VME Gateway

product manual

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WARNING!

Only qualified personnel who thoroughly understand the operation of this equipment and any associated machinery should install, start-up, or attempt maintenance of this equipment. Non-compliance with this warning may result in serious personal injury and/or equipment damage.

WARNING!

Never work on any control equipment or motors without first removing all power supplies from the equipment.

Caution

This equipment contains **ESD** (Electrostatic Discharge) sensitive parts. Observe static control precautions when handling, installing, and servicing this device.

Caution

This equipment was tested before it left our factory. However, before installation and start up, inspect all equipment for transit damage, loose parts, packing materials, etc.

Caution

Ruptured semiconductor devices may release toxic materials. Contact Eurotherm Drives or the semiconductor manufacturer for proper disposal procedures for semiconductors or other material.

NOTE. The installation of this equipment must comply with the National Electric Code and any applicable local codes.

CONTENTS

Chapter 1 INTRODUCTION

The L5211 VME gateway is a VME-based peripheral which allows a *LINK* network to interface with any VME-based system. It is intended for use with industrial control programmable logic controllers (PLC's), but may be used in any VME environment.

Two versions are available, one is intended for use in a standard VME backplane and takes up one slot. The other installs directly into a G.E. Fanuc double-width slot. Both versions function identically, but have different spare parts as listed in Appendix A.

Chapter 2 THEORY OF OPERATION

The L5211 is essentially a dual ported, random access memory (RAM) which is installed directly into the VME Bus and is interconnected to the *LINK* network. 32K of RAM is available, much of which may be used by the VME programmer for general purpose data storage. Future versions of the device may use more memory for the intended functionality, that of passing data back and forth between the VME bus and the *LINK* network.

MEMORY

Memory is referenced from a "base", or starting address; that is, the lowest address into which data may be stored. For the purposes of this discussion, the base address will be referred to as $000 ($ specifies hexadecimal) . Refer to the installation instruction section of this manual for details on how to set the base address. The memory is configured in byte format.

SHARED MEMORY

"Shared memory" is that portion of the 32K RAM that is accessed by both the VME and the *LINK* network for purposes of communication. Shared memory presently resides between $000 and $29F, and is broken up into six specific regions. These regions, defined in Table 1, facilitate the transfer of bits, bytes, and words, from each device to the other. Further, Flags are used to notify the receiving device that a particular value has been changed.

Data Address	Flag Bytes	Type	Direction
$000 - $00B	$258 - $263	Bit	VME to Link
$00C - $06B	$264 - $26F	Byte	VME to Link
$06C - $12B	$270 - $27B	Word	VME to Link
$12C - $137	$27C - $287	Bit	Link to VME
$138 - $197	$288 - $293	Byte	Link to VME
$198 - $257	$294 - $29F	Word	Link to VME

Table 1. Memory Region Definition

FLAG BYTES

The Flag bytes provide an efficient means of controlling the flow of data between the two mediums. When data is written from one device to the other, the sending device must set the appropriate bit in the Flag byte to notify the receiver of the change in data. Therefore, simply scanning the flags allows the receiver a convenient means of determining if data has been modified. The use of this feature is optional on data

transfers from *LINK* to VME, but mandatory for VME to *LINK*. *LINK* will ignore any writes until the appropriate flag bit is set. The VME may simply scan its inbound data area and use or ignore the flags as it sees fit.

MEMORY CONFIGURATION

The memory configuration allows for some combination of up to 96 each of bits, bytes, or words to be transferred from each device to the other. The actual total number of parameters is limited by the configuration space available. For VME to *LINK* transfers, eight unique bits may be stored at locations $000 through $00B for a total of 96 unique bits. 96 sequential locations are provided between $00C and $06B for bytes, and 192 sequential locations are provided between $06C and $12B for 96 words. An identical set of memory locations exist for *LINK* to VME transfers.

Flag bits correspond to the associated data bit, byte, or word in bit-logical order, hence bit zero of the first flag byte points to the first of the 96 entities. Bit zero of the second flag byte points to the ninth of the 96 entities, and so forth. Logically, there is a one to one correlation between flag bits and the bit data area as shown below. Throughout this discussion, the "first" entity is referred to as bit 0, byte 0 or word 0. Figure 1 defines the flag bits that correspond to the first eight data bits for bit transfers from VME to *LINK*. By logical extension, the Flag byte at $259, bit 0 refers to data bit 8 at address $001.

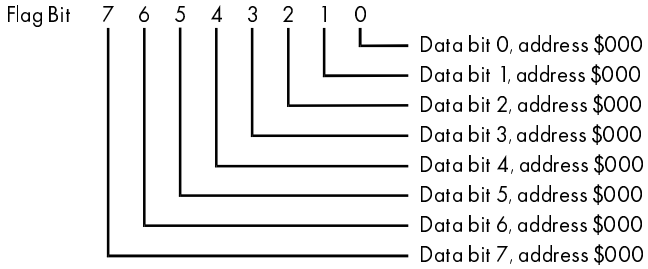

Figure 1- Flag Byte Assignments at Address $258, VME to *LINK*

Figure 2 defines the flag bits that correspond to the first eight data bytes for byte transfers from *LINK* to VME. By logical extension, the Flag byte at $289, bit 0 refers to byte address $140.

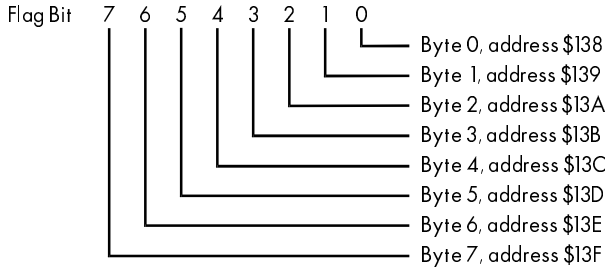

Figure 2 - Flag Byte Assignments at Address $288, *LINK* to VME

Figure 3 defines the flag bits that correspond to the first eight data words for word transfers from VME to *LINK*. By logical extension, the flag byte at $271, bit 0 refers to word 8 which resides at addresses $07C, $07D.

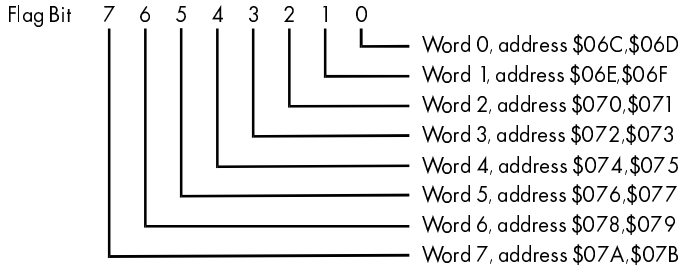

Figure 3 - Flag Bit Assignments for Address $270, VME to LINK

WRITE OPERATION

When a write operation is performed from the VME to *LINK*, the VME side writes the data (bit, byte or word), then sets the appropriate flag bit. When *LINK* finds the flag bit set, it inputs the data, then clears the flag bit. The VME may use this as a handshake signal if so desired.

For data transfers from *LINK* to the VME, *LINK* writes the appropriate datum and sets the flag bit, but thereafter ignores the flag until the next write to the same location. In this manner, the VME programmer is afforded the maximum flexibility in the software design. The "current" value in a relevant location can be scanned and treated as current, or the flags can be used to look for data that has been changed since the last check of the flags.

Note. Throughout the balance of this manual, writes and reads will be referenced by address and by flag byte in the following manner:

Write word 1 ($19A) and set Flag $294.1

This example defines a transfer from *LINK* to the VME, which is specified by the location in memory affected. It affects the second word (from word zero), and sets the Flag bit 1 (second bit) in address $294.

Chapter 3 L5211 CONFIGURATION

Using *LINK* tools, configurations may be prepared and loaded into the L5211. Please refer to the ConfigEd manual RG350672 for details. The cable provided with the ConfigEd software package connects between the L5211 at the jack labeled RTNX on the end panel and your computer's serial port.

To provide a convenient means of getting familiar with the L5211, a simple configuration is loaded into it prior to shipping. This configuration is illustrated in Figure 4.

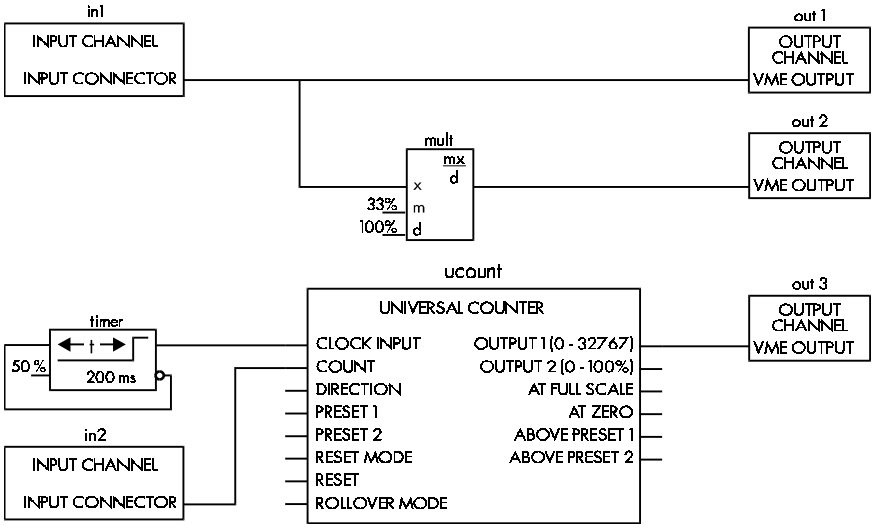

Figure 4 - L5211 Shipping Configuration

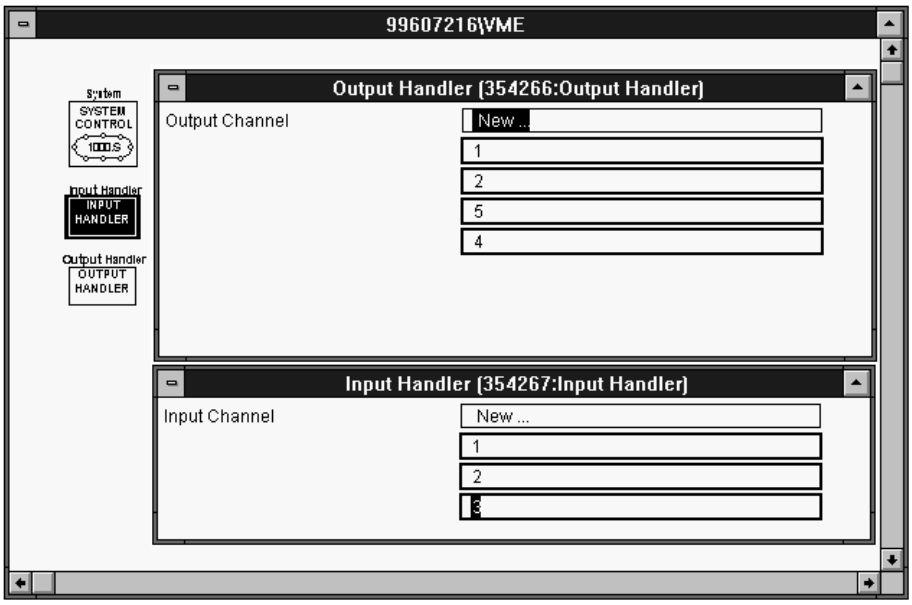

Figure 5 - VME Handler Channel Sequencing

NOTE. The input and output channels must be numbered sequentially starting at 1. ConfigEd will number the entries correctly but if the user edits the configuration (by adding or deleting entries in the handler) the numbers may get out of sequence. Figure 5 shows the Input Handler with correct sequencing and the Output Handler with incorrect sequencing.

The configuration increments a 16 bit unsigned word (ordinal type), and writes it to word 2 ($19C) and sets Flag $294.2. It is incremented every 100 ms, hence the L5211 initiates a write cycle approximately every 100 ms, depending on how often the VME accesses the memory. The ordinal word starts at zero upon L5211 initialization, and rolls over at 32,767.

The VME may set the counter to a specific value at any time by writing word 1 ($06E) and setting Flag $270.1. It may also write word 0 ($06C and set Flag $270.0). The L5211 will echo the value by writing word 0 ($198) and setting Flag $294.0, and will also take the value, compute 33.333% of it, and write it to word 1 ($19A) and set Flag $294.1.

Using this configuration, the programmer may test software that waits for an event to occur (counter incremented), or may initiate a transfer and see specific, quantifiable results immediately (setting the counter, or looking for the value written to be echoed and a math function to be accomplished).

When using *LINK* tools to develop configurations for the L5211, keep in mind that inputs and outputs are referenced from the perspective of *LINK*. Please refer to the L5211 section in the Function Block Manual, RG352134 for specifics on how to assign data addresses.

EXAMPLE RUNGS

Most VME applications use ladder networks to program system operation. Following is a simple example for the G.E. Fanuc Series 90-70 PLC and its LM90 software that could be used to preset the counter in the L5211 sample configuration from an Analog input:

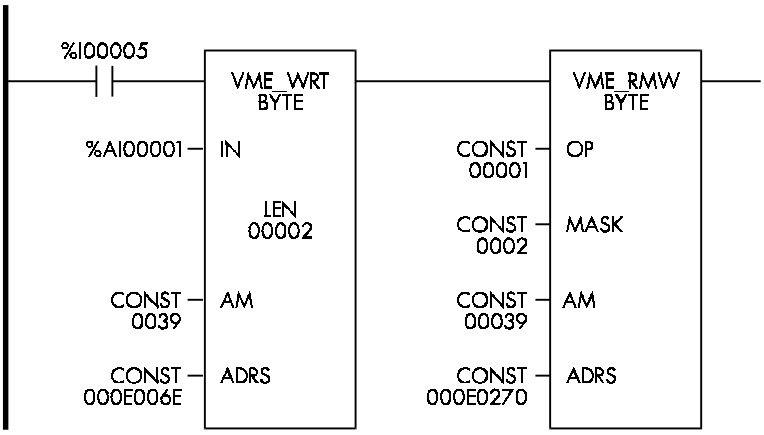

Figure 6 - Example Preset Counter[12]

When digital input 5 is true, the value of analog input 1 is written to the counter. The second step in the rung is a read/modify/write which will read the flag register, mask in the flag bit, and write the appropriate location.

In the following example, the PLC will read the output of the counter from the L5211 example configuration.

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[1] The abbreviations in the examples are defined below.

AM	Address Modifier	ADRS	Memory location, made of the base + word
IN	Block length	LEN	1 to 32767
MASK	Bit mask	OP	Or

[2] The G.E. programming software requires the user to enter constants as decimal numbers. The display, however, shows the constant as a HEX number.

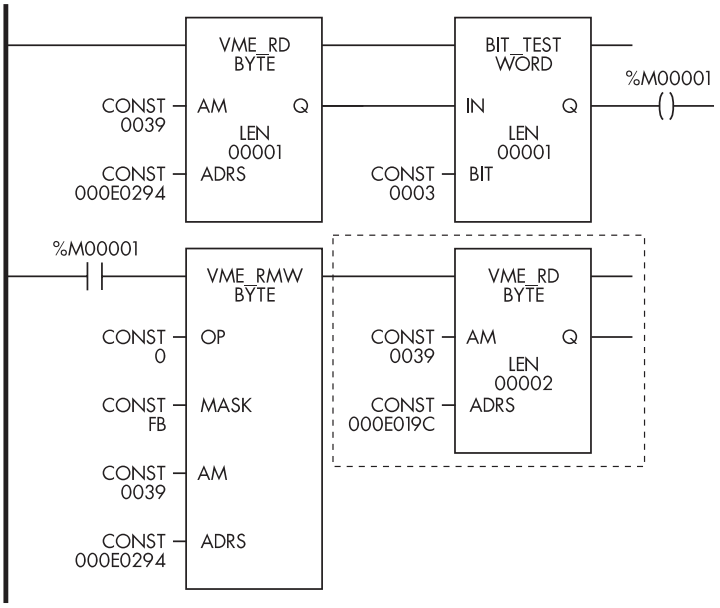


Figure 7 - Output of the Counter

Note that in the example, the PLC will clear the flag bit BEFORE actually reading the data. If this methodology is followed, the PLC will never miss a data transfer as the next scan will reflect the fact that new data has been sent by *LINK* even if a collision occurs. Also, the upper portion of each address will reference the VME slot number which, of course, changes from application to application.

Because the flag bits are optional when reading data from *LINK*, the portion of the example encircled by the dashed line is all that is required if the processes which follow are quick. When used, it is more efficient to process the flags as bytes, then gather and process the data for all eight entities associated with the flag byte. The flags must be used when the PLC writes data to *LINK*. In that direction, the flags are not optional.

WARNING!

Long VME memory instructions may cause the VME processor to lock out its bus for extended cycles and cause the L5211 VME Gateway to enter a *H-Error* state. Slower VME central processing units may require shorter VME byte instructions. Instructions 8 bytes long have proven successful, even with slow PLCs. Dividing a long VME memory instruction into smaller ones on the same rung will break up the buss accesses and prevent L5211 timeout errors.

Chapter 4 INSTALLATION

As previously stated, the L5211 is installed in the VME backplane, and is powered by both the +5 VDC and +12 VDC supplies. The former powers the VME interface electronics, and the latter powers the *LINK* interface electronics. In addition to the L5211, the L5206 Gateway Repeater is used to interface the digital signals supplied by the L5211 into light levels compatible with the *LINK* fiber optic network.

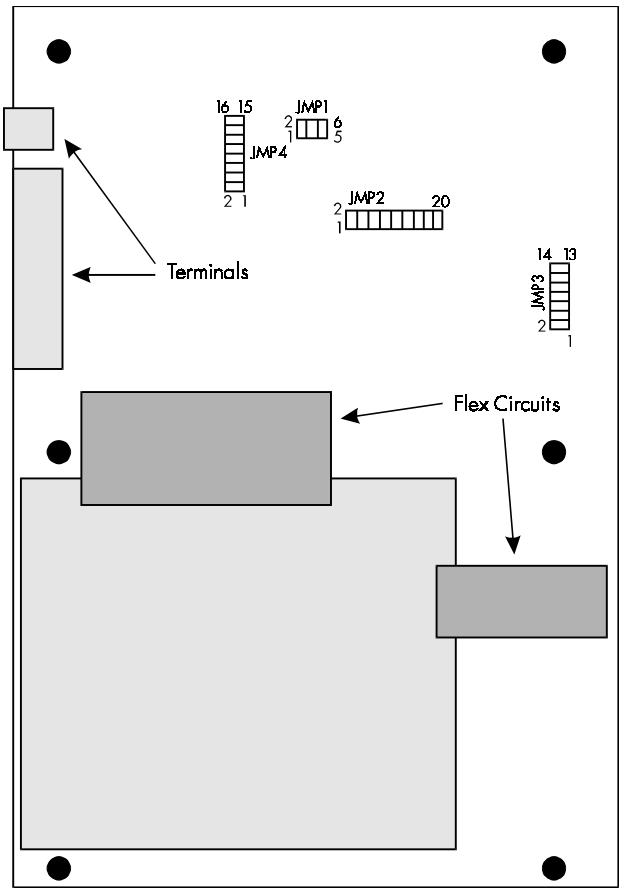


Figure 8 - PCB Layout

The L5211 is shipped such that it will respond to base address $020000. Given the size of the shared memory area (see Table 1 in Chapter 2), the default address range is

$020000 to $02029F. If this base address is unsuitable, before installation, remove the cover from the L5211 (which has the *LINK* product label attached) by removing the six flat head screws. Refer to Figure 7 which shows the location of JMP2. By changing the jumpers at JMP2, any starting address from $00000 to $FF800 on 32K boundaries may be configured. Configurations are accomplished by installing or removing (in or out) Berg post jumpers.

Caution

Observe static discharge precautions when handling the L5211, especially when the cover is removed.

Caution

Do not touch the flex circuits when the cover is removed from the L5211. They are fragile and can easily be damaged.

JMP2 positions 1-2 and 3-4 determine if the 32K boundary is upper or lower within 64K; that is, nn000 (JMP2 3-4 in) or nn800 (JMP2 1-2 in), hence are mutually exclusive and must not be installed at the same time.

JMP2 positions 3 through 10 represent a zero if installed or a one if removed and correspond directly to the high order address bits. If JMP2 19-20 is installed, address bit 23 is a zero. If JMP2 5-6 is removed, address bit 16 is a one. Refer to the following table for examples.

19-20	17-18	15-16	13-14	11-12	9-10	7-8	5-6	3-4	1-2	Base Address
IN	IN	IN	IN	IN	IN	OUT	IN	IN	OUT	$020000
IN	IN	IN	IN	IN	OUT	IN	IN	IN	OUT	$040000
IN	IN	IN	IN	IN	OUT	IN	IN	OUT	IN	$040800
OUT	OUT	OUT	IN	IN	OUT	IN	IN	OUT	IN	$E40000
OUT	IN	OUT	OUT	IN	IN	IN	IN	IN	OUT	$B00000

Figure 9 - JMP2 Jumper Positions

IN = Jumper installed, OUT = Jumper removed.

NOTE. Address $20000 is the base address as shipped.

JMP1, JMP3, and JMP4 are not used currently and will not have any jumpers installed.

	Slot Number/Address Allocation							
Rack Number	2	3	4	5	6	7	8	9
0	000000 to 01FFFF	020000 to 03FFFF	040000 to 05FFFF	060000 to 07FFFF	080000 to 09FFFF	0A0000 to 0BFFFF	0C0000 to 0DFFFF	0E0000 to 0FFFFF
0	100000 through 7FFFFF User defined for Rack 0 only							
1	E00000 to E1FFFF	E20000 to E3FFFF	E40000 to E5FFFF	E60000 to E7FFFF	E80000 to E9FFFF	EA0000 to EBFFFF	EC0000 to EDFFFF	EE0000 to EFFFFF
2	D00000 to D1FFFF	D20000 to D3FFFF	D40000 to D5FFFF	D60000 to D7FFFF	D80000 to D9FFFF	DA0000 to DBFFFF	DC0000 to DDFFFF	DE0000 to DFFFFF
3	C00000 to C1FFFF	C20000 to C3FFFF	C40000 to C5FFFF	C60000 to C7FFFF	C80000 to C9FFFF	CA0000 to CBFFFF	CC0000 to CDFFFF	CE0000 to CFFFFF
4	B00000 to B1FFFF	B20000 to B3FFFF	B40000 to B5FFFF	B60000 to B7FFFF	B80000 to B9FFFF	BA0000 to BBFFFF	BC0000 to BDFFFF	BE0000 to BFFFFF
5	A00000 to A1FFFF	A20000 to A3FFFF	A40000 to A5FFFF	A60000 to A7FFFF	A80000 to A9FFFF	AA0000 to ABFFFF	AC0000 to ADFFFF	AE0000 to AFFFFF
6	900000 to 91FFFF	920000 to 93FFFF	940000 to 95FFFF	960000 to 97FFFF	980000 to 99FFFF	9A0000 to 9BFFFF	9C0000 to 9DFFFF	9E0000 to 9FFFFF
7	800000 to 81FFFF	820000 to 83FFFF	840000 to 85FFFF	860000 to 87FFFF	880000 to 89FFFF	8A0000 to 8BFFFF	8C0000 to 8DFFFF	8E0000 to 8FFFFF

Figure 10 - Address Allocation for Standard Access AM Code - 39H

The address space for the L5211 must be set according to the table above. For example, when the L5211 is placed in Rack 1, Slot 4, the address space should be set to the range from E40000 to E5FFFF. This is done by installing jumpers 13-14, 11-12, 7-8, and 5-6.

NOTE. The user definable address space for standard access AM code 39H is 100000H through 7FFFFFH. This space is available in rack 0 only.

Once you have set the desired base address, replace the cover and the six flat head screws. The L5211 is ready to be installed in any standard VME backplane. Use the fastening screws on the top rail for reliable operation. Make sure that the target system has been powered down before installing.

The data cable provided is now connected between the L5211 and the L5206 gateway repeater module. The L5206 must be permanently located in the proximity dictated by the length of the cable. A longer cable must not be used.

The L5206 is powered from any convenient +24 VDC supply, typically the same supply that some or all of the other *LINK* hardware is connected to. Loosen the four cover screws on top of the L5206 and remove the cover. The power terminals are clearly marked. While the cover is removed, connect the fiber optic data leads to the L5206 as described in Appendix B. When completed, restore the cover to the unit.

Once all hardware has been connected and the *LINK* network has been powered up, apply power to the VME system in which the L5211 is installed. The status LED will turn on within three seconds. This indicates that the L5211 is communicating normally with the *LINK* network. Any other indication suggests there is a problem. Refer to the *LINK* Overview Manual HA350678 for troubleshooting information.

Appendix A SPARE PARTS LIST

The L5211-2-00 package contains the following items:

Qty	Part Number	Description
1	LA352201	VME gateway assembly
1	CM350901	Cable assembly for VME *LINK* gateway
1	L5206-2-01	*LINK* gateway repeater
1	HA352201	Instruction manual

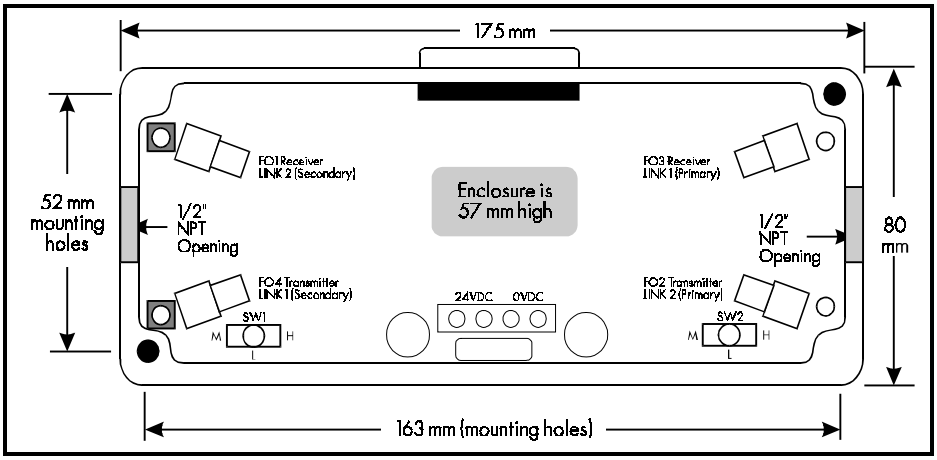
The L5211-2-01 package contains the following items:

Qty	Part Number	Description
1	LA352201	VME gateway assembly
1	CM352259	Cable assembly for GE Fanuc *LINK* gateway
1	L5206-2-01	*LINK* gateway repeater
1	HA352201	Instruction manual

After unpacking, make certain that all items are present, and have suffered no shipping damage. If there are any problems, contact your supplier at once. Please refer to the installation instructions in this manual to properly set up and install this equipment.

Appendix B L5206 DATA SHEET

Module Model Number	L5206-2-01
Module Name	Gateway Repeater Module

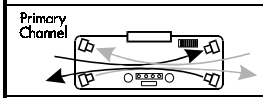
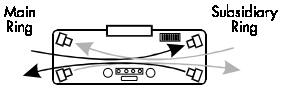
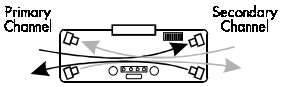
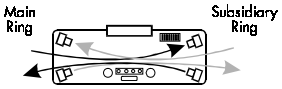


Refer to the *LINK* Overview manual (HA350678) for general information on this module.

Module Description	The L5206-2-01 *LINK* Gateway Repeater receives and retransmits network data between the *LINK* network and a Gateway. It can be used with any LINK5204, LINK5210 or LINK5211 model Gateway. The Gateway is connected to the *LINK* network via a shielded cable (part number CM350901) to the Gateway Repeater's DB-25 connector. The L5206-2-01 behaves identically to the L5206-2-00 *LINK* Repeater in the absence of a gateway. However, when a gateway is connected, network data is re-routed to include it in the *LINK* network ring.
Transmission Distance	The L5206-2-01 transmission distance is selected by the toggle switches inside the enclosure. SW1 controls the FO4 transmitter and SW2 controls the FO2 transmitter. The LOW setting (center) is used for distances between 0 and 20 meters; the MED setting (left) is used for distances between 20 and 40 meters; and the HIGH setting (right) is used for distances between 40 and 60 meters.

In the presence of an L5211 *LINK* Gateway, the L5206-2-01 is connected to implement the desired *LINK* network topology. The connections are show in the table on the next page for each type of topology. Note that the arrow denotes the direction

of transmission in the fiber; that is, from the fiber optic transmitter towards the fiber optic receiver.

Fiber Optic Connections	Network Topology	Effect when L5204 is disconnected
	Simple	Network ring is *broken*.
	Tapped	**Network ring is *preserved.*
	Redundant	Network ring is *preserved.*
	Aux. Tapped	**Network ring is *preserved.*

** A fiber optic signal failure at either receiver breaks **both** rings.

TECHNICAL DETAILS

Environmental	
Temperature	0 - 50 °C
Storage Temp.	-10°C to +70°C
Humidity	85% relative humidity in a dry, non-condensing environment
Enclosure	NEMA 4 (IP66) with appropriate waterproof 1/2" NPT fittings.
Power Supply	
Voltage	20 - 28 VDC (24VDC nominal)
Current	55 mA maximum
Power Dissipation	1.5 Watts maximum
Power Terminals	14 - 22 gauge (0.5 - 1.5 mm^2) wire size, 8A maximum when daisy-chained module-to-module
Physical	
Weight	1.35 lbs. (0.61 Kg)
Height	6.9 in. (175 mm)
Width	3.2 in. (80mm)
Depth	2.3 in. (59mm)

Contact your Eurotherm Drives Sales Engineer, local representative, or the factory for more information on this product.

Appendix C DIMENSIONS

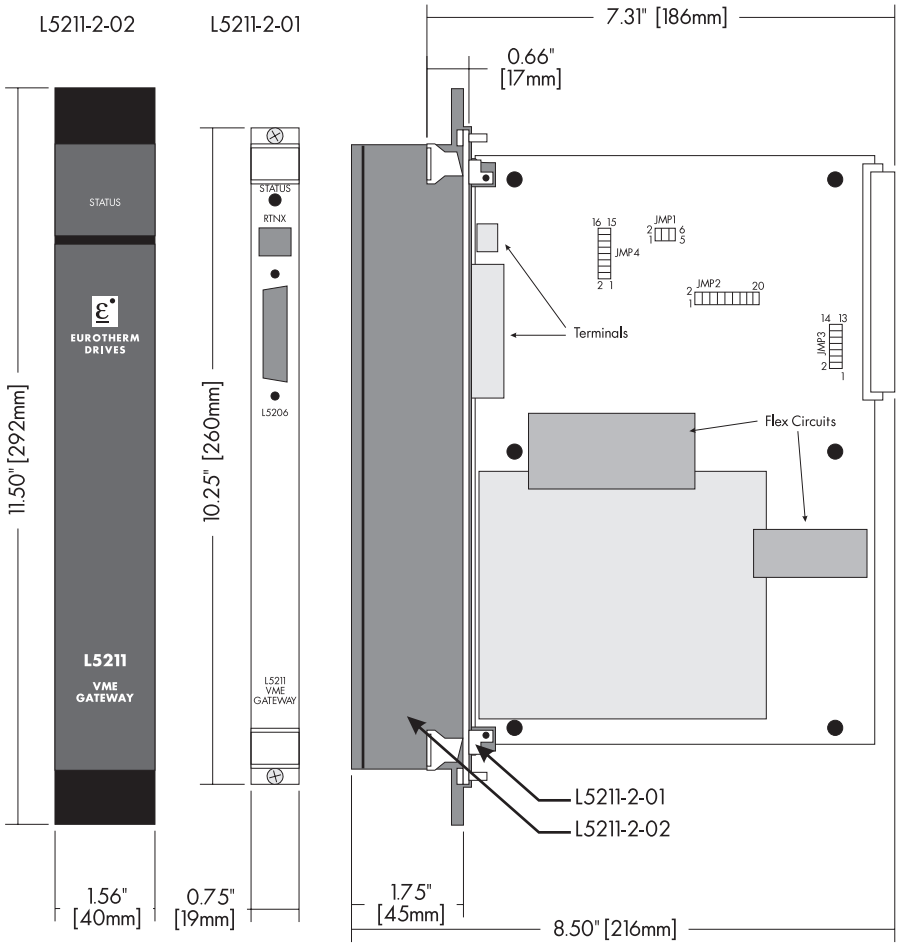


Figure 11 - 5211 Layout Dimensions