

**PRODUCT SPECIFICATION
FOR**



**CORPORATION
MODEL 1052**

Nine-Track Magnetic Tape Transport

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1. INTRODUCTION

This document provides a physical and functional description and electrical specification for the Qualstar Model 1052 formatted streaming tape drives.

The 1052 is designed to read and write industry compatible 9-track formats on standard 1/2 inch magnetic tape. The tape speed for 1600 Bits per inch (Bpi) read/write operation is 50.0 inches per second (ips), and 25.0 ips during 3200 Bpi read/write operations.

Available options include a dust cover, a rack mount configuration and a front door.

Qualstar reserves the right to make changes to this specification without notice.

2. REFERENCE DOCUMENTS

The following documents form a part of this specification to the extent specified herein:

- | | |
|--------------------|---|
| ANSI X 3.40 - 1983 | Unrecorded Magnetic (9-Track 800 Bpi, NRZI;
1600 Bpi, PE; and 6250 CPI, GCR) Tape for Information
Interchange |
| ANSI X 3.39 - 1973 | Recorded Magnetic Tape for Information Interchange
(1600 Bpi, PE) |

3. GENERAL DESCRIPTION

The 1052 is designed to be operated as a self-contained unit. It is generally used in the desk-top configuration but a rack mounting option is also available.

The 1052 reads and writes ANSI Standard 9-Track tapes at 1600 and 3200 Bpi. Reel sizes from six inches through 10-1/2 inches may be used and tape lengths up to 3600 feet are accommodated.

The unit requires 100, 120, 220, or 240 volts AC at 50 to 60 Hz.

The tape drive has an internal formatter which uses the industry standard formatted tape interface.

Interface connectors, power switch and power connections are on the side of the unit.

4. SPECIFICATIONS

4.1. Recording Modes

Half Inch 9 track format:
 1600 Bpi Phase Encoded, ANSI X 3.39-1973 and IBM compatible
 3200 Bpi Phase Encoded, Double Density

4.2. Interface

Industry Standard Formatted Tape with a data transfer rate of 80K per second.

4.3. Tape Requirements

Computer Grade, .500 inch, ANSI X3.40-1983 Standard lengths:

1200 feet8.5 inch reel1.5 mils
 2400 feet10.5 inch reel1.5 mils
 3600 feet10.5 inch reel1.0 mils

4.4. Data Capacity

4.4.1. Unformatted Data Capacity in Megabytes

Density	1200 ft	2400 ft	3600 ft
1600 Bpi	23.1	46.1	69.2
3200 Bpi	46.1	92.2	138.4

4.4.2. Formatted Data Capacity in Megabytes @ 1600 Bpi - 0.62" IBG

Rec.Size	1200 ft	2400 ft	3600 ft.
80	1.6	3.2	4.8
128	2.4	4.9	7.4
256	4.4	8.9	13.3
512	7.4	14.9	22.3
1024	11.2	22.5	33.7
2048	15.1	30.2	45.3
4096	18.3	36.5	45.3
8192	20.4	40.7	61.1
16384	21.6	43.2	64.8
32768	22.3	44.6	66.9
65536	22.7	45.3	68.0

4.4.3. Formatted Data Capacity in Megabytes @ 3200 Bpi - 0.62" IBG

<u>Rec.Size</u>	<u>1200 ft.</u>	<u>2400 ft.</u>	<u>3600 ft.</u>
80	1.7	3.4	5.1
128	2.7	5.4	8.1
256	5.1	10.2	15.2
512	9.2	18.3	27.4
1024	15.3	30.5	45.8
2048	22.9	45.9	68.8
4096	30.6	61.2	91.9
8192	36.8	73.6	110.4
16384	40.9	81.8	122.8
32768	43.3	86.7	130.0
65536	44.7	89.3	134.1

4.5. Tape Speed

Operating Speed at 3200 Bpi:	25 inches per second
Operating Speed at 1600 Bpi:	50 inches per second
Rewind Speed:	100 inches per second
Speed Variation:	±3% maximum (25 or 50 ips)
Start/Stop Time at 25 ips:	0.25 seconds nominal
Start/Stop Time at 50 ips:	0.50 seconds nominal

4.6. Head/Media Handling

Head:	9 Track, read-after-write with D.C. erase
Tape Cleaner:	Carbide blade type
Tape Tension:	8 ounces nominal
File Protect:	Switch Operated Only (does not sense the WRITE ENABLE ring)

4.7. Physical Characteristics

4.7.1. Without Door Option

Dimensions (see Figure 1):

Width:	11.75 inches	(29.8 cm)
Height:	20.50 inches	(52.1 cm)
Depth:	6.75 inches	(1.1 cm)
Net Weight:	27.0 pounds	(12.2 kg)

4.7.2. With Door Option

Dimensions:

Width:	12.75 inches	(32.4 cm)
Height:	21.50 inches	(54.6 cm)
Depth:	9.25 inches	(23.5 cm)
Net Weight:	37.0 pounds	(16.8 kg)

4.8. Power Requirements

Voltage:	100, 120, 220, 240 volts AC, + 5%, -10%
Frequency:	47 to 62 Hertz;
Power (Watts):	72 minimum, 110 average, 195 maximum

4.9. Operating Environment

Temperature:	40 to 110 degrees F	5 to 40 degrees C
Humidity:	15 to 90%	non-condensing
Altitude:	0 to 8,000 feet	2,438 meters

4.10. Storage Environment

Temperature:	22 to 158 degrees F	30 to 70 degrees C
Humidity:	5 to 95%	non-condensing
Altitude:	0 to 50,000 feet	15,240 meters

4.11. Read Data Reliability Characteristics

Non-recoverable Error Rate:	less than 1 in 10^{10}
Recoverable Error Rate:	less than 1 in 10^9

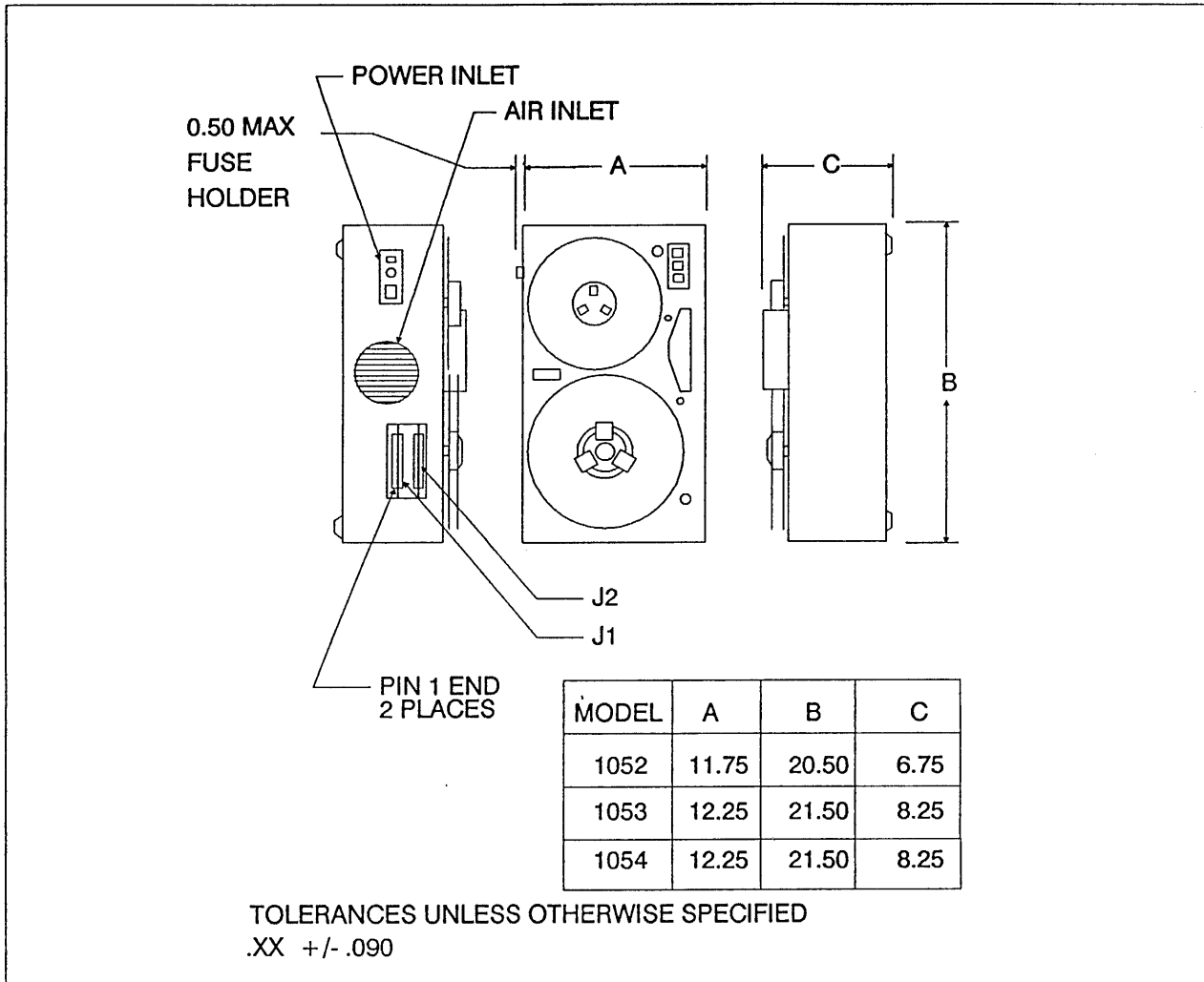


Figure 4-1
 1052 Dimensions

5. INDUSTRY STANDARD INTERFACE

5.1. Connectors

The Model 1052 contains a built-in formatter with an industry standard formatted tape Interface. This interface uses two 50 pin printed circuit edge connectors referred to as J1 and J2. The physical interface consists of two 50 conductor ribbon cables terminated with a 3M connector P/N 3415-0001 or equivalent. All of the signals are TTL compatible and are true when in the low state.

Plug	Sig	Gnd	Name	Signal Description
J1	4	3	ILWD	Last Word (Terminates Write)
J1	6	5	IW4	Write Data, Channel 4
J1	8	7	IGO	GO Command (Command Strobe)
J1	10	9	IW0	Write Data, Channel 0 (MSB)
J1	12	11	IW1	Write Data, Channel 1
J1	14	13		<i>reserved for future use</i>
J1	16	15		<i>reserved for future use</i>
J1	18	17	IREV	Reverse Command
J1	20	19	IREW	Rewind Command
J1	22	21	IWP	Write Data, Parity (optional)
J1	24	23	IW7	Write Data, Channel 7 (LSB)
J1	26	25	IW3	Write Data, Channel 3
J1	28	27	IW6	Write Data, Channel 6
J1	30	29	IW2	Write Data, Channel 2
J1	32	31	IW5	Write Data, Channel 5
J1	34	33	IWRT	Write Command
J1	36	35		<i>reserved for future use</i>
J1	38	37	IEDIT	Edit Command
J1	40	39	IERASE	Erase Command
J1	42	41	IWFM	Write Filemark Command
J1	44	43		<i>reserved for future use</i>
J1	46	45	ITAD0	Transport Address 0
J2	18	17	IFEN	Formatter Enable
J2	24	23	IRWU	Rewind/Unload Command
J2	46	45	ITAD1	Transport Address 1
J2	48	47	IFAD	Formatter Address
J2	50	49	IHISP	Hisp Speed Command

Table 5-1
Interface Signals, Host to Transport

Plug	Sig	Gnd	Name	Signal Description
J1	2	1	IFBY	Formatter Busy
J1	48	47	IR2	Read Data, Channel 2
J1	50	49	IR3	Read Data, Channel 3
J2	1	—	IRP	Read Data, Parity
J2	2	—	IR0	Read Data, Channel 0 (MSB)
J2	3	—	IR1	Read Data, Channel 1
J2	4	—	ILD P	Load Point
J2	6	5	IR4	Read Data, Channel 4
J2	8	7	IR7	Read Data, Channel 7 (LSB)
J2	10	9	IR6	Read Data, Channel 6
J2	12	11	IHER	Hard Error Detected
J2	14	13	IFMK	Filemark Detected
J2	16	15	IDENT	Ident Burst Detected
J2	20	19	IR5	Read Data, Channel 5
J2	22	21	IEOT	End of Tape Detected
J2	26	25		<i>reserved for future use</i>
J2	28	27	IRDY	Transport Ready
J2	30	29	IRWD	Transport Rewinding
J2	32	31	IFPT	Transport File Protected
J2	34	33	IRSTR	Read Data Strobe
J2	36	35	IWSTR	Write Data Strobe
J2	38	37	IDBY	Data Busy Indicator
J2	40	39	IEARLY	Early EOT Indicator (50 feet)
J2	42	41	ICER	Correctable Error Detected
J2	44	43	IONL	Transport Online

Table 5-2
Interface Signals, Transport to Host

5.2. Signals and Commands

The following is a brief description of the commands available via the interface. See the Interface Manual for detailed descriptions, control words, and timings.

5.2.1. Read Forward

Instructs the drive to read in the forward direction the block following the last block read or written.

5.2.2. Read Reverse

Instructs the drive to read in the reverse direction (no data transferred in GCR mode).

5.2.3. Read Reverse Edit

Instructs the drive to read in the reverse direction and prepare itself for rewriting (editing) that block.

5.2.4. Write

Instructs the drive to write a block (always in the forward direction). The block is terminated by setting the ILWD signal true during the last byte.

5.2.5. Write Edit

Instructs the drive to overwrite the block read by the Read Reverse Edit command. The block length must be the same as previously read and is terminated by setting the ILWD signal true during the last byte (PE mode only).

5.2.6. Write Filemark

Instructs the drive to write a filemark.

5.2.7. Erase Variable Length

Instructs the drive to erase the tape. Generates write strobes as if it were writing data. Terminated by setting ILWD true when the desired length (number of write strobes) has been erased.

5.2.8. Erase Fixed Length

Instructs the drive to erase 4 inches of tape.

5.2.9. Security Erase

Instructs the drive to erase tape from its present position to 5 feet past the End of Tape marker.

5.2.10. Space Forward

Instructs the drive to skip forward over the next block. Read strobes and error signals are not generated. Filemarks are indicated.

5.2.11. Space Reverse

Instructs the drive to skip reverse over the previous block. Read strobes and error signals are not generated. Filemarks are indicated.

5.2.12. File Search Forward without Data

Instructs the drive to search forward for a Filemark. No read data strobe or error signals are generated, however the IDBY will remain true until the Filemark is detected (common to all 4 search commands). In the GCR mode, the drive will respond to the IHISP signal to achieve a 4 times speed increase (50 IPS).

5.2.13. File Search Reverse without Data

Identical to the above instruction except for the direction.

5.2.14. File Search Forward with Data

Instructs the drive to search forward for a Filemark. Read data strobe and error signals are generated for each block passed during the search (just as in Read Forward).

5.2.15. File Search Reverse with Data

Identical to the above instruction except for the direction.

5.2.16. Select 1600 CPI

Selects the 50 IPS tape speed and 1600 CPI data density. Accepted only when the tape is at the load point.

5.2.17. Select 3200 CPI (OPTIONAL)

Selects the 25 IPS tape speed and 3200 CPI data density. Accepted only when the tape is at the load point.

5.2.18. Select 6250 CPI

Selects the 12.5 IPS tape speed and 6250 CPI data density. Accepted only when the tape is at the load point.

6. FAULT DETECTION & RECOVERY

A microprocessor in the tape drive monitors several possible drive faults and operational errors. These events suspend operation and are indicated on the front panel indicators. In some cases operation can be continued after acknowledging the error.

Table 6-1 lists the detectable faults and error conditions.

ERROR CONDITION	RECOVERABLE
Tape improperly loaded	Yes
Attempting to write on a file-protected tape	Yes
Failure to read data just written	Yes
Starting/Positioning/Motion fault	No
Write/Erase power fault	No
Fan failure	No

Table 6-1
Error Conditions

7. CONTROLS AND INDICATORS

7.1. POWER Switch)

The power switch is located on the side panel and is a rocker type switch.

7.2. LOAD Switch and Indicator

The LOAD switch is used to initiate the tape load sequence when the drive is unloaded. The indicator is illuminated when the tape is at the load point (BOT sensed at end of load sequence). When the tape is loaded and not at load point, pressing the switch initiates the rewind sequence. When at the load point, pressing the switch initiates the unload sequence.

7.3. FPT Switch and Indicator

The FPT (File Protect) switch is used to change the File Protect status of the drive when at the load point (LOAD indicator illuminated). Upon loading, the drive is protected (cannot write on tape). Pressing the switch toggles the File Protect state. The indicator is illuminated when the drive is in the protected state.

Normally, on larger tape transports, a write enable ring on the tape reel is utilized to protect files. The presence or absence of this ring is ignored by the tape drive.

7.4. 3200 Switch and Indicator

The 3200 switch is used to change the data density of the drive when the tape is at BOT (LOAD indicator illuminated). Upon loading or upon power-up, the drive is set to the 1600 Bpi density. Pressing the switch toggles the density between 1600 and 3200 Bpi. The indicator is illuminated when 3200 Bpi is selected.

8. FIELD-SELECTABLE OPTIONS

NOTE:

A qualified technician may change the field-selectable options by setting DIP switches inside the drive.

8.1. Read While Write Threshold

Most tape drives use a higher read threshold during write operations to assure that the written data has adequate amplitude to make it readable years later, after natural degradation has reduced the recorded signal amplitudes. The Model 1052 uses a relatively high read threshold during writing to assure maximum data integrity. This higher threshold may cause frequent write errors on worn or marginal media. This is quite normal and is automatically corrected by the SCSI controller. It erases the marginal portion of the tape and re-writes the data block downstream from the location of the media defect. The only detrimental effect of this is slower writing times and less efficient tape usage.

In this case Qualstar recommends replacing the tape with a new reel, however some users may choose to give up some of this extra safety margin for fewer "write retries". This would speed up the writing process on marginal tape.

There is a lower read while write threshold option located on the Write Board. Simply turn DIP switch 2 to the ON position to select the lower read while write threshold. Doing so in no way affects normal read thresholds.

Switch S2:

On	Lower Threshold
Off	Normal Threshold

9. DIAGNOSTIC AND SERVICE AIDS

9.1. TEST 1 – Read Mode

This test provides for reading forward and reverse at either density (tape speed). The transport will automatically change direction at BOT and EOT.

9.2. TEST 2 – Motor Torque Calibration

This test applies the 1.0 amps of current to the supply reel motor or the take up reel motor, for checking the motor output torque or the motor drive circuitry.

9.3. TEST 3 – Motor Amplifier Ramp Check

This check causes a sawtooth current waveform from zero to three amps to be continuously generated by the supply or take motor drivers. This may be used to check the linearity of the motor drive circuitry.

9.4. TEST 4 – Write Blocks

This test continuously writes blocks of all zeroes approximately 2,000 bytes long.

9.5. TEST 5 – Write Filemarks

This test writes filemarks continuously to the tape.

9.6. TEST 6 – Write/Erase

This test causes write and erase power to be alternately applied to the head. There is no tape motion. The output signals may be viewed on the write/controller PCBA at the appropriate test points. This test is used to check write and erase power ramp timing.

9.7. TEST 7 – Motion Test

This diagnostic causes repetitive forward and reverse motion of the tape at alternating tape speeds. Because the motion in the forward direction is longer than in the reverse direction, the tape advances slightly with each cycle until reaching EOT, then it rewinds. This will continue until interrupted. This mode is used for burn-in of new components or to test the motion control of the unit on a long term basis. No data is recorded during this test.