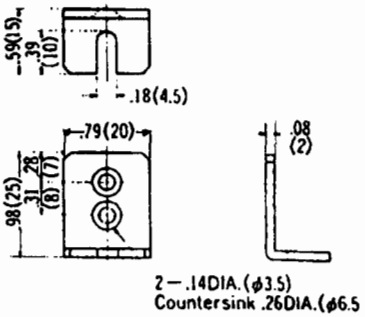
DP-01



· Mounting Bracket

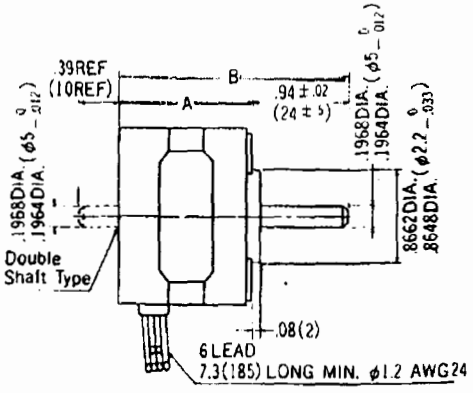


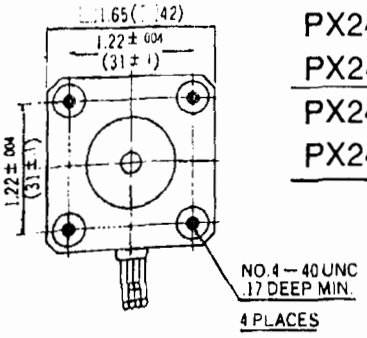
· Mounting Bracket



2-phase Stepping Motors
(Available separately)

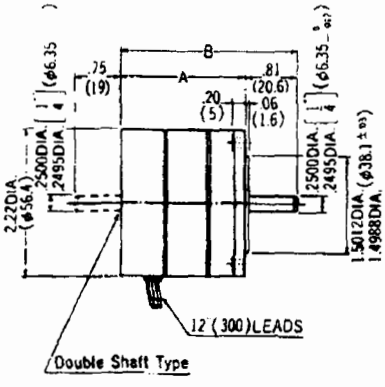
PX Type, Unit = inch(mm)

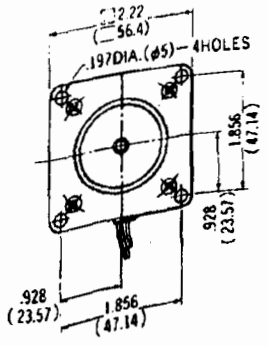




Model	A	B
PX244-02AA(BA) PX244M-01AA(BA)	1.54 (39)	2.48 (63)
PX245-01AA(BA) PX245M-01AA(BA)	1.85 (47)	2.80 (71)

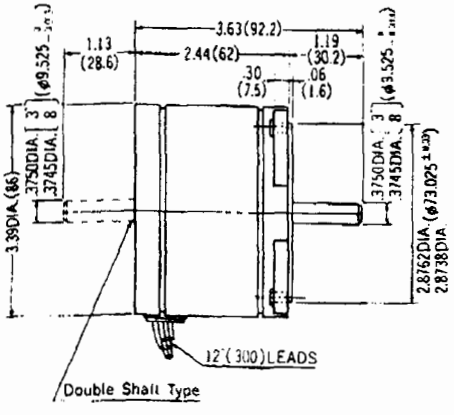
PH26 □Type, Unit = inch(mm)

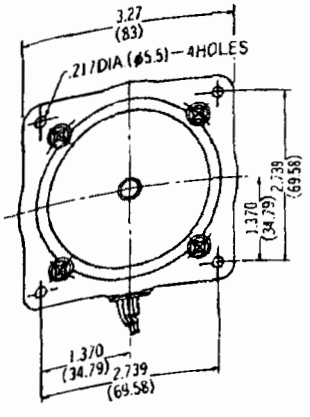




Model	A	B
PH264-01(B) PH264M-01(B)	1.54 (39)	2.35 (59.6)
PH265M-01(B)	2.01 (51)	2.82 (71.6)
PH266-01(B)	2.13 (54)	2.94 (74.6)
PH268-21(B)	2.99 (76)	3.80 (96.9)

PH296-02(B) Type, Unit = inch(mm)





SPECIFICATIONS

INTELLIGENT DRIVER UI215GA:

Power Requirements:		115VAC ± 10%, ≤1.3 Amps 60 Hz
Driver Section	Driver Type	Unipolar Constant-Current Chopper (PWM)
	Driver Output Power	1 Amp - 2.5 Amps total with two-phases "ON"
	Excitation Mode	2-phases "ON" (Full Step) or 1-2 phase "ON" (Half-step), Switch selectable
Input/Output Signal Charateristics		Input: Opto-isolated (photo coupler) attached to +10VDC through a 2.2kΩ resistor, 4.5mA maximum (source current) Common GND input Output: Opto-isolated (photo coupler) 30 VDC, 8mA maximum (sink current) Open-collector output: emmiter common
Built-in Functions	Auto Current Cutback at Standstill [ACD-Auto CurrentDown]	After the motor has been stopped for approximately 0.2 seconds, the motor current is automatically reduced to between 30% and 80% (adjustable) of the selected running current. (Switch selectable override available).
	Auto-Thermal Cutout [AHO-Auto Heat Off]	When the temperature of the driver's internal heat sink reaches approximately 175°F(80°C), the alarm indicator on the front panel will illuminate and the motor current will be shut off. The Overheat Alarm signal is also sent to pin #35 on connector CN1. (Switch selectable override available).
	Timing Signal (Phase Ø) output	The step motor phase excitation sequence is repeated every four full steps (eight half steps). When the step motor is in the "Phase Ø" position, the Timing indicator on the front panel will illuminate. For Full-Step (2-phase "ON") operation, the Timing indicator will illuminate every fourth step. For Half-Step (1-2 phase "ON") operation, the Timing indicator will illuminate every eighth step. The Timing signal is also sent to pin #34 on connector CN1. Upon power-up, the driver will be in the "Phase Ø" position.
Motion Data Inputs	Operating Modes:	Index Mode: Move a preset number of steps. Return-to-Electric Home Mode: (Returns to point where internal counter is 0) Maximum number of steps from home = ±16,777,216 steps. Jog Mode Move 1 step per "Start " signal, or move 4pps with a continuous "Start" signal. Continuous Running/Home Hunting Mode: Runs continuously until told to stop or seeks out a mechanical home limit switch when used with an external controller.
	Number of Index Steps	Decimal; 4 digit; 0 - 9,999 steps (PULSE)
	Speed Range	2 Ranges; Low (1000pps max) and High (5000pps max) (RANGE)
	Pulse Speed	Running Speed; 16 levels (0 - F) for each speed range, 32 total (SPEED)
	Accel/Decel Rate	Acceleration/Deceleration Rate; 4 (0 - 3) for each speed range, 8 total (RATE)

SPECIFICATIONS (CONT.)

INTELLIGENT DRIVER UI215GA (CONT.):

LED Indicators	Power, Ready, Timing, Alarm
Method of Cooling	Convection
Ambient Temperature Range	32° - 104°F (0° - 40°C)
Weight	1.8lb (0.8kg)
Outer Dimensions	1.4"(W) x 9.5"(H) x 4"(D) [35mm(W) x240mm(H) x 100mm (D)]
Dielectric Strength	Sufficient to withstand 1 KVAC applied for 1 minute, between the input power terminal and the case .
Insulation Resistance	Greater than 100Mohms when measured between the input power terminal and the case by a 500 VDC megger.

DATA PACK DP-01:

Motion Data Settings	Operating Modes:	Index Mode: Move a preset number of steps. Return-to-Electric Home Mode: (Returns to point where internal counter is 0) Maximum number of steps from home = ±16,777,216 steps. Jog Mode Move 1 step per "Start " signal, or move 4pps with a continuous "Start" signal. Continuous Running/Home Hunting Mode: Runs continuously until told to stop or seeks out a mechanical home limit switch when used with an external controller.
	Number of Index Steps	Decimal; 4 digit; 0 - 9,999 steps (PULSE)
	Speed Range	2 Ranges; Low (1000pps max) and High (5000pps max) (RANGE)
	Pulse Speed	Running Speed; 16 levels (0 - F) for each speed range, 32 total (SPEED)
	Accel/Decel Rate	Acceleration/Deceleration Rate; 4 (0 - 3) for each speed range, 8 total (RATE)
	SW Control	Disables CW/CCW, RESET, S-STOP and START switches on the DP-01when in the "OFF" position. This allows these functions to be controlled exclusively from an external controller. (SW CONTROL)
	Direction	Two directions; CW and CCW (CW/CCW)
	Pushbuttons	RESET; Stops the motion and resets the internal counter to zero. (RESET)
		S-STOP; In the continuous mode, the motor will slow down to the appropriate base speed (50pps in the Low range, 300pps in the High range). In the Index and Return modes, the motor will decelerate and stop. The interrupted move will be completed when the next "START" signal is received. (S-STOP)
		START; The "START" signal causes the UI215GA to read all of the input data lines, calculate the motion profile and then begin the motion. All input switches are ignored (except for S-STOP and RESET) until the move has been completed and the READY light turns "ON".
Weight		0.66lb (0.3kg)
Ambient Temperature Range		32° to 104°F (0° to 40°C)
Outer Dimensions		0.79"(W) x 9.45"(H) x 3.49"(D) [20mm x(W) x 240mm(H) x 100mm(D)]

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(c) The Products or Parts have not been subjected to misuse, negligence, accident or unauthorized repairs.

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Oriental Motor reserves the right to make engineering refinements without notice.

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