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M300

ARCNET Controller M-module

User Manual

Revision 3.1

AcQuisition Technology B.V.

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Printed in The Netherlands.

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1. Using the manual

This manual serves as instruction for starting the module, for the connection of peripheral devices, and for the integration in a system. Furthermore it gives the user additional information for special applications and configuration possibilities of the assembly.

Detailed information concerning the individual assemblies (data sheets etc.) are not part of this manual. A bibliography of these is listed in the annex.

This manual describes the hardware of the assembly.

Notes concerning the nomenclature:

Hex numbers are marked with a leading "$"-sign: for example: $800000 or $B34D.

Active-low signals are represented by a trailing asterisk (i.e. IACK*).

1.1. Validity of this manual

The contents of this manual is valid for M300 revision 4.x.

The revision identification (x.y) is composed of the PCB revision (the 'x'-part), and the firmware revision (the 'y'-part).

To find out the revision of a module, use the 'modident' utility which is shipped in source together with the module. For more information on this, please refer to the software manual.

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2. General description

The M300 ARCNET M-module complies with the M-module specification revision 2.2 and has the following functionality;

- Deterministic, 2.5Mbps, token passing protocol.
- 2k*8 On-chip dual-ported RAM for fast access.
- Command chaining for top performance.
- Flexible NodeID setting capabilities:
  - Hardware configurable by a DIP-Switch,
  - Software configurable, and
  - Automatic Free-NodeID search.
- Duplicate node ID detection
- Powerful diagnostics
- Flexible media interface:
  - Traditional hybrid interface for long distances,
  - RS485 differential driver interface for low-cost, low-power, high reliability,
  - Backplane mode for direct connection to media in short distance applications.
  - Provisions for Fiber Optic interface.
- Self reconfiguration protocol.
- Supports various network topologies (Star, Tree, Bus, ...).
- Identification EEPROM implemented.

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3. Network topologies

The nodes in a network can be connected to each other in many ways. The way it is done is called the network topology, which can be e.g. bus (all nodes are 'daisy-chained') or star (all nodes connect to one central node). By using active and/or passive HUB's, these topologies can be mixed.

3.1. Bus topology

In a bus topology the nodes at the two outer ends of the cable must have a termination resistor mounted to avoid unwanted signal reflection. This can be done in two ways:

- An external termination resistor can be mounted on the 'T'-adapter, or
- The on-board termination resistor (93Ω) can be 'activated' by placing jumper J3.

The external termination resistor is recommended in a bus topology, because this can be mounted and removed during system operation while removing jumper J3 requires a power-down.

3.2. Star topology

In a star topology, every node must be terminated with a 93Ω termination resistor. In this case it is recommended to use the on-board termination resistor by placing jumper J3.

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4. M300 Blockdiagram

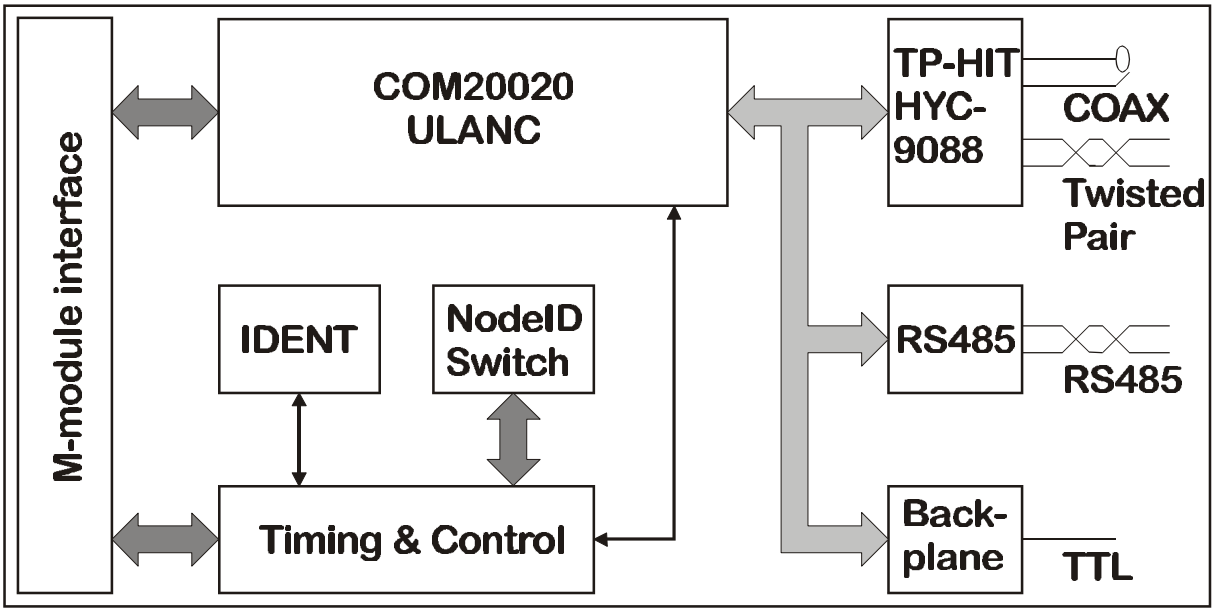


Figure 2: Blockdiagram

The main controller on the M300 ARCNET M-module is the COM20020 Universal Local Area Network Controller. The ULANC has on-chip dual-ported RAM for packet storage. Timing and control logic are provided through implementation of PLD's. The identification readout EEPROM is of the type 93C06 as prescribed in the M-module specification by MUMM.

On the M300 ARCNET M-module, a wide variety of media interfaces is available. Depending on the ordered configuration (with or without TP-HIT) the media interface can be:

Without TP-HIT; RS-485 and Backplane Mode
With TP-HIT; Same as above plus coax/twisted-pair on a bus/star topology.

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5. M300 register layout

The M300 ARCNET M-module must be accessed as a D08O device. This means that quantities of one byte (8 bits) can be transferred to/from the module at odd addresses. Accesses to even addresses do not generate bus-errors, but the transferred data has no effect (for writing) or meaning (for reading).

In order to control the operation of the COM20020 ULANC, it is necessary to take note of the register layout of the controller. It has 8 R/W registers available for this purpose. The meaning of these are the following:

Offset	Read	Write
0x01 0x03 0x05 0x07 0x09 0x0b 0x0d 0x0f	Status register Diagnostic register Address pointer high Address pointer low Data register Reserved Configuration register | Tentative ID | Node ID | Setup register | Next ID	Interrupt mask register Command register Address pointer high Address pointer low Data register Reserved Configuration register | Tentative ID | Node ID | Setup register | Next ID
0x11	DIP-Switch	Invalid!
0xff	M-module Identification	

Table 1: Module Register Map

For a detailed description of the COM20020, please refer to the appropriate documentation listed in the bibliography.

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6. Connections on the module

6.1. M-module interface connections

The M300 ARCNET M-module is connected to the M-module interface through a 40 pole female header connector. The specification of this interface is available on request (please refer tot the appendix for more details).

6.2. Power connections

Power for the M300 ARCNET M-module is supplied through the M-module interface. The M300 uses +5VDC for its logic and drivers and -12VDC when the TP-HIT is mounted.

6.3. Peripheral connections

The M300 can have several media interfaces, depending on whether the TP-HIT is mounted.
Access to the M300 can be obtained by the peripheral in two ways:

- Through the 25 pole sub-D connector at the front,
- Through the 24 pole header which can be connected on VMEbus boards to the (RV-100 connector-system at the) P2 at the back.

The layout of the peripheral connectors is shown below.

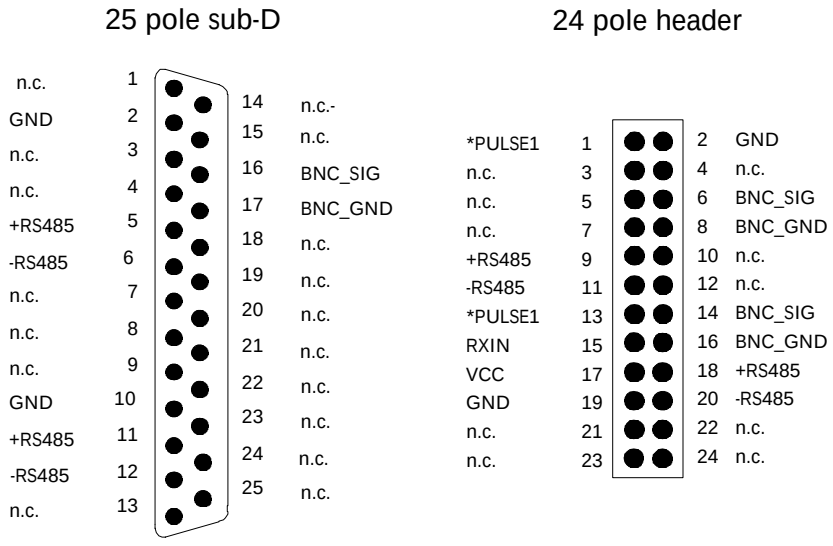


Figure 3: Peripheral connections, DTE Configuration

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For connection to the peripheral through the VMEbus carriers P2-connector, cable assemblies are available.

The following table shows:

- what media interfaces are possible,
- what signals are used by what interface, and
- the location of that signal on both connectors.

Media-Interface	Signal Mnem	Pos. On 25p	Pos. On 24p	Remark
Coaxial (93 Ohm)	BNC_SIG BNC_GND	16 17	6,14 8,16	BNC signal Negative signal
Twisted-Pair	BNC_SIG BNC_GND	16 17	6,14 8,16	Positive signal Negative signal
RS-485	+RS485 -RS485	5,11 6,12	9,18 11,20	Positive signal Negative signal
Backplane	*PULSE1	n.c.	1,13	TTL-level, short distance
Fiber	*PULSE1 RxIN	n.c. n.c.	1,13 15	External driver circuitry required.

Table 2: Media overview

6.3.1. M300/BNC adapter

This adapter is used for the connection of a BNC (RG62) cable to the module. It converts the 25 pole D-sub connector to a standard BNC receptacle in the following way:

25p.	BNC
1617	Center Shield

Table 3: M300/BNC adapter connections

6.4. DIP-Switch

With this version of the M300 Arcnet M-module it is also possible to configure the network ID of the node by setting a DIP-Switch on the PCB. This 8-position switch can be read by the software.

Setting the NodeID in hardware has the advantage that a node ID can be changed without changing the software. This can be a nasty problem in ROMmed applications.

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7. Integration in the network

The length of the medium between two nodes or the length of the medium of the entire network is highly dependant of the type of medium used, the number of nodes and several other characteristics. For exact details, please refer to the appropriate documentation, e.g. SMC's Technical Note TN7-1.

7.1. Connection to coaxial cable

When the M300 is connected to a coaxial cable, the TP-HIT must be mounted. It provides the correct electrical interface (and isolation) between the controller and the net.

The TP-HIT is capable of driving both bus and star topologies. The number of nodes that can be active in the network regarding the cable load depends on the length of the cable between the nodes. Please refer to the Arcnet specifications for details. The logical maximum active nodes in a network is 255.

The characteristic impedance of the network cable must be 93Ω. A typical cable type is RG-62 Belden #86262.

7.2. Connection to twisted-pair

For twisted pair there are two electrical specifications available on the M300:

- TP-HIT twisted pair driver
- RS485 transceiver

7.2.1. TP-HIT twisted pair driver

When this option is selected, a twisted pair is daisy-chained through all nodes in the network. Refer to table 2 for peripheral connections. The following jumper configuration is necessary for proper functioning:

Please refer to table 4 for the correct jumper settings.

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7.2.2. RS485 transceiver

This option does not require the TP-HIT and is a good alternative for the TP-HIT twisted pair driver in low-cost applications. As the name implies, the electrical specifications comply to the RS485 electrical specifications, in fact, they are the same. Refer to table 2 for peripheral connections.

Please refer to table 4 for the correct jumper settings.

7.3. Backplane mode

For backplane mode, no interfacing transceivers are required. This mode is applicable in short-distance, low-cost low-power applications. The *PULSE1 signal is (using a pullup resistor) directly routed to the peripheral connector. It is recommended to let a ground conductor run parallel to the *PULSE1 signal to reduce common-mode noise. Refer to table 2 for peripheral connections.

Please refer to table 4 for the correct jumper settings.

7.4. Connection to fiber

The M300 has provisions to interface to an external adapter on which an optical fiber can be connected. This external adapter is sold separately and uses the signals listed in table 2.

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8. Jumper configuration

The M300 can be configured for several media interfaces. For each media interface a specific jumper configuration is necessary as listed in the table below.

Network medium	J1	J2	J3	J4	J5	J6	J7	J8
Coax (RG-62)	OFF	ON	(1)	OFF	2-3	OFF	OFF	1-2
Twisted-pair using TP-HIT	ON	OFF	(1)	ON	2-3	OFF	OFF	1-2
Twisted-pair using RS485	OFF	OFF	OFF	OFF	1-2	OFF	OFF	2-3
Backplane	OFF	OFF	OFF	OFF	OFF	ON	ON	1-2
Optical fiber (external hardware required)	OFF	OFF	OFF	OFF	OFF	OFF	OFF	1-2

Table 4: Jumper configuration

OFF: No jumper installed.
ON: Jumper installed.
a-b: Jumper connects pin a to b.
(1): Jumper installation 'activates' on-board termination resistor (93Ω)

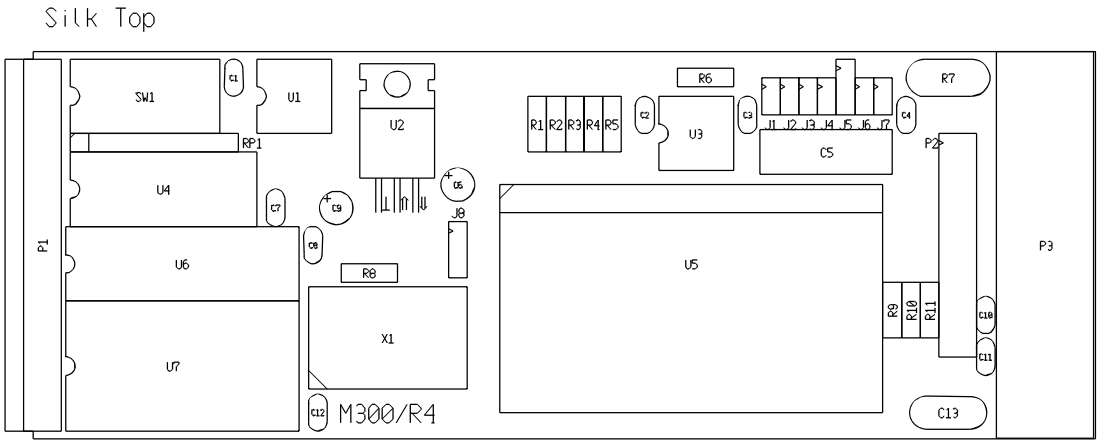


Figure 4: Assembly layout

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9. Annex

9.1. Bibliography

- M-module interface specifications rev. 2.2 by MUMM (Manufacturers and Users of M-modules).
- COM20020 Universal Local Area Network Controller by Standard Microsystems Corporation (SMC).
- TP-HIT HYC9088 by SMC.
- Technical Note TN7-1 by SMC.

9.2. Differences compared to former versions

The M300 rev 3.x is the successor of M300 rev 2.x. The main difference is the availability of a DIP-Switch to be able to program the NodeID by hardware.

Revision 4.x: PCB layout fixup, connector assignment modification.

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9.3. Technical data

- Databus:
  8-bit wide.

- Addressbus:
  8-bit wide.

- Interrupt source:
  COM20020 ULANC.

- Interrupt vector:
  Must be provided by base-board or autovector.

- Type interrupter:
  INTA (release by software).

- Connection:
  To M-module interface via 40 pole connector.
  To peripheral - through 25 pole sub-D at the front.
  - through 21 pole RV100-header at the back.

- Power supply:
  +5VDC ± 10%, typical 200mA.
  -12VDC ± 10%, typical 75mA.

- Temperature range:
  Operating: 0°C .. +70°C.
  Storage: -20°C .. +80°C.

- Humidity:
  Class F, non-condensing.

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