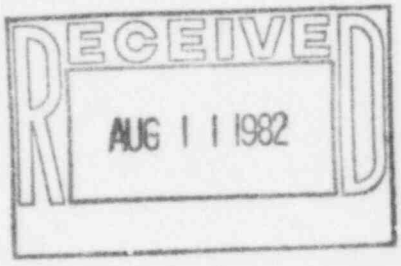
THE UNIVERSITY OF TEXAS
COLLEGE OF ENGINEERING
AUSTIN, TEXAS 78712

Department of Mechanical Engineering
Nuclear Engineering Program
512—471-5136

50-192

July 30, 1982



Mr. Hunnicutt
Region IV USNRC Office of
Inspection and Enforcement
611 Ryan Plaza Drive Suite 1000
Arlington, Texas 76012

Dear Mr. Hunnicutt:

The University of Texas TRIGA reactor facility is implementing a series of major and minor changes to the reactor instrumentation and control systems. All of the changes are being examined with respect to 10 CFR 50.59 changes with the intent of each change to "modernize" the function or reliability of current console functions. The enclosed description of modifications is provided for your information. No changes are contemplated that lessen the degree of safety of any reactor system or alter the requirements of Technical Specifications.

The current reactor instrumentation is fundamentally the same as the originally installed system and has become less reliable in recent years because of increased failure frequencies of certain components. An effort is being initiated to implement changes that impact on the total system reliability, eliminating some of the troublesome components and providing an improved overall system. Most changes represent the replacement of complete functions or components by totally new equipment of newer design providing the same functions. All replacement components will meet or exceed previous instrumentation specifications.

IE-24

Diagrams of functional and specific changes are enclosed with a list of steps implementing the changes. Phase One parts A and B of the changes have been completed. Part C and Phase Two is to be completed pending reactor committee review and establishment of 10 CFR 50.59 change status. Phase Three is projected for future implementation.

Sincerely yours,

Thomas L. Bauer

Thomas L. Bauer
SOP 3664

Enclosures

TLB:mgm

cc: D. Klein
H. Marcus

Review of Phase I

Instrumentation Changes

7-29-82

A review of the reactor instrumentation implemented as described in the proposed modification have been reviewed with respect to 10 CFR 50.59 conditions. The changes have been determined neither to deviate from the technical specifications of license R-92 nor to represent an unreviewed safety question. Items determined in the review are as follows:

A wide range channel instrumentation unit manufactured by General Atomic for nuclear reactor instrumentation is to replace the functions of the original GA log compensated ionization chamber and channel, and the source range startup fission counter and channel. The fission counter/chamber is a Reuter Stokes RSN-314A with GA PA-5 preamplifier and GA model NLL-2F Linear and Log Safety Channel which had been previously installed as instrumentation at another facility.

a. A single counter/chamber that operates on ac and dc current or pulse mode replaces the function of two separate detectors. The fission counter provided neutron source counts and rod withdrawal interlock. The ionization chamber measured log power and period scram. Replacement of the two detectors that operated in non-overlapping regions of neutron flux level by a single detector capable of both types of measurements does not increase the probability of occurrence or consequences of an accident or malfunction of equipment important to safety.

b. The source count interlock to prevent control rod withdrawal at less than 2 counts per second neutron indication is replaced by a scram bus signal preventing rod withdrawal. Substitution of a scram bus open for the control rod power open represents a more conservative approach to effecting the source interlock since the rod drive interlock prevented rod motion on loss of source count whereas the scram signal provides for reinsertion of rods. Functional design of the source count circuit is similar to the replaced circuit but consists of new circuit elements and design feature providing increased or equivalent operation reliability.

c. The period measurement circuit provided through mechanical operation of the recorder is replaced with an all electronic version associated with the wide range channel's operation. Significant improvement in measurement accuracy, performance, and reliability are accomplished. The period scram is not a technical specification requirement but does routinely provide an additional reactor parameter monitoring system. No decrease in probability or consequences of the period measurement unit are expected compared to the replaced unit.

d. Extension of the scram bus to include the additional scrams of percent power, period, high voltage, and source level from the wide range detector increases the console safety scrams providing three power level scrams, one more than the technical specification requirement of two. No increase in probability of occurrence or consequences of a malfunction of the additional scram functions are expected.

e. Installation of pulse mode switch bypass of all wide range channel functions maintains the current console operation configuration during pulse mode operation. Any failure of the bypass maintains the wide range channel scrams. No increase in probability or consequences of occurrence are created by the pulse mode bypass.

f. Removal of log channel with its functions is replaced by functions of the wide range channel that have equivalent or decreased probability of occurrence of consequences of equipment malfunction. Neither a different type of accident nor the margin of safety required by technical specifications have been altered by the channel replacement.

g. Removal of the startup channel and its functions is replaced by functions of the wide range channel that have equivalent or decreased probability of occurrence or consequences of equipment malfunction. Neither a different type of accident nor the margin of safety required by technical specifications have been altered by the channel replacement.

Chairman, Nuclear Reactor Committee

Harris L. Marcus

Director, Nuclear Engineering Teaching Laboratory

Dale Klein

Reactor Supervisor License R-92

Thomas L. Bauer

UT TRIGA Reactor Control
and Instrumentation Changes

1982

I. Phase One - Wide Range Channel Installation

A. Remove log channel function.

1. Compensated ionization chamber is removed and is available as a spare chamber.
2. Period scram from log channel recorder is inactivated since it is not required.
3. Current logging circuit in "nv-nvt" unit is replaced with shorting module for correct signal routing during steady-state or pulse operation.

B. Install wide range channel function.

1. Fission chamber for wide range measurements is positioned at previous log channel location.
2. General Atomic Wide Range Channel is calibrated and tested and chamber positioned for correct measurements.
3. Wide range recorder output is routed to the log recorder with appropriate change of scale and calibration signal.
4. Chassis wiring of console is modified physically to allow more convenient placement of instrument components, but all electrical characteristics remain unchanged.
5. Changes documented in diagrams and procedures, and reactor committee approvals of major changes requested.

C. Implement function of wide range channel.

1. Rod control scram bus is extended to include wider range channel scrams on high voltage, low source level, period, and percent linear power.
2. Bypass of extended scram bus is installed in pulse mode switch to avoid unrequired scrams during operation.
3. Source range channel is removed and available as auxiliary instrumentation. The source interlock is replaced by the extended scram bus functions.

II. Phase Two - Physical Components Arrangement

A. Scram relay coil function is moved.

1. Function of decommissioned log period scram is changed to scram relay power scram.
2. Scram relay power indication, test and reset now available for alternate function.

B. Water systems alarm condition indications are altered.

1. Indicator lights above console scram bus are rewired to indicate various coolant systems conditions.
2. Audible alarm for coolant system conditions with test and mute switch installed.
3. Radioactivity water monitor is moved to front panel display.

C. Fuel temperature indication is moved from rear panel position to removed log record period meter position.

III. Phase Three - Other Compenent Changes

A. Install new recorder.

1. Linear channel amplifier required for correct impedance.
2. Linear recorder scale scarm required for safety channel.

B. Install new fuel measurement circuits.

1. Obtain fail safe mode.
2. Establish fuel temperature record during pulse.

C. Install ventilation monitoring system.

Wide Range Channel Installation

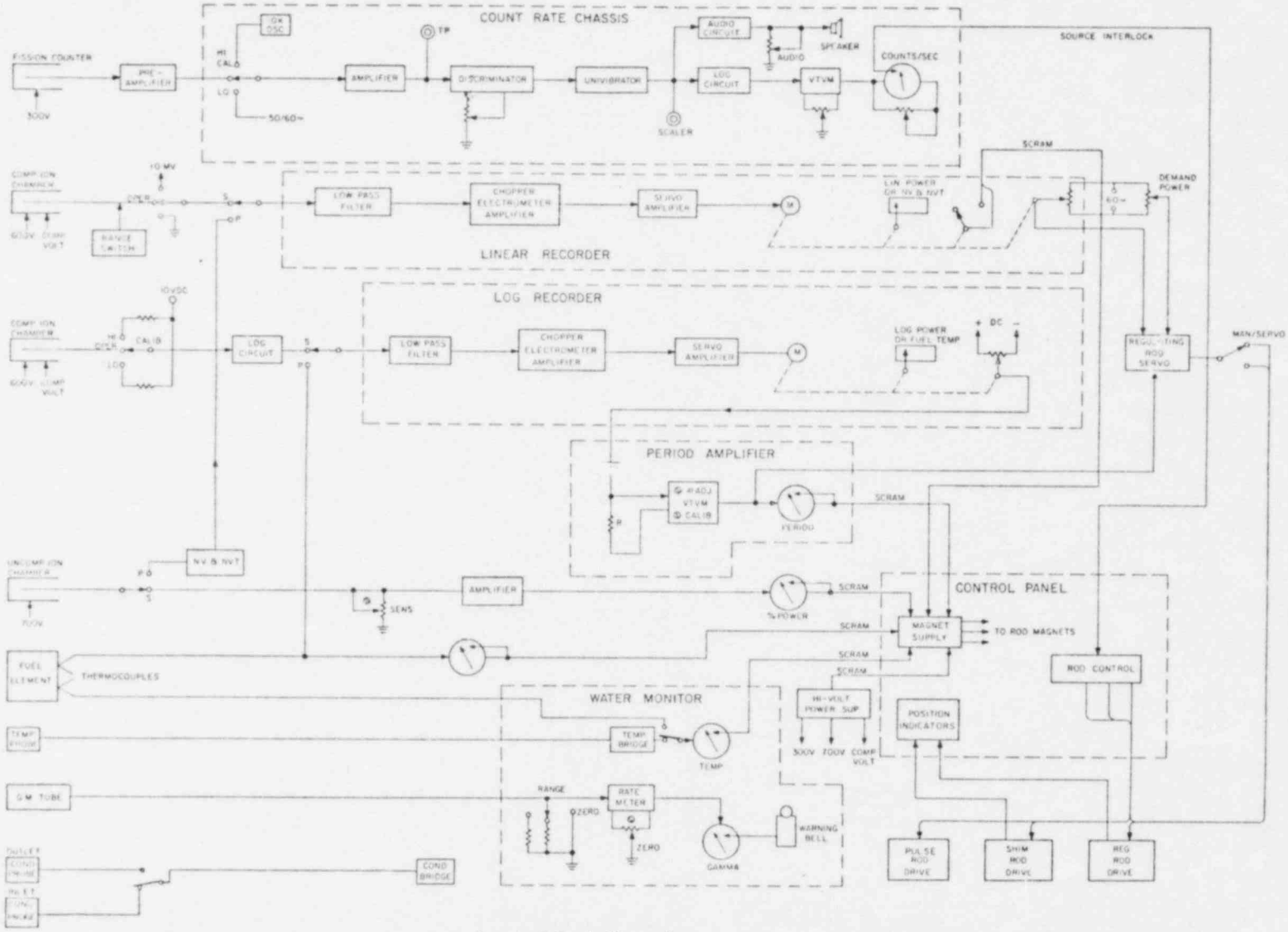
(Console Instrumentation Changes Phase I)

I. Documentation Requirements

- A. Function block diagrams
- B. File schematics
- C. Procedures, checklist and calibrations
- D. Safety Analysis Report descriptions
- E. Evaluation of "unreviewed safety question"
- F. Reactor committee approval of proposed experiment
- G. Letter to Region IV

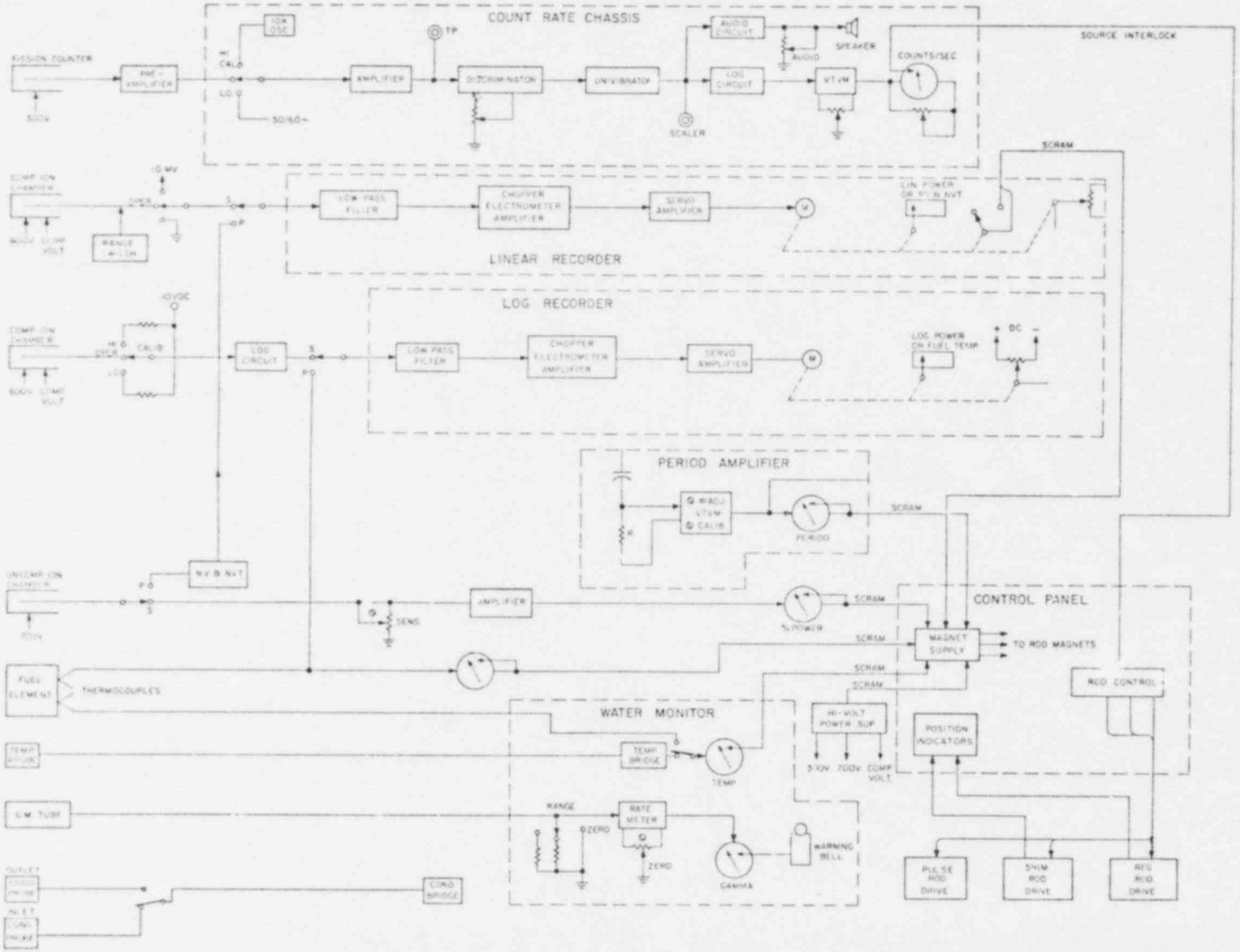
II. Physical Alterations

- A. Removal of functions
  1. Period scram - no technical specification requirement
  2. Log channel ionization chamber - no t.s. requirement
  3. Source range startup channel and fission chamber - interlock required for minimum startup source
- B. Installed functions
  1. Fission chamber (3 modes of operation)
     a. Source count channel - pulse mode
     b. Log power channel - ac current mode
     c. Linear power channel - dc current mode
  2. Scram bus extension
     a. Source interlock replaced with scram signal
     b. Hi level linear channel; 2 required 110%, 3 active
     c. Hi level log channel; not required, inaccurate
     d. Rate scram; not required
- C. Special considerations and details
  1. Channel tests for trip on HV, source have been installed on WR channel front panel
  2. To maintain operable pulse mode operation a parallel contact through the mode switch bypasses the WR scram bus. No scram signals on WR are required for pulse mode operation.
  3. The logging circuit in the console has been replaced by a shorting module so that the input is accepted at the current location.
  4. "Log" recorder calibration will be set by the 0-10mV calibration method in the linear channel.
  5. Scram bus on wide range clears on condition, positive action of operator required for indication reset.



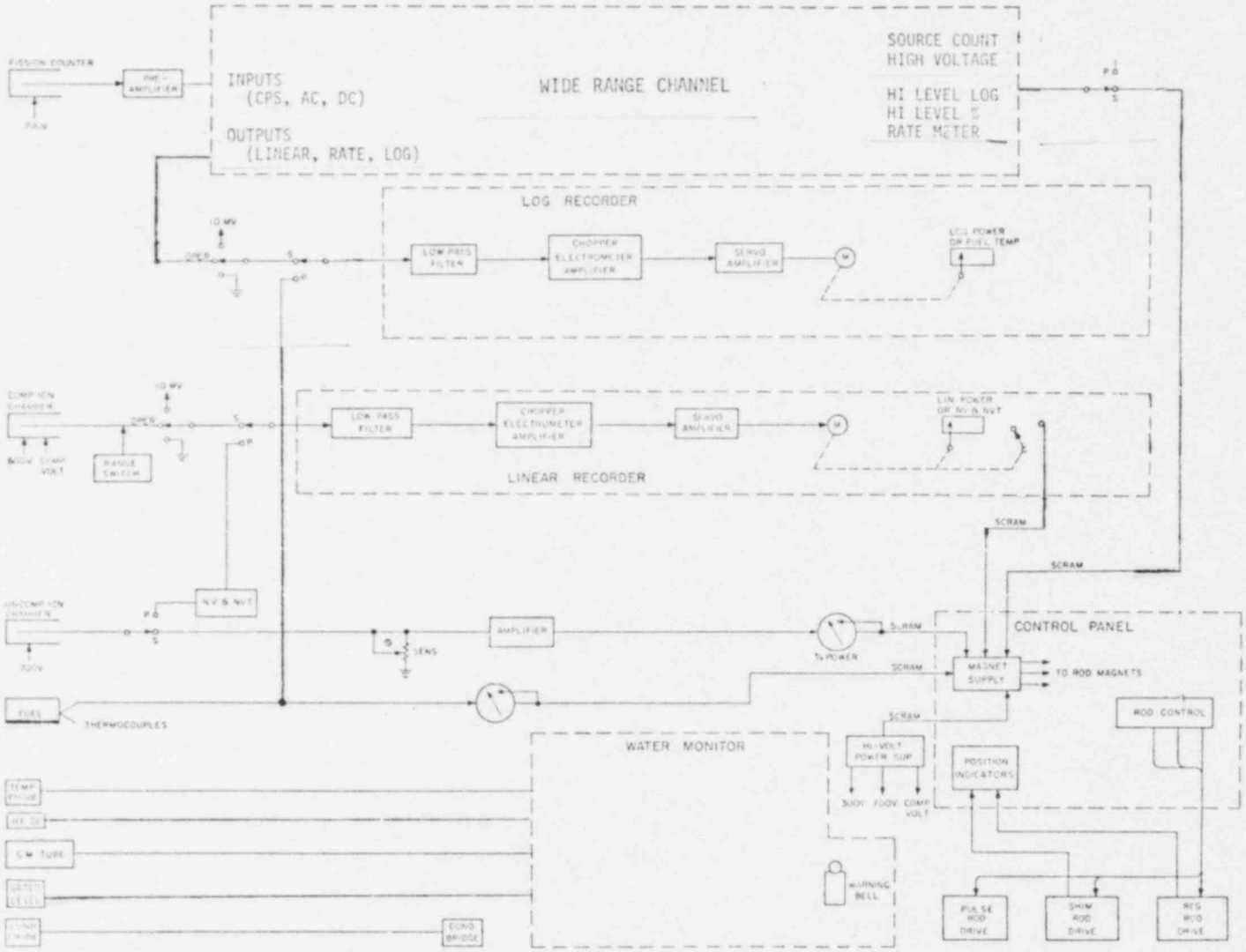
Installed Version

Functional block diagram



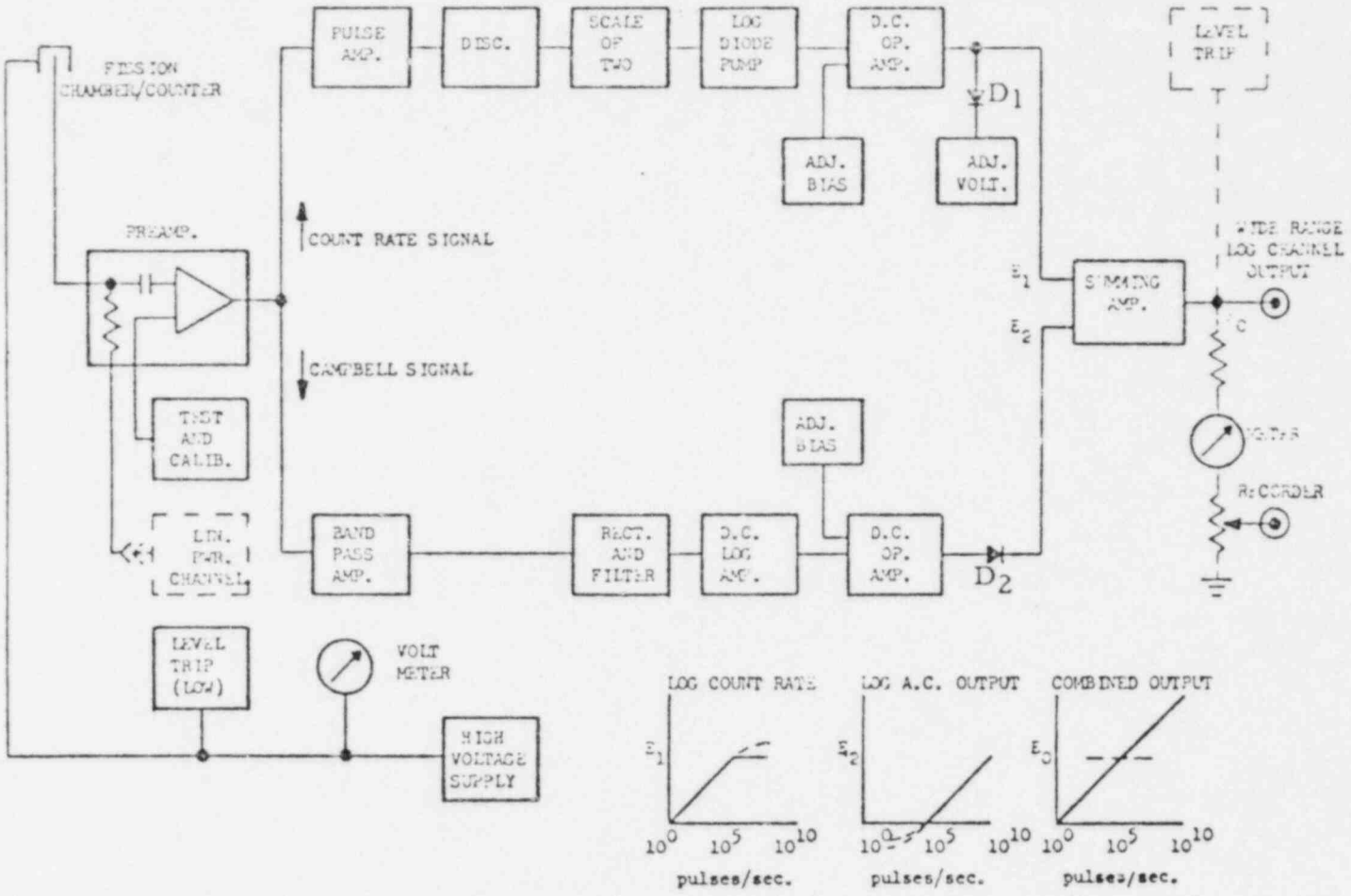
Functioning Version 250 kW
Functional block diagram

Version 0.1



Wide Range Channel Installation
Functional block diagram

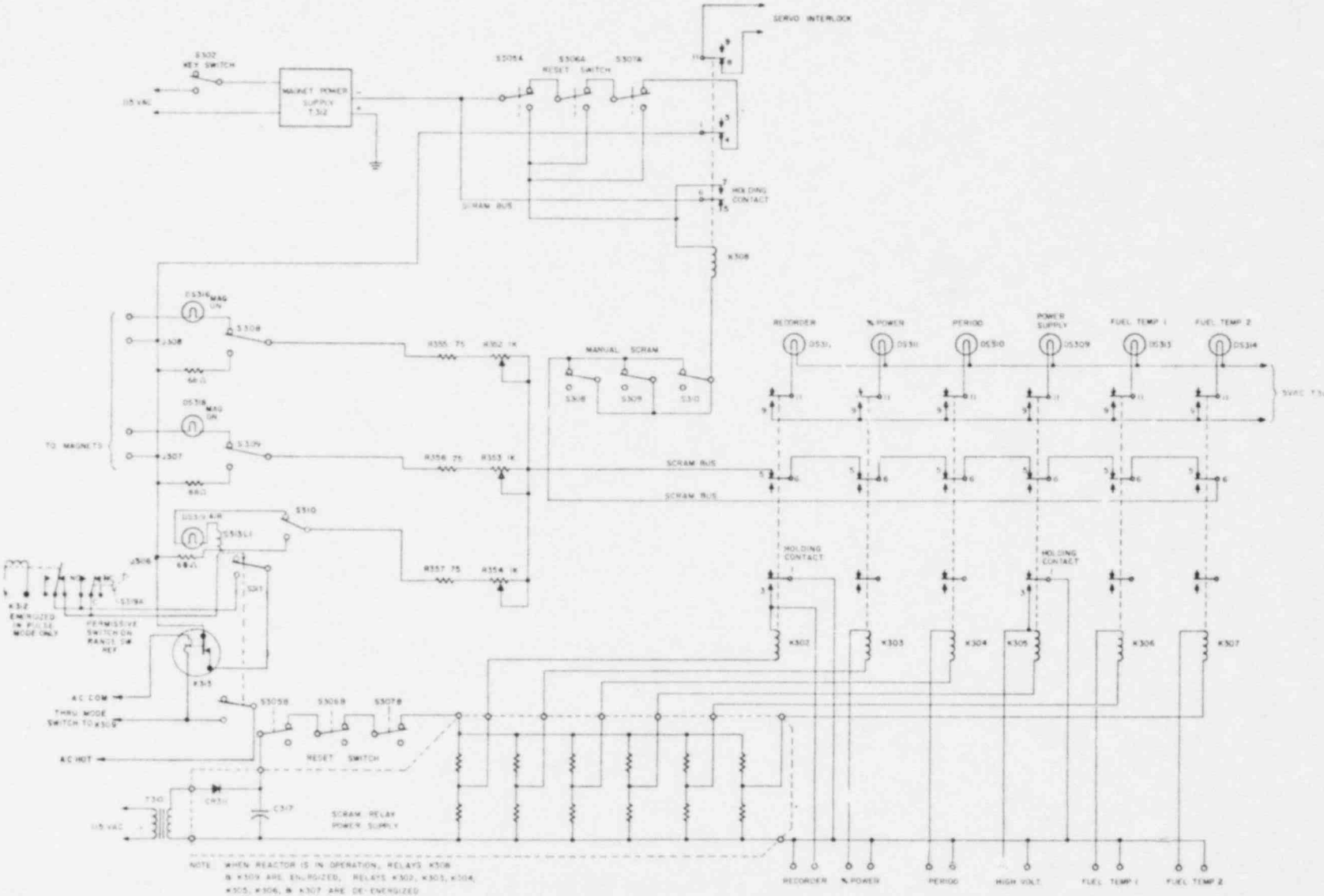
Version 1.0



WIDE RANGE LOG CHANNEL

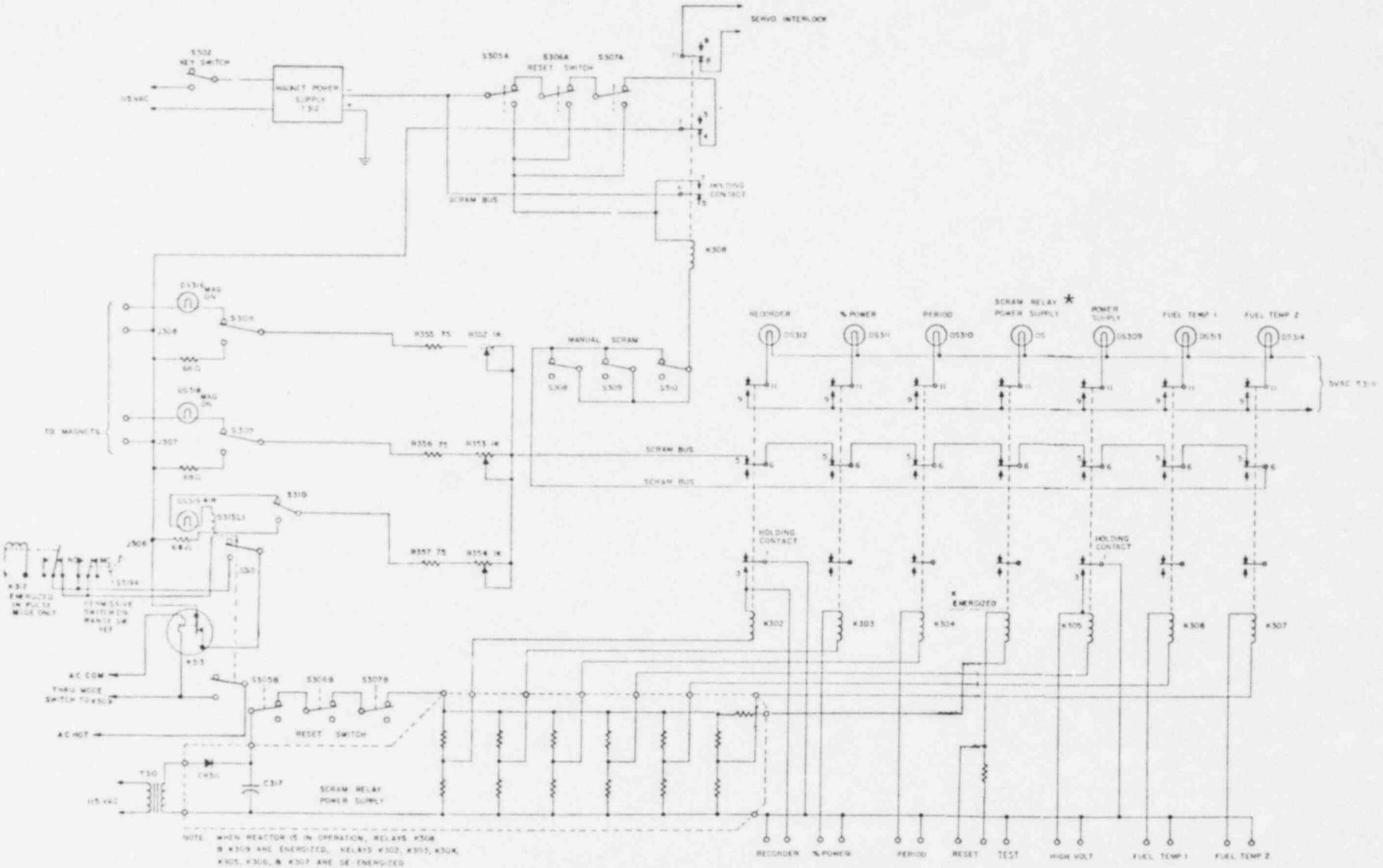
PATENTED

GA Wide Range Instrumentation Unit



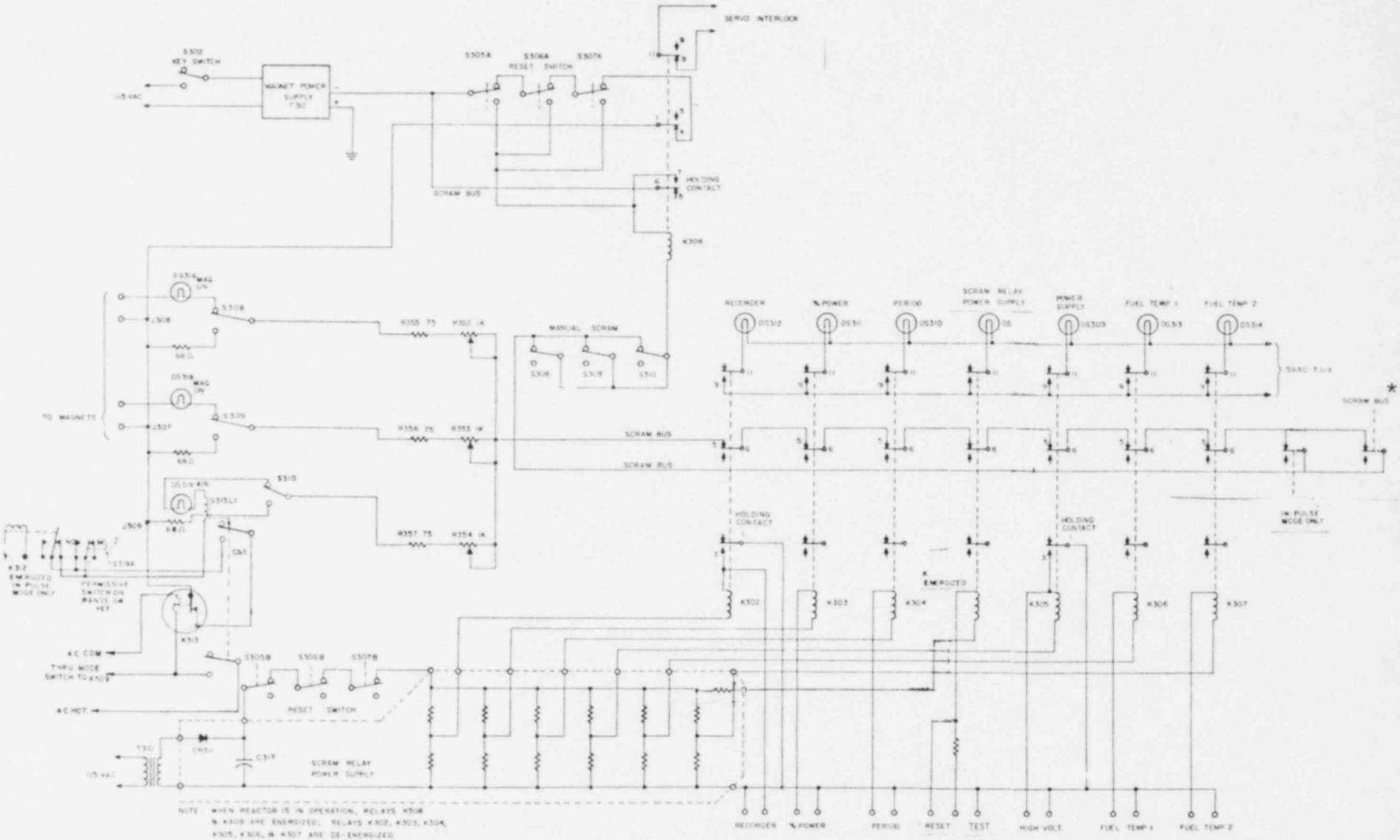
Installed Version

--Magnet and scram circuit



Scram Relay Power Failure Modification*
--Magnet and scram circuit

Version Ø.1



NOTE: WHEN REACTOR IS IN OPERATION, RELAYS K308 & K309 ARE ENERGIZED; RELAYS K302, K303, K304, K305, K306, & K307 ARE DE-ENERGIZED

Extended Scram Bus Modification*
--Magnet and scram circuit

Version 1.0