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IBM Series/1

**4991-201 Explosion-Proof Magnetic
Card Reader, RPQ D02008:
General Information Manual**

Preface

This manual is the primary source of information for the IBM Explosion-Proof Magnetic Card Reader. It contains general information and planning information for the physical set-up of the card readers.

Information concerning site preparation requirements, card reader specifications, reader operation, cabling and the magnetic stripe card is included.

This manual should be used in conjunction with the *IBM Series/1 Installation Manual—Physical Planning*, GA34-0029, to successfully plan the set-up of the system.

The requirements of the card reader are subject to modification by engineering developments.

Second Edition (September 1978)

This is a major revision of, and obsoletes, GA34-1546-0. Changes have been made to enhance text and art. Technical changes to the text and illustrations are indicated by a vertical line to the left of the changes.

Changes are periodically made to the information herein; before using this publication in connection with the operation of IBM systems, have your IBM representative confirm editions that are current and applicable.

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Contents

Chapter 1. Explosion-Proof Magnetic Card Reader

(RPQ D02008) 1-1

Description 1-1

Operation 1-1

Maintenance 1-2

Philosophy 1-2

Trouble Determination 1-4

Repairs 1-4

Spare Parts 1-4

Chapter 2. Magnetic Stripe Card 2-1

Description 2-1

Specifications 2-1

Encoding 2-3

Data Format 2-3

Character Codes 2-3

Data Location 2-4

Encoding Accuracy 2-4

Readback Signal 2-4

Chapter 3. Site and Set-Up Planning 3-1

Signal Wiring Considerations 3-2

Installation Practices 3-2

Filtering Digital Signals 3-4

Isolation Techniques 3-5

Switching Loads That Store Energy 3-5

Explosion-Proof Magnetic Card Reader 3-7

Specifications 3-11

Electrical Requirements 3-12

Environmental Requirements 3-13

Special Materials Required 3-14

Chapter 1. Explosion-Proof Magnetic Card Reader (RPQD02008)

Description

The IBM hazardous area magnetic stripe card reader reads and transmits to an IBM Series/1 the data encoded on the magnetic stripe of the card.

Some of the common features of the magnetic card reader are:

- Simple design that minimizes exposure to accidental damage by the user.
- User retains possession of the card even when the card is fully inserted in the card reader.
- Asynchronous reading technique, which allows reading both on insertion and removal.
- One-handed operation.

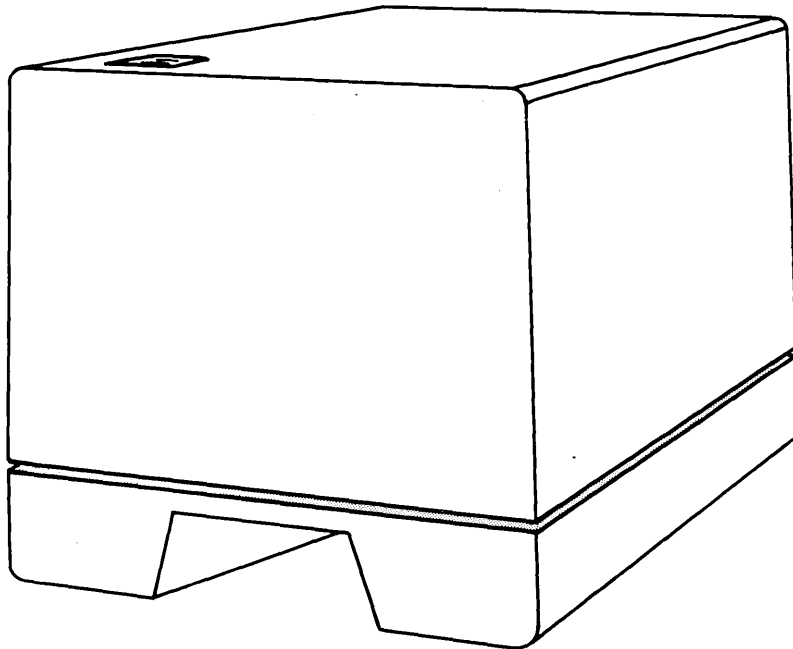


Figure 1-1. Explosion-Proof Magnetic Card Reader

Operation

The person desiring to activate a controlled device inserts an encoded magnetic stripe credit card into the slot provided in the reader. The card is inserted in an upward direction with the magnetic stripe facing away and on the right side into the card reader which is mounted with the opening slot facing downward. When the card reaches a positive stop, reading is complete. The card is also read on withdrawal. Within a certain time span determined by the customer's program, and if the decision is reached to permit the processor to activate the control device, the control mechanism will be activated. It remains activated for a period of time determined by the customer's program.

If the control device does not activate, the person attempting to activate the device may insert the card again. Each time the card is inserted or withdrawn, the data will be read and transmitted to the Series/1 for a decision.

All data is transmitted by the reader and control signals may be received by reader.

The card reader operates in the following sequence:

1. The magnetic stripe card is inserted by the user and read by the card reader.
2. The data from the card is processed by the customer's program.
3. The customer's program determines what action should be taken.
4. The signal to activate the customer's device is sent by the Series/1 and sensed by the explosion-proof card reader.
5. The switching device (Triac) activates the device and the device remains activated for a length of time determined by the program.

The timing chart (Figure 1-2) illustrates the relationship between the card reader's internal functioning and the transmitted signal sensed by the Series/1. Each transition on the data line causes a process interrupt at the Series/1.

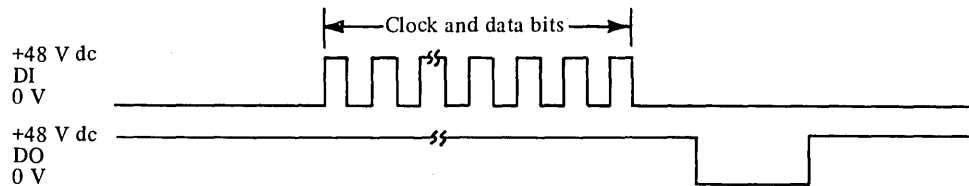


Figure 1-2. Card Reader Timing Chart

There is a switching device (Triac) in the reader that can be gated via the Series/1 digital output point which is under program control. This switching device (Triac) should be wired during set-up so it may be used at a later date.

Maintenance

Philosophy

The maintenance philosophy for the card reader is the immediate replacement of the card reader's electronic plate assembly at the device site to restore normal device operation. The card readers are repaired on an online basis at a designated spare port provided by the customer (Figure 1-3). Spare port refers to an area in the immediate proximity of the using system to which a defective readers plate assembly may be connected for maintenance. This port must provide all signals which were present at the failing readers' site. The user program should be capable of reading, comparing and acknowledging customer supplied test credit cards. The recommended data pattern encoded on test cards is:

0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 0, 1, 2, 3, 4.

If repair of the electronics assembly is necessary, two methods are available:

Customer Repair

Using spare parts supplied by the customer (obtained from the IBM branch office) and maintenance documentation supplied with the card reader, the customer may repair the unit without IBM assistance.

IBM Repair (Time and Materials)

CE will repair defective card readers when:

- The defective electronics assembly is connected to the system via the recommended spare port.
- Test credit cards are provided to CE by the customer.
- The maintenance documentation shipped with the credit card reader is available.

The following are recommended to facilitate service:

- A visual acknowledgement from the system indicating a successful read of the test card and/or error information in the form of printed output, displayed output, or a unique light is available.
- A user program capable of reading and comparing test credit cards is available.

Although the card reader is designed for highly reliable operation, with few moving or wearing parts, failure either from user abuse or from machine or wiring malfunctions may occur. To prepare for this, the user should maintain a supply of spare card readers, so that replacement of the card reader can restore operation.

To determine how many extra card readers to order, the user should judge the distance between devices, availability of maintenance personnel, importance of the function controlled, etc. If the user is unable to make a judgment on the number of extra card readers needed, IBM recommends one spare for every 10 card readers or portion thereof as initial stock.

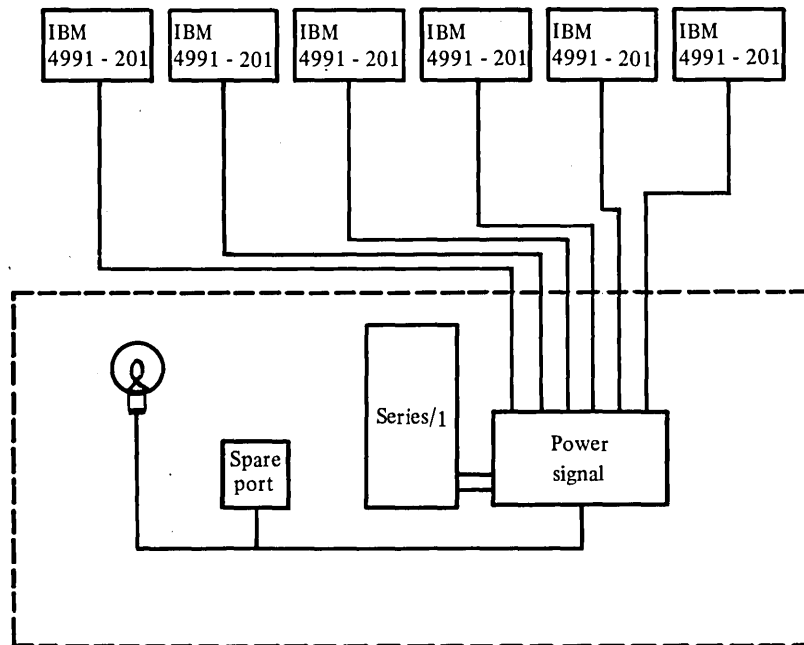


Figure 1-3. Example of Typical Card Reader Set-up with Spare Port

Trouble Determination

To test card readers, a spare port should be included in the original system planning. This *spare port* is terminated at the card reader repair site and activated by user supplied test cards when required.

If the card reader itself is the cause of failure, it can be repaired at the spare port after restoring the failing location to operation.

Repairs

The card reader has the following subassemblies which are field replaceable units (FRUs):

- Read Amplifier Card
- Regulator Card
- Sensing Assembly
- Feed-Through Assembly
- Heater Assembly
- Electronics Plate Assembly
- Printed Circuit Assembly
- Bracket Assembly (Thermostat)

Read Amplifier Card. This card contains a high gain integrating amplifier which converts the magnetic flux transition to square waves. The output of the read amplifier drives a line driver circuit. The line driver then converts the signal levels to 48 Vdc.

Regulator Card. This card contains a 12 Vdc regulator. The regulator provides voltage for the read amplifier. It is designed to operate from 48 Vdc \pm 10%.

Sensing Assembly. This unit contains the read head and throat assembly.

Feed-Through Assembly. This unit contains the "Intrinsically Safe" circuitry, which is designed to limit the electrical energy in the read head area, under normal or abnormal conditions.

CAUTION: Component substitution in this assembly may adversely affect the intrinsic safety of the unit.

Electronics Plate Assembly. This metal plate supports all electronics and read head subassemblies.

Heater Assembly. This unit provides optimum humidity control.

Spare Parts

Parts are available from IBM as field replaceable units or if extra card readers are available the spares can be used to furnish spare parts.

All parts must be ordered by the IBM Branch Office.

Chapter 2. Magnetic Stripe Card

Description

The magnetic stripe embossed credit card contains a unique encoded number, that is used by the card reader and the IBM Series/1.

Data is encoded on the card using non-return-to-zero (NRZ) double frequency (F/F2) mode. Each data bit or data no-bit is preceded by a clock bit (Figure 2-1). Only half of the magnetic stripe length is used for data purposes, therefore, a maximum of 18 characters can be stored. Clock bits must precede and follow the data bits to ensure establishment of accurate timing relationships.

The data encoded on the stripe must include only characters valid in the code chart (Figure 2-4). This data must be preceded by a start of card (SOC) character, followed by an end of card (EOC) character and a longitudinal redundancy check (LRC) character. This leaves a maximum of 15 data characters available for use. The magnetic stripe card layout diagram (Figure 2-3) shows the relationship between the control characters, data characters, and the card.

The encoded data on the stripe does not conflict with other information and functions required on the card; the card remains compatible with existing embossed cards and imprinters.

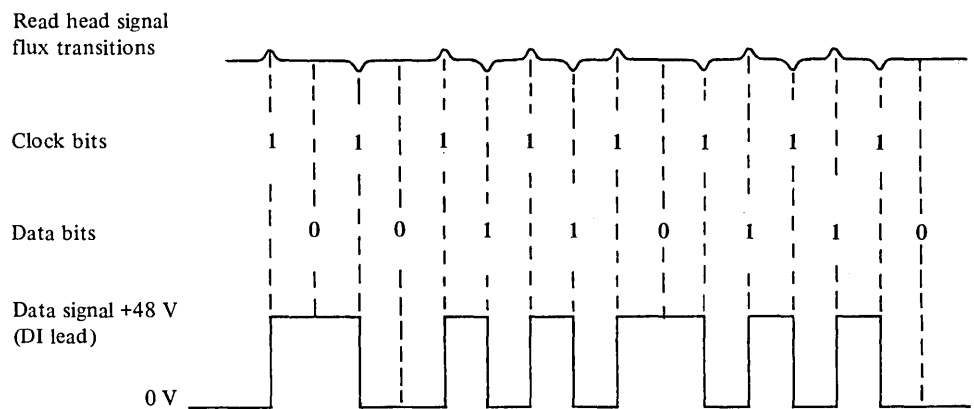
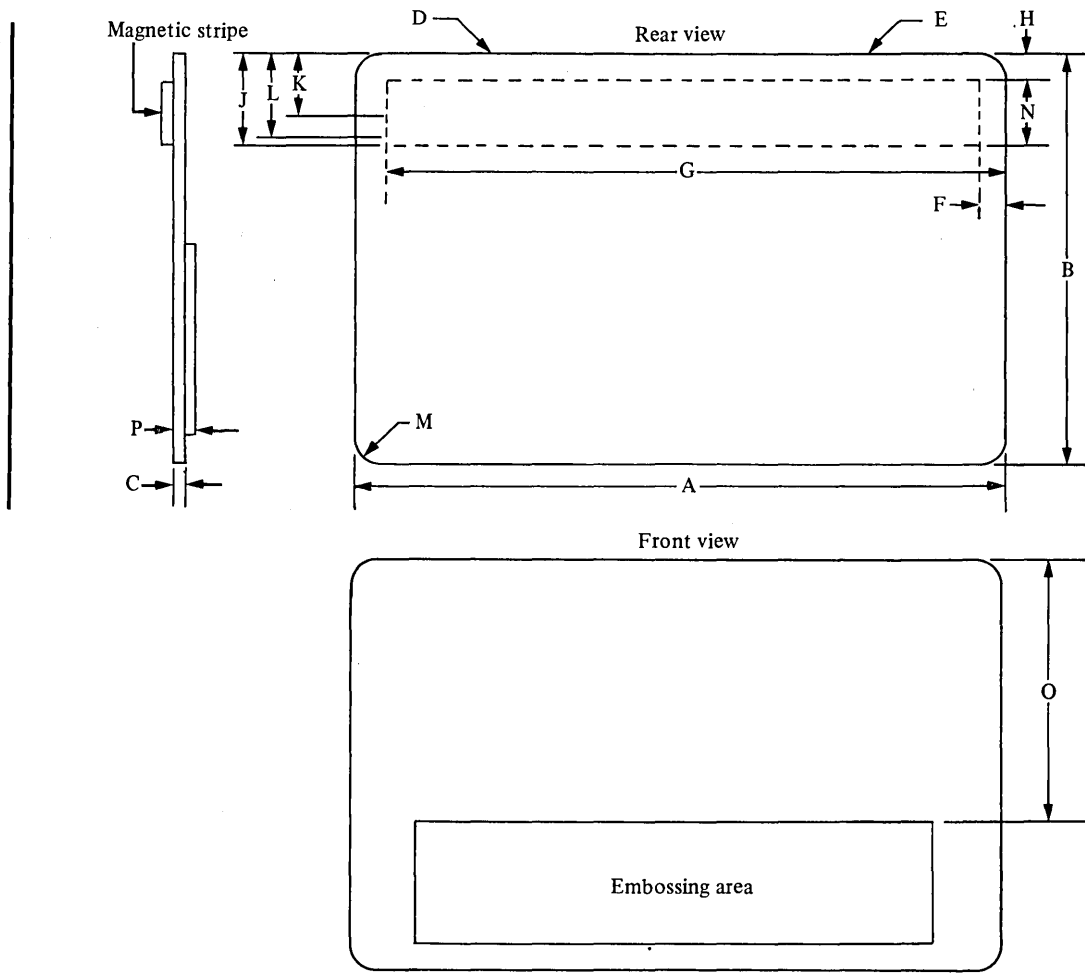


Figure 2-1. Timing relationships—data signal, clock bits, data bits

Specifications

Figure 2-2 shows limits of card dimensions essential for a magnetic stripe embossed credit card that can operate satisfactorily in an IBM explosion-proof magnetic stripe card reader.



A	Card width	85.725+0.127-0.254 mm (3.375+0.005-0.010 inch)
B	Card height	53.975+0.127-0.254 mm (2.125+0.005-0.010 inch)
C	Card thickness	0.762±0.0762 mm (0.030±0.003 inch)
D	Card edge burrs	0.0762 mm (0.003 inch) maximum
E	Card top edge straightness	0.0762 mm (0.003 inch) maximum
F	Magnetic stripe (right end from right edge of card)	2.921 mm (0.115 inch) maximum
G	Magnetic stripe (left end from right edge of card)	82.55 mm (3.250 inch) maximum
H	Magnetic stripe (top edge to top edge of card)	5.537 mm (0.218 inch) maximum
J	Encoding (lower edge to top edge of card)	11.125 mm (0.438 inch) maximum
K	Encoding (top edge to top edge of card)	8.712±0.178 mm (0.343±0.007 inch)
L	Encoding (lower edge to top edge of card)	11.76 mm (0.463 inch) minimum
M	Corner radius	3.175±0.762 mm (0.125±0.030 inch)
N	Magnetic stripe width	6.35 mm (0.250 inch) minimum
O	Embossing (top edge to top edge of card)	27.31 mm (1.075 inch) minimum
P	Embossing height (character height plus card thickness)	1.321+0.000-0.051 (0.052+0.000-0.002 inch)

Figure 2-2. Dimensions for embossed credit card with magnetic stripe

Encoding

Data Format

The data on the stripe consists of a maximum of 18 characters (Figure 2-3). Reading from right to left, they are: 1 SOC (start of card) character, up to 15 numeric characters, an EOC (end of card) character, and an LRC (longitudinal redundancy check character). All data is encoded using the non-return-to-zero (NRZ) double frequency (F/2F) mode and is continuous. All characters including the LRC must have odd parity.

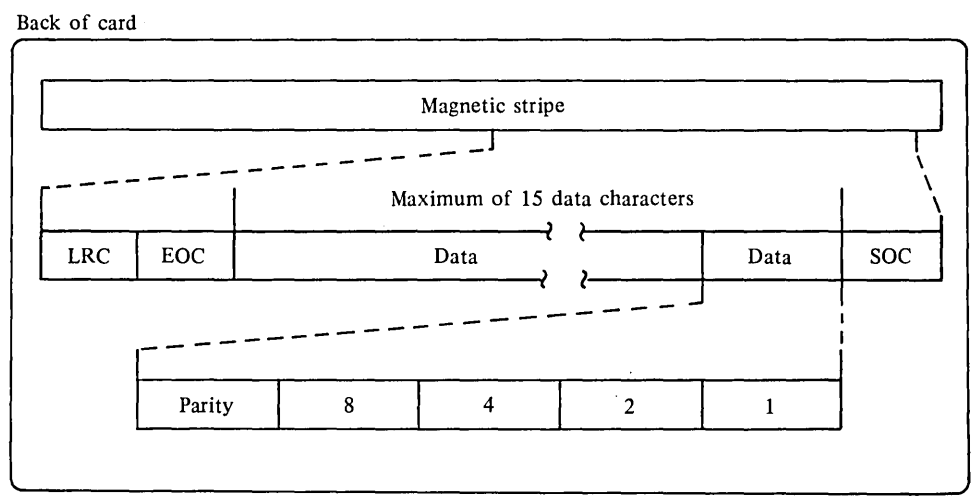


Figure 2-3. Format of data encoded on magnetic stripe

Character Codes

Character coding for the set of characters used on the magnetic stripe is defined in Figure 2-4.

Character	Bits
	P 8 4 2 1
0	1 0 0 0 0
1	0 0 0 0 1
2	0 0 0 1 0
3	1 0 0 1 1
4	0 0 1 0 0
5	1 0 1 0 1
6	1 0 1 1 0
7	0 0 1 1 1
8	0 1 0 0 0
9	1 1 0 0 1
#	1 1 0 1 0
SOC	0 1 0 1 1
##	1 1 1 0 0
#	0 1 1 0 1
#	0 1 1 1 0
EOC	1 1 1 1 1

Available for future definition
Restricted except as LRC

Figure 2-4. Character set

Data Location

Data is read on the magnetic stripe from right to left, low order bit first (viewing the back of the card with the stripe at the top). The first data flux transition must occur 7.44 ± 0.5 mm (0.293 ± 0.020 inch) from the right edge of the card. Clock transitions must precede and follow the data transitions so that the entire length of the stripe is filled. At least 10 clock pulses must precede the first data bit. Arrangement of encoded data (maximum format length) is:

<i>Magnetic Stripe Card Information Format</i>	<i>Characters</i>
SOC-mandatory	1
Data	15
EOC-mandatory	1
LRC-mandatory	1
Total	18

Encoding Accuracy

The flux changes throughout the stripe must be within $\pm 3\%$ of nominal spacing, as measured between adjacent flux changes. The nominal density is 3 bits per millimeter (75 bits per inch); thus, the nominal spacing is 0.34 mm (1/75 inch) for clock transition to clock transition or 0.17 mm (1/150 inch) for clock transition to data transition.

Readback Signal

After being cleaned with a tissue, a card must meet the following requirements when read on a properly adjusted reader. The read head angle is 0 degrees \pm 20 minutes.

1. Level.
The read head signal from a properly adjusted reader must be greater than 3.0 mV peak when the card is inserted at 10.2 cm per second (4 ips).
2. Signal Pulse Width.
The read signal pulse width must be 0.8 ± 0.3 ms wide at the 50% signal amplitude point.
3. Spurious Signals.
Spurious signals included in the readback signal cannot be greater than 12% of the signal caused by the previous flux change.

Chapter 3. Site and Set-Up Planning

Once your company has ordered the Series/1 and the explosion-proof card readers, you should carefully and thoroughly prepare your site for a smooth set-up of your equipment. Good site preparation requires a planner or manager to oversee all preparation tasks, detailed action plans, a detailed schedule, and a detailed overall site plan showing the location of units, wire sizes, wire labeling, conduit routing, and internal wiring of the terminal blocks (TBs).

The first step is to clearly understand your responsibilities as a planner, which are:

- Perform the planning required for your application. That is, the physical location you desire for the Series/1 and the Explosion-Proof Magnetic Card Reader(s).
- Draw a detailed site plan showing the location of all units, all wiring and wire sizes, wire length, conduit routine and type of conduit used. Also a list and description of all customer supplied hardware (conduit, conduit fittings, wire, junction boxes, electrical hardware, etc.).
- Prepare a site preparation schedule of events. The schedule should have the responsibilities of each event clearly indicated (who does what, and when).
- Insure conformance to all of your local and municipal electrical and building codes.

CAUTION: Compliance to NFPA section 500/501 is mandatory in a hazardous environment in which flammable gases or vapors are or may be present in the air in quantities sufficient to produce explosive or ignitable mixtures.

- Provide 54 Vac power to the card readers.
- Provide 48 Vdc to the card readers.
- If wall mounts are being used, determine whether the walls can support the weight of the equipment. If not the wall must be strengthened.
- Determine if the environmental conditions of your site are within the acceptable limits as stated in this document.
- Provisions for safety considerations (safe access, safety signs, safe site construction, fire protection, and control).
- Provide general lighting for satisfactory visibility by the user.
- Spare reader(s). You should consider stocking a spare reader(s) for optimum system performance.
- Provide a service area for use by service personnel and for storage of test equipment and parts. This area must not be in the hazardous area.

Signal Wiring Considerations

This section discusses the signal wiring considerations from the reader to the system interface. This wiring is installed by the customer, or by a contractor either through IBM Sensor Based Installation Services (SBIS) or working directly for the customer.

Installation Practices

Noise is a spurious and unintended signal appearing at an input or output. There is always some noise present in any electronic device or circuit. Only when the noise reaches the threshold of energy level that could cause a circuit malfunction does it actually cause a problem.

The following guidelines represent good installation practices and will contribute to preventing noise from entering the system.

1. Signal Transmission Consideration
 - a. Select the best instrument signal cable available
 - b. Lines carrying signals that differ from each other in average signal voltage level by more than 50%, should not be grouped in the same body shielded cable.
 - c. Where practical, keep cables well separated from each other, especially power from signal cables and cables with widely differing signal characteristics.
 - d. The "break-out" at the ends of signal cables must be kept as short as possible.
 - e. Unused wires must be grounded.
2. Grounding Considerations
 - a. Establish and follow a consistent grounding practice throughout the system.
 - b. Building framework, conduits, sprinkler system pipe, etc. are not suitable for dc signal or ground returns.
 - c. Ground busses for dc and ac grounds should have only one common point within the system.
3. Power Sources for non-IBM Equipment
 - a. System components and power supplies should be selected to minimize the number of noise sources.
 - b. Include adequate filtering on outputs of dc (rectified ac) power supplies.

4. Cable Routing

Caution must be exercised in locating cables near equipment which may cause electrical interference (noise). Examples of electrical and electromagnetic noise sources are:

- a. Fluorescent fixture and neon fixture.
- b. Power distribution, including wiring, transformers, generators, and alternators.
- c. Motors that drive machinery such as air conditioners, elevators, escalators, large blowers, and machine tools.
- d. Radio and television transmitters and television receivers.
- e. Signal generators, intercommunication systems, and security signal systems.
- f. Arc welders, electro-discharge machinery equipment, and related equipment.
- g. Radar transmitting equipment.
- h. R.F. induction heaters.
- i. Ultrasonic cleaning equipment.
- k. Electromagnetic equipment, such as degaussers, magnetic chucks, etc.
- l. Control equipment (relays, contactors) for machinery and other switching devices that carry or switch relatively large currents.

Interference between signal cable and typical sources of electrical interference will be more likely to exist with long parallel runs. Good rules to follow are to keep all cabling at least 0.3 m (1 ft.) away from any power line or other ac source voltage.

The signal cable length from the reader(s) to the system should always be minimized to reduce the signal degeneration due to all external effects. System location to minimize signal cable length should be considered in the initial planning. Multiple signal cables should follow the same route from the reader(s) to the system. Excess connected signal cable length should not be coiled up but should be stored in a "snake" effect. Raising external cables above floor level can have a drastic effect on the electrostatic rejection level. Their proximity to the floor has somewhat the same effect as a transient plate, in that this provides a "sink" for the high-frequency noise pulses. All signal wiring must comply with local, state and federal electrical codes.

Filtering Digital Signals

Filtering is used on digital circuits to prevent noise on signal transmission lines from being interpreted at a digital input point as data. Also, filters are required when a digital input point is used to sense contact closures to prevent the mechanical bounce of the contact from being interpreted at the input as data. Filters on single-ended input circuits will not reduce common mode noise.

Simple single section resistance-capacitance (RC) filters as shown in Figure 3-1 are usually adequate to eliminate the noise content imposed on high speed logic signals. Since the RC filter reduces the bandwidth of the signal it reduces the noise but increases the rise time and fall time of the digital data pulse as shown in Figure 3-2. Depending upon the series impedance of the filter and the input impedance of the digital input circuit, the positive level of the input signal (V_2 in Figures 3-1 and 3-2) may be reduced due to voltage drop across the series impedance of the filter. Voltage V_3 at the filter output must still be within the detectable up level as specified for the system digital input.

The RC filter will introduce a delay in the time at which the input signal reaches a detectable change of state. If V_4 in Figure 3-2 is the detectable up level then the filter has introduced a delay from t_0 to t_1 in the time it takes the change of state to be detected. This delay is a function of the filter bandwidth and the peak amplitude of the signal at the input to the filter. Variation in the input signal amplitude can cause major variations in the delay.

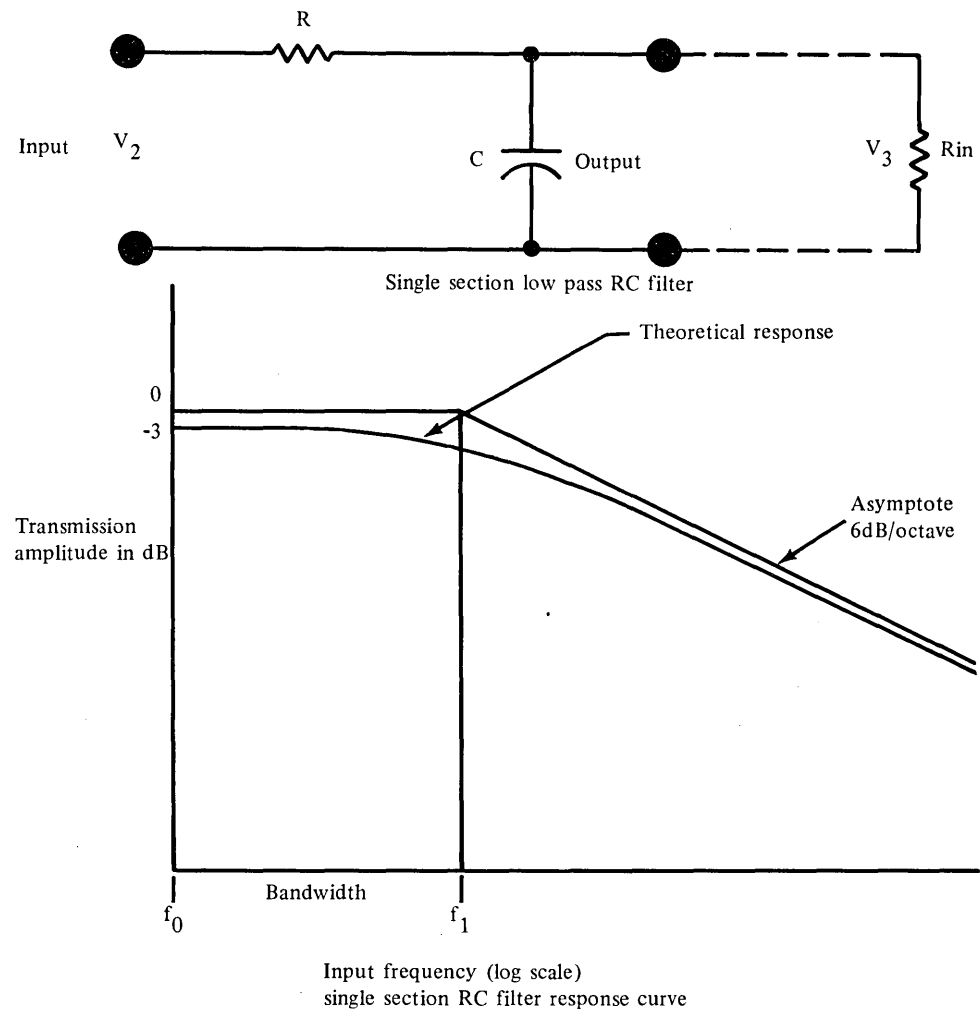


Figure 3-1. Single RC Filter and Response Characteristics

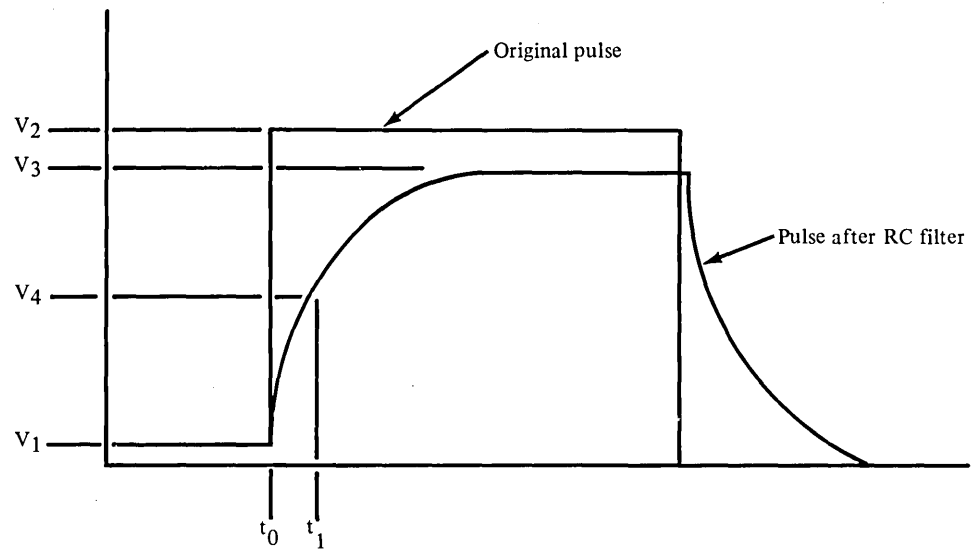


Figure 3-2. Effect of Filter on Pulse Waveshape

Isolation Techniques

There are two basic circuit conditions where it is desirable or necessary to electrically isolate the signal source from the Series/1 input. The first condition is where the signal source is at an elevated common mode voltage. The second condition is where it is necessary to isolate the source ground from a single-ended Series/1 input. Optocouplers can accomplish either of these functions.

Optocouplers (Photoisolators)

An optical coupler (optocoupler) typically consists of an infrared emitting diode and a photodetector that are coupled only by the light path. These devices are particularly attractive for use with digital signal sources. The device linearity limits their usage for analog circuits. The devices are sturdy and reliable, resistant to shock and vibration, and have very good temperature coefficients. They have no inductive loading or coupling, create no EMI, and have no mechanical contacts to fail. Many types of physical packages are available for optocouplers, including dual-in-line packages, cable-in-line packages, printed circuit, and screw mount packages.

Optocouplers provide an effective and inexpensive method of isolating the source ground from the system ground when using any of the Series/1 nonisolated input features. Since optocouplers have a limited bandwidth, the upper limit ranging from dc to 2.5 KHz (some units may operate at up to 5 MHz), they can perform a useful filtering function. The current transfer ratio of an optocoupler is typically 50%–100%. Some optocouplers contain output circuits capable of enough current to directly drive a relay without an intermediate amplifier.

Switching Loads That Store Energy

The Series/1 DO features are specified driving a resistive load. Often stored energy devices are driven by these features. This usually takes the form of a capacitance in parallel, or an inductor in series, with the DO drivers. The cables which carry the signals to a purely resistive load unavoidably add such components. The normal consequence of these loads is an initial surge of current from the capacitive load and a high reverse voltage from the inductive load. The Series/1 DO drivers can withstand a brief (1 usec) current overload (200%) and a small (<5V) inverse voltage for a short (1 usec) period. This is

enough to interface with the expected cable characteristics but any significant stored energy devices must limit the power dissipated in the drivers to the specified amounts. See Figures 3-3, 3-4 and 3-5 for Signal Conditioning.

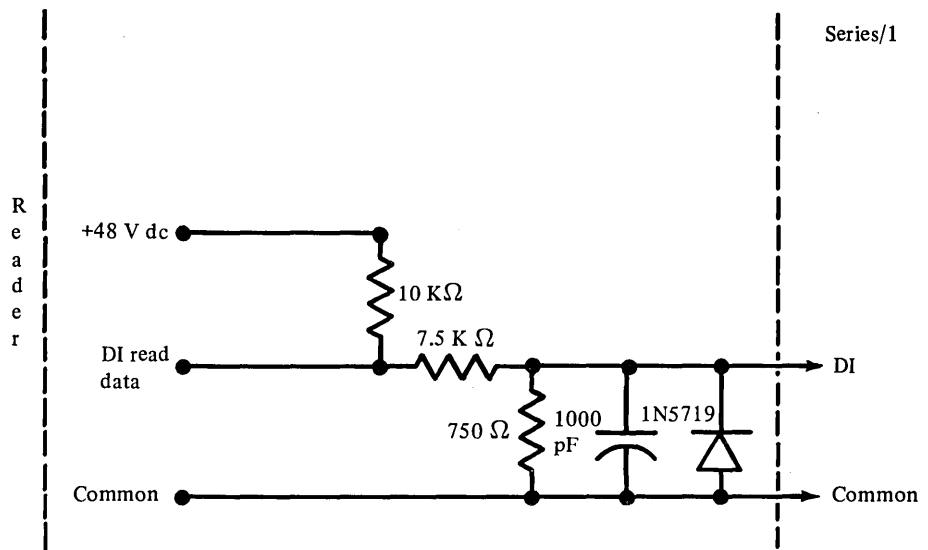


Figure 3-3. Limited Distance, Read Signal Conditioning (1 mile or less)

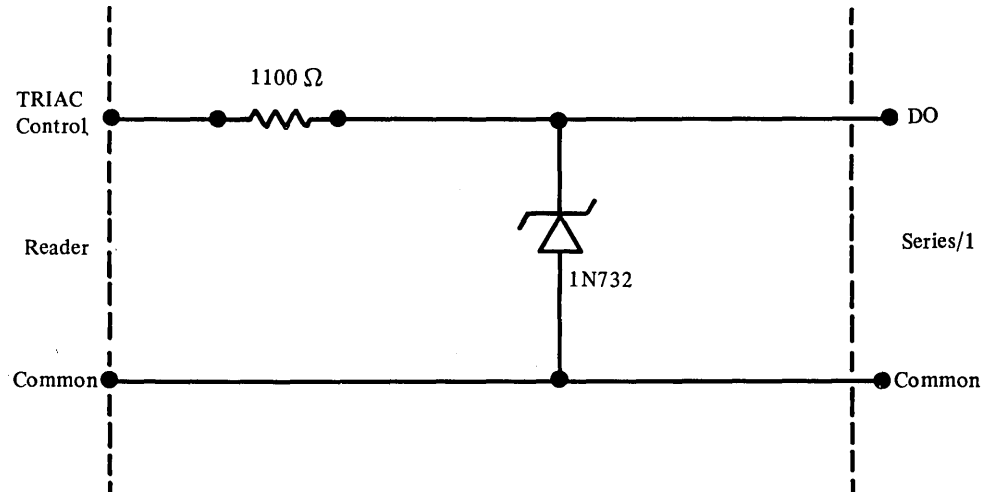


Figure 3-4. Limited Distance TRIAC Control, Signal Conditioning (1 mile or less)

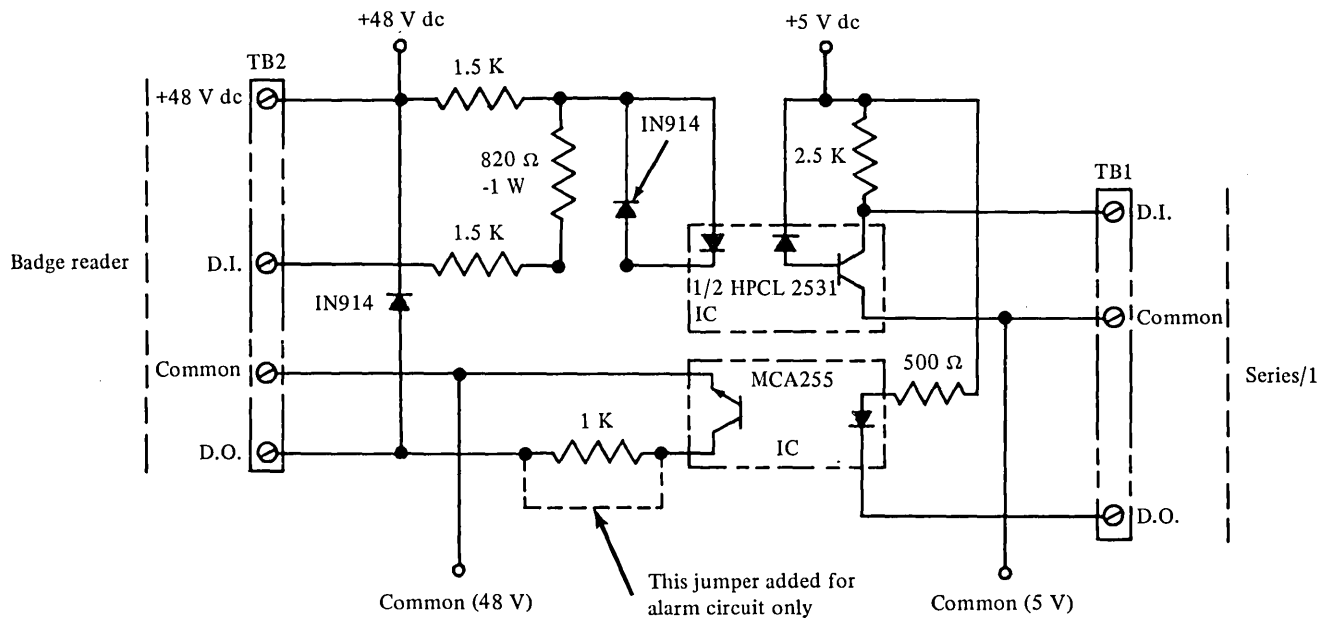


Figure 3-5. Long Distance, Typical Badge Reader Interface Circuit (5 miles or less)

Explosion-Proof Magnetic Card Reader

The IBM Explosion-Proof Magnetic Card Reader, reads and transmits, the data encoded on the magnetic stripe of the card. For examples of reader setups, conduit and fittings and mounting diagrams see Figures 3-6, 3-7 and 3-8. See Figure 3-9 for card reader specifications.

CAUTION: It is very important that you inform the party responsible for actually performing the physical set-up of the card reader, to exercise *extreme* care in handling the card reader casting. Any scratch or mar on the machined surfaces will invalidate the UL listing and IBM's warranty. If the machined surface is scratched or marred in any way, replace the casting.

The set-up of this card reader must adhere to the NFPA codes 500/501 in all respects, throughout the hazardous area.

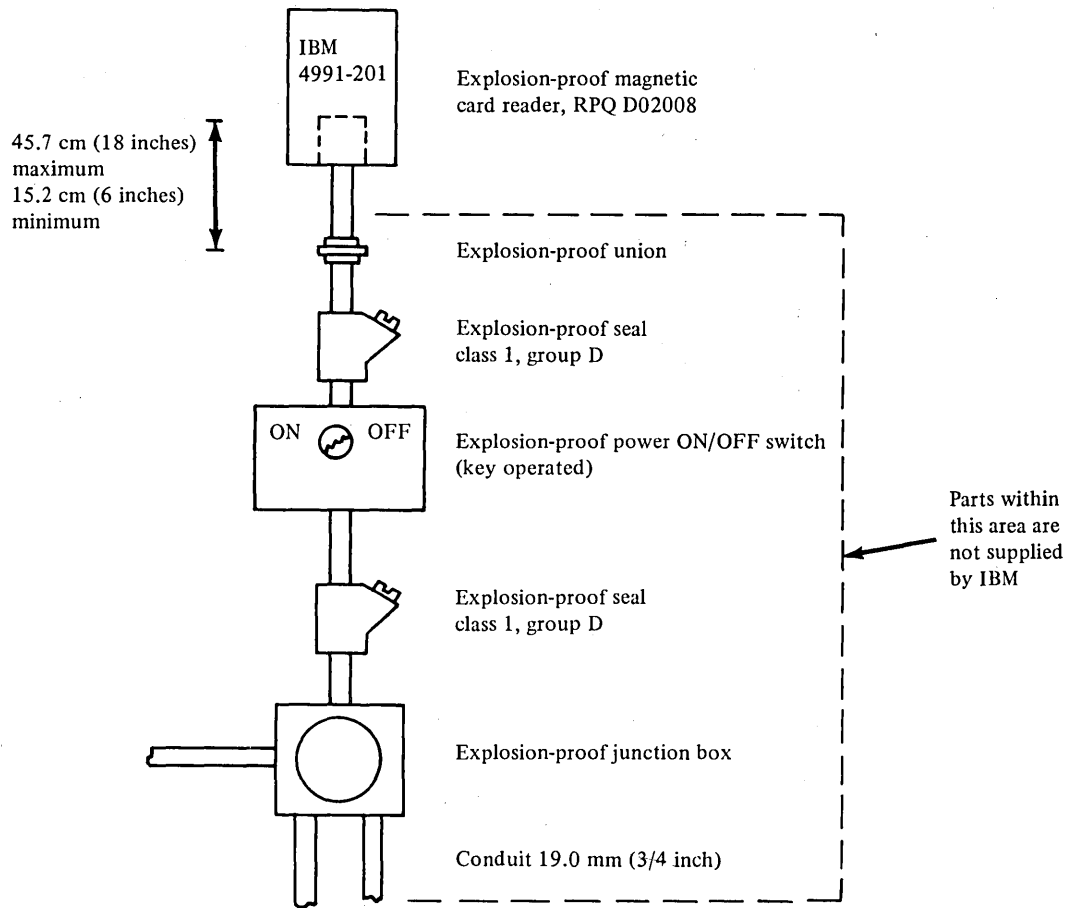
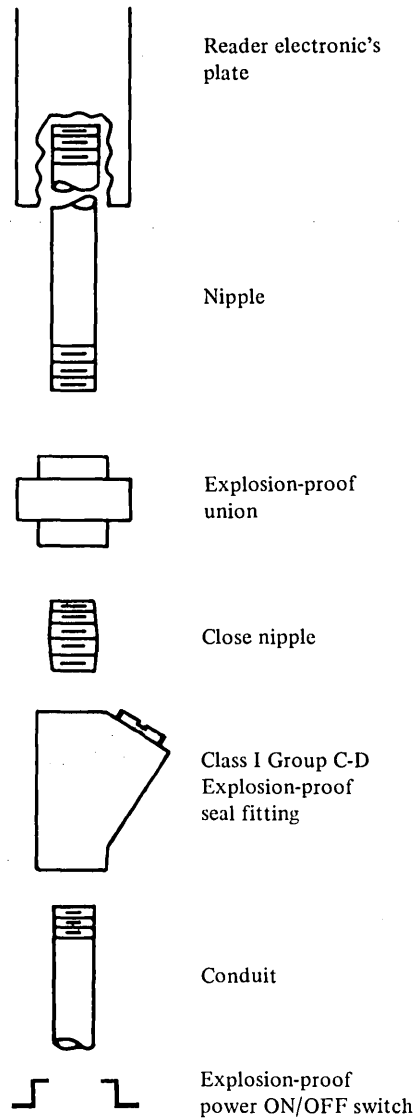


Figure 3-6. Example of a Reader Set-up



Note:

A 38.1 mm (1 1/2 inch) hole is provided in the reader base to allow the conduit and the small section of the explosion-proof union to be pulled up through the base when removing the electronics plate for maintenance.

If the union selected is mounted in reverse or the small section of the union is not approximately 35.6 mm (1 3/8 inches), the nipple must be disconnected from the electronics plate to return the plate for maintenance.

Figure 3-7. Reader Conduit and Fittings (partial exploded view of Figure 3-6)

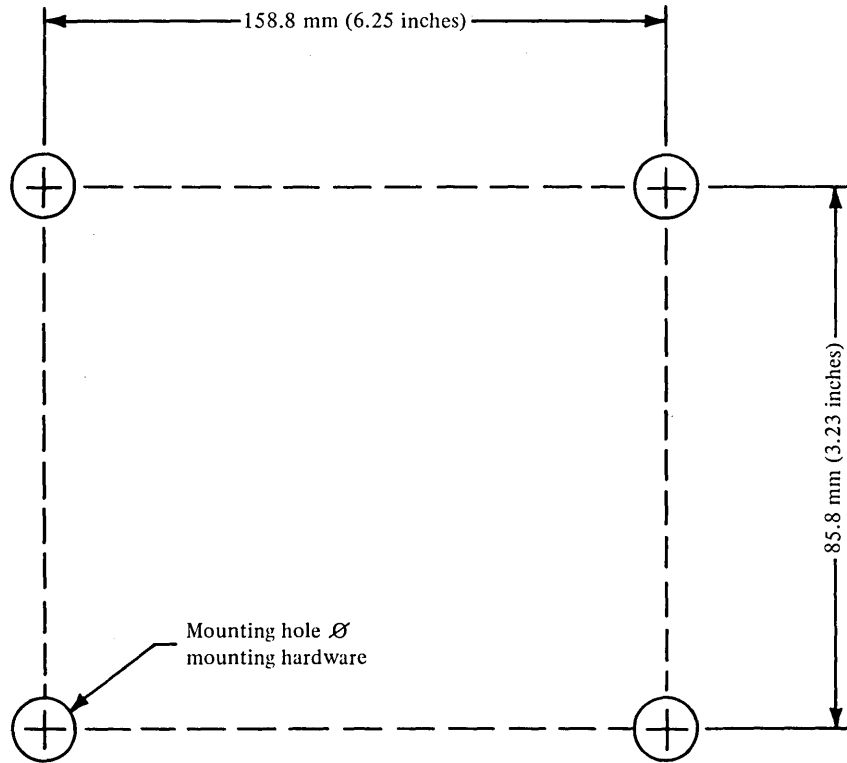


Figure 3-8. Card Reader Mounting Hole Diagram

Specifications

Dimensions

Width	22.9 cm (8.88 inches)
Height	19.7 cm (7.75 inches)
Length	30.5 cm (12.0 inches)
Weight	11.4 kg (25.0 pounds)

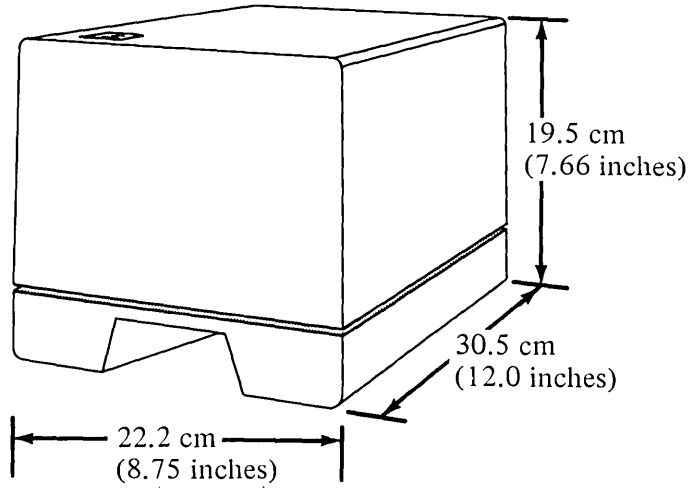


Figure 3-9. Explosion-Proof Magnetic Card Reader

Electrical Requirements

The following are the electrical requirements for the reader:

Reader Input Voltage	+48 Vdc \pm 10%	0.5 ampere (max)
Heating Element	54 Vac \pm 10%	1.0 ampere (max)
Switching Device (triac) Maximum	27 Vac	1.0 ampere
Switching Device (triac) Minimum	5 Vac	0.1 ampere

The heaters are rated at 20 W 28 Vac @ 1 A. They are connected in series. See Figure 3-10 for card reader wiring.

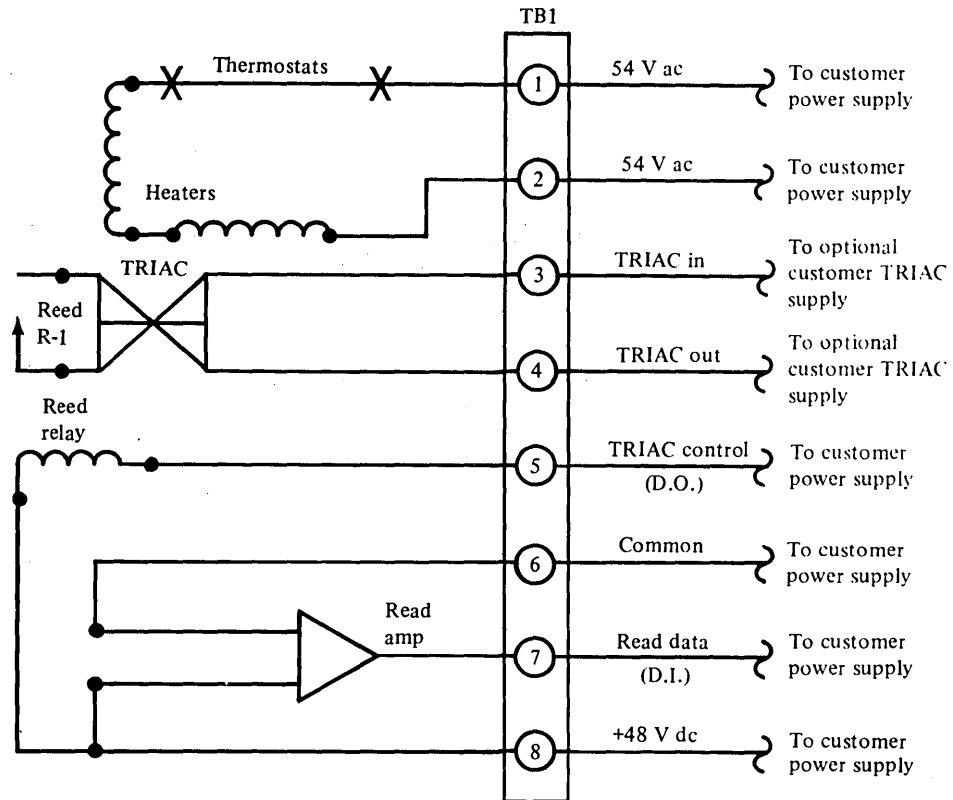


Figure 3-10. Wiring of Card Reader

Signal Cable Specifications

The card reader signal cabling is #24 AWG, 4 conductors, shielded, jacketed, UL listed, with an outside diameter of 3.2 mm (.125 inch) minimum, 6.4 mm (.25 inch) maximum.

This cable shall be contained in a 19.0 mm (.75 inch) diameter conduit. The maximum wire length is determined by proper signal conditioning and termination. The shield is "floated" at the reader and connected to ground at the using system.

CAUTION: The conduit from the reader to the junction box and the junction box itself, must adhere to the NFPA codes 500/501 in all respects.

Recommended line characteristics are not to exceed:

Series resistance	90 Ohms per 1.61 km (mile)
Line inductance	1.0 mH per 1.61 km (mile)
Line capacitance	0.1 uf per 1.61 km (mile)
Line to line leakage	112 K Ohms resistance

Card Reader Power Cabling Specification

The customer provided power cabling to the card reader is for the internal heaters. If the optional ac switching device (Triac) is to be used, two additional wires are required (see Figure 3-11 for example of Triac application).

The card reader power cable is #18 (minimum) AWG, stranded, 2 or 4 wire conductor, UL listed. This cable may be contained in the same conduit as the signal cable mentioned above.

Triac

Figure 3-11 is an example of a Triac application.

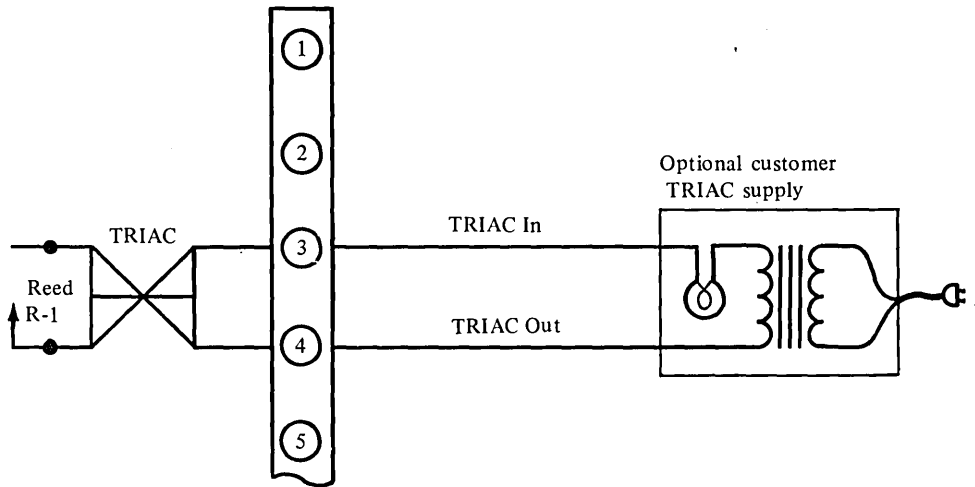


Figure 3-11. Example of Triac Application

Conduit Specifications

The conduit and fittings from the junction box to the card reader are 19.0 mm (.75 inch) and must adhere to NFPA codes 500/501 in all respects.

Environmental Requirements

Normal operation is expected to be in a class 1, group D environment, including outdoor exposures such as rain, sleet, and snow.

Operating ranges are:

Temperature	-34.1° to 51.2°C (-30° to 125°F)
Wet Bulb	29.4°C (85°F)
Relative Humidity	5% to 100%
Altitude	0 to 2135 m (0 to 7000 feet) ± 2.6%

Install Environment -56.1° to 59.4°C (-70° to 140°F)

Nonoperating ranges are:

Temperature	-56° to 68°C (-70° to 155°F)
Wet Bulb	1.0° to 29.4°C (30° to 85°F)
Relative Humidity	5% to 100%

Special Materials Required

Note. The set-up of the Explosion-Proof Magnetic Card Reader and associated materials must conform to the NFPA codes for class 1, group D, division 1, hazardous location.

The following materials are required and are not supplied by IBM:

Conduit	3/4 inch rigid type heavy conduit.
Sealing Units	Explosion-proof vertical sealing unit 3/4 inch.
Sealing Compound	Explosion-proof sealing compound type "SC."
Rope Packing Fiber	"PF" rope type packing fiber.
Thread Lubricants	Temperature -40 to +500 F.
Unions	3/4 inch explosion-proof unions.
Power ON/OFF Switch	Key operated DP/DT explosion-proof.
Junction Box	Explosion-proof.
Mounting Hardware	Four 3/8 inch x 'N' bolts. 'N' equals the length required for the specific set-up.

Note. IBM recommends using 22 AWG 4 wire shielded and jacketed cable for signal wiring between the reader and using system. The shield must be connected at the using systems termination point and taped back at the reader.

READER'S COMMENT FORM

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General Information Manual**

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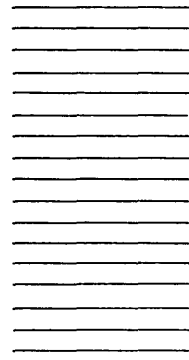


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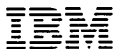
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