COMPONENT TECHNICAL SPECIFICATION

ORIGINATING CENTER: Electrical, Information and Controls Center

SUBSYSTEM: Power and Signal Distribution

COMPONENT: Column Mounted Discrete Logic Ignition Switch

PART NUMBER: 12450250

FIRST USAGE: 2003 GMX 357 Program

MODELS: GMX 357/001/020 GMT 001

ENGINEER: _____ _____

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REVISION HISTORY

DATE	EWO	REV	Paragraph	DESCRIPTION	RESP.
10/2/97				Initial Publication	teu
2/17/98		001	Cover Page	Renamed component, revised resp. engineer	teu
			3.1.2.2.1	Revised mechanization drawing	teu
			3.2.1	Signal level ckts: deleted 150mV drop req.	teu
			3.2.1	Signal level ckts: revised contact resistance from 100Ω	teu
			3.2.1.4	Revised contact resistance req. from 100Ω to 100mΩ	teu
			3.2.1.7.1	Clarified short ckt. test, revised resistive values	teu
			3.2.2.15	Completed all theft deterrence TBD's.	teu
10/19/99		002	3.2.2.3	Update switch timing	rgd
			3.2.2.3	Revise tactile plots	rgd
			3.2.1	Include switch loads for GMX 320 Program	rgd
			3.1.2.2.1	Add Switch Mech	rgd
03/22/01		003		Finalized	rgd

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1.0 INTRODUCTION

1.1 SCOPE OF DOCUMENT

This specification outlines the design, performance, appearance and validation requirements for a low current column mounted ignition switch.
This specification should not prevent the manufacturer from suggesting alternative approaches which would result in an improved or more cost effective product.

1.2 MISSION/THEME

The ignition switch shall be used to operate the vehicle's power moding and ignition systems and is located on the steering column upper head assembly opposite the lock cylinder.

1.3 CLASSIFICATION

The following are specific classifications of the ignition switch described in this document.
The ignition switch shall contain a means of translating a manual input (rotation of the ignition key) into electrical signals which may be interpreted by one or more electronic modules and relays. In addition, the switch shall contain detents and a return spring to provide tactile feedback to indicate key position.
The ignition switch shall functionally support the following vehicle features:

Determine Power Mode (OFF, ACC, RUN, START)
Determine Key-In State (KEY-IN or KEY-OUT)
Include theft resistor and breakage mechanism to support theft deterrent system.

1.4 DOCUMENT CONTROL

1.4.1 Definition

The word "shall" will be used to state binding requirements of the component defined by this document.
The word "must" will state requirements of other components and/or subsystems whose definitions are outside the scope of this document.
The word "will" is intended to state either of the following:

Conditions that result from immutable laws of physics
Conditions that result from adherence to their stated, binding requirements

The words "are" and "is" will state definitions and facts that do not require verification.
The word "withstand" will be defined as: "Maintains design-intended functional and structural integrity while being subjected to the specified conditions."

2.0 APPLICABLE DOCUMENTS

2.1 ORDER OF PRECEDENCE

The order of precedence for all applicable documents shall be:

1. Purchase Order
2. Statement of Requirements and Component Specification
3. Other Referenced Documents

In the event of a conflict between the text of this specification and the documents cited herein, the text of this specification takes precedence. Nothing in this specification, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.2 GOVERNMENT DOCUMENTS

Suppliers are expected to be aware of and comply with worldwide component and vehicle standards and regulations where applicable. Requirements of national governments shall apply even if not explicitly stated below. Specific national requirements may be waived under specific purchase orders or engineering part drawings.

2.2.1 United States Documents

The switch shall comply with all applicable FMVSS regulations, including, but not limited to:
FMVSS 101 -- Control location, identification, and illumination.
FMVSS 114 -- Theft protection.
FMVSS 201 -- Occupant protection in interior impact.
FMVSS 203 -- Impact protection for the driver from the steering column system.
FMVSS 208 -- Occupant crash protection.
MVSS 302 -- Flammability of interior materials.
FSREG 554 -- Standard enforcement and defects investigation.
FSREG 581 -- Low speed impact resistance of vehicles.

2.2.2 Canadian Documents

The switch shall comply with applicable CMVSS regulations.

2.2.3 Export Requirements

The switch shall comply with all applicable intended export country regulations, including, but not limited to:
ECE 18 -- Theft protection.
EEC 95/56 Directive (New), EEC 74/61 Directive (Old) -- Theft Protection.
EEC 91/338 Directive -- Cadmium Restriction.
ECE 12 R 12.03 -- Body (torso) impact.

2.3 GENERAL MOTORS DOCUMENTS

2.3.1 Part Drawing

The part drawing shall show all views to clearly define dimensions not contained herein, the device part number, labeling requirements, and any parameters necessary to fully define the product on a "purchased part level."

2.3.2 GM Materials and Process Standards

Suppliers are expected to subscribe to the applicable books or individual specifications of the GM Engineering Materials and Process Standards as several of these standards are called out in this specification. Suppliers must work to a current copy of these standards; specifically those listed below:

GM 1000M	Restricted and Reportable Chemicals
GM 6090M	Flammability of Materials
GM 9100P	Automotive Component EMC Specification
GM 9105P	Immunity to Conducted Transients
GM 9109P	Immunity to Electrostatic Discharge
GM 9110P	Procedure for Testing Switches
GM 9117P	Immunity to Jump Start Voltages
GM 9604P	Standard Practice for Specifying Switches
GM 9605P	Developmental Tests for Low Level Switching
GM 9123P	Electronic Module (Interior Mounted, Unexposed) Validation Test Standard

2.3.2.1 Plastic Parts

Plastic materials used in all portions of the switch should be approved to the GMP material specifications. The actual switch material must be approved to the GM 4350M Class C0, Oven Aging and Impact, specification.

2.4 INDUSTRY DOCUMENTS

Suppliers must work to a current copy of the following documents:

QN 2101	Production Parts Approval Process (PPAP)
QS 9000	Quality Systems Requirements
QN 2102	Potential Failure Mode and Effects Analysis

2.5 SUPPLIER DOCUMENTS

2.6 OTHER DOCUMENTS

USCAR/EWCAP PF1 - Performance Standard for Automotive Electrical Connection Systems

3.0 REQUIREMENTS

3.0.1 Drawing Requirements

The design configuration of the switch shall be specified by a suitably sized drawing. The switch drawing shall include the items as specified in Section 1.1 of GM 9604P and the items listed in section 4.4.2 of the Statement of Requirements for this part.

3.1 COMPONENT DEFINITIONS

3.1.1 Appearance

The switch shall have no sharp edges for handling purposes. All flash must be removed from mounting holes. Switch assemblies shall be free of any cracks or blisters. The switch shall exhibit no permanent deformation that exceeds the released print tolerance, and shall have no separation or loosening of mechanical/chemical bonds or displacement of switch components.

3.1.2 Content

The required physical and functional content for the ignition switch are identified in the following paragraphs.

3.1.2.1 Physical Content

The ignition switch shall conform to the ignition switch packaging and dimensional requirements specified in the component part drawing.

Baseline content requirements:

1. **Four positions: OFF, ACC, RUN, START.**
2. **Detents for the OFF, ACC, and RUN positions.**
3. **Mechanism to return the key from START to RUN position.**
4. **Theft resistor (random one of ten values, 1% lot tolerance, unmarked) to support a Passlock theft deterrent system.**
5. **Integral key-in switch**
6. **Mechanism to destroy (damage beyond value determination) the theft resistor in the case of attempted removal of the switch actuator or tamper of the ignition switch in the OFF state.**
7. **Maximum five terminal connection, max. terminal size DPE 150 series or equivalent**

3.1.2.2 Functional Content

During actuation no switch shall change the state of any circuit not associated with that switch function. Release of the switch from any actuated position shall not cause activation of unwanted functions or the opening or closing of other contacts.

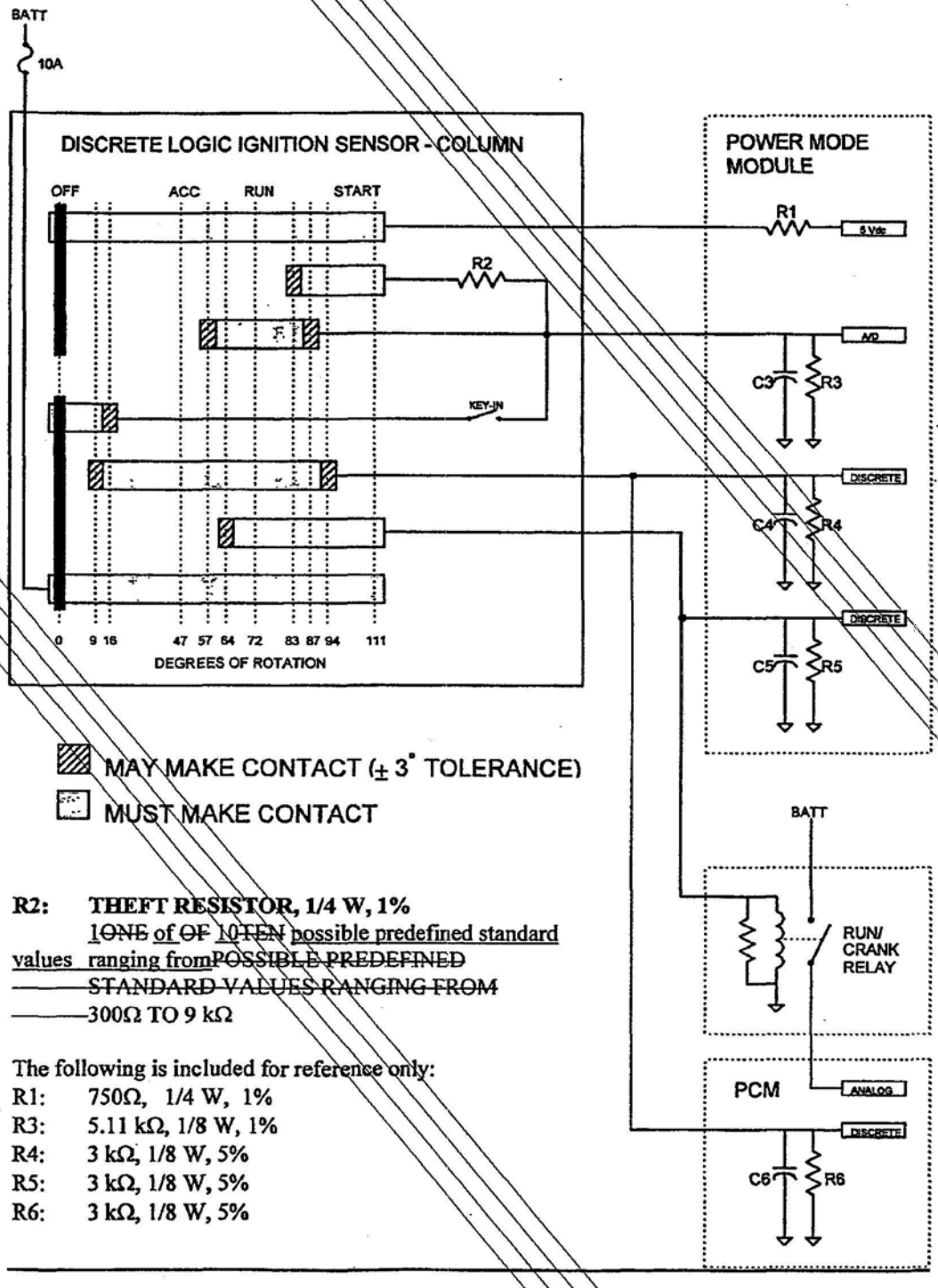
Baseline functional requirements:

1. **Ability to continuously diagnose the theft deterrent circuit for failures (short-to-ground, short-to-battery, or open circuit) in the RUN position.**
2. **Inability to externally determine the theft resistor value on the OFF position.**
3. **START key position shall not be falsely interpreted in the case of any single-point circuit failure (short-to-ground, short-to-battery, or open circuit).**
4. **Survivability of switch under all conditions involving a single-point circuit failure.**
5. **The ignition switch shall meet the performance objectives of GM9105P, Immunity to Conducted Transients, and GM9109P, Immunity to Electrostatic Discharge, for a Class C device.**
6. **For all 12Vdc circuits, ability to interpret OFF,ACC, START positions and theft resistor value with a 9.0 to 26.5Vdc source voltage, and ability to interpret RUN position with a 4.5 to 26.5Vdc source voltage.**

Desired features:

1. **Retained ability to interpret ALL key positions with any single-point circuit failure.**
2. **Minimal number of circuits.**
3. **Minimal system cost impact.**
4. **Ability to sample the theft resistor value in the START and RUN key positions.**

3.1.2.2.1 Electrical Mechanization Delta Z Switch Mechanization



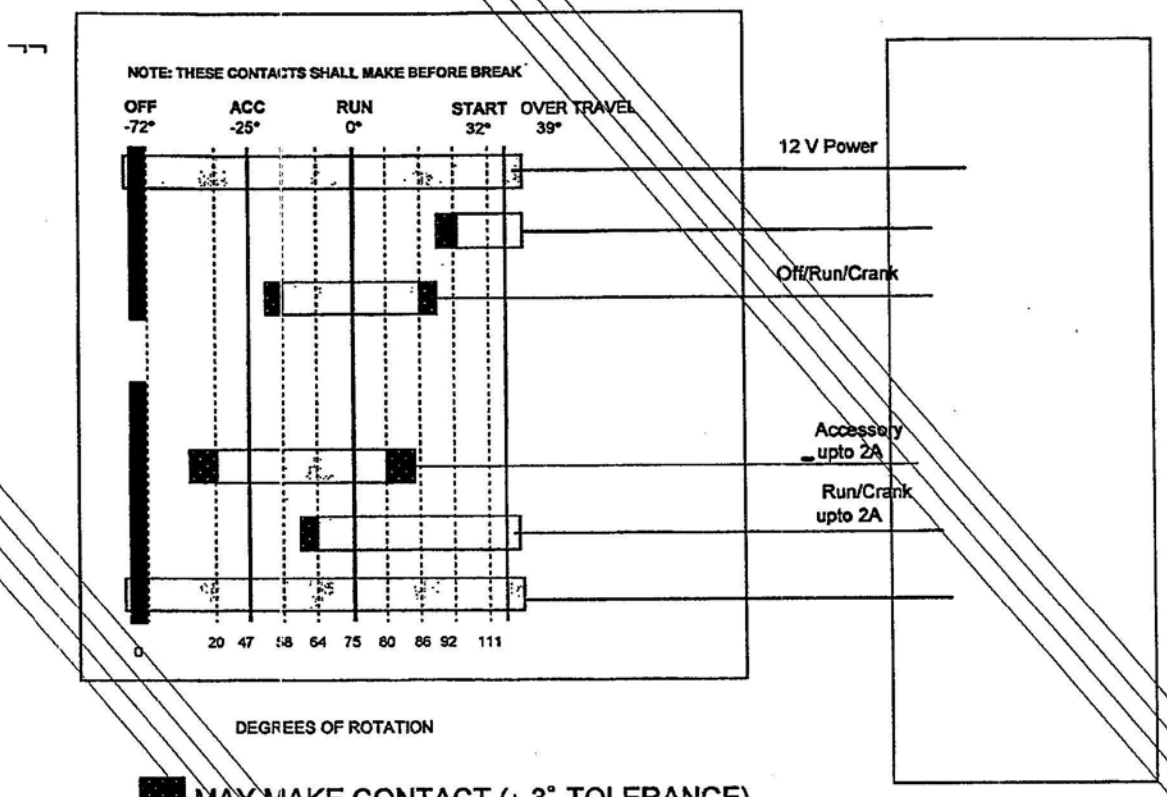
R2: THEFT RESISTOR, 1/4 W, 1%
1~~ONE~~ of ~~OF~~ 10~~TEN~~ possible predefined standard values ranging from~~POSSIBLE PREDEFINED STANDARD VALUES RANGING FROM~~ 300Ω TO 9 kΩ

The following is included for reference only:

R1: 750Ω, 1/4 W, 1%
R3: 5.11 kΩ, 1/8 W, 1%
R4: 3 kΩ, 1/8 W, 5%
R5: 3 kΩ, 1/8 W, 5%
R6: 3 kΩ, 1/8 W, 5%

GMX320 Ignition Switch – Column Mounted

10A



ONLY: GMX320 Ignition Switch – Column Mounted

3.1.2.2.2 Ignition Switch Functions

The ignition switch shall be a rotary type switch with four positions consisting of: OFF, ACC, RUN, START. The switch shall have three detent positions and one spring loaded position. Make and break positions vs. displacement have been arranged to meet vehicle electrical requirements.

3.1.2.2.2.1 Start

START shall be the extreme clockwise (CW) position and shall be a momentary contact spring loaded position. When released from the START position, the switch shall return to the RUN position and shall not over-travel past the RUN detent in either direction.

3.1.2.2.2.2 Run

RUN shall be located counter clockwise (CCW) from START. The RUN position shall be a detented position.

3.1.2.2.2.3 Accessory

ACC shall be a detented position located CW of LOCK and CCW of the RUN position..

3.1.2.2.2.4 Off

OFF shall be a detented position and shall be CCW from the ACC position.

3.1.2.2.3 Key Alarm Switch

The key alarm switch consists of a single pole normally open switch, which detects insertion of the ignition key into the lock cylinder.

1. The key alarm switch contacts shall make when the ignition key is inserted into the lock cylinder assembly. The key alarm switch contacts shall break when the ignition key is removed. Switch make/break points and overtravel allowances shall be identified on the component release drawing.
2. Any axial play within the ignition switch assembly shall not cause closure of the key alarm switch contacts with the key removed; and shall not break the key alarm switch contacts with the key fully inserted.
3. The key alarm contact shall remain made as the lock cylinder is rotated through its operating range.
4. The key alarm switch action shall be smooth with no detents.
5. The key alarm switch mechanism shall provide enough force to return the lock cylinder key alarm actuator to the retracted position as the key is removed.

3.1.3 Ambient Environment

The ambient environment is the range of environmental conditions that the switch is expected to be exposed to during its lifetime. The switch shall meet the functional objectives of this document when exposed to the environmental conditions defined in this specification.

3.1.3.1 Operating Temperature

The switch shall be able to operate, without damage or functional degradation, within an operating temperature range of -40°C to +85°. Normal operating temperature shall be designated at 23°C. The switch shall comply with this requirement when tested according to the schedule shown in Figure 20-1 in Section 9.4 of GM 9110P.

3.1.3.1.1 Storage Temperature

The switch shall operate without damage or functional degradation when subjected to a storage temperature range of -40°C to +105°C for 96 hours when tested as follows.

1. Place test samples in environmental chamber. Lower the chamber air temperature to -40°C at a rate not exceeding 10°C per minute.
2. Maintain -40°C temperature for 48 hours. At the end of this period increase the chamber air temperature to +25°C at a rate not exceeding 10°C per minute. Perform simple function check.
3. Repeat procedure for high temperature storage; chamber temperature to be +105°C

3.1.3.2 Humidity

The switch shall operate without damage or performance degradation in an atmosphere of 95% ± 3% non-condensing relative humidity when tested as specified in Section 8.2 of GM 9110P.

3.1.3.2.1 Moisture Susceptibility

The switch shall meet all specified performance test requirements during and after exposure to conditions of high humidity and condensation. Test per the following procedure:

1. Test samples should be dried, placed in a moisture proof container, and soaked for minimum of two hours at -20°C. Transfer the samples to the second chamber maintained at 45°C and 95 % RH within 1 minute and remove from protective container. Mount in the normal operating position using care to protect from drips. After 5 minutes, power up the switch with 14.0 ± 0.1 Vdc.
2. Perform functional tests immediately, after 30 minutes, and at 2 hours recording any anomalies. Class C functional requirements per GM 9100P must be met immediately upon power up. Class B functions return at 30 minutes and Class A functions return at 2 hours.

   (NOTE: Moisture proof container refers to the standard product shipping bag. Use the bag to transfer the product between locations (test chambers) if two locations are utilized for the -20°C and +45°C environments.)

3.1.3.3 Vibration

The switch shall operate during exposure to a vibration environment without damage or loss of function according to the actual vehicle vibration profile for component usage, as defined below.

1. The switch shall be tested in the RUN detent, key-in simulated, with continuous monitoring of all switch circuits. No circuit interruption or unintended makes shall be allowable.
2. SAE Sin vibration: the frequency range is to be from 10 to 55 to 10 Hz with a linear sweep period of 2 minutes per cycle. Excursion shall be 1.0 mm (.0393 in) peak to peak over the entire frequency range (ref. GM9110 section 7.7 for procedure).
3. Each sample is to be vibrated in each of 3 mutually perpendicular planes for the period of time specified in section 4.4.1.2 Test Sequence.