

Part 1 General

1.1 Related Work

- .1 Wiring: Section 26 05 21, Wires and Cables 0-1000V.
- .2 Conduits: Section 26 05 34, Conduits, Conduit Fastenings and Conduit Fittings.

1.2 References

- .1 CAN/ULC-S524-2001, Installation of Fire Alarm Systems.
- .2 ULC-S525-1999, Audible Signal Appliances for Fire Alarm.
- .3 CAN/ULC-S527-1999, Control Units, Fire Alarm.
- .4 CAN/ULC-S528-1991, Manual Pull Stations.
- .5 CAN/ULC-S529-2002, Smoke Detectors, Fire Alarm.
- .6 CAN/ULC-S530-M1991, Heat Actuated Fire Detectors, Fire Alarm.
- .7 CAN/ULC-S536-M97, Inspection and Testing of Fire Alarm Systems.
- .8 CAN/ULC-S537-2004, Verification of Fire Alarm Systems.
- .9 National Fire Alarm Code, NFPA 72-2002.

1.3 System Description

- .1 Fully supervised, microprocessor-based, single stage, fire alarm system, utilizing digital techniques for data control, and multiplexing techniques for data transmission.
- .2 System to carry out fire alarm and protection functions; including receiving alarm signals; initiating general alarm; supervising components and wiring; actuating annunciators and auxiliary functions; initiating trouble signals and signalling to fire department.
- .3 Sequence of Operation:
 - .1 Activation of any heat detector, smoke detector (standard alarm level) or manual pull station shall constitute general alarm condition and both components of horn/strobes shall operate.
- .4 Zoned, non-coded single stage.
- .5 Modular in design to allow for future expansion.

- .6 Operation of system shall not require personnel with special computer skills.
- .7 System to include:
 - .1 Central Control Unit in separate enclosure with power supply, stand-by batteries, central processor with microprocessor and logic interface, main system memory, input-output interfaces for alarm receiving, annunciation/display, and program control/signalling.
 - .2 Power supplies.
 - .3 Initiating/input circuits.
 - .4 Output circuits.
 - .5 Auxiliary circuits.
 - .6 Wiring.
 - .7 Manual and automatic initiating devices.
 - .8 Audible/strobe signalling devices.
 - .9 End-of-line resistors.
 - .10 Capable of disconnecting auxiliary relays (fan shutdown, door holder, etc.) for fire alarm testing and drills. This function to activate "Trouble Signal".
 - .11 Local and remote annunciator displays.
 - .12 Printer Event log memory chip.
 - .13 Historic time/date event recorder.

1.4 Requirements of Regulatory Agencies

- .1 System:
 - .1 Subject to Manitoba Fire Commissioner (FC) approval.
 - .2 Subject to FC inspection for final acceptance.
- .2 System components: listed by ULC and comply with applicable provisions of National Building Code and Local/Provincial Building Code, and meet requirements of local authority having jurisdiction.

1.5 Shop Drawings

- .1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Include:
 - .1 Detail assembly and internal wiring diagrams for control units.
 - .2 Overall system riser wiring diagrams identifying control equipment, initiating zones and signaling circuits; identifying terminations, terminal numbers, conductors and raceways.
 - .3 Details for devices.

- .4 Details and performance specifications for control, annunciation and peripherals with item by item cross reference to specification for compliance.
- .5 Step-by-step operating sequence, cross central control unit referenced to logic flow diagram.
- .6 Wording for device identification for Central Control Unit Annunciator Display.
- .7 Contract Administrator will provide electronic copy of floor plans at no charge.

1.6 Operation and Maintenance Data

- .1 Provide operation and maintenance data for fire alarm system for incorporation into manual. Contractor to submit four (4) copies of O&M manuals to City upon completion of the project.
- .2 Include:
 - .1 Instructions for complete fire alarm system to permit effective operation and maintenance.
 - .2 Technical data - illustrated parts lists with parts catalogue numbers.
 - .3 Copy of approved shop drawings with corrections completed and marks removed except review stamps.
 - .4 Fire alarm manufacturer's drawings with device designations.
 - .5 List of recommended spare parts for system.
 - .6 Certificate of Verification from fire alarm system manufacturer's agent and Authority Having Jurisdiction.

1.7 Maintenance

- .1 Inspection tests to conform to CAN/ULC-S536. Submit inspection report to Contract Administrator.
- .2 Provide individual price with bid for temporary program changes during construction period, to include zone labels, control functions, system operation.

1.8 Spare Parts

- .1 Provide 3 spare control fuses for each size supplied.
- .2 Provide 1 detector for each type supplied (smoke, heat).
- .3 Provide 1 pull station.
- .4 Provide 1 horn/strobe of each type.
- .5 Provide 1 End of Line Resistor.

Part 2 PART 2 - PRODUCT

2.1 Materials

- .1 Equipment and devices: ULC listed and labelled and supplied by single manufacturer.
- .2 Power supply: to CAN/ULC-S524.
- .3 Audible signal devices: to ULC-S524.
- .4 Control unit: to CAN/ULC-S527.
- .5 Manual pull stations: to CAN/ULC-S528.
- .6 Thermal detectors: to CAN/ULC-S530.
- .7 Smoke detectors: to CAN/ULC-S529.
- .8 Visual alarms to CAN/ULC-S526.

2.2 System Operation: Single Stage - Signals Only

- .1 Actuation of any alarm initiating device to:
 - .1 Cause electronic latch to lock-in alarm state at central control unit.
 - .2 Indicate zone and initiating device of alarm at central control unit, remote annunciator and graphic display.
 - .3 Cause audible signalling devices to sound continuously throughout building and at central control unit.
 - .4 Transmit trouble and alarm signal to fire department via central station.
 - .5 Cause air conditioning and ventilation fans to shut down or to function to provide required control of smoke movement.
- .2 Acknowledging alarm: indicated at central control unit.
- .3 Possible to silence signals by "alarm silence" switch at control unit, after 60 s period of operation.
- .4 Subsequent alarm, received after previous alarm has been silenced, to re-activate signals.
- .5 Actuation of supervisory devices to:
 - .1 Cause electronic latch to lock-in supervisory state at central control unit.
 - .2 Indicate respective supervisory zone and initiating device at central control unit and at remote annunciators.
 - .3 Cause audible signal at central control unit to sound.
 - .4 Activate common supervisory sequence.

- .6 Resetting alarm and supervisory device not to return system indications/functions back to normal until control unit has been reset.
- .7 Trouble on system to:
 - .1 Indicate circuit in trouble at central control unit.
 - .2 Activate "system trouble" indication, buzzer and common trouble sequence. Acknowledging trouble condition to silence audible indication; whereas visual indication to remain until trouble is cleared and system is back to normal.
 - .3 Initiate "Trouble" signal to Monitoring Station.
- .8 Trouble on system: suppressed during course of alarm.
- .9 Trouble condition on any circuit in system not to initiate alarm conditions.
- .10 Class B wiring.

2.3 Control Panel

- .1 Central control unit (CCU).
 - .1 Features specified are minimum requirements for microprocessor-based system with digital data control and digital multiplexing techniques for data transmission.
 - .2 Minimum capacity of 94 intelligent detectors and 99 monitor/control modules.
 - .3 System to provide for priority reporting levels, with fire alarm points and pre-alarm assigned highest priority, supervisory and monitoring lower priority, and third priority for troubles. Possible to assign control priorities to control points in system to guarantee operation or allow emergency override as required.
 - .4 Integral power supply, battery charger and standby batteries.
 - .5 Basic life safety software: retained in non volatile Erasable Programmable Read-Only-Memory (EPROM). Extra memory chips: easily field-installed. Random-Access-Memory (RAM) chips in panel to facilitate password-protected field editing of simple software functions (e.g. zone labels, priorities) and changing of system operation software.
 - .6 Circuitry to continuously monitor communications and data processing cycles of microprocessor. Upon failure, audible and visual trouble indication to activate.
 - .7 Support up to 4 RS-232-C I/O ports. CCU output: parallel ASCII with adjustable baud rates to allow interface of any commercially available printer, terminal or PC.
 - .8 Equipped with software routines to provide Event-Initiated-Programs (EIP); change in status of one or more monitor points, may be programmed to operate any or all of system's control points.

- .9 Software and hardware to maintain time of day, day of week, day of month, month and year.
- .10 Software to operate variable sensitivity addressable smoke detectors and annunciate their status and sensitivity settings at control panel.
- .11 Replacement of initiating/signalling devices shall not require additional programming or external programming devices.
- .12 Fire Alarm Control Panel and all components to be Year 2000 compliant.
- .13 Approved Product: Notifier NFS-320 or Simplex equal.

2.4 Power Supplies

- .1 120 V, 60 Hz as primary source of power for system.
- .2 Voltage regulated, current limited distributed system power.
- .3 Primary power failure or power loss (less than 102 V) will activate common trouble sequence.
- .4 Interface with battery charger and battery to provide uninterruptible transfer of power to standby source during primary power failure or loss. Battery power supply to provide 30 minutes of alarms after 24 hour power failure.
- .5 During normal operating conditions fault in battery charging circuit, short or open in battery leads to activate common trouble sequence and standby power trouble indicator.
- .6 Standby batteries: sealed, maintenance free, 10 year long life.
- .7 Continuous supervision of wiring for external initiating and alarm circuits to be maintained during power failure.

2.5 Initiating/ Input Circuit

- .1 Receiving circuits for alarm initiating devices such as manual pull stations, smoke detectors, heat detectors, sprinkler flow and tamper switches wired in DCLB configuration to central control unit.
- .2 Alarm receiving circuits (active and spare): compatible with smoke detectors and open contact devices.
- .3 Actuation of alarm initiating device: cause system to operate as specified in "System Operation".
- .4 Receiving circuits for supervisory, N/O devices. Devices: wired in DCLB configuration to central control unit.

- .5 Actuation of supervisory initiating device: cause system to operate as specified in "System Operation".
- .6 The loading of device loops shall be based on approximately 80% load. Provide additional loops to comply with this loading.

2.6 Alarm Output Circuits

- .1 Alarm output circuit: connected to signals, wired in class B configuration to central control unit.
 - .1 Signal circuits' operation to follow system programming; capable of sounding horns and activating strobes separately and continuously. Each signal circuit: rated at 2.5 A, 24 VDC; fuse-protected from overloading/overcurrent.
 - .2 Manual alarm silence, automatic alarm silence and alarm silence inhibit to be provided by system's common control.
 - .3 The loading of bell and strobe circuits shall not exceed 75% circuit capacity. Provide additional circuits to comply with this loading.

2.7 Auxiliary Circuits

- .1 Auxiliary contacts for control functions.
- .2 Actual status indication (positive feedback) from controlled device.
- .3 Alarm and supervisory trouble on system to cause operation of programmed auxiliary output circuits. Relays shall be monitored for open coil or shorted conditions.
- .4 Upon resetting system, auxiliary contacts to return to normal or to operate as pre-programmed.
- .5 Fans: stagger-started upon system reset; timing circuit to separate starting of each fan or set of fans connected to auxiliary contact on system. Timing circuit: controlled by CCU.
- .6 Auxiliary circuits: rated at 2 A, 24 V dc or 120 V ac, fuse-protected, independent Form C contacts, 4 relays/module.

2.8 Wiring

- .1 Shielded, twisted copper conductors: rated 300 V minimum.
- .2 To initiating circuits: 18 AWG minimum, and in accordance with manufacturer's requirements.
- .3 To signal circuits: 12 AWG minimum, and in accordance with manufacturer's requirements.

- .4 To control circuits: 14 AWG minimum, and in accordance with manufacturer's requirements.

2.9 Manual Alarm Stations

- .1 Addressable manual pull station.
 - .1 Pull lever, surface or semi-flush wall mounted type, single action, single stage, electronics to communicate station's status to addressable module over 2 wires and to supply power to station. Station address to be set on station in field.
- .2 Approved Product: Notifier NBG-12LX or Simplex equal.

2.10 Automatic Alarm Initiating Devices

- .1 Addressable thermal fire detectors, combination fixed temperature and rate of rise, non-restorable fixed temperature element, self-restoring rate of rise, fixed temperature 88°C.
 - .1 Electronics to communicate detector's status to addressable module/transponder.
 - .2 Device to be provided with isolator base for every 25 devices.
 - .3 Detector address to be set on detector base in field.
 - .4 Approved Product: Notifier FST-851A Series or Simplex equal.
- .2 Non-addressable heat detectors
 - .1 Fire detection devices to Model CR135 EWT.

2.11 Audible/Strobe Signal Devices

- .1 Red enclosure.
- .2 Weatherproof enclosure.

2.12 End-of-line Devices

- .1 End-of-line devices to control supervisory current in alarm circuits and signalling circuits, sized to ensure correct supervisory current for each circuit. Open , short or ground fault in any circuit will alter supervisory current in that circuit, producing audible and visible alarm at main control panel and remotely as indicated.

2.13 Addressable Field Modules

- .1 Addressable modules shall monitor and supervise dry contact input devices. Installation shall include box and face plates.
- .2 Approved Product: Notifier FMM-1 or Simplex equal.

2.14 Isolator Base

- .1 Isolator Base:
 - .1 The isolator base shall support all detector types and have the following minimum requirements:
 - .1 The operation of the isolator base shall be controlled by its respective detector processor. Isolators which are not controlled by a detector processor shall not be accepted.
 - .2 The isolator shall operate within a minimum of 23 msec. of a short circuit condition on the communication line.
 - .3 Following a short circuit condition, each isolator/detector shall be capable of performing an internal self-test procedure to re-establish normal operation. Isolator/detectors not capable of performing independent self-tests shall not be acceptable.
 - .2 When connected in Class A configuration, the Loop Controller shall identify an isolated circuit condition and provide communications to all non-isolated analog devices. Loop wiring shall be Class "AL, T-tapping is allowed between isolator bases/modules only. Isolator bases to be provided when a loop is used between floors, between areas which have fire separations. Do not exceed 12 devices on a branch without an isolator.
 - .3 Terminal connections shall be made on the room side of the base. Bases which must be removed to gain access to the terminals shall not be acceptable.
 - .4 The Loop Controller shall support up to 96 isolator bases.

2.15 Modules

- .1 Single Input Module
 - .1 The intelligent Single Input Module shall be capable of a minimum of 4 personalities, each with a distinct operation.
 - .2 The personality of the module shall be programmable at site to suit conditions and may be changed at any time using a personality code downloaded from the Analog Loop Controller. Single function modules or modules requiring Eprom, ROM or PROM changes or DIP switch/jumper changes shall not be acceptable.
 - .3 The single input module shall support the following circuit types:
 - .1 Alarm Latching, Manual Station, Conventional Heat, Waterflow.
 - .2 Delayed Waterflow.
 - .3 Non-Latching Monitor.
 - .4 Supervisory.
 - .4 Input circuit wiring shall be supervised for open and ground faults.
 - .5 The input module shall have a minimum of 2 diagnostic LEDs mounted behind finished cover plate. A green LED shall flash to confirm communication with the

loop controller. A red LED shall flash to display alarm status. The module shall be capable of storing up to 24 diagnostic codes.

- .6 Terminal connections shall be accessible from the room side of the assembly. Devices which must be removed to gain access to the wiring terminals shall not be acceptable.
- .7 The single input module shall be suitable for mounting on North American 2 1/2" (64 mm) deep 1 gang, 1 1/2" (38 mm) deep 4" square box with 1 gang cover.
- .8 The input module shall be suitable for operation in the following environment:
 - .1 Temperature: 32°F to 120°F (0°C to 49°C).
 - .2 Humidity: 0-93% RH, non-condensing.
- .9 It shall be possible to address each module without the use of DIP or rotary switches. Devices using DIP switches for addressing shall not be acceptable.

.2 Dual Input Module

- .1 The intelligent Dual Input Module shall provide two (2) supervised input circuits capable of a minimum of 4 personalities, each with a distinct operation.
- .2 The personality of the module shall be programmable at site to suit conditions and may be changed at any time using a personality code downloaded from the Analog Loop Controller. Single function modules or modules requiring Eprom, ROM or PROM changes or DIP switch/jumper changes shall not be acceptable.
- .3 The dual input module shall support the following circuit types:
 - .1 Alarm Latching, Manual Station, Conventional Heat, Waterflow.
 - .2 Delayed Waterflow.
 - .3 Non-Latching Monitor.
 - .4 Supervisory.
- .4 Input circuit wiring shall be supervised for open and ground faults.
- .5 The dual module shall have a minimum of 2 diagnostic LEDs mounted behind finished cover plate. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. The module shall be capable of storing up to 24 diagnostic codes.
- .6 The dual input module shall be suitable for mounting on North American 2 1/2" (64 mm) deep 1 gang, 1 1/2" (38 mm) deep 4" square box with 1 gang cover.
- .7 Terminal connections shall be accessible from the room side of the assembly. Devices which must be removed to gain access to the wiring terminals shall not be acceptable.
- .8 The input module shall be suitable for operation in the following environment:
 - .1 Temperature: 32°F to 120°F (0°C to 49°C).
 - .2 Humidity: 0-93% RH, non-condensing.
- .9 It shall be possible to address each module without the use of DIP or rotary switches. Devices using DIP switches for addressing shall not be acceptable.

.3 Single Input Signal Module

- .1 The intelligent Single Input Riser/Signal Module shall provide one supervised output circuit. The output circuit shall be suitable for any of the following operations:
 - .1 24 vdc, polarized audible and visible signal appliances.
 - .2 The personality of the module shall be programmable at site to suit conditions and may be changed at any time using a personality code downloaded from the Analog Loop Controller. Single function modules or modules requiring Eprom, ROM or PROM changes or DIP switch/jumper changes shall not be acceptable.
 - .3 Input circuit wiring shall be supervised for open and ground faults.
 - .4 The signal module shall have a minimum of 2 diagnostic LEDs mounted behind finished cover plate. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. The module shall be capable of storing up to 24 diagnostic codes.
 - .5 The signal module shall be suitable for mounting on North American 2 1/2" (64 mm) deep 1 gang, 1 1/2" (38 mm) deep 4" square boxes.
 - .6 Terminal connections shall be accessible from the room side of the assembly. Devices which must be removed to gain access to the wiring terminals shall not be acceptable.
 - .7 The signal module shall be suitable for operation in the following environment:
 - .1 Temperature:32°F to 120°F (0°C to 49°C).
 - .2 Humidity: 0-93% RH, non-condensing.
 - .8 It shall be possible to address each module without the use of DIP or rotary switches. Devices using DIP switches for addressing shall not be acceptable.
- .4 Control Relay Module
 - .1 The intelligent micro-processor based Control Relay Module shall provide one form "C" dry relay contact rated at 2 amps at 24 Vdc to control external appliances or equipment shutdown. The control relay shall be rated for pilot duty and releasing systems.
 - .2 The position of the relay contact shall be confirmed by the system firmware.
 - .3 The control relay module shall have a minimum of 2 diagnostic LEDs mounted behind finished cover plate. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. The module shall be capable of storing up to 24 diagnostic codes.
 - .4 The control relay module shall be suitable for mounting on North American 2 1/2" (64 mm) deep 1 gang, 1 1/2" (38 mm) deep 4" square box with 1 gang cover.
 - .5 The module shall be suitable for operation in the following environment:
 - .1 Temperature:32°F to 120°F (0°C to 49°C).

- .2 Humidity: 0-93% RH, non-condensing.
- .6 Terminal connections shall be accessible from the room side of the assembly. Devices which must be removed to gain access to the wiring terminals shall not be acceptable.
- .7 It shall be possible to address each module without the use of DIP switches. Devices using DIP switches for addressing shall not be acceptable.
- .5 Universal Class A/B Module
 - .1 The intelligent Universal Class A/B Module shall be capable of a minimum of 15 distinct operations.
 - .2 The personality of the module shall be programmable at site to suit conditions and may be changed at any time using a personality code downloaded from the Analog Loop Controller. Single function modules or modules requiring Eprom, ROM or PROM changes or DIP switch/jumper changes shall not be acceptable.
 - .3 The Universal Class A/B module shall support the following circuit types:
 - .1 Two Class B or one Class A Initiating Device Circuits (IDC) capable of delayed waterflow alarm operation.
 - .2 One Class A or B Indicating Device (Signal) Appliance Circuit (IAC).
 - .3 One Class A or B Circuit for 2 wire Smoke Detectors (Verified or non-verified).
 - .4 One Form "C" (NO/NC) Dry Output Contact Relay.
 - .4 Input/Output circuit wiring shall be supervised for open and ground faults.
 - .5 The universal Class A/B module shall have a minimum of 2 diagnostic LEDs mounted behind finished cover plate. A green LED shall flash to confirm communication with the loop controller. A red LED shall flash to display alarm status. The module shall be capable of storing up to 24 diagnostic codes.
 - .6 The control relay module shall be suitable for mounting on North American 2 1/2" (64 mm) deep 1 gang, 1 1/2" (38 mm) deep 4" square boxes.
 - .7 Terminal connections shall be accessible from the room side of the assembly. Devices which must be removed to gain access to the wiring terminals shall not be acceptable.
 - .8 The universal Class A/B module shall be suitable for operation in the following environment:
 - .1 Temperature: 32°F to 120°F (0°C to 49°C).
 - .2 Humidity: 0-93% RH, non-condensing.
 - .9 It shall be possible to address each module without the use of DIP or rotary switches. Devices using DIP switches for addressing shall not be acceptable.

2.16 As-Built Floor Plans

- .1 Fire alarm system floor plans complete with address and device names and exits: in glazed frame minimum size 600 x 600 mm at main floor entrance.

2.17 Ancillary Devices

- .1 Remote relay unit to initiate fan shutdown: Notifier FRM-1, or Simplex equal.

2.18 Conduit

- .1 Rigid galvanized steel shall be used for fire alarm system.

Part 3 Execution

3.1 Installation

- .1 Install systems in accordance with CAN/ULC-S524.
- .2 Install central control unit and connect to ac power supply, dc standby power.
- .3 Install manual alarm stations and connect to alarm circuit wiring.
- .4 Locate and install detectors and connect to alarm circuit wiring. Do not mount detectors within 1 m of air outlets. Maintain at least 600 mm radius clear space on ceiling, below and around detectors. Locate duct type detectors in straight portions of ducts. Relocate existing detector bases to avoid grille locations, etc.
- .5 Connect alarm circuits to main control panel.
- .6 Connect signalling circuits to main control panel.
- .7 Install end-of-line devices at end of alarm and signalling circuits as required.
- .8 Install addressable modules for non-addressable heat detector and connect to new fire alarm control panel.
- .9 Splices are not permitted.
- .10 Utilize existing conduit system where practical.
- .11 Provide new raceways, where required, cable and wiring to make interconnections to annunciator equipment and CCU, as required by equipment manufacturer.
- .12 Ensure that wiring is free of opens, shorts or grounds, before system testing and handing over.
- .13 Identify circuits and other related wiring at central control unit, annunciators, and terminal boxes.
- .14 Supply and install visible address number labels on all detector and pull station bases.

- .15 Device location/description wording as they will appear on main control panel and annunciator shall be reviewed by Contract Administrator at shop drawing stage.
- .16 Cut, patch and paint walls, ceilings and floors as required to carry out work. Utilize qualified trades to perform this work. Restore to original condition.

3.2 Field Quality Control

- .1 Perform tests in accordance with CAN/ULC-S537-M97.
- .2 Fire alarm system:
 - .1 Test each device and alarm circuit to ensure manual stations, thermal and smoke detectors transmit alarm to control panel and actuate general alarm and ancillary devices.
 - .2 Simulate grounds and breaks on alarm and signalling circuits to ensure proper operation of systems.
 - .3 Addressable circuits system style DCLB:
 - .1 Test each conductor on all DCLB addressable links for capability of providing 3 or more subsequent alarm signals on line side of single open-circuit fault condition imposed near electrically most remote device on each link. Operate Acknowledge/Silence switch after reception of each of the 3 signals. Correct imposed fault after completion of each series of tests.
 - .2 Test each conductor on all DCLB addressable links for capability of providing 3 or more subsequent alarm signals during ground-fault condition imposed near electrically most remote device on each link. Operate Acknowledge/Silence switch after reception of each of the 3 signals. Correct imposed fault after completion of each series of tests.
- .3 Provide final PROM program re-burn for system incorporating program changes made during construction at no charge to City.
- .4 The manufacturer or his authorized representative must perform tests in accordance with CAN/ULC-S537-M97.
- .5 Provide a complete verification report on CFAA forms. The verifying technician must bear approval from CFAA (Canadian Fire Alarm Association).
- .6 Manufacturer or his authorized representative to provide complete system verification.

END OF SECTION