



- **Provides Mounting & Connections for Accelnet CANopen Servoamplifiers**

## FEATURES

- **Works with all Accelnet Models**
- **Develop & Debug Accelnet projects then transfer design to oem pc board.**

Dev Kit	Model *	Vdc	Ic	Ip
MDK-180-01	ACM-055-18	20 - 55	6	18
	ACM-055-60	20 - 55	30	60
MDK-180-01	ACM-090-09	20 - 90	3	9
MDK-180-01	ACM-090-24	20 - 90	12	24
	ACM-090-50	20 - 90	25	50
MDK-180-01	ACM-180-09	20 - 180	3	9
MDK-180-01	ACM-180-18	20 - 180	6	18
MDK-180-01	ACM-180-20	20 - 180	10	20

## DESCRIPTION

The Development Kit is a companion product to Copley Controls' new *Accelnet* modular servoamplifiers. It provides mechanical mounting and electrical connections for the amplifier so users can quickly connect *Accelnet* and begin to develop applications.

Euro style screw-terminal connector blocks simplify connections for power and motor phase-windings. Sub-D connectors use same pinouts as *Accelus™* Panel amplifiers and carry motor encoder and Hall signals, and I/O signals.

A connector is provided for +24V from an external power supply to power *Accelnet* as an auxiliary power supply. This enables *Accelnet* to "stay-alive" to monitor motor position and report back to the controller via the CANopen bus while +HV is removed for an E-stop condition.

A 16-position rotary switch connects to *Accelnet* I/O pins for selection of the CANopen device address. Individual toggle switches are wired to other I/O pins to simulate limit, capture, and home switch functions. Jumpers permit these switches to be disconnected so that the I/O pins can connect to user equipment through the Sub-D connectors.

Across-the-line encoder termination resistors can be switched in or out via another set of jumpers giving a 121Ω terminating impedance when high speed encoder signals could be susceptible to noise if wires were left open-circuit and subject to ringing.

Another 121Ω resistor can be jumpered in or out as a terminator for the CAN bus signals if the development kit is the last device on a CANopen network.

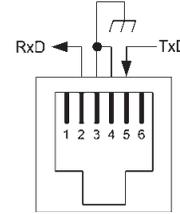
Two led's can be jumpered in or out to the *Accelnet* Out1 or Out2 pins. These give an easy read-out of the output status for debugging.

Motor encoder signals are connected through from the motor connector to the signal connector eliminating split cables in cases where the *Accelnet* is operating in stand-alone mode as a torque amplifier. In these cases, the controller uses the encoder for position feedback, and *Accelnet* operates as a torque or force amplifier.

**RS-232 CONNECTION**

The RS-232 port is used to configure *Accelnet* for stand-alone applications, or for configuration before it is installed into a CANopen network. *CME 2™* software communicates with *Accelnet* over this link and is used for complete amplifier setup. The CAN address that is set by the rotary switch can be monitored, and an address offset programmed as well. This will add to the switch address to produce a working CAN address that can be from 1 to 127.

The RS-232 connector, J4, is a modular type that uses a 6-position plug, four wires of which are used for RS-232. A connector kit (SER-CK) is available that includes a modular cable, and an adaptor to interface this cable with a 9-pin RS-232 port on a computer.



J4:  
RS-232

**CAN CONNECTORS**

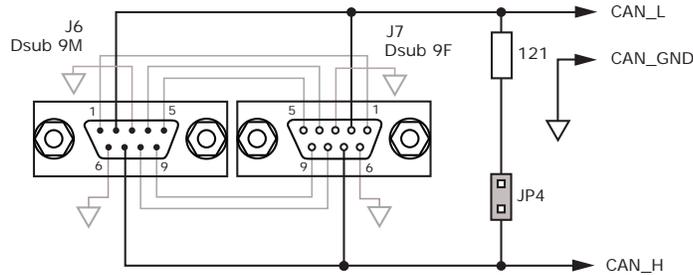
Connectors J6 & J7 are Sub-D male and female 9-position types that conform to the CAN DS-102 Physical Layer specification. The male-female configuration supports a single cable type with male and female connectors that can be daisy-chained from device to device along a CANopen network.

*Accelnet* uses only the CAN\_H, CAN\_L, and CAN\_GND signals. The CAN\_GND is connected to the circuit ground on the development kit. This ground is also shared by the amplifier power supply, accessory +5 Vdc (for encoders), and the RS-232 link. Other DS-102 signals are wired-through for use by products that might support them.

The table below lists the signals and pins on J6 & J7. Signals in ( ) are those that have no connection on the development kit and which are connected pin-to-pin between J6 & J7.

CAN Bus Connector Signals

PIN	SIGNAL
1	(Reserved)
2	CAN_L
3	CAN_GND
4	(Reserved)
5	(CAN_SHLD)
6	No connection
7	CAN_H
8	(Reserved)
9	(Reserved)



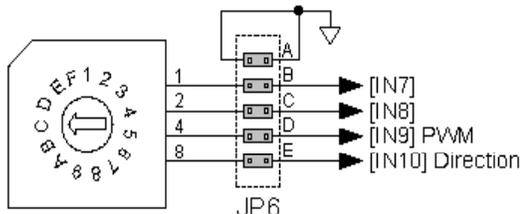
JP4 Connects termination resistor for last node on CAN bus

**Important!**  
Install JP4 ONLY if development kit is the LAST node on a CAN bus

**CAN ADDRESS SELECTION**

Rotary switch SW6, labeled "CAN ADDR" connects to logic inputs 7, 8, 9, and 10 of the amplifier. These are programmable inputs which default to CAN address bits. The switch will select CAN addresses 0x00 through 0x0F (0~15 decimal). Address 0x00 is reserved for network management devices so amplifiers should use addresses 0x01~0x0F. The CAN standard permits up to 127 devices, so if the amplifier must have a address of 0x10 (decimal 16) or higher, this is done by programming an address offset into the amplifier before it is installed into the CAN bus. When this is done, the switch setting is added to the CAN offset in the amplifier to produce the actual CAN address.

CAN Address Switch



Accelnet Logic Inputs

Note: To use inputs 7,8,9, or 10 as logic inputs remove jumpers on JP6. Connections can then be made via the pins on JP6. Inputs [IN9,10] are digital reference inputs for use when amplifier is used in stand-alone mode.

**LOGIC INPUTS**

Accelnet has ten logic inputs. On the development kit four are used for the CAN address (see CAN address selection on opposite page), five are connect either to switches or to external equipment via J3, and one is wired to J2 for the motor temperature sensor. Input [IN1] is dedicated to the amplifier Enable function, the others are programmable using CME 2 software.

Each of the five inputs (IN1,2,3,4,6) is wired to two jumpers, one on JP2 and one on JP3. If the JP2 jumper is in place, the input connects to a switch on the development kit. If the JP3 jumper is in place, the signal is wired through to J3 where it is accessible to external equipment. Only one of the jumpers for any input should be installed at a time.

The switches are labeled with the default functions of these inputs, and when in the LO position, ground the inputs, and when in the HI position, leave the inputs in an open-circuit condition. Pull-up resistors in Accelnet will then pull these to +5V.

Input IN5 connects to the motor feedback connector J2 where it can connect to a temperature sensor in the motor. If a temperature sensor is not used the input can be programmed to be a logic input.

**LOGIC OUTPUTS**

Accelnet has two logic outputs that can drive controller logic inputs or relays. If relays are driven, then flyback diodes must be connected across their terminals to clamp overvoltages that occur when the inductance of the relay coil is suddenly turned off.

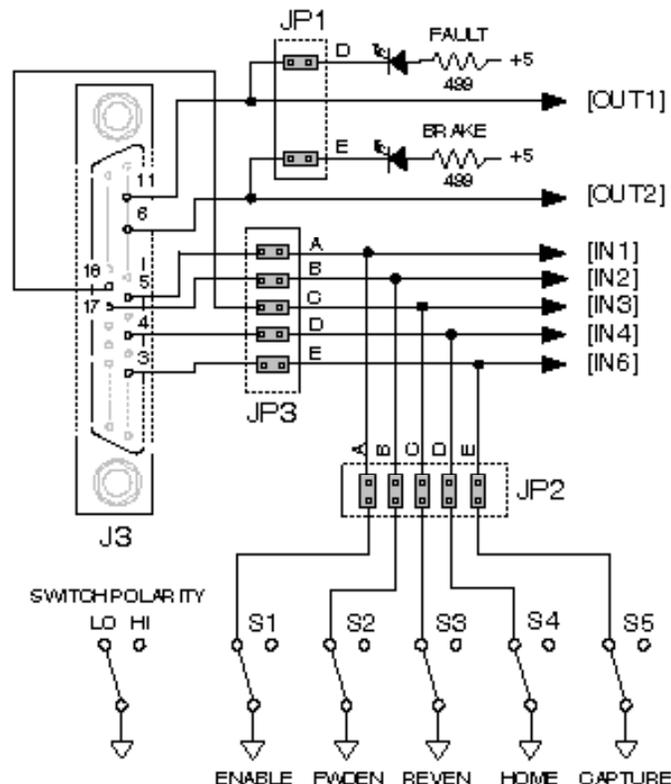
As delivered, these outputs drive two led's: FAULT, and BRAKE. Jumpers JP1-D and JP1-E connect these led's to amplifier outputs. The outputs are N-channel MOSFET's which sink current from loads connected to positive voltages. When the outputs are ON, they ground the cathode of the led's which then turn on as they are connected to the +5V supply via current-limiting resistors.

The logic outputs also connect to signal connector J3. If they are used to drive external loads >+5 Vdc, the jumpers must be removed.

Connecting logic inputs to development kit switches or to external devices via connector J3

Logic Input	Default Function	Switch Connection	External Connection		
IN01	Enable	SW1	JP2-A	J3-5	JP3-A
IN02	Fwd Enable	SW2	JP2-B	J3-17	JP3-B
IN03	Rev Enable	SW3	JP2-C	J3-18	JP3-C
IN04	Home	SW4	JP2-D	J3-4	JP3-D
IN06	Capture	SW5	JP2-E	J3-3	JP3-E

Connections for logic inputs 1,2,3,4, & 6, and logic outputs



**ENCODER CONNECTIONS**

The development kit has 10 kΩ pull-up resistors on the A,B, and X encoder signal inputs (J2-8, 7, 6). There are no pull-up resistors on the /A, /B, and /X inputs (J2-15,14,13). Jumpers JP1-A,B,C connect 121 Ω terminating resistors between the A-/A, B-/B, and X-/X signal pairs for use with differential-output encoders.

If single-ended encoders are used, these should be connected to the A,B, & X inputs and jumpers JP1-A,B, C must be removed to take the terminating resistors out of circuit. For motors which use encoders with differential outputs, jumpers JP1-A,B,C should be installed to eliminate reflections that degrade signal quality. For longer distances between motor and amplifier, and to offset the effects of cable capacitance, wiring should be twisted-pair, preferably with a shield for each pair.

Encoder power is supplied from an external +5 Vdc supply with sufficient cur-

rent to drive the motor encoder. Typically these will be 250 mA or less. In cases where an encoder uses a separate interpolater module to process the data, current demand may be higher. Consult the motor encoder literature to be sure that the +5 Vdc supply can handle the encoder power requirements.

**POWER SUPPLIES**

Amplifier main power, +HV, is typically supplied by unregulated DC power supplies. These must be isolated from the mains, and all circuits should be grounded to earth at some point.

The +HV supply connects to J1. Pin J1-5 is the +HV positive terminal, and pin J1-4 is the power supply negative terminal that connects to circuit ground. For good wiring practice, the HV wires should be twisted together for noise suppression, and the power supply should not be grounded. Doing this ensures that the higher currents flowing

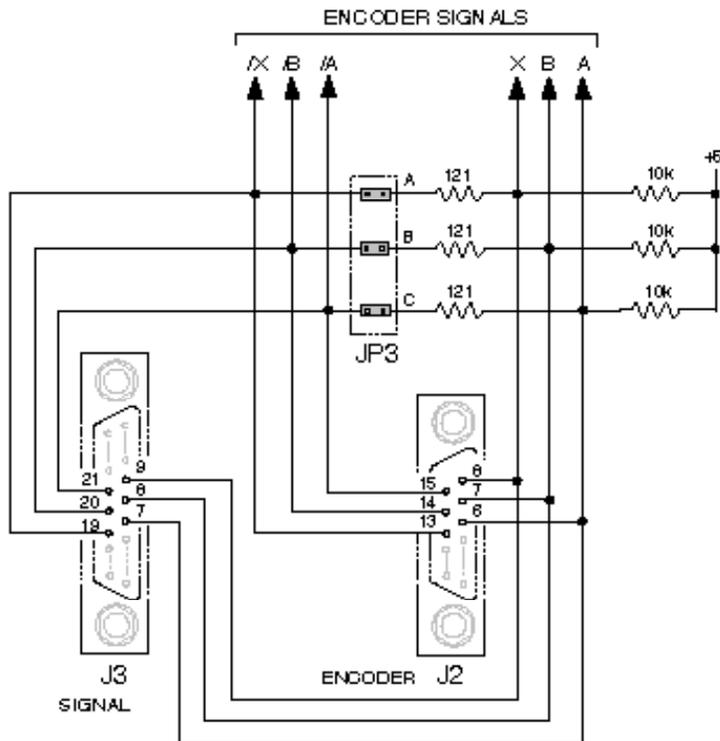
in these conductors will not flow through any circuit grounds where they might induce noise.

During deceleration, mechanical energy in the motor and load is converted back into electrical energy that must be dissipated as the motor comes to a stop. While some of this is converted to heat in the motor windings, the rest of it will flow through the amplifier into the power supply. An external storage capacitor should be used if the load has appreciable inertia, and this should be sized such that adding the undissipated energy from the motor will not raise the voltage beyond the point at which the amplifier shuts down. When this is not possible, an external ‘dumper’, or regenerative energy dissipater must be used which acts as a shunt regulator across the HV terminals.

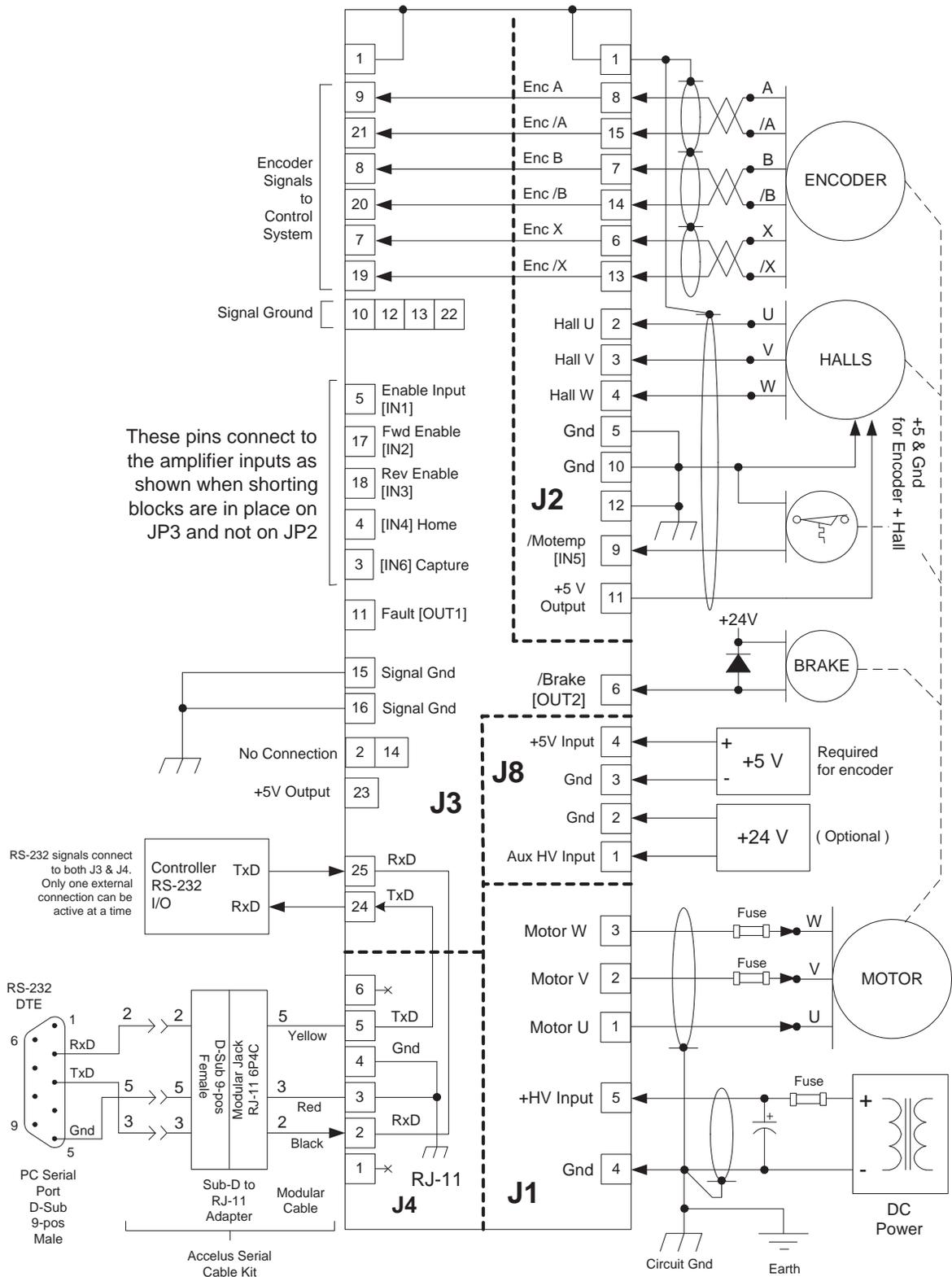
Switching power supplies can also be used to power *Accelnet*. Unlike unregulated supplies, these cannot accept reverse energy flow, so an isolating diode must be placed between the power supply and J1-5 to block current flow back into the power supply. When this is done, an external storage capacitor must be used across J1-5 & J1-4 because the capacitor on the Development Kit board is only for ripple-current control, and can't store enough energy to handle regeneration.

An earthing ground connection can be made via a second conductor to J1-4 that connects to the equipment frame ground.

If desired, an Aux HV supply can also be connected via J8-1 and J8-2. This supply must be greater than the amplifier minimum supply voltage of +20 Vdc. Commonly available +24 Vdc supplies work well for this. Using the Aux HV input enables the amplifier to have the HV supply turned off for equipment safety or EMO (Emergency Off) conditions. At this time, the Aux HV will keep the amplifier ‘alive’ and able to communicate and monitor position, but not to power the motor.

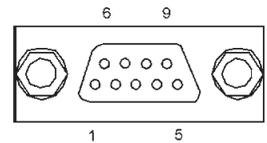


## CONNECTIONS

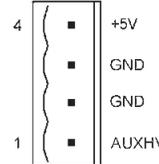


CONNECTOR LAYOUT

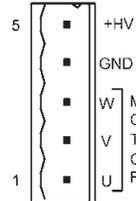
CANopen Signal	Pin
(Reserved)	1
CAN_L	2
CAN_GND	3
(Reserved)	4
(CAN_SHLD)	5



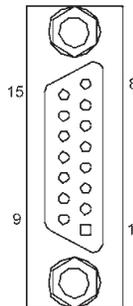
J8 SIGNAL	PIN
+5V Input	4
Gnd	3
Gnd	2
Aux HV Input	1



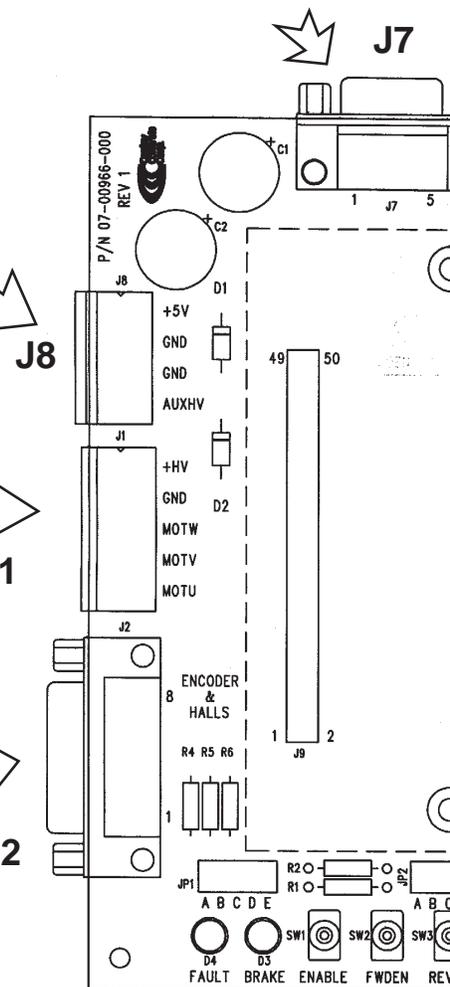
J1 SIGNAL	PIN
+HV Input	5
GND	4
Motor W Output	3
Motor V Output	2
Motor U Output	1



J2 SIGNAL	PIN
Encoder /A Input	15
Encoder /B Input	14
Encoder /X Input	13
Signal Ground	12
+5V Output	11
Signal Ground	10
[IN5] Motor Temp Sensor	9



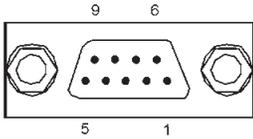
PIN	J2 SIGNAL
8	Encoder A Input
7	Encoder B Input
6	Encoder X Input
5	Signal Ground
4	Hall W Input
3	Hall V Input
2	Hall U Input
1	Chassis Ground



Pin	CANopen Signal
6	CAN_GND
7	CAN_H
8	(Reserved)
9	(CAN_V+)

**CANopen Notes:**

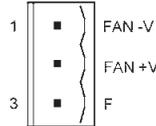
1. Connector pinouts for J6 & J7 follow CAN standard DS-102.
2. Signals in ( ) are wired-through from J7 to J6 and have no other connections on the pc board.
3. CAN\_GND is connected to Gnd on pc board (Accelnet signal and power ground)



**J6**



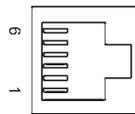
PIN	J5 SIGNAL
1	Fan -V
2	Fan +V
3	F



**J5**



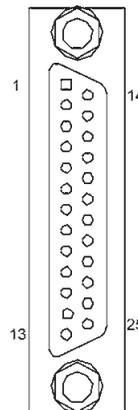
PIN	J4 SIGNAL
6	No Connection
5	TxD Output
4	Ground
3	Ground
2	RxD Input
1	No Connection



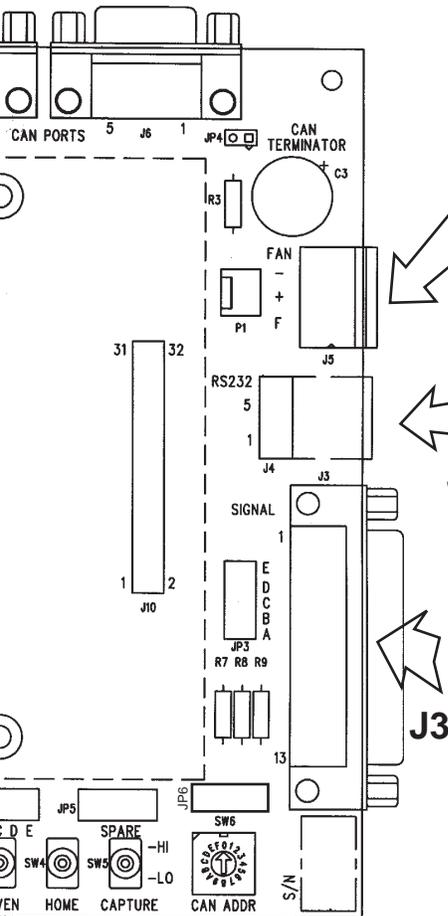
**J4**



J3 SIGNAL	PIN
Chassis Ground	1
No Connection	2
Capture [IN6]	3
Home [IN4]	4
Enable Input [IN1]	5
Brake Output [OUT2]	6
Encoder X Output	7
Encoder B Output	8
Encoder A Output	9
Signal Ground	10
Fault Output [OUT1]	11
Signal Ground	12
Signal Ground	13



PIN	J3 SIGNAL
14	No Connection
15	Signal Ground
16	Signal Ground
17	[IN2] Forward Enable Input
18	[IN3] Reverse Enable Input
19	Encoder /X Output
20	Encoder /B Output
21	Encoder /A Output
22	Signal Ground
23	+5V Output
24	RS-232 TxD Output
25	RS-232 RxD Input



**ORDERING GUIDE**

PART NUMBER	DESCRIPTION
MDK-180-01	Accelnet™ Development Kit
MDK-CK	Accelnet™ Development Kit Connector Kit
SER-CK	Serial Cable Kit
CME2	CME2™ Drive Configuration Software CD-ROM