



DSF-2010-MB



KEEP THIS MANUAL IN A SAFE PLACE FOR FUTURE REFERENCE!

Read this manual before using this product. Failure to follow the instructions and safety precautions in this manual can result in serious injury or death or damage to equipment.

Applicable Scanner Part Numbers

PART NUMBER	TYPE (SB, MB)	AREA (NON-HAZ, HAZ)	TEMP RATING	FEATURE	INPUT PINS
2653-271-12	MB	NON-HAZ	-30°C to 70°C	Programmable	14
2653-271-62	MB	NON-HAZ	-30°C to 70°C	Programmable, FIBER OPTIC	14
2653-271-06	MB	HAZ	-30°C to 70°C	Programmable	10

Contact Technical Support +1.866.821.5504 with any questions.

For a list of relevant patents and trademarks, please see <http://www.chentronics.com/legal-notice>.

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1 Safety Information

IMPORTANT SAFETY INFORMATION

Read All Instructions before Using

The instructions provided in this manual have been prepared to serve as a general guide. It is intended for use by qualified personnel with knowledge of Equipment of this type. It is not intended to cover all possible variations in equipment or to provide for specific operating problems which may arise.

You are responsible for adhering to all warnings or cautions provided in this Manual.

In addition to any general safety measures provided in this Manual, you must comply with all current national, state, local and company safety regulations at all times.

Safety Symbols used in this manual comply with ISO 3864.



Indicates a hazard with a high level of risk which, if not avoided will result in death or serious injury.



Indicates a hazard with a medium level of risk which, if not avoided could result in death or serious injury.



Indicates a hazard with a low level of risk which, if not avoided will result in minor or moderate injury.



EXPLOSION HAZARD



Do not open the equipment cover or service the equipment if an explosive atmosphere may be present. Equipment must be installed and serviced by qualified personnel in accordance with applicable local and national codes, standards, and ordinances.

2 Customer Support

For Technical Support

Inside USA Call: 866.821.5504

Outside USA Call: +1.607.334.5531

Website: www.chentronics.com

3 Electrical Area Classification and Safety Markings

3.1 Description of Equipment Protection System

Special Conditions of Use: The flying leads of the flame scanner shall be suitably protected against mechanical damage and terminated within a terminal or junction facility for the conditions of use.

3.2 Hazardous Area

The iScan2 DSF-2010 system hazardous area models have been assessed and comply with the following hazardous area standards:

NEC/CEC/ABS



CLASS I, DIVISION 1, GROUPS B, C, & D T5
NEMA TYPE 4X
SIL 3



20140305-MH26433



2396109



16-HS1490644-PDA

FM3610:2009UL, FM7610:1997

60730-2-5

CAN/CSA C22.2 No. 199-2007

ANSI Z21.20

FM3600:1998, FM3615:1989, FM3810:1989

CAN/CSA C22.2 No. 60079-0

ISA 60079-1:2002

CAN/CSA C22.2 No. 30

IEC 61508-1:2010, IEC 61508-2:2010, IEC 61508-3:2010

IECEx



Ex d IIC T5 Ta -30°C to +70°C

Ex tD A21 IP66 T100°C Ta -30°C to +70°C

IECEx FME 10.0004X

IEC 60079-0:2004

IEC 60079-1:2007

IEC 61241-0:2004

IEC 61241-1:2004

3.3 Non-hazardous Area

The iScan2 DSF-2010 system has been assessed and complies with the following safety standards:

NEC/CEC/ABS



NEMA TYPE 4X
SIL 3



20140305-MH26433



2396109



16-HS1490644-PDA

FM3610:2009UL, FM7610:1997

60730-2-5

CAN/CSA C22.2 No. 199-2007

ANSI Z21.20

IEC 61508-1:2010, IEC 61508-2:2010, IEC 61508-3:2010

LVD 2006/95/EC



EN 60730-2-5:2010

GAD 2009/142/EC



C86CQ26

EN 298:2012, EN 61010-1:2010

MD 2006/42/EC



EN 60529:1991+A1:2000

EMC 2004/108/EC



EN 61000-6-1:2005, EN 61000-6-2:2005, EN 61000-6-3:2005, EN 61000-6-4:2005

4 General

4.1 Product Description

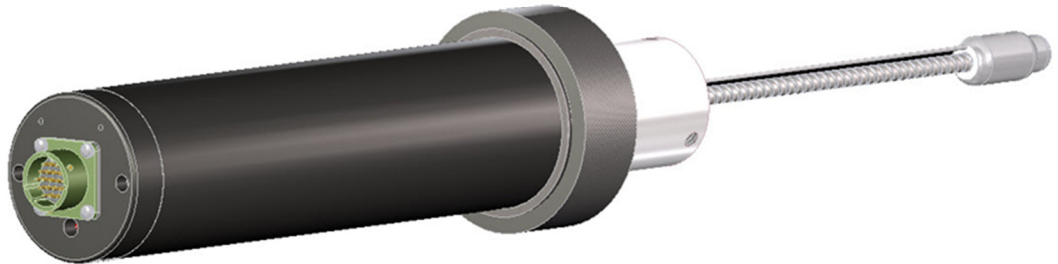
The iScan2 is designed for detecting burner flames of fossil fuels such as natural gas, refinery gas, waste gas, fuel oils, biomass and coals. The iScan2 flame scanner consists of an integrated viewing head and signal processor. No secondary signal processor or amplifier is required.

4.2 Views of Models

4.2.1 Non-hazardous Area (PN 2653-271-12)



4.2.2 Fiber Optic (PN 2653-271-62)



4.2.3 Hazardous Area (PN 2653-271-06)



4.3 Product Features

4.3.1 Programmability

Using DSFComm software, the SB models have limited programmability (intended for single burner applications). MB models have a high degree of programmability, as outlined in the table below:

SCANNER ROOT PART NUMBER (suffix may vary)	USER PROGRAMMABLE FEATURES (with DSFComm)						
	4-20 mA SIGNAL MAPPING	4-20 mA Calibrate	4-20 mA Gain	FLAME RELAYS SERIES –or– INDEPENDENT	RESPONSE TIME (FLAME ON)	MULTIPLE SETUP FILES	RESPONSE TIME (FLAME OFF)
2653-271-12	YES	YES	YES	YES	YES	YES	YES
2653-271-62	YES	YES	YES	YES	YES	YES	YES
2653-271-06	NO	YES	YES	NO	YES	YES	YES
2653-271-11	NO	YES	NO	YES	NO	NO	NO
2653-271-05	NO	YES	NO	NO	NO	NO	NO

For instructions on how to program the scanner, please reference the DSFComm Software manual.

4.3.2 Digital Signal Processing with Self Check

The *iScan2* is a DSP (digital signal processor) based instrument. The flame scanner uses a solid-state optical detector to generate an analog signal. The optical detector operates in ultraviolet and infrared light spectra. The processor uses DSP techniques to determine if a flame is present.

The flame scanner incorporates a self-check system that tests all critical components every 20 seconds. A self-check failure will automatically de-energize the internal flame relay (relays if configured in Redundant Flame Relay Mode) and energize the fault relay (if configured in the Independent Flame/Fault Relay Mode).

4.3.3 Electronically Assisted Sighting Indicator (EASI)

Non-Hazardous models of the *iScan2* include the EASI (Electronically Assisted Sighting Indicator) feature, which assists in optimum sighting of the flame and providing quick diagnostics of the scanner's status.

4.3.4 Configurable Flame Relays

Non-Hazardous models have two relays which can be configured in one of the following two modes:

Redundant Flame Relay Mode: Two relays are connected in series
-OR-
Independent Flame/Fault Relay Mode: Two relays are connected in parallel

4.4 Technical Specifications

4.4.1 Definitions

FLICKER – Flicker or Flicker Frequency refers to the modulation of flame intensity due micro-explosions of the fuel.

FDORT – *Flame Detector ON Response Time* – the period of time from flame intensity rising above the user adjustable threshold to flame relay contacts closed.

FDRT – *Flame Detector Response Time* – the period of time between the loss of a sensed flame and the signal indicating the absence of flame.

MFFRT – *Marginal Flame Fail Response Time* – period of time from flame intensity falling below the the user adjustable threshold to the flame relay contacts open.



EASI - *Electronically Assisted Sight Indicator* – refers to the red LED (Light Emitting Diode) located on the back of the Non-hazardous Area Models, that flashes to indicate flame intensity. When no flame is present the LED blinks approximately 1 time per second. When a flame is present the LED's blink rate increases proportional to the flame intensity. At optimal sighting and scanner gain, the LED blinks at approximately 30 times per second. If the LED is on solid or off the scanner is faulted and should not be used.

DSFComm - This acronym stands for Digital Scanning Flame-detector Communications software.

GAIN – When a signal is amplified, GAIN is the ratio of the amplified signal relative to the original.

DISCRIMINATION – is the ability to distinguish between multiple flames. An example of good discrimination is when the MB scanner is able to recognize a pilot flame with other burner's main fuel flame in the background. The status of the main (background) flame does not affect the ability to detect the pilot flame (ON or OFF).

4.4.2 Specification Table

AREA CLASSIFICATION	Non-hazardous Area	Non-hazardous Area	Hazardous Area
Part Number	PN 2653-271-12	PN 2653-271-62	PN 2653-271-06
Area Classification	NEMA 4X, IP66	NEMA 4X, IP66	NEMA 4X and IP66 Class 1, Division 1, Groups B, C, & D <div>   </div> II 2 G Ex d IIC T5 and II 2 D Ex tD A21 IP66 T100 °C Ta
Input Cable	Quick Disconnect Separate Cable	Quick Disconnect Separate Cable	Individual Wires Attached 10 Ft. (3 m) Long
Weight	3.4 lb. (1.54 kg)	3.2 lb. (1.45 kg)	3.8 lb. (1.72 kg)
Mounting	1" NPT(F)	Adaptor for Fiber Optic Extension	1" NPT(F)
Purge Air ^{NOTE 1}			
Flow	5 scfm (8.5 Nm ³ /hr)	10 scfm (17 Nm ³ /hr)	5 scfm (8.5 Nm ³ /hr)
Pressure	5" w.c. (13 mbar)	13" w.c. (33 mbar)	5" w.c. (13 mbar)
EASI	Yes	Yes	No
Optics	Quartz Lens	Fiber Optic Extension	Quartz Lens
Sensor Type	Solid-State	Solid-State	Solid-State
Sensor Range	Ultraviolet Peak at 350 nm and Infrared Peak at 700 nm	Ultraviolet Peak at 350 nm and Infrared Peak at 700 nm	Ultraviolet Peak at 350 nm and Infrared Peak at 700 nm
Communication	USB/RS485: up to 127 scanners (with repeaters placed every 30 scanners) may be connected in one loop up to a distance of 4000 Ft. (1200 M).	USB/RS485: up to 127 scanners (with repeaters placed every 30 scanners) may be connected in one loop up to a distance of 4000 Ft. (1200 M).	USB/RS485: up to 127 scanners (with repeaters placed every 30 scanners) may be connected in one loop up to a distance of 4000 Ft. (1200 M).
Temperature	-30°C to 70°C	-30°C to 70°C	-30°C to 70°C

AREA CLASSIFICATION	Non-hazardous Area	Non-hazardous Area	Hazardous Area
Part Number	PN 2653-271-12	PN 2653-271-62	PN 2653-271-06
Humidity	0 to 100% Relative Humidity, Condensing	0 to 100% Relative Humidity, Condensing	0 to 100% Relative Humidity, Condensing
Input Power ^{NOTE 2}	24 ± 4 VDC Filtered 3.4 VA (140 mA)	24 ± 4 VDC Filtered 3.4 VA (140 mA)	24 ± 4 VDC Filtered 3.4 VA (140 mA)
Relay Contacts ^{NOTE 3}	Normally Open Voltage Free Contacts (i.e. contacts close when flame is detected) 0.5 A @ 125 VAC Resistive Load 1.0 A @ 24 VDC Resistive Load	Normally Open Voltage Free Contacts (i.e. contacts close when flame is detected) 0.5 A @ 125 VAC Resistive Load 1.0 A @ 24 VDC Resistive Load	Normally Open Voltage Free Contacts (i.e. contacts close when flame is detected) 0.5 A @ 125 VAC Resistive Load 1.0 A @ 24 VDC Resistive Load
Signal Output ^{NOTES 4,5}	Output #1, 4–20 mA, Flame Signal Output # 2, 4-20 mA, Map Auto Gain, Raw Signal, or Internal Scanner Temperature Maximum Current Loop Resistance = 750 ohms	Output #1, 4–20 mA, Flame Signal Output # 2, 4-20 mA, Map Auto Gain, Raw Signal, or Internal Scanner Temperature Maximum Current Loop Resistance = 750 ohms	Output #1, 4–20 mA, Flame Signal Maximum Current Loop Resistance = 750 ohms
FDORT (FLAME ON)	Flame ON: Configurable from 1-4 seconds in 1 second increments	Flame ON: Configurable from 1-4 seconds in 1 second increments	Flame ON: Configurable from 1-4 seconds in 1 second increments
FDRT (FLAME OFF)	Flame OFF Configurable from 1-4 seconds in 1 second increments	Flame OFF: Configurable from 1-4 seconds in 1 second increments	Flame OFF: Configurable from 1-4 seconds in 1 second increments
MFRRT	Marginal Flame OFF Configurable from 1-6 seconds in 1 second increments	Marginal Flame OFF: Configurable from 1-6 seconds in 1 second increments	Marginal Flame OFF: Configurable from 1-6 seconds in 1 second increments
Safety Integrity Level (SIL3) Data	$PFD_{avg} = 2.64 \times 10^{-5}$ $\lambda S = 9.05 \times 10^{-7}$ $\lambda DD = 2.81 \times 10^{-7}$ $\lambda DU = 5.51 \times 10^{-9}$ SFF = 99.5% Proof Test Interval time = 1 year ^{NOTE 6}	$PFD_{avg} = 2.64 \times 10^{-5}$ $\lambda S = 9.05 \times 10^{-7}$ $\lambda DD = 2.81 \times 10^{-7}$ $\lambda DU = 5.51 \times 10^{-9}$ SFF = 99.5% Proof Test Interval time = 1 year ^{NOTE 6}	$PFD_{avg} = 2.64 \times 10^{-5}$ $\lambda S = 9.05 \times 10^{-7}$ $\lambda DD = 2.81 \times 10^{-7}$ $\lambda DU = 5.51 \times 10^{-9}$ SFF = 99.5% Proof Test Interval time = 1 year ^{NOTE 6}

NOTES:

- Note 1** Purge air pressure is the minimum differential pressure required between the purge air supply pressure at “Y” (scanner connection) and the back pressure.
- Note 2** 24 VDC Power supply to iScan2 must not include any inductive load.
- Note 3** To achieve higher relay contact voltages, use iScan2 relay contacts to energize the coil of an interstitial relay.
- Note 4** Output for monitoring only. Not to be used to prove flame.
- Note 5** 4-20 mA outputs are calibrated at the factory to a known load. Monitoring hardware will have an impact of the current output. For accurate readings, 4-20 mA output(s) should be calibrated using a milli-ammeter between the scanner’s 4-20 mA output and the monitoring hardware. Refer to the 4-20 ma Settings section MNL-DSFCOMM for details on how to execute the calibration procedure.
- Note 6** To maintain SIL3 rating for any system in which a scanner is installed, all scanners in that system must be re-tested at an interval not to exceed one year. **SIL3 rating for the system is void if scanners are not re-tested annually.** Contact Chentronics to arrange re-test.

4.4.3 Default Configuration (Settings)

Flame Detector On Response Time (FDORT)	2 seconds nominal
Flame Detector Response Time (FDRT)	1 second nominal
Marginal Flame Failure Response Time (MFFRT)	2 seconds nominal
Gain Configuration	Manual
Gain Channel	High
Signal Gain	3.5
Flame Flicker Frequency	26 Hz
Flame Flicker Bandwidth	12 Hz
Flame Flicker Threshold	-45 dB
Mains Filter	Enabled
Rail Filter	Enabled
Solar Filter	Enabled
Flame Filter	Enabled

The following settings apply to the overall scanner and not to an individual scanner file:

Communications Address	COMM 1 ^{NOTE 1}
Active File	A
Remote File Select	Disabled
Multiple Fuels	Disabled
4 To 20 mA Gain	1 mA/dB above threshold

NOTES:

- Note 1** As part of setup in DSFCOMM scanners are assigned unique addresses.

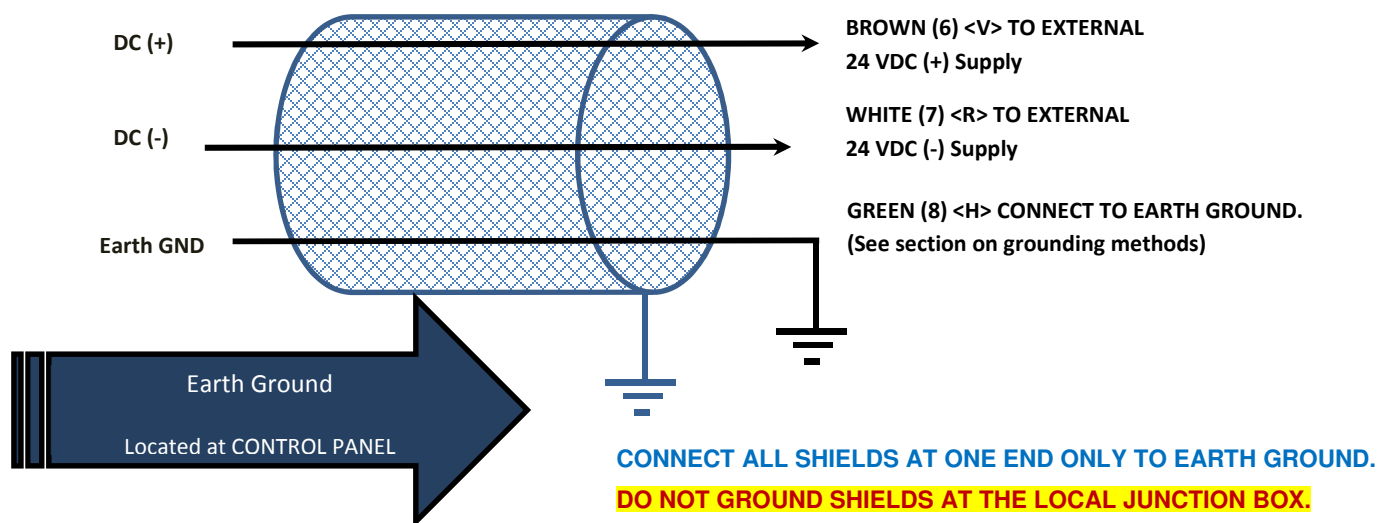
5 Wiring Instructions

All wiring shall be done in accordance with all applicable local and national codes, standards, and ordinances.

The front Non-hazardous Area models use a quick disconnect scanner cable. This cable does not require a flexible conduit if permitted by local authority.

The Hazardous Area model has a ½" NPT (F) flexible conduit connection. The scanner cable for the hazardous area model shall be installed inside a grounded flexible conduit to protect it from mechanical damage and to reduce electrical noise interference. Connections for power, Earth Ground, and Flame Relay (N.O. and Common) are required for all applications. Use of the 4-20 mA outputs, Communications, and connections are "as-required" for each application.

5.1 Shielding Single Point Ground Connection



Electrical noise interference from high voltage/energy ignition sources can adversely affect the operation of the flame scanner. To minimize the possibility of electrical noise interfering with the operation of the flame scanner:

- Do **not** install ignition wires in the same conduit as the scanner wires.
- Ignition Systems shall have a dedicated return.
- Do **not** mount an ignition transformer in the same enclosure where the flame scanner wiring is terminated.
- Ignition cables shall be routed a minimum of 12" (305mm) from scanner wiring at all times.
- DSF-2010 complies with IEC 61000-4-3 (RF Radiated Immunity). However if a strong enough RF source, such as a portable radio, is within 3 m of the DSF-2010 or its cable operation may be adversely affected. For safe operation avoid introducing RF energy within 10' (3m) of the device to avoid false Flame On/Off indication.

5.2 Non-hazardous Area Model (14 Wire) Installations

The wires on the Non-hazardous Area models are contained in overall shielded quick disconnect cable. Wires are #20 AWG; all wires are stripped and tinned. Use shielded twisted pair cables as noted in the wiring diagram for all functions from the quick connect cable to the instrument panel. Connect all the shields at one end only to earth ground at the control panel. Do not ground the shields at the local junction boxes.

NOTE: Do not ground the shields at the local junction boxes.

Note 1 If more than one 24 VDC supply is required, the 24 VDC returns labeled as “DC (-)” shall be connected to each other. The 24 VDC return line shall be isolated from earth ground.

Note 2 If more than one 24 VDC supply is required, the 24 VDC source connections labeled as “DC (+)” shall be isolated from all other power supplies. If switching power supplies are used the supplies may be connected via a wired OR diode configuration.

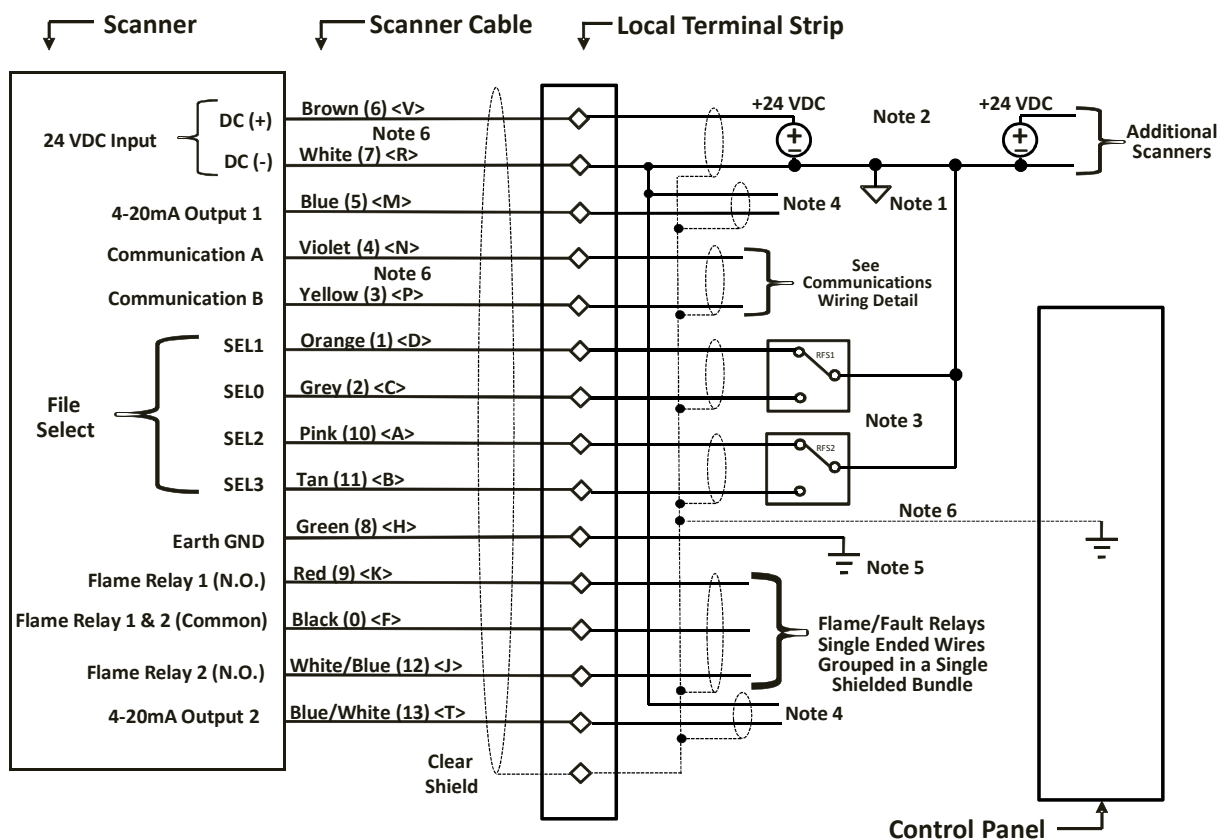
NOTE: the BLOCKING DIODE must be rated for a minimum of 50 volts and 10 Amps.

Note 3 The 24 VDC return, “DC (-)”, shall be used as the low side of the File Select relays.

Note 4 The 24 VDC return, “DC (-)”, is the return for the 4–20 mA output loop(s). Input must be isolated type. Maximum current loop resistance is 750 ohms.

Note 5 Connect the scanner Earth GND (Green, 8, <H>) to EARTH GROUND. A short BRAIDED CONDUCTOR (alternately a short AWG #12 wire) is recommended.

Note 6 All shields are tied to Earth Ground in the Control Panel only.



5.3 Hazardous Area Model (10 Wire) Installations

The Hazardous Area Model has black wires and is numbered as shown. Wires are #24 AWG; all wires are stripped and tinned. Use shielded twisted pair cables as noted in the wiring diagram for all functions from the scanner to the instrument panel. Connect all the shields at one end only to earth ground at the control panel. Do not ground the shields at the local junction boxes.

Note 1 If more than one 24 VDC supply is required, the 24 VDC returns labeled as “DC (-)” shall be connected to each other. The 24 VDC return line shall be isolated from earth ground.

Note 2 If more than one 24 VDC supply is required, the 24 VDC source connections labeled as “DC (+)” shall be isolated from all other power supplies. If switching power supplies are used the supplies may be connected via a wired OR diode configuration.

NOTE: the BLOCKING DIODE must be rated for a minimum of 50 volts and 10 Amps.

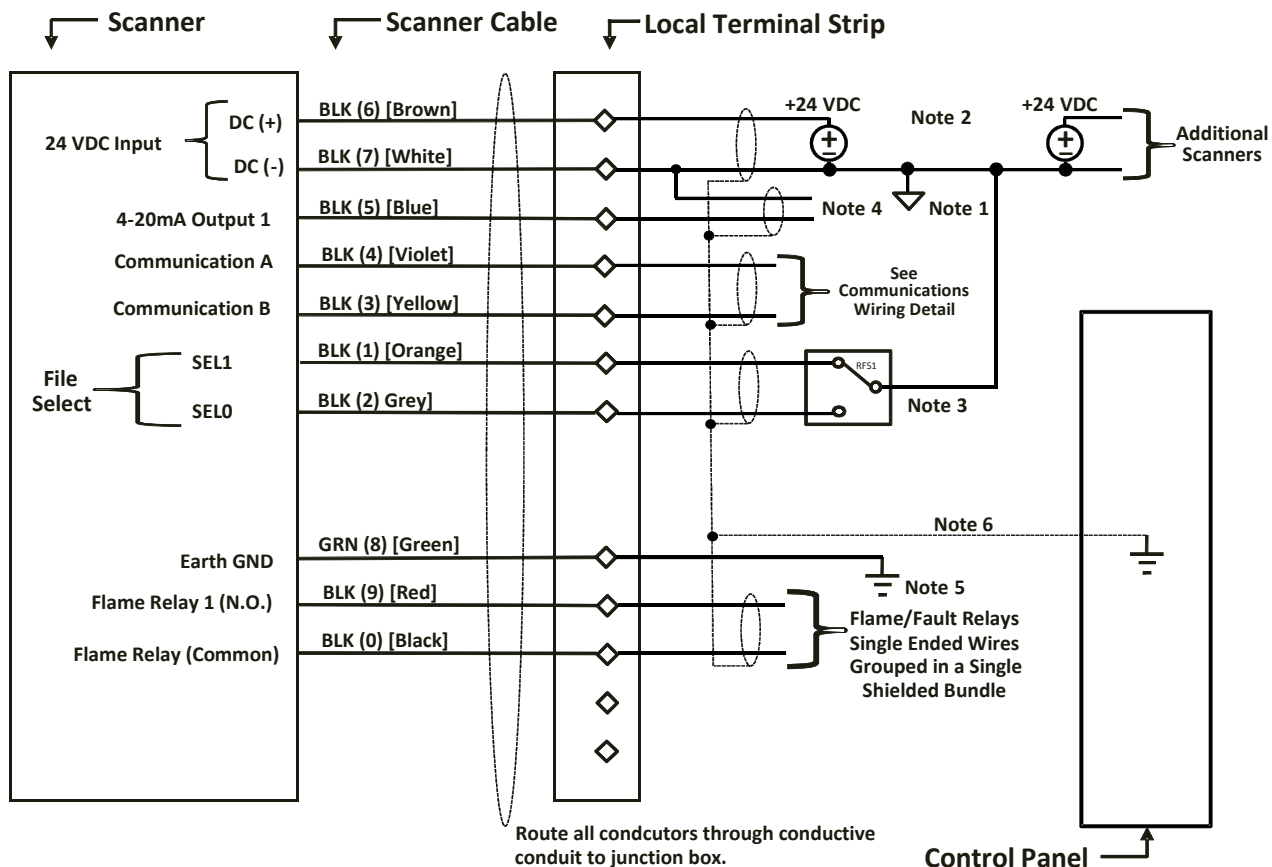
Note 3 The 24 VDC return, “DC (-)”, shall be used as the low side of the File Select relays.

Note 4 The 24 VDC return, “DC (-)”, is the return for the 4–20 mA output loop(s). Input must be isolated type. Maximum current loop resistance is 750 ohms.

Note 5 Connect the scanner Earth GND (GRN (8)) to EARTH GROUND. A short BRAIDED CONDUCTOR (alternately a short AWG #12 wire) is recommended.

Note 6 All shields are tied to Earth Ground in the Control Panel only.

Note 7 All conductors are black except Earth GND (GRN (8)) which is green/yellow. Older models have a wraparound cloth label with the wire numbers. Recent models have a sleeve of color coded heat shrink at both ends of the conductor with the wire number printed on it. The corresponding wire number/color is shown in the diagram below, for example BLK (6) [Brown].



5.4 Communication Wiring Detail

Communication with the iScan2 is RS-485 via a USB to RS-485 Converter (PN 3425-057-01). RS-485 is a differential multi-drop network. For iScan2, the network is a half-duplex, 2-wire, echo-off configuration operating at 19200 KBAUD. The maximum allowable number of nodes on a given section of the network is 32 including the USB to RS-485 converter and any repeaters. If more than 32 loads are connected (1 USB converter, 1 RS-485 repeater and 30 iScan2s) then an RS-485 repeater is required between sections to boost the signal. The repeater must be compatible with the EIA-485 standard, must have input to output DC isolation, must operate on 24VDC over the operating temperature range of -30°C to +70°C and must have agency approvals sufficient to meet the area classification. B&B Electronics 485 repeater model 485OPDRI-PH meets these requirements. Additional repeaters may be added to extend the network to 127 scanners.

NOTE: When calculating 32 loads, include the USB to RS-485 converter and the number of repeaters in a section). For the extended sections, up to 30 iScan2s may be connected. The maximum length of any given section is 4000 FT (1200 M).

If using the B&B Electronics 485 repeater model mentioned above, configure the DIP switches on ports as follows:

1	2	3	4	5	6	7	8
ON	ON	ON	ON	OFF	OFF	ON	OFF

Note 1: In this configuration TDA and RDA are connected as TDB and RDB so either TD or RD terminals will work.

Note 2: The green screw terminal on the case is for earth ground, not the GND terminals.

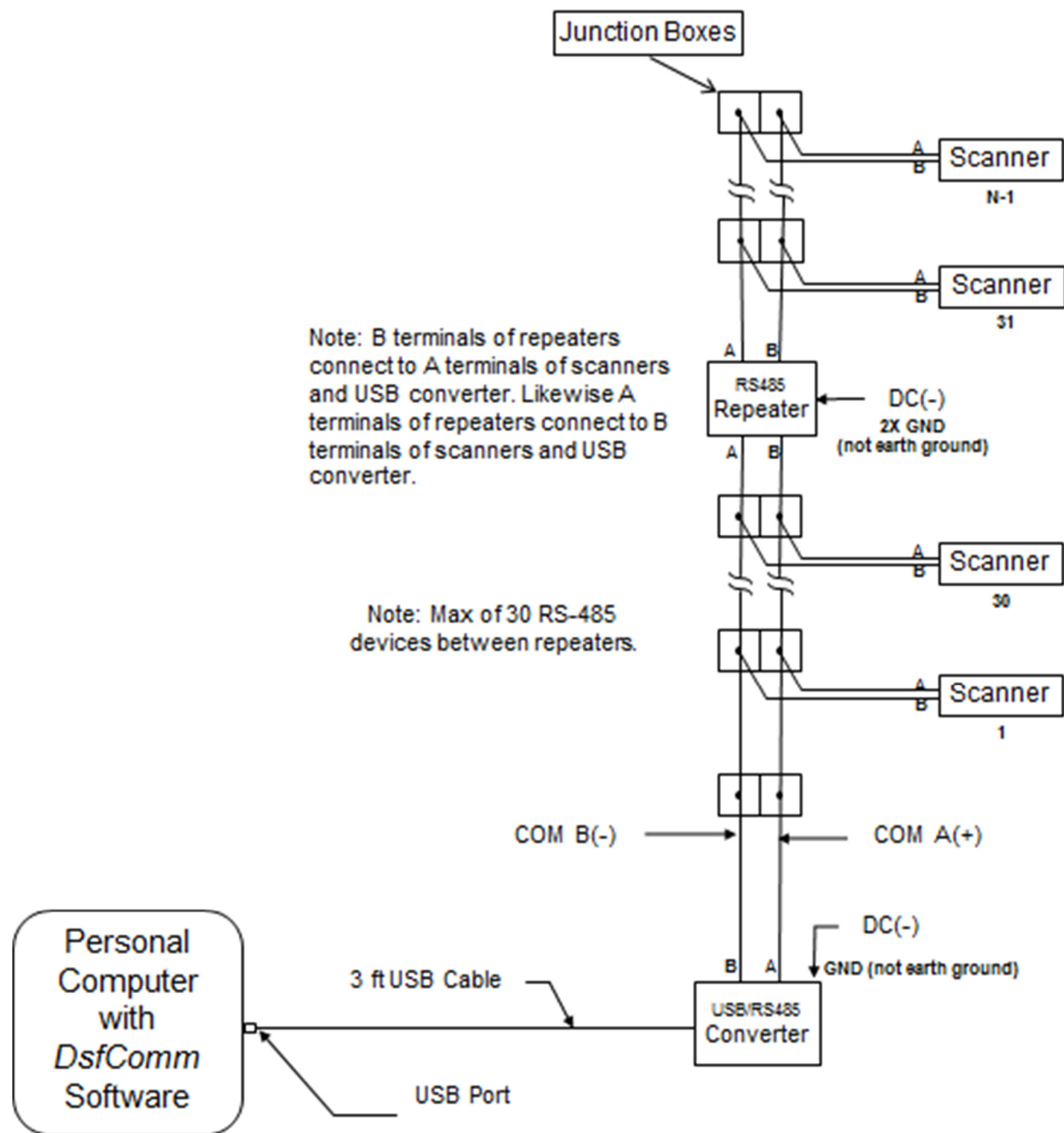
Since there is no dedicated signal reference, the 24 VDC return labeled as DC (-) is used. The USB to RS-485 and the Repeaters must have their GND terminals connected to the DC (-) as well. Failure to provide the signal reference may result in communication errors and potentially damage the iScan2.

The recommended topology is “Daisy Chain” as shown in the wiring diagrams below. A split or Y configuration is acceptable. **NO OTHER CONFIGURATION IS ACCEPTABLE.** Please refer to the EIA-485 specification for further information on RS-485 networks.

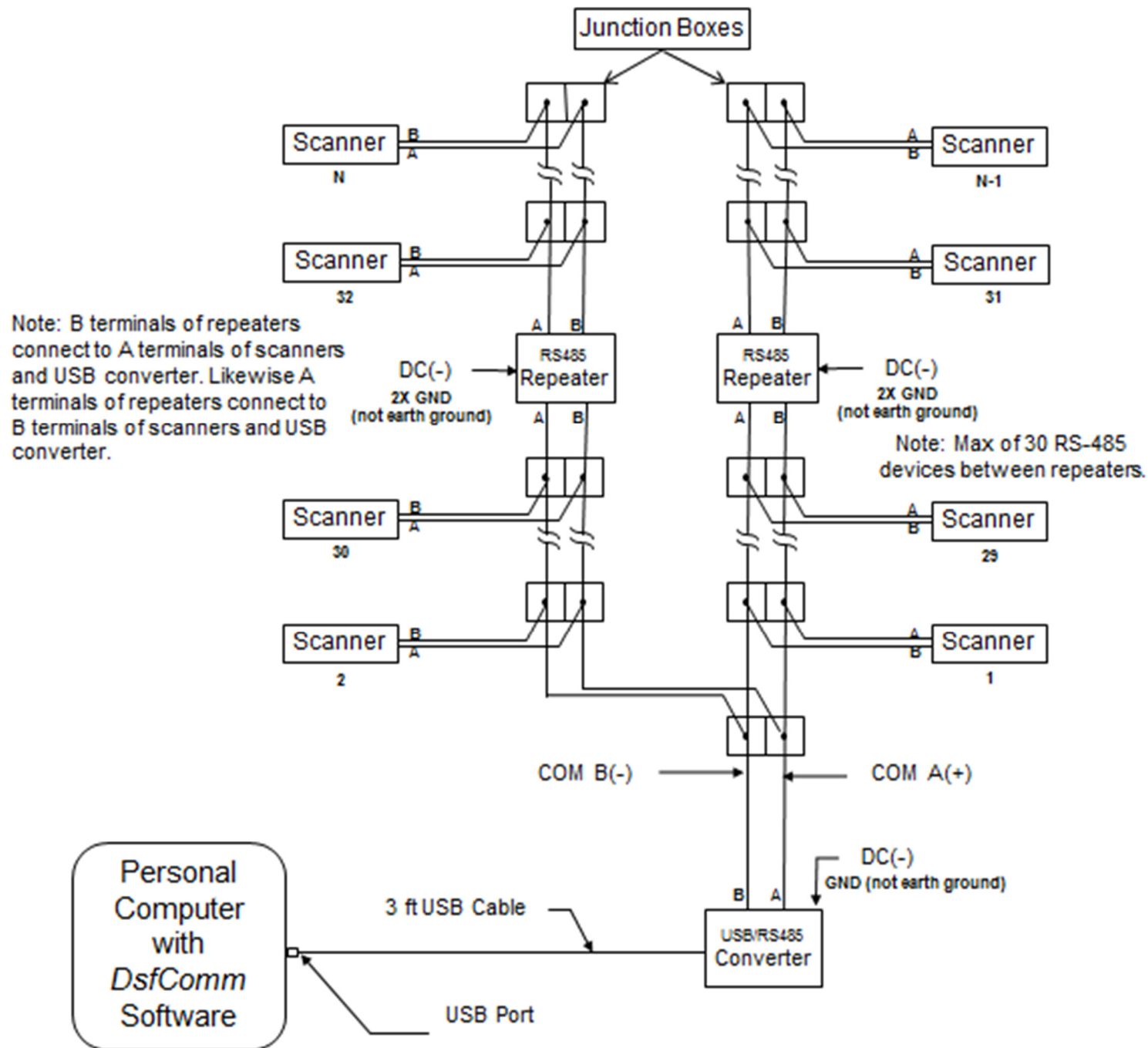
COMMUNICATION WIRING SUMMARY:

- Wiring must be twisted pair shielded cable. Ground the shield only at the control panel to prevent ground loops.
- Use only “Daisy Chain” or “Y” configurations. Connect all of the “Com A” wires together. Connect all of the “Com B” wires together. Make sure that the “Com A” and “Com B” wires are connected to the correct terminals on the converter.
- An RS-485 repeater is required for every 30 scanners or 4000 ft (1200 m) of length for a maximum of 127 scanners in a network.
- Ensure the DC (-) of all scanners are tied together as a reference for RS-485 communications. The GND terminal of the USB to RS-485 converter and the repeaters must also be connected to the DC (-) of the scanners.

5.4.1 "Daisy Chain" Configuration



5.4.2 Split or “Y” Configuration



5.5 Remote File Select Wiring Configuration

The Remote File Select feature provides a means for automatically selecting one the configuration files resident within the scanner. For the non-hazardous models the selection of one of four configuration files is available while for the hazardous area models the selection of one of two configuration files is available.

Non-hazardous Area Scanner “Enable 4 Inputs” - File Select Relay Logic

File Select	SEL 3	SEL 2	SEL 1	SEL 0
A	Energized	De-energized	Energized	De-energized
B	De-energized	Energized	Energized	De-energized
C	De-energized	Energized	De-energized	Energized
D	Energized	De-energized	De-energized	Energized

Note: Not all configurations are legal for the non-hazardous area models. Illegal configuration will cause iScan2 to go into a fault condition. Refer to Remote File Select (RFS) section of MNL-DsfComm for instructions on setting up and using the Remote File Select feature.

Non-hazardous Area “Enable 2 Inputs” and Hazardous Area - File Select Relay Logic

File Select	SEL 1	SEL 0
B	Energized	De-energized
C	De-energized	Energized

Note: Connect iScan2 SEL (File Select) wires to the high side of the File Select relays. Connect the low side of the File Select relays to 24 VDC return. Remote File Select must be enabled otherwise SEL inputs are ignored. Refer to Remote File Select (RFS) section of MNL-DsfComm for instructions on setting up and using the Remote File Select feature.

6 Non-hazardous Area Model and Hazardous Area Model Mounting

6.1 Purge Air Connections

The iScan2 flame scanners (Non-hazardous Area Model and Hazardous Area Model) have a 1" NPT (F) mounting connection. Use of a swivel mount assembly is recommended to permit proper sighting adjustment of the flame scanner. (See Section "SIGHTING THE SCANNER" for instructions).

6.2 Mounting Instructions:

- STEP 1** Remove the mounting ring and the mounting adapter from the scanner by unscrewing the mounting ring.
- STEP 2** Slip the mounting ring over the scanner mount.
- STEP 3** Thread the mounting adapter onto the scanner mount and tighten by hand only.
- STEP 4** Attach the scanner housing to the mounting adapter with the mounting ring and tighten by hand only.
- STEP 5** Avoid a sharp bend radius of scanner cable's quick disconnect. Provide strain relief if required in order to maintain proper seating for the quick disconnect connectors.

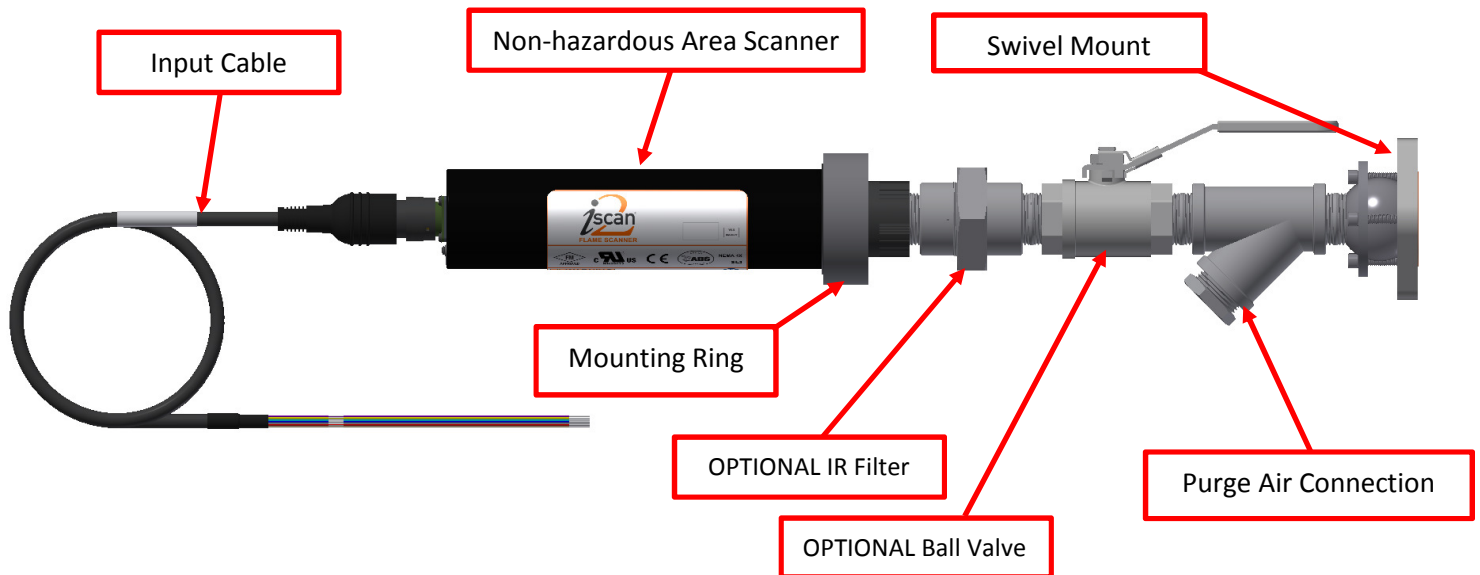
NOTE: *The mounting ring must be tightened and removed by hand only to allow for ease of removal and to prevent mechanical damage.*

- STEP 6** For applications requiring **CE** marking, specifically for EN298:2012, the input cable (PN 2649-026) must have ferrite added to meet CISPR 14-1. The ferrite must be installed within 6" (15 cm) of the scanner body. The cable must pass through the ferrite 3 times as shown in the picture below.

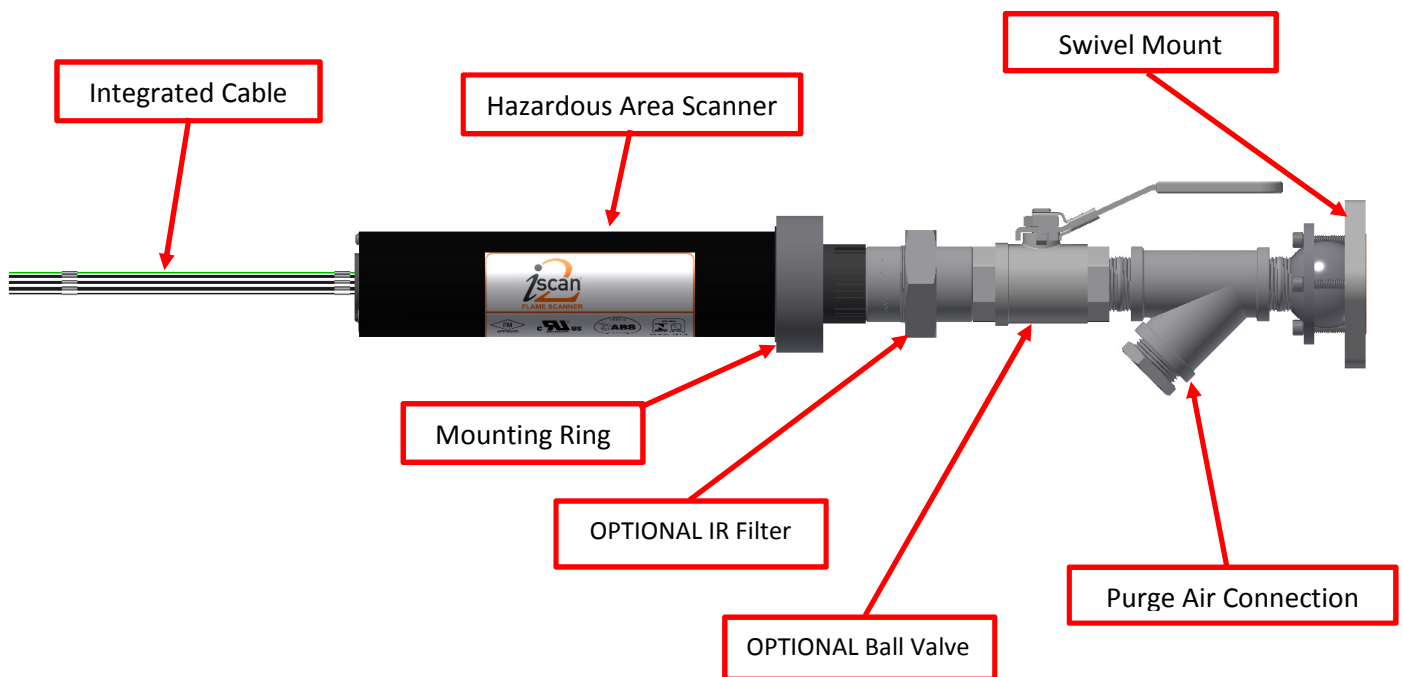


Ferrite is manufactured by Fair-Rite. Part number is 0431177081.

6.3 Non-hazardous Area Model (PN 2653-271-12) General Arrangement



6.4 Hazardous Area Model (PN 2653-271-06) General Arrangement



6.5 Fiber Optic Mounting

- A job specific installation drawing (refer to job bill of material) is generally supplied separate from this manual. Use this drawing with the following general instructions for installation.
- The Fiber Optic Model is shipped in two parts — the scanner housing and the fiber optic extension assembly. Each part has a protective cover. Keep these protective covers in place whenever possible. Once installation is complete, save the protective covers for use when performing maintenance on the scanner assembly.
- The fiber optic cable assembly shall be removed from the outer carrier of the fiber optic extension assembly before installing the outer carrier into the burner. Refer to detailed instructions below.



The lens inside the mounting block at the end of the fiber optic extension assembly can be damaged from welding spatter. When welding is to be done in the near vicinity, protect the lens by either removing the fiber optic cable assembly from the outer carrier of the fiber optic extension assembly or by putting a temporary protective cover over the opening in the mounting block. Damage to the lens can prevent the equipment from properly detecting the flame.

6.5.1 Fiber Optic Options

The fiber optic mounting options include high and low temperature versions, as well as rigid or flexible. See the drawing for each root part number to specify lengths.

STYLE	MIN TEMP	MAX TEMP	ROOT PN
FLEXIBLE	-40 °C (-40 °F)	426 °C (800 °F)	04001100
FLEXIBLE	-40 °C (-40 °F)	1093 °C (2000 °F)	04001300
RIGID	-40 °C (-40 °F)	426 °C (800 °F)	04001200
RIGID	-40 °C (-40 °F)	1093 °C (2000 °F)	04001400

6.5.2 Fiber Optic General Arrangement

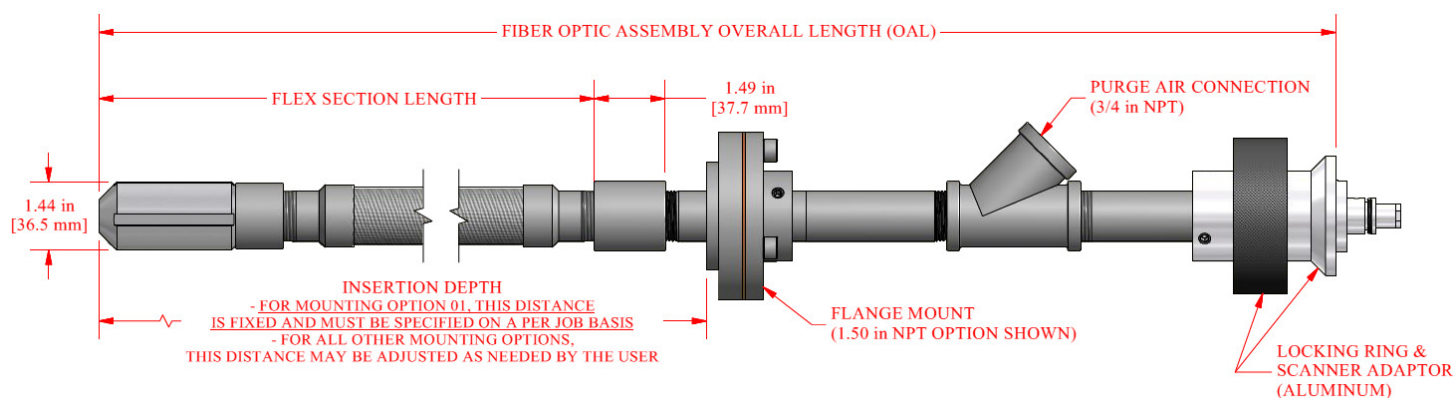
The Fiber Optic model is designed to mount in the air compartments of a tilting tangentially fired boiler or in a burner where a location cannot be found on the burner front that will allow an unobstructed view of the flame.

The Fiber Optic Model can be mounted with a FLEXIBLE or RIGID output section (see below) and consists of the Fiber Optic Scanner mounted to a flexible or rigid extension assembly. The fiber optic extension assembly has an adjustable swivel ball mount for mounting to the wind-box. The fiber optic extension assembly consists of a fiber optic cable assembly installed in an outer carrier. The fiber optic cable assembly is removable for installation and maintenance.

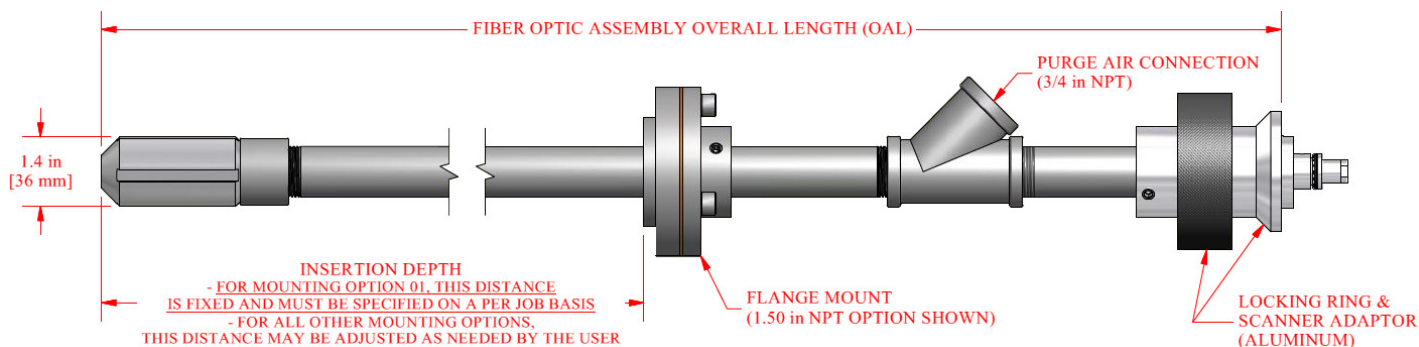
All Fiber Optic Model configurations require a continuous supply of clean/dry/purge/cooling air (refer to Technical Specification section).

6.5.2.1 Flexible General Arrangement (PN 04001100, PN 04001300)

The length of the fiber optic extension assembly is sized specifically for each application. The viewing angle is determined by lens skew or angled fiber optic tip mounting plate.



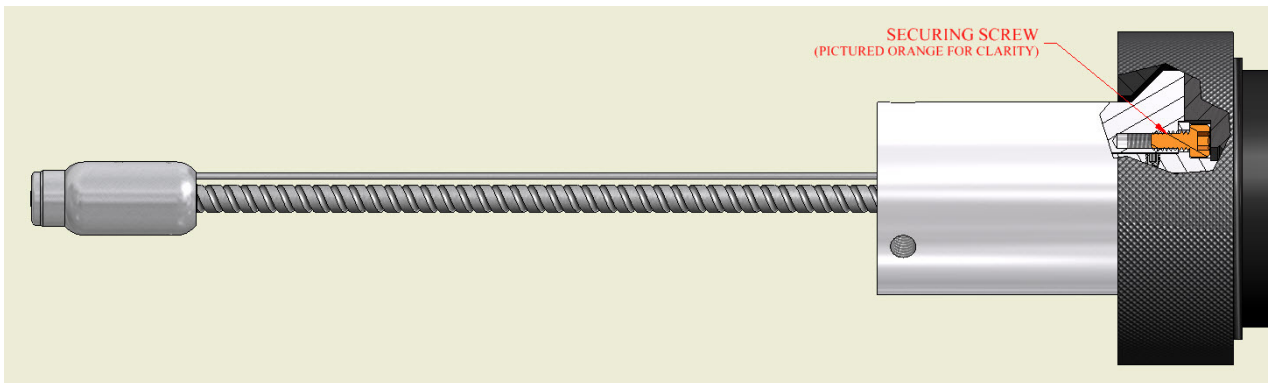
6.5.2.2 Rigid General Arrangement (PN 04001200, PN 04001400)



6.5.3 Fiber Optic Internal Cable Mounting Instructions

Step 1: Remove the protective cover from the end of the fiber optic extension assembly.

Step 2: Remove the one Securing Screw (see below) to release the fiber optic cable assembly from the outer carrier of the fiber optic extension assembly.



Step 3: Remove the fiber optic cable assembly by carefully pulling it out of the outer carrier. Replace the protective cover on the end of the fiber optic cable assembly (not on the outer carrier).

Step 4: Install the outer carrier of the fiber optic extension assembly into the burner as shown on the job specific installation drawing. Weld the mounting block to the appropriate location and mount the swivel ball mount on the wind-box front plate.

Step 5: Reinstall the fiber optic cable assembly by carefully pushing it into the outer carrier. Remove the protective cover and secure the fiber optic cable assembly in place with the securing screw.

Step 6: Remove the protective cover from the scanner housing and install the scanner housing onto the fiber optic extension assembly by carefully pushing them together. Secure by screwing the mounting ring to the scanner housing.

NOTE: Use a clean lint free cloth to clean the surface before mating parts of the scanner housing and fiber optic extension assembly.

Step 7: Connect a purge/cooling air source to the connection on the fiber optic extension assembly.

7 Sighting the Scanner



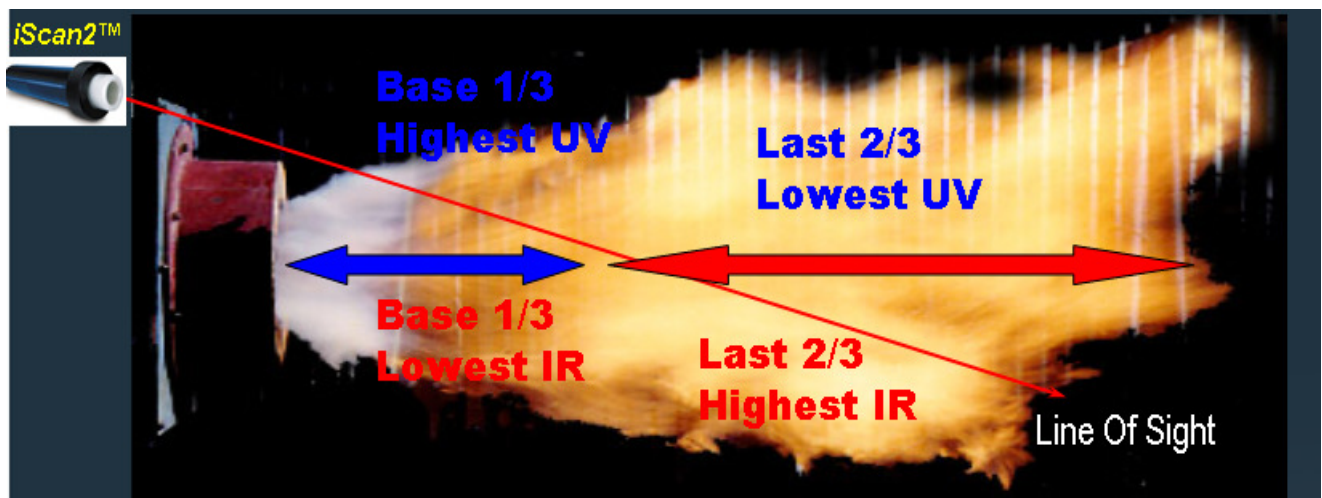
EXPLOSION HAZARD

Failure to sight the scanner properly can cause an explosion. This Equipment must be installed and serviced by qualified personnel in accordance with applicable local and national codes, standards, and ordinances.

Proper sighting of the flame is required for proper flame scanner detection and discrimination. The view through the sighting port should be full flame, as illustrated below.



7.1 Flame Line of Sight



7.2 Sighting Non-hazardous Area Models

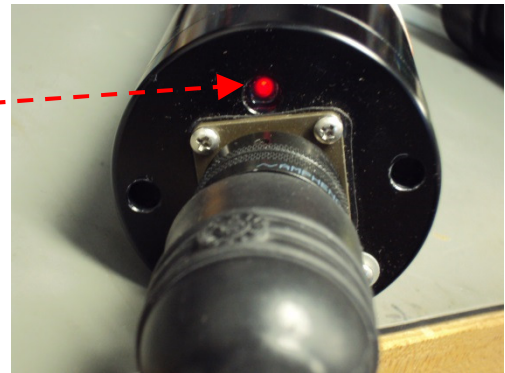
Move the scanner while observing the EASI on the back of the scanner. The red LED blinks 1 time per second when no flame is detected. The LED's blink rate increases proportional to the intensity of the flame detection. For optimal sighting, the LED will blink at approximately 30 times per second.



DO NOT use the scanner if the LED is on solid or off.

If the LED is on solid or off, the scanner is faulted and will not work properly.

Best flame view is indicated when the EASI (LED) is blinking the fastest.



7.3 Sighting Hazardous Area Models

Hazardous area models require measurement of flame strength during the sighting process. Use an ammeter to observe the signal from the 4-20 mA output. This can be observed as current flow between pin 5 to the DC (-) return. Adjust the line of sight to achieve the highest 4-20 mA reading. Ideal aiming provides the highest signal (dB) above the threshold (-45) and the lowest gain value.

8 Maintenance

The scanner is a rugged, high temperature device, and contains no moving parts.



NEVER open the scanner housing. Doing so may damage the scanner and will void the warranty.

8.1 Maintenance for Non-Fiber Optic Models

The only maintenance that may be required for the Non-hazardous Area Model and Hazardous Area Model is periodic cleaning of the outside of the quartz glass lens. To clean the lens:

Step 1: Unscrew the mounting ring and remove the scanner from the scanner mount

Step 2: Clean the lens with a clean lint free cloth

Step 3: Reinstall the lens

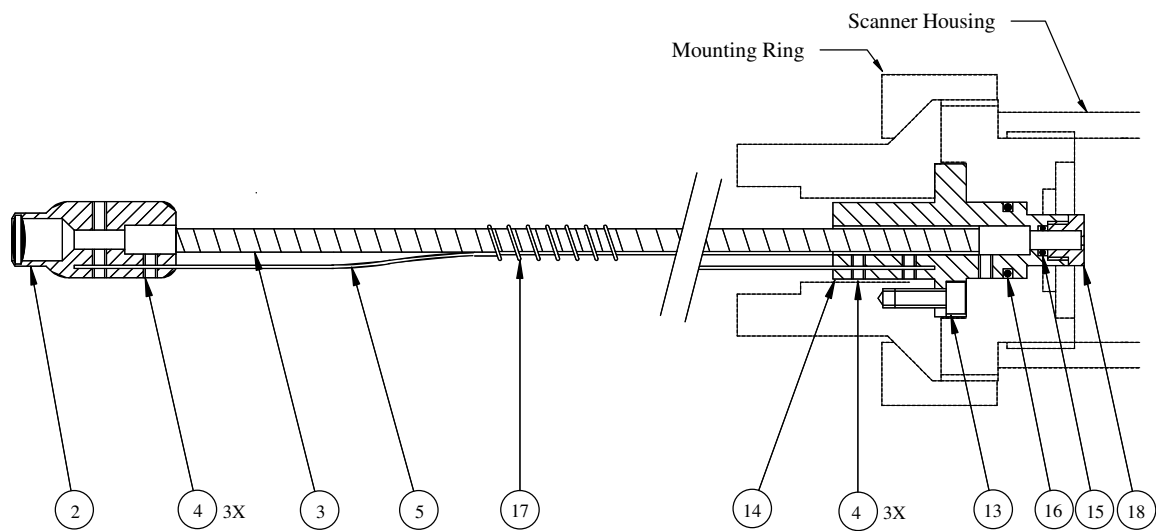


Do not remove the lens from the scanner housing. Doing so may damage to scanner and will void the warranty.

8.2 Maintenance for Fiber Optic Models

8.2.1 Fiber Optic Internal Cable General Arrangement

For the fiber optic model, the only maintenance that may be required is repair of the fiber optic cable assembly.



- | | | | |
|----|---------------------|----|-----------------|
| 2 | Lens Mount Assembly | 14 | Scanner Adapter |
| 3 | Fiber Optic Cable | 15 | O-ring |
| 4 | Socket Set Screws | 16 | O-ring |
| 5 | Guide Wire | 17 | Binding Springs |
| 13 | Securing Screw | 18 | Orifice |

8.2.2 Removal of Fiber Optic Internal Cable Assembly



The fiber optic cable assembly will be hot when first removed. To prevent risk of burns, use protective gloves and eye protection to remove and handle the fiber optic cable assembly until it has cooled.

Step 1: Keep the purge/cooling air on if replacement is being made while the boiler is operating.



A burst of Hot purge/cooling air may blow back.

Step 2: Remove the scanner housing from the fiber optic extension assembly by unscrewing the knurled mounting ring on the scanner and carefully pulling the scanner housing away from the fiber optic extension assembly.



The fiber optic cable assembly may be hot.

Step 3: Use the protective cover that was shipped with the scanner to protect the open end of the scanner housing until the scanner housing is reinstalled onto the fiber optic extension assembly.

Step 4: Remove the one (1) Securing Screw (Item 13) releasing the fiber optic cable assembly from the outer carrier of the fiber optic extension assembly.

Step 5: Remove the fiber optic cable assembly by carefully pulling it out of the outer carrier.



The lens mount assembly at the end of the cable will be extremely hot and will take longer to cool than the fiber optic cable. Slowing removing the lens mount assembly will aid in the cooling of the cable assembly.

8.2.3 Replacement of the Fiber Optic Internal Cable Assembly

To ensure proper mating of parts, make sure that the scanner housing and the fiber optic assembly are clean before assembling.

Step 1: Keep the purge/cooling air on if replacement is being made while the boiler is operating.

Step 2: Reinstall the fiber optic cable assembly by carefully pushing it into the outer carrier and securing it in place with the Securing Screw (Item 13).

NOTE: Remove the protective cover before the securing screw is installed.

Step 3: Use the protective cover that was supplied with the fiber optic extension assembly to protect the scanner adapter until the scanner housing is reinstalled onto the fiber optic extension assembly.

Step 4: Remove the protective covers and install the scanner housing onto the fiber optic extension assembly by carefully pushing them together. Secure by screwing the mounting ring to the scanner housing.