Model 3362

Stepping Motor Controller

INSTRUCTION MANUAL

February, 1987

Stepping-motor Controller

Options available with 0.5 and 6 ampere motor drive

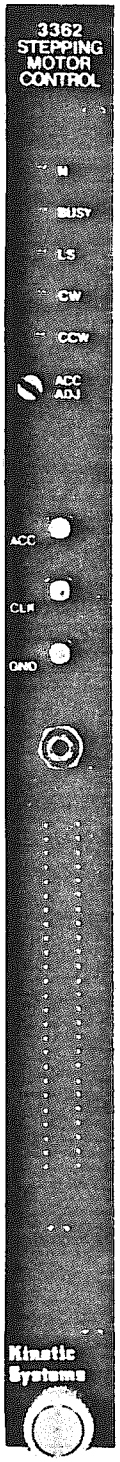
3362

Features

- **0.5 ampere motor drive capacity (single-width) or 6 ampere motor drive capacity (double-width)**
- **Programmable maximum/minimum step rates**
- **Front-panel potentiometer adjusted acceleration/deceleration profiles**
- **Programmable half/full step selection**
- **Strap-selectable polarity of limit switch inputs and clockwise/counterclockwise step inputs**
- **Velocity programmable up to 5000 steps per second**
- **Up to 32,767 steps with one command**

Typical Applications

- **Driving a stepping motor**
- **Positioning one axis of a machine**
- **Positioning a spectrometer**
- **Positioning a valve**



General Description *(Product specifications and descriptions subject to change without notice.)*

The 3362 is a single-width CAMAC module that contains the controls and driving circuits for a typical stepping motor. Writing a 16-bit sign and magnitude word into a countdown register initiates a process that counts the register down to zero while generating a new output phase at each count. The countdown is halted at a count of zero or upon setting one of two external limit switch inputs. The sign bit determines which input is able to inhibit the counting process. If the related limit switch input is set and an attempt is made to restart the count with an F(16)·A(0) command, the countdown register will not be written and Q = 0 will be returned. Typically, the two external switch inputs are a clockwise limit switch and a counterclockwise limit switch. The polarities of these limit switch inputs are strap-selectable.

The countdown register is clocked at a minimum and maximum rate determined by the control register. The acceleration rate is set by the front-panel potentiometer and is linear between the minimum and maximum rates. Rate of acceleration will remain constant even when the minimum and/or maximum frequencies are changed. Once the acceleration is set for a specific motor, the minimum and maximum frequency can be changed without any new acceleration rate adjustments.

Half-step or full-step mode of operation is also set via the control register.

Two inputs are provided for clockwise and counterclockwise signals that allow an external device to step the motor independent of the computer. These inputs accept TTL level signals. As with the limit switch inputs, the polarity of these signals is also strap-selectable. Two open-collector, low-true outputs monitor device activity, one clockwise and one counterclockwise. Whenever the motor is stepped---whether from the computer or an external device---a directional pulse is produced on the appropriate output. These outputs can connect to one channel of the Model 3640 Up-Down Presettable Counter. After initialization the 3640 will keep track of the position of the device controlled by the 3362.

The two output drive circuits consist of four open-collector transistor switches, each with emitters tied in common. Each collector has a clamping diode tied to a common bus which should be connected to the positive terminals of the motor power supply. The current-limiting resistors are external to the module. One drive circuit can drive motor windings rated up to 0.5 amperes using either an external motor power supply or the 24-volt supply of the CAMAC crate. With this drive circuit, the 3362 is a single-width CAMAC module. The second drive circuit has the capability of driving motor windings rated up to 6 amperes. The power supply for this circuit must be external to the module. With this option, the 3362 becomes a double-width CAMAC module. The motor power supplies of either module should not exceed 28 volts. All current limiting resistors are external to the module.

An open-collector control switch, which is controlled by Dataway commands, can switch 24 volts at 100 milliamperes.

A LAM source is set by the count reaching zero or by the count stopping due to an external inhibit and is cleared by a Write or Clear command. The LAM request can be tested, and the Status register can be read. The LAM request can be enabled and disabled. On power-up, the LAM source and the LAM enable are cleared and the motor is stopped.

Function Codes

Command		Q	Action
F(0)·A(0)	RD1	1	Reads the Countdown register.
F(1)·A(12)	RD2	1	Reads the Status register.
F(8)·A(15)	TLM	LR	Tests whether a LAM request is present. (See Note 1.)
F(10)·A(0)	CLM	1	Clears the LAM status.
F(16)·A(0)	WT1	$\overline{\text{BUSY}}\cdot\overline{\text{LIMIT}}$	Writes the Countdown register if not busy and not at limit. (See Note 2.)
F(17)·A(0)	WT2	$\overline{\text{BUSY}}$	Writes the Control register. (See Note 3.)
F(24)·A(0)	DIS	1	Disables the LAM request.
F(25)·A(0)	XEQ	1	Stops the motor.
F(26)·A(0)	ENB	1	Enables the LAM request.
F(28)·A(0)	F28	1	Opens the control switch.
F(30)·A(0)	F30	1	Closes the control switch.
Z	CZ	0	Stops the motor, clears the LAM status, disables the LAM request, and opens the control switch.

Notes:
1. Q = 1 for LAM request present, Q = 0 otherwise.
2. Q = 1 for module not busy and not at limit, Q = 0 otherwise.
3. Q = 1 for module not busy, Q = 0 otherwise.
4. X = 1 for all valid addressed commands.

Power Requirements

Models 3362-A1A, E1A, P1A

+6 volts:	1400 mA
–6 volts:	10 mA
+24 volts:	30 mA
–24 volts:	30 mA

Models 3362-A2A, E2A, P2A

+6 volts:	1420 mA
–6 volts:	10 mA
+24 volts:	30 mA
–24 volts:	30 mA

Note: The 3362-A1A, E1A, and P1A options contain a +24 volt output rated at one ampere to allow the stepping motor to derive its power from the +24 volt power supply in the crate. Other options require an external power supply.

Ordering Information

Model	Connector	Module Width	Mating Connector	Power Supply
3362-A1A	50-contact Ribbon	Single-width	5950-Z1A	
3362-E1A	50-contact "D" Plug	Single-width	5934-Z1A	
3362-P1A	36-contact P.C. Edge	Single-width	5960-Z1A or Z1B	
3362-A2A	50-contact Ribbon	Double-width	5950-Z1A	5461
3362-E2A	50-contact "D" Plug	Double-width	5934-Z1A	5461
3362-P2A	36-contact P.C. Edge	Double-width	5960-Z1A or Z1B	5461

Note: The 3362 is pin-compatible with the Model 3361 Stepping Motor Controller, which it replaces.

FRONT PANEL DESCRIPTION

N LED	This LED flashes momentarily when the module is addressed.
BUSY LED	This LED is lit when the module is in the process of stepping a motor. During this time period neither an F(16)·A(0) or F(17)·A(0) command will be accepted.
LAM SET LED	This LED is lit when the module has stopped counting down or when the count is stopped either by an F(25)·A(0) command or the appropriate LIMIT switch. This LED is turned off by an F(10)·A(0) command, CAMAC crate Z, or by writing an F(16)·A(0) command to start stepping the motor.
CLOCKWISE LIMIT LED	This LED is lit whenever the clockwise limit input is true.
COUNTERCLOCKWISE LIMIT LED	This LED is lit whenever the counterclockwise limit input is true.
ACCELERATION POTENTIOMETER	This front-panel accessed potentiometer is used to adjust the acceleration of the stepping motor. See section on Acceleration Adjustment.
ACCELERATION TEST POINT	This test point is monitored in the adjustment of the acceleration. See section on Acceleration Adjustment.
CLOCK TEST POINT	The actual frequency at which the motor is being stepped is monitored from this test point. This frequency will be twice the frequency when the motor is being stepped in half-step mode.
GROUND TEST POINT	Module ground is brought out to this test point to be used as a reference.

COMMAND DESCRIPTION

On the double-wide options (Model 3362-A2A, E2A, or P2A), the station number (N) of the module is the slot number of the left-most board.

F(0)·A(0)

Reads the present value of the countdown register, and the direction of travel. Bits 1-15 indicate the value of the countdown register, while Bit 16 indicates the direction. Bit 16=0 represents CW direction, where Bit 16=1 indicates CCW. Q=1 is returned at all times. Caution should be used when reading the countdown register while the module is stepping a motor since the count can change during the middle of the command.

F(1)·A(12)

Reads the present value of the status register. See the separate section on the status register for a description of each of the bits. Q=1 is returned at all times.

F(8)·A(15)

This command tests the LAM condition of the module. Q=1 will be returned if the LAM request is enabled by the F(26)·A(0) command, and the LAM status bit is set. Q=0 is returned otherwise.

F(10)·A(0)

Clears the LAM status bit. Q=1 is returned at all times.

F(16)·A(0)

Writes the direction and number of steps for the motor to move and then initiates the stepping process. This value is a 16-bit sign/magnitude word. The number of steps (magnitude) in Bits 1-15 is loaded into the countdown register, while Bit 16 indicates the direction. If Bit 16=0, the motor will step in the clockwise direction, and if Bit 16=1, it will step in the counterclockwise direction. Q=1 is returned only if the module is not busy and the appropriate limit switch is not set for desired direction indicated by Bit 16. Q=0 is returned otherwise.

F(17)·A(0)

Writes the control register which contains the minimum and maximum frequency settings and half/full step mode selection.

Bits 1-8: Writes the minimum frequency which will be ten times the written value.

Bits 9-16: Writes the maximum frequency which will be approximately 19.5 times the written value.

(i.e. 100100010000101_2; Bits 9-16 = 145_{10}
Bits 1-8 = 5_{10}

minimum frequency = 10 * 5 = 50 Hz
maximum frequency = 19.5 * 145 = 2827.5 Hz)

To step a motor at a constant frequency with no ramping, the maximum frequency should be set to zero and the minimum frequency to the desired stepping rate. When used in this manner, the minimum frequency must be greater than 40 Hz. (Q=1 is returned if the module is not busy, Q=0 otherwise.)

Bit 17: Sets Half/Full step selection
Bit 17 = 0 Full step operation
Bit 17 = 1 Half step operation

F(24)·A(0)

Disables the LAM request. Q=1 is returned at all times.

F(25)·A(0)

Stops the motor from stepping. Will set the LAM Status bit, but not the DONE bit in the status register. Q=1 is returned at all times.

F(26)·A(0)

Enables the LAM Request. Q=1 is returned at all times.

F(28)·A(0)

Opens the control switch and resets Bit 5 of the status register to "0". Q=1 is returned at all times.

F(30)·A(0)

Closes the control switch and sets Bit 5 of the status register to "1". Q=1 is returned at all times.

STATUS REGISTER

The Status Register of the Model 3362 is read with the F(1)·A(12) command. The following is a description of each of the five bits.

R5	R4	R3	R2	R1
Control Switch	Half/ Full	CW Limit	CCW Limit	Done

Bit One

This bit is the DONE bit. Once the countdown register reaches the count of zero this bit is set to "1" to indicate that the module is finished stepping completely through a step sequence. This bit is reset to "0" when the module is busy stepping the motor, and will remain in this state until the count is finished.

Bit Two

This bit is set to "1" when the counterclockwise limit switch input is true.

Bit Three

This bit is set to "1" when the clockwise limit switch input is true.

Bit Four

When the module is written to be in half step mode by the F(17)·A(0) command, this bit will be set to "1".

Bit Five

This bit is set to "1" to indicate when the control switch is closed. Once the control switch is opened, either by an F(24)·A(0) command or a crate initialize command this bit will be reset to zero. Upon power-up of the module this bit is reset to "0".

INITIAL SET-UP PROCEDURE

Before inserting module into the CAMAC crate the following checklist should be performed.

1) Strap the module to meet your needs.

2) Double-check the wiring between the module, motor, resistors, and power supply.

3) If the CW or CCW outputs are being used, verify that the inputs they are connected to accept open-collector outputs. It might be necessary to add a pull-up resistor to the inputs.

Insert the module into the CAMAC crate without the crate power or the stepping motor power turned on.

1) Turn the crate power on.

2) None of the front panel lights should stay turned on.

3) Adjust the acceleration of the motor through the front-panel potentiometer. See section on Acceleration Adjustment.

MODULE STRAPS

The Model 3362 straps are located on the "A" Board of the module. The module is shipped with the straps loaded to make the Model 3362 pin compatible with the Model 3361. Refer to Figure 1 for the strap locations on the module.

Strap Description

A: With this strap loaded the CAMAC crate will supply +24 volts for stepping motor power supply. If an external stepping motor power supply is used, this strap must be removed. This strap is used only with the single-wide Model 3362 options.

INL: This strap is loaded if the limit inputs are high-true signals. Remove this strap if it is desired to have this input low-true. This strap is not loaded at the factory.

INI: This strap is loaded if the step inputs are high-true signals. Remove this strap if it is desired to have this input low-true. This strap is not loaded at the factory.

3/2: With this strap loaded the module will drive a 2-phase motor, in which two windings of the motor are always energized. Removing this strap allows the module to control a 3-phase stepping motor. Contact the factory if it is desired to operate a 3-phase stepping motor. This strap is loaded at the factory.

2/W: With this strap loaded only one winding at a time per step will be activated (Wave Drive). Removing this strap will cause the Model 3362 to activate two windings per step (2-phase). This strap is not loaded at the factory.

In half-step mode the windings of the motor are alternately energized between 2-phase and wave drive. Thus, this strap is over-ridden during operation of the module in half-step mode.

Four spare strap locations are included on the module for straps that are not in use.

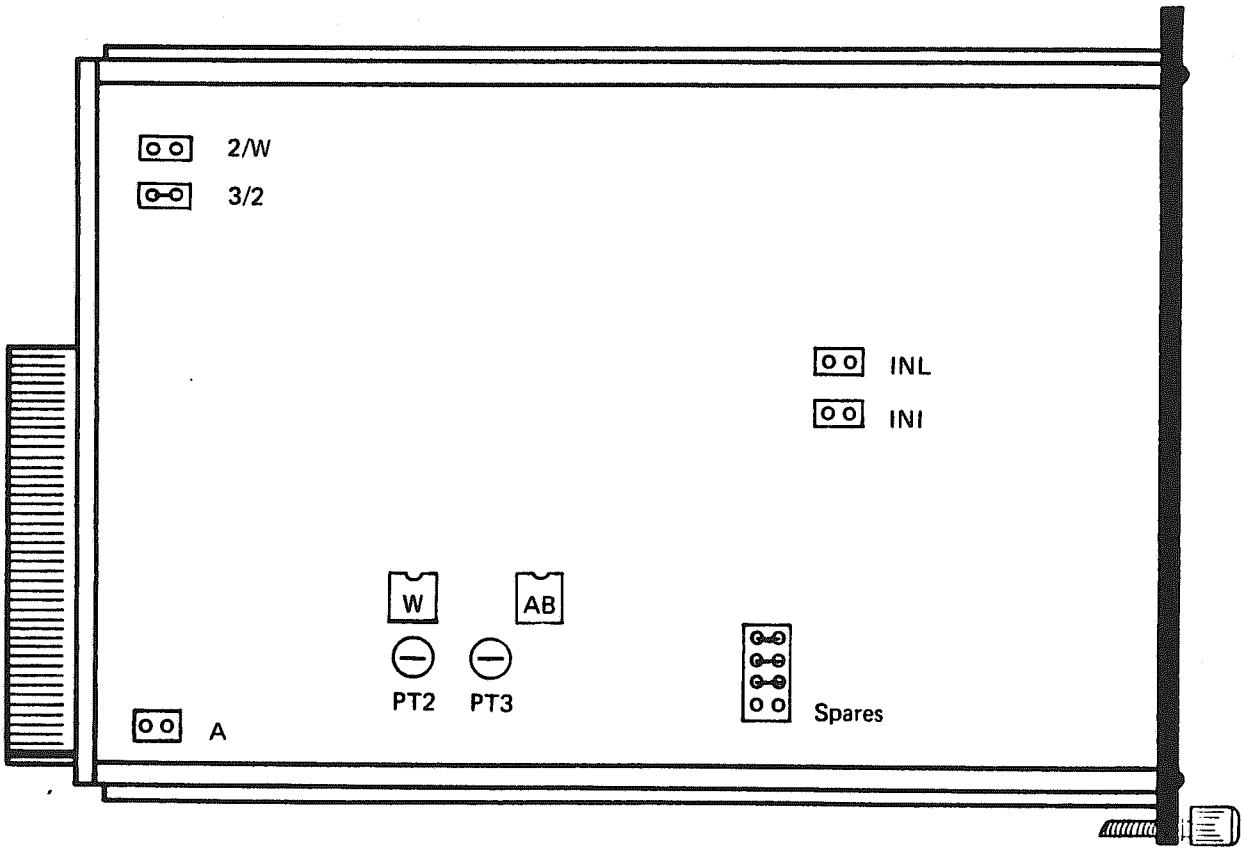


FIGURE 1

MOTOR CONNECTIONS

Model 3362-A1A, E1A, and P1A options (single-width module).

The necessary motor connections needed are shown in Figure 2(a). The pin numbers for the module connector can be found on Page 21. If an external power supply is to be used, remove strap A on the Model 3362. This strap is located on the lower left-hand part of the board. The external power supply voltage should not exceed 28 volts. Also, the maximum current per winding of the stepping motor should not exceed 0.5 amps. See the section on Calculation of Resistor Values to determine the resistance and wattage of Series Resistor R1.

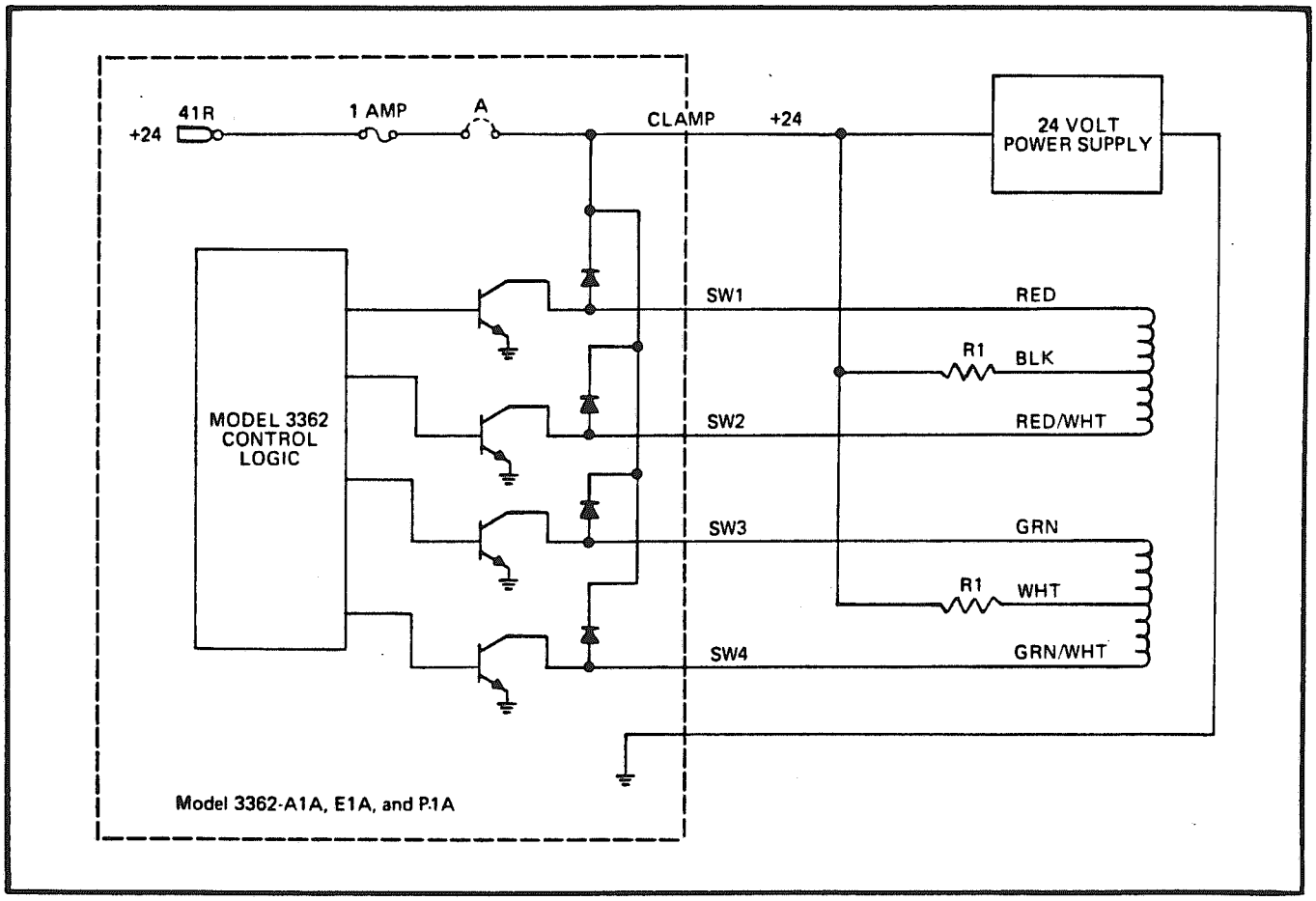


FIGURE 2(a)

Model 3362-A2A, E2A, and P2A options (double-width module).

The necessary motor connections needed are shown in Figure 2(b). The pin numbers for all the connections can be found on Page 21. Like the single-width options, the power supply voltage should not exceed 28 volts. Calculations of the Drive Current Limiting Resistor R2, and the Series Resistor R1, can be found under the section Calculation of Resistor Values.

Motor connections for the Model 3362-P2A are made to the "B" Board of the module, which is the right-most board when the module is viewed from the front panel.

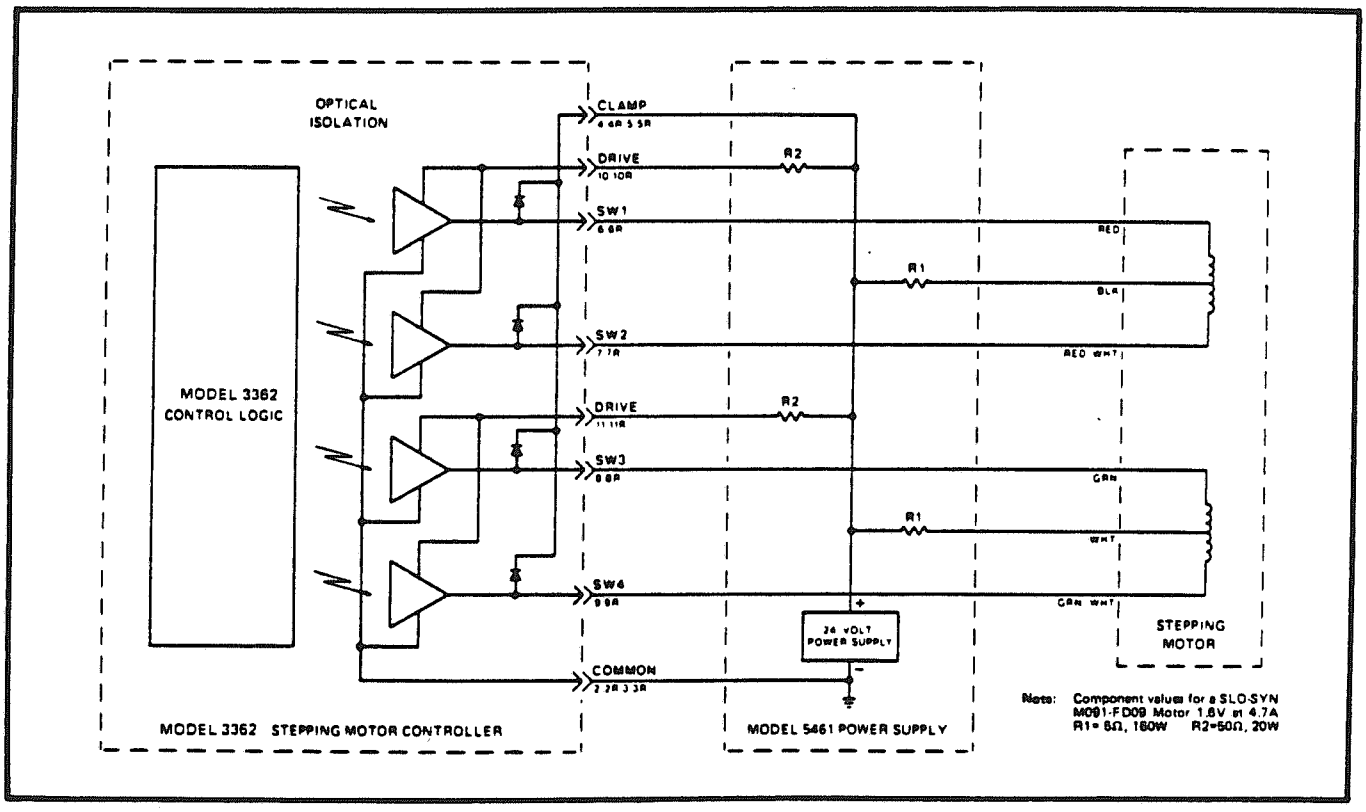


FIGURE 2(b)

CALCULATION OF RESISTOR VALUES

Series Resistor: R1

The following equation is used to calculate the value of the Series Resistor.

$$\frac{V_S - V_m}{I_m} = R1, \text{ where}$$

V_S = Power supply voltage
V_m = Rated motor voltage
I_m = Rated motor current per winding

To calculate the wattage of this resistor use the following equation.

$$(I_m)^2 \; R1 = \text{Wattage of R1}$$

Drive Current Limiting Resistor: R2

This resistor is only used on the double-width, high-power options (A2A, E2A, and P2A options) of the Model 3362. The value of this resistor is selected to limit the maximum current into the Drive input to 0.5 amps. See the following equation for this calculation.

$$\frac{V_S}{0.5 \text{ amps}} = R2, \text{ where}$$

V_S = Power supply voltage

To calculate the wattage of this resistor, use the following equation.

$$(0.5)^2 \; R2 = \text{Wattage of R2}$$

A good general rule-of-thumb to follow is to double the calculated wattage of a resistor.

Example: Calculation of resistor values for a Superior Electric Slo-Syn M091-FD09-Stepping Motor, using a Model 5461 Stepping Motor Power Supply.

$$V_S = 24.0 \text{ volts}$$
$$V_m = 1.7 \text{ volts}$$
$$I_m = 4.7 \text{ amps}$$

$$R1 = \frac{(24 - 1.7) \text{ volts}}{4.7 \text{ amps}} = \text{ohms}$$

$$(4.7 \text{ amps})^2 (4.7 \text{ ohms}) = 103.8 \text{ watts}$$

Use a 5 ohm, 200 watt resistor for R1.

$$R2 = \frac{24 \text{ volts}}{0.5 \text{ amps}} = 48 \text{ ohms}$$

$$(0.5 \text{ amps})^2 (48 \text{ ohms}) = 12 \text{ watts}$$

Use a 50 ohm, 25 watt resistor for R2.

INPUT CIRCUITS

All four control inputs (CW Limit, CCW Limit, CW Step, and CCW Step) possess the same type of circuitry. The input circuits accept TTL, open-collector, or switch inputs.

The polarity of CW and CCW step inputs is dependent upon strap INI, while strap INL selects the polarity of SW and CCW limit inputs. The terminal used to control the set input of the set/reset flip-flop is the (+) terminal while the other input is the (-) terminal. See Figure 3 for a typical input circuit. Note that the motor is stepped at the trailing edge of the step input as it goes from "ON" to "OFF" while the limit is set as soon as the input goes true.

SPDT Switch

When both contacts of a SPDT Switch are used, one contact should be connected to the (+) terminal while the other to the (-) terminal. The common point of the switch should be connected to module ground. With the switch set to be in the off state (no step to be performed or no limit set) the INX (INI for step inputs and INL for limit inputs) strap should be loaded if the (+) terminal is grounded. If the (+) terminal is high in the off state, then the INX strap should be removed. See Figure 3(a).

If only one contact of the SPDT switch is used it should be connected to the (+) terminal with no connection made to the (-) terminal. The position of strap INX is the same as above. See Figure 3(d).

SPST Switch

Connect one contact of SPST Switch to module ground and the other contact to the (+) terminal of the input circuit. No connection is made to the (-) terminal. With strap INX removed this signal is low-true. See Figure 3(b).

TTL or Open-Collector Input

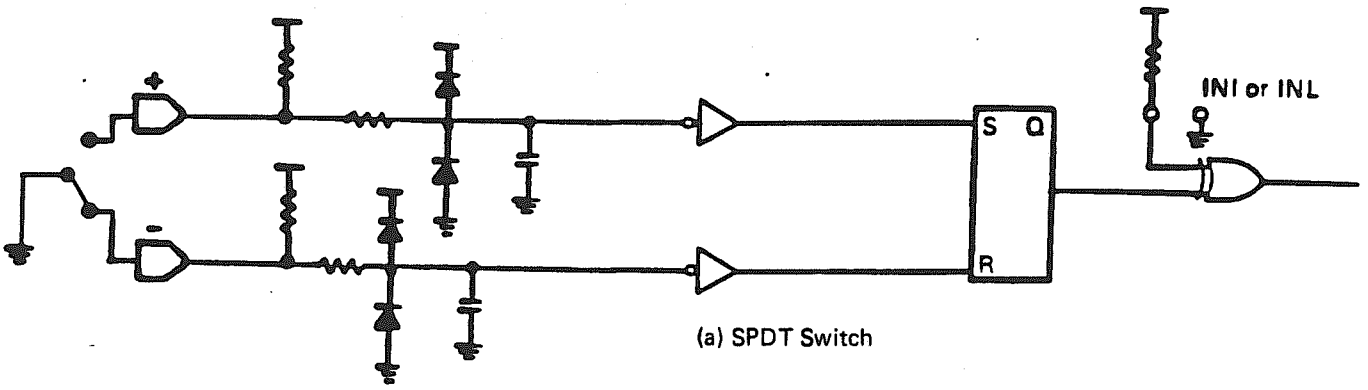
This input is connected to the (+) terminal and can either be a low-true or high-true signal. With strap INX removed this signal is low-true. The gate driving this input must be capable of sinking approximately 5 milliamps. See Figure 3(c).

PULSE OUTPUTS

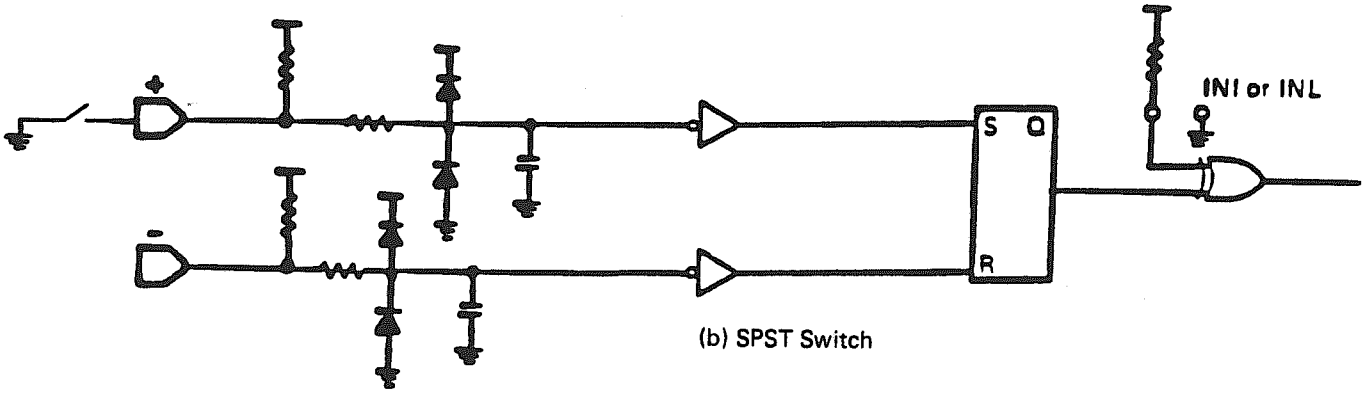
These two outputs, clockwise and counterclockwise, are open-collector and pulse-low for every clockwise or counterclockwise pulse generated, whether internal or external. If the inputs do not possess the necessary pull-up resistors, they will have to be added for these outputs to operate properly.

The pulse output will be approximately 3 microseconds long for an internally-generated clockwise or counterclockwise pulse, while the pulse output will follow the external clockwise or counterclockwise input.

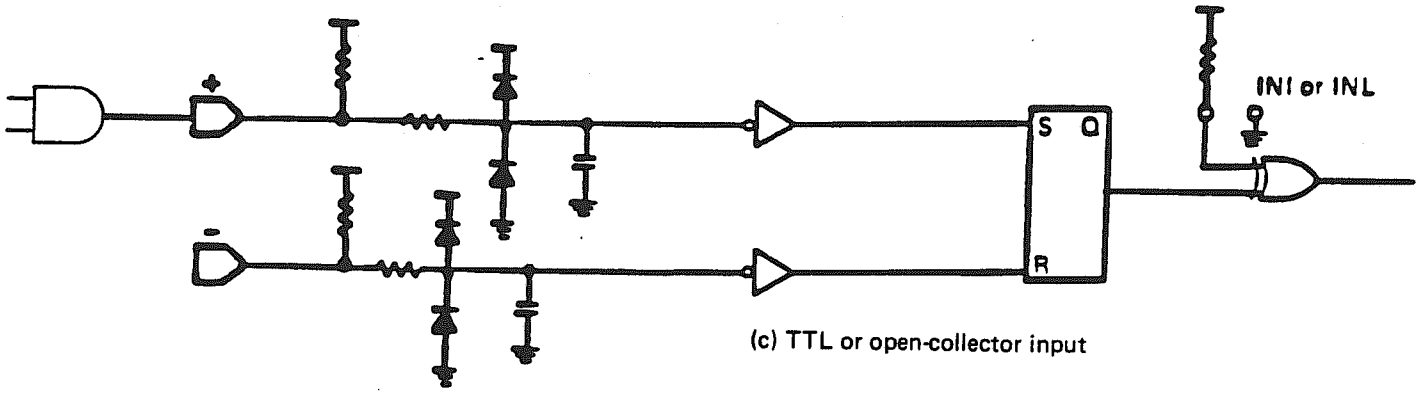
For example, if the input pulse is 10 milliseconds long, the output pulse will be 10 milliseconds in duration.



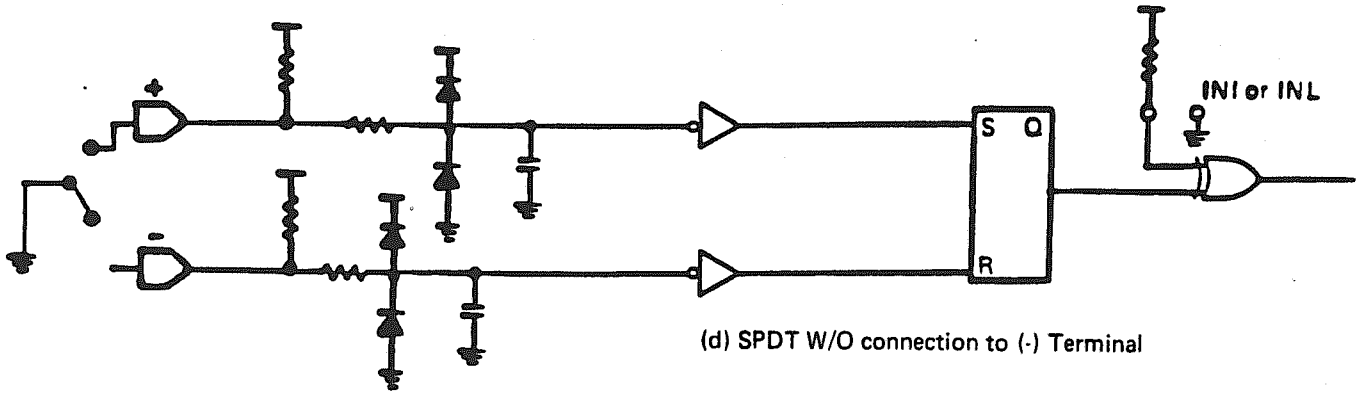
(a) SPDT Switch



(b) SPST Switch



(c) TTL or open-collector input



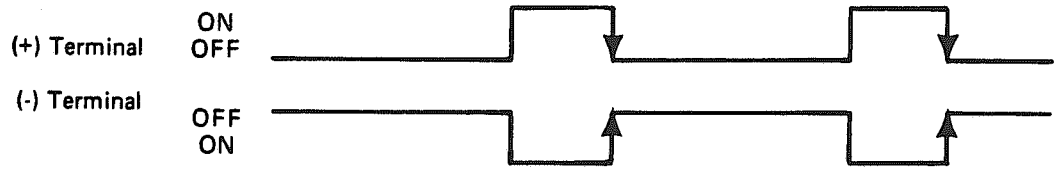
(d) SPDT W/O connection to (-) Terminal

FIGURE 3

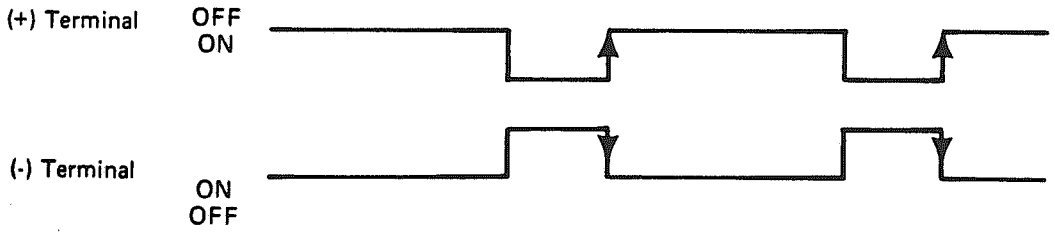
Input Signals

SPDT Switch (See Figure 3(a))

INX Strap loaded for high- true signals.



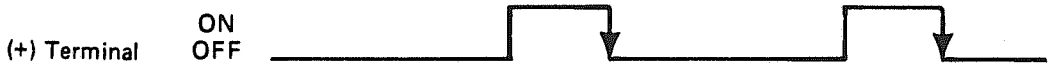
INX Strap removed for low-true signals.



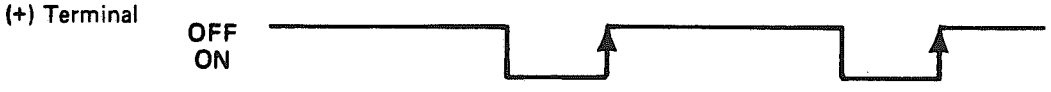
All other inputs (See Figure 3 (b), (c), (d))

No connection made to (-) terminal.

INX Strap loaded for high-true signals.



INX Strap removed for low-true signals.



Note: 1) The stepping motor is stepped at the trailing edge of input signal.

2) CW and CCW limits are set as soon as the input goes true, going from the off to the on state.

3) INX =INI for step inputs.
INX =INL for limit inputs.

ACCELERATION ADJUSTMENTS

The rate of acceleration of the stepping motor is adjusted by the front panel potentiometer. Once the rate of acceleration has been set it will remain the same even if the minimum and/or maximum frequencies are changed. The time the stepping motor takes to ramp from the minimum to the maximum frequency is dependent on the acceleration adjustment and the frequency difference between the minimum and maximum frequencies. From Figure 4 it can be seen that with the acceleration rate set using F_{min} and F_{max0} as endpoints, and then increasing F_{max0} to F_{max1} the rate of acceleration does not change, but the time to ramp increases from T_0 to T_1.

In the adjustment of the acceleration, it is not necessary to have the stepping motor power supply turned on, or the stepping motor connected to the module. The acceleration adjustment should be done as follows:

1) Write the maximum and minimum frequencies with the F(17)·A(0) command.

2) Have the computer loop on a program where the module's countdown register is written (F(16)·A(0)) with a large number.

3) With the computer looping on writing the Model 3362, monitor the acceleration test point and adjust the front-panel potentiometer until the desired acceleration is obtained.

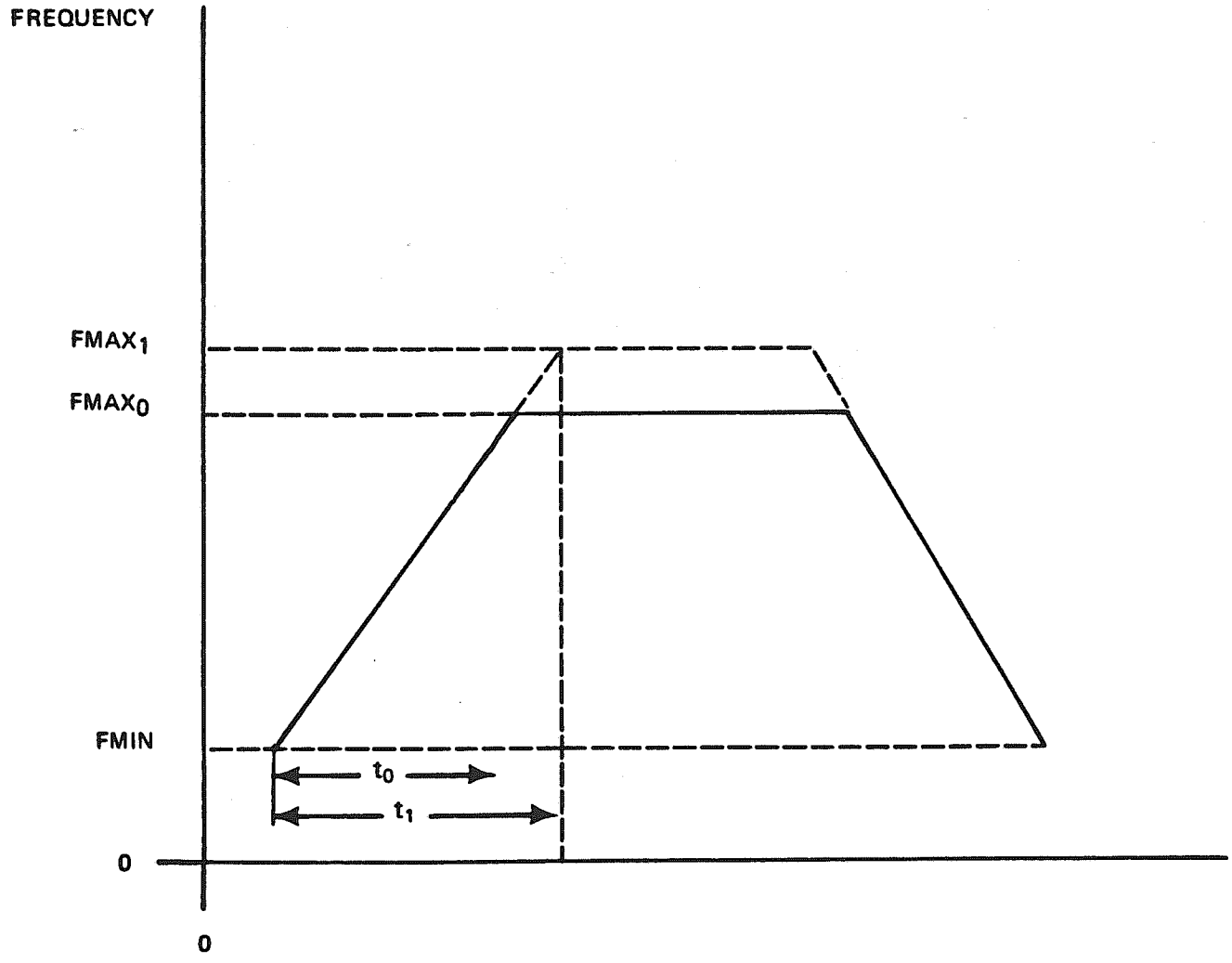


FIGURE 4

BLOCK DIAGRAM

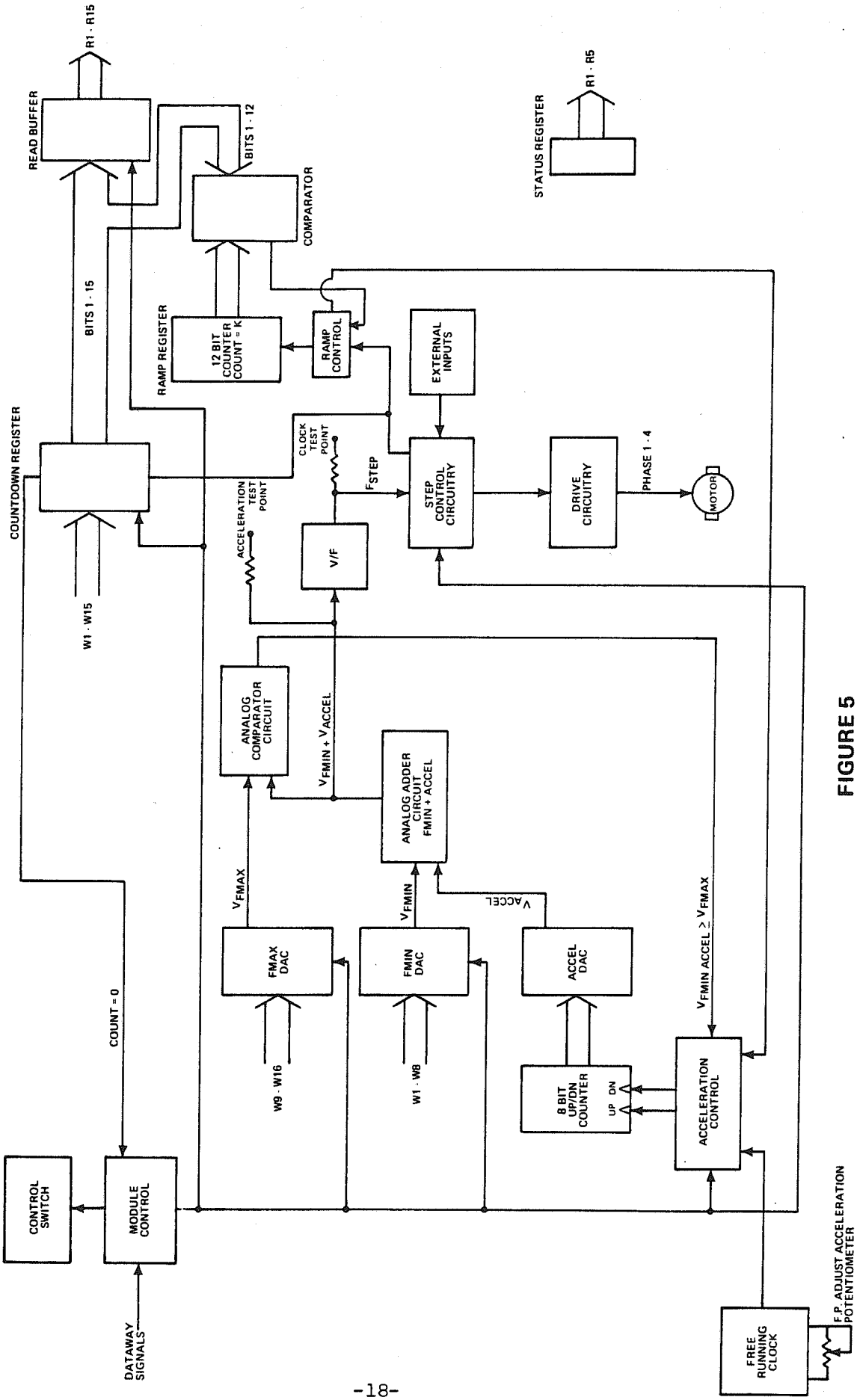
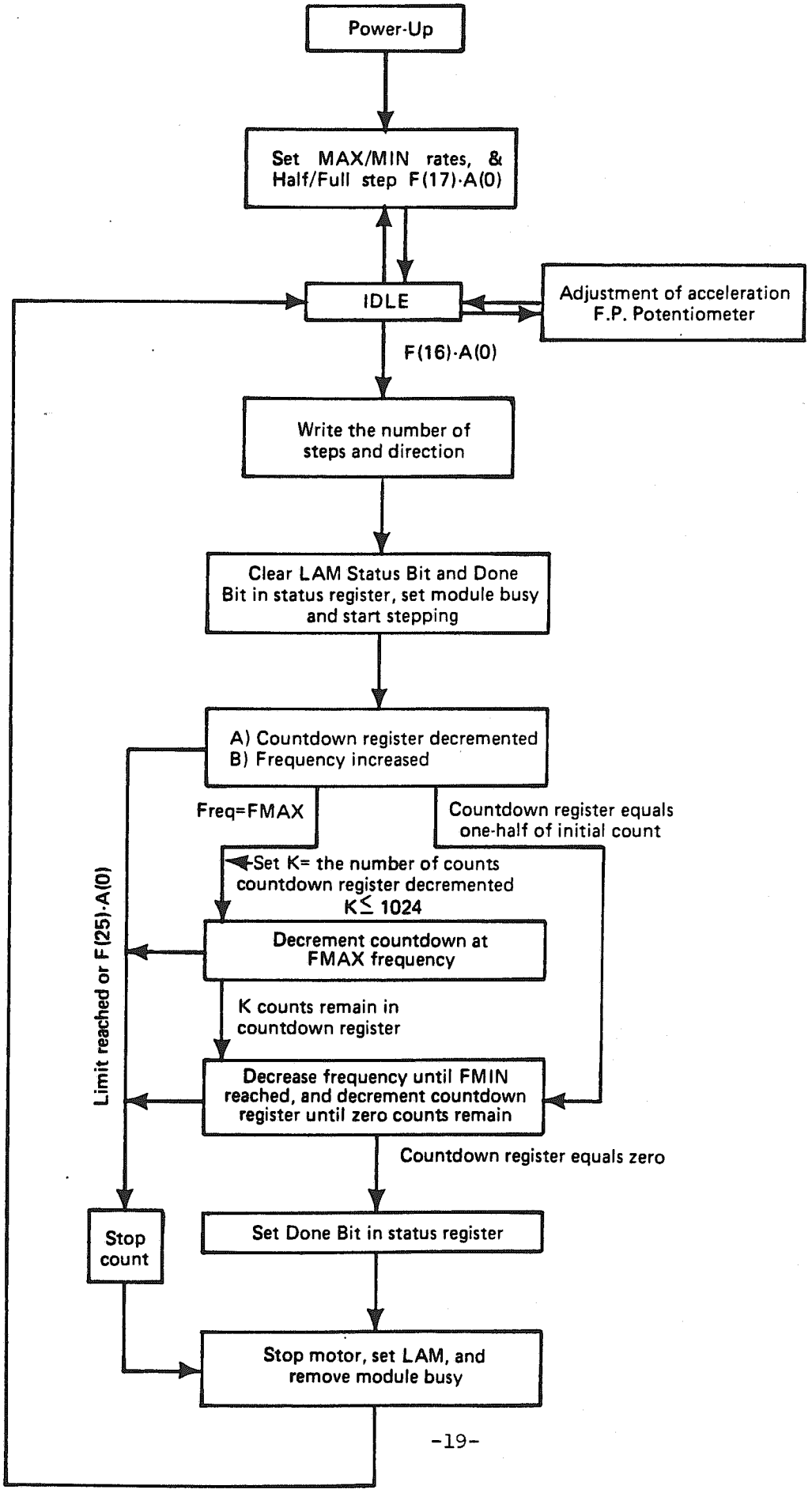


FIGURE 5

FLOWCHART OF STEPPING PROCESS



FREQUENCY CALIBRATION

If for any reason the minimum and/or maximum frequencies need to be adjusted the procedure given below should be followed:

a) Insert the module into the crate where the potentiometer PT2 and PT3 can be reached. Or, place the module onto a Dataway Extender Card.

b) Turn the crate power on and let the module run for approximately 15 minutes before performing any adjustments.

c) Write both the minimum and maximum frequencies to zero hertz with the F(17)·A(0) command.

d) To adjust the minimum frequency offset measure the voltage at AB-6 with a digital voltage meter and adjust PT3 until 0.00005 ± 0.00001 volt is obtained.

e) To adjust the maximum frequency offset measure the voltage at W-6 with the digital voltage meter and adjust PT2 until a 0.00005 ± 0.00001 volt is obtained.

f) The adjustments are finished, and the module is ready to be used.

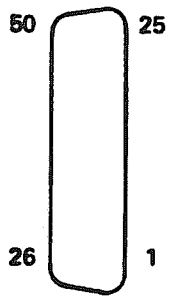
See Figure 1 for the locations of chips W and AB and potentiometers PT2 and PT3.

Model 3362-A1A

Stepping Motor Controller

INSTRUCTION MANUAL

February, 1987



FACE VIEW

Socket/Wire List

50 SOCKET RIBBON CONN.

Model 3362-A1A

SOCKET NO.		SOCKET NO.	
50	Module Ground	25	Module Ground
49	CCW Limit +	24	CW Limit +
48	CCW Input +	23	CW Input +
47	CCW Output	22	CW Output
46		21	Control Switch
45	CW Limit -	20	
44	CCW Limit -	19	
43	CW Input -	18	
42	CCW Input -	17	
41		16	
40	Clamp	15	Clamp
39	Clamp	14	Clamp
38		13	
37		12	
36	Switch 1	11	Switch 1
35	Switch 2	10	Switch 2
34		9	
33		8	
32	Switch 3	7	Switch 3
31	Switch 4	6	Switch 4
30		5	
29		4	Motor Common
28	Motor Common	3	Motor Common
27		2	
26	Module Ground	1	Module Ground

SPECIAL OPTION

Model 3362-S003

Stepping Motor Controller

February, 1992

*****SPECIAL OPTION*****

Model 3362-S003

The Model 3362-S003 is the same as the Model 3362-A1A except it has been modified to replace the component at position "F" with just a socket. (Do not load chip in socket)

Model 3362-A2A

Stepping Motor Controller

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****SPECIAL OPTION****

MODEL 3362-S001

STEPPING MOTOR CONTROLLER

NOVEMBER 1984

******SPECIAL OPTION******

Model 3362-S001

The Model 3362-S001 is identical to the Model 3362-A2A with the addition of the capability to turn the motor windings off with the control switch commands. With the motor windings off, no power is dissipated, either in the drive transistors or the motor.

Notes:

1.) The top strap of the four spare strap locations (Right of Chip AU) is used to disable the "power-down" option. With this strap removed, the 3362-S001 operation is identical to the 3362-A2A. Loading this strap enables the "power-down" option.

2.) On power-up, the motor windings are disabled. An F(30)·A(0) command will allow the module to control the motor windings. An F(28)·A(0) command will prevent the module from controlling the motor windings.

3.) In the "power-down" state, none of the motor windings are energized. Thus, the holding torque of the motor will approach zero. The only holding torque present will be from the permanent magnets within the motor.

Schematic for Model 3362-S001 is as follows:

#022163-D-4243

****SPECIAL OPTION****

MODEL 3362-S002

STEPPING MOTOR CONTROLLER

NOVEMBER 1984

******SPECIAL OPTION******

MODEL 3362-S002

Model 3362-S002 is a Model 3362-A2A with the addition of a strap to select when the motor-stepping process is initiated. With the strap in one position, the 3362-S002 operates just like the 3362-A2A; i.e., the stepping process starts at the end of the loading of the countdown register (F(16)·A(0) command). Moving the strap allows an external device to start the motor with a low true TTL input pulse. This input pulse width should be less than 50 microseconds.

NOTES:

1) The external signal is inputted on Pin 18 of the front-panel Amphenol connector.

2) Straps are located left of Chip BA (9602 I.C.). Of the four strap locations, the bottom two are for spare straps. A strap loaded in the top location selects normal 3362-A2A operation. Loading the strap in the second strap location allows the external pulse to start the stepping process. Do not have straps loaded in the top two locations at the same time.

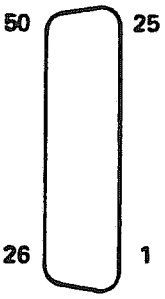
3) The countdown register must be loaded prior to any stepping process initiated by the external TTL pulse.

4) Do not load the value of zero into the countdown register when stepping process is initiated by an external TTL pulse.

NOTE: The schematics which apply to Model 3362-S002 are as follows:

#022163-B-4227
#022163-D-4228

Model 3362



FACE VIEW

Socket/Wire List

50 SOCKET RIBBON CONN.

Model 3362-A2A

SOCKET NO.		SOCKET NO.	
50	Module Ground	25	Module Ground
49	CCW Limit +	24	CW Limit +
48	CCW Input +	23	CW Input +
47	CCW Output	22	CW Output
46		21	Control Switch
45	CW Limit -	20	
44	CCW Limit -	19	
43	CW Input -	18	
42	CCW Input -	17	
41		16	
40	Clamp	15	Clamp
39	Clamp	14	Clamp
38		13	
37	Drives 1 and 2	12	Drives 1 and 2
36	Switch 1	11	Switch 1
35	Switch 2	10	Switch 2
34		9	
33	Drives 3 and 4	8	Drives 3 and 4
32	Switch 3	7	Switch 3
31	Switch 4	6	Switch 4
30		5	
29	Common	4	Common
28	Common	3	Common
27		2	
26	Module Ground	1	Module Ground

Model 3362-E1A

Stepping Motor Controller

INSTRUCTION MANUAL

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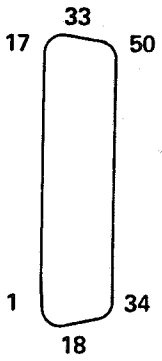

FACE VIEW

Pin/Wire List

Model 3362-E1A

50 PIN 'D'

PIN NO.		PIN NO.		PIN NO.	
17		33		50	Module Ground
16		32	Switch 3	49	CCW Limit +
15	Clamp	31	Switch 4	48	CCW Input +
14	Clamp	30		47	CCW Output
13		29	Motor Common	46	
12		28	Motor Common	45	CW Limit -
11	Switch 1	27		44	CCW Limit -
10	Switch 2	26	Module Ground	43	CW Input -
9		25	Module Ground	42	CCW Input -
8		24	CW Limit +	41	
7	Switch 3	23	CW Input +	40	Clamp
6	Switch 4	22	CW Output	39	Clamp
5		21	Control Switch	38	
4	Motor Common	20		37	
3	Motor Common	19		36	Switch 1
2		18		35	Switch 2
1	Module Ground			34	

Model 3362-E2A

Stepping Motor Controller

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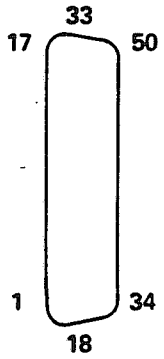

FACE VIEW

Pin/Wire List

Model 3362-E2A

50 PIN 'D'

PIN NO.		PIN NO.		PIN NO.	
17		33	Drives 3 and 4	50	Module Ground
16		32	Switch 3	49	CCW Limit +
15	Clamp	31	Switch 4	48	CCW Input +
14	Clamp	30		47	CCW Output
13		29	Motor Common	46	
12	Drives 1 and 2	28	Motor Common	45	CW Limit -
11	Switch 1	27		44	CCW Limit -
10	Switch 2	26	Module Ground	43	CW Input -
9		25	Module Ground	42	CCW Input -
8	Drives 3 and 4	24	CW Limit +	41	
7	Switch 3	23	CW Input +	40	Clamp
6	Switch 4	22	CW Output	39	Clamp
5		21	Control Switch	38	
4	Motor Common	20		37	Drives 1 and 2
3	Motor Common	19		36	Switch 1
2		18		35	Switch 2
1	Module Ground			34	

Model 3362-P1A

Stepping Motor Controller

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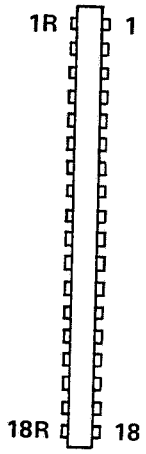

FACE VIEW

Pin/Wire List

Model 3362-P1A

18/36 POSTION P.C. EDGE

PIN NO.		PIN NO.	
1R	Module Ground	1	Module Ground
2R	Motor Common	2	Motor Common
3R	Motor Common	3	Motor Common
4R	Clamp	4	Clamp
5R	Clamp	5	Clamp
6R	Switch 1	6	Switch 1
7R	Switch 2	7	Switch 2
8R	Switch 3	8	Switch 3
9R	Switch 4	9	Switch 4
10R		10	
11R		11	
12R		12	
13R		13	CW Limit -
14R	Control Switch	14	CCW Limit -
15R	CW Limit +	15	CW Input -
16R	CCW Limit +	16	CCW Input -
17R	CW Input +	17	CCW Output
18R	CCW Input +	18	CW Output

NOTE: TO KEEP THE CURRENT ON THE I/O CONNECTOR PINS WITHIN THEIR RATING, PARALLEL THE APPROPRIATE MOTOR CONNECTIONS ON THE MATING CONNECTOR (FOR EXAMPLE, PARALLEL TERMINALS, 2, 2R, 3 AND 3R IN THE MOTOR COMMON CIRCUIT).

Model 3362-P2A

Stepping Motor Controller

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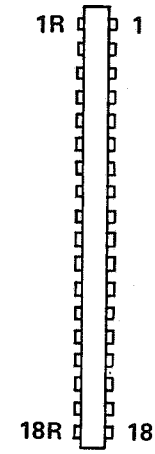
Model 3362



FACE VIEW

Pin/Wire List

Model 3362-P2A

18/36 POSTION P.C. EDGE

PIN NO.		PIN NO.	
1R	Module Ground	1	Module Ground
2R	Motor Common	2	Motor Common
3R	Motor Common	3	Motor Common
4R	Clamp	4	Clamp
5R	Clamp	5	Clamp
6R	Switch 1	6	Switch 1
7R	Switch 2	7	Switch 2
8R	Swtich 3	8	Switch 3
9R	Switch 4	9	Switch 4
10R	Drive 1 and 2	10	Drive 1 and 2
11R	Drive 3 and 4	11	Drive 3 and 4
12R		12	
13R		13	CW Limit -
14R	Control Switch	14	CCW Limit -
15R	CW Limit +	15	CW Input -
16R	CCW Limit +	16	CCW Input -
17R	CW Input +	17	CCW Output
18R	CCW Input +	18	CW Output

NOTE: To keep the current on the I/O connector pins within their rating, parallel the appropriate motor connections on the mating connector (for example, parallel terminals, 2, 2R, 3 and 3R in the motor common circuit).