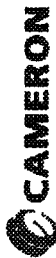


DRILLING & PRODUCTION SYSTEMS

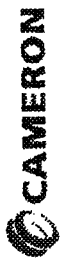


Performance

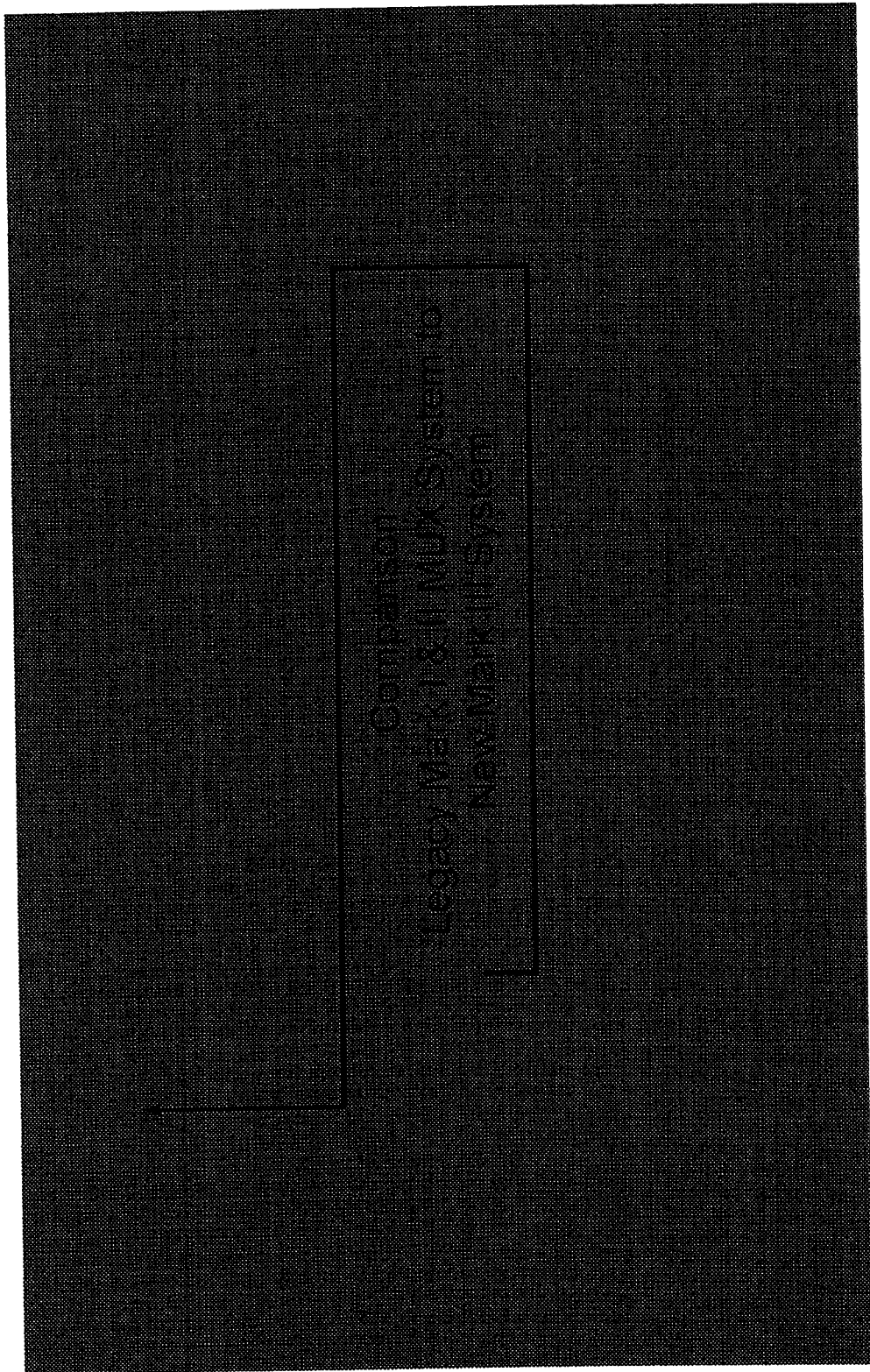
THROUGH LEADERSHIP

Transocean
Mark II Upgrade
March 18, 2009
Houston, Texas

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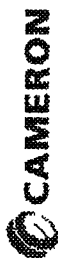


DRILLING & PRODUCTION SYSTEMS



Comparison
Legacy Mark II & I MUX System to
New Mark III System

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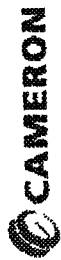


DRILLING & PRODUCTION SYSTEMS

Contents

- Transocean install Base
- Mark III System Overview – New Features

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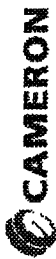
DRILLING & PRODUCTION SYSTEMS

Cameron Mux Systems

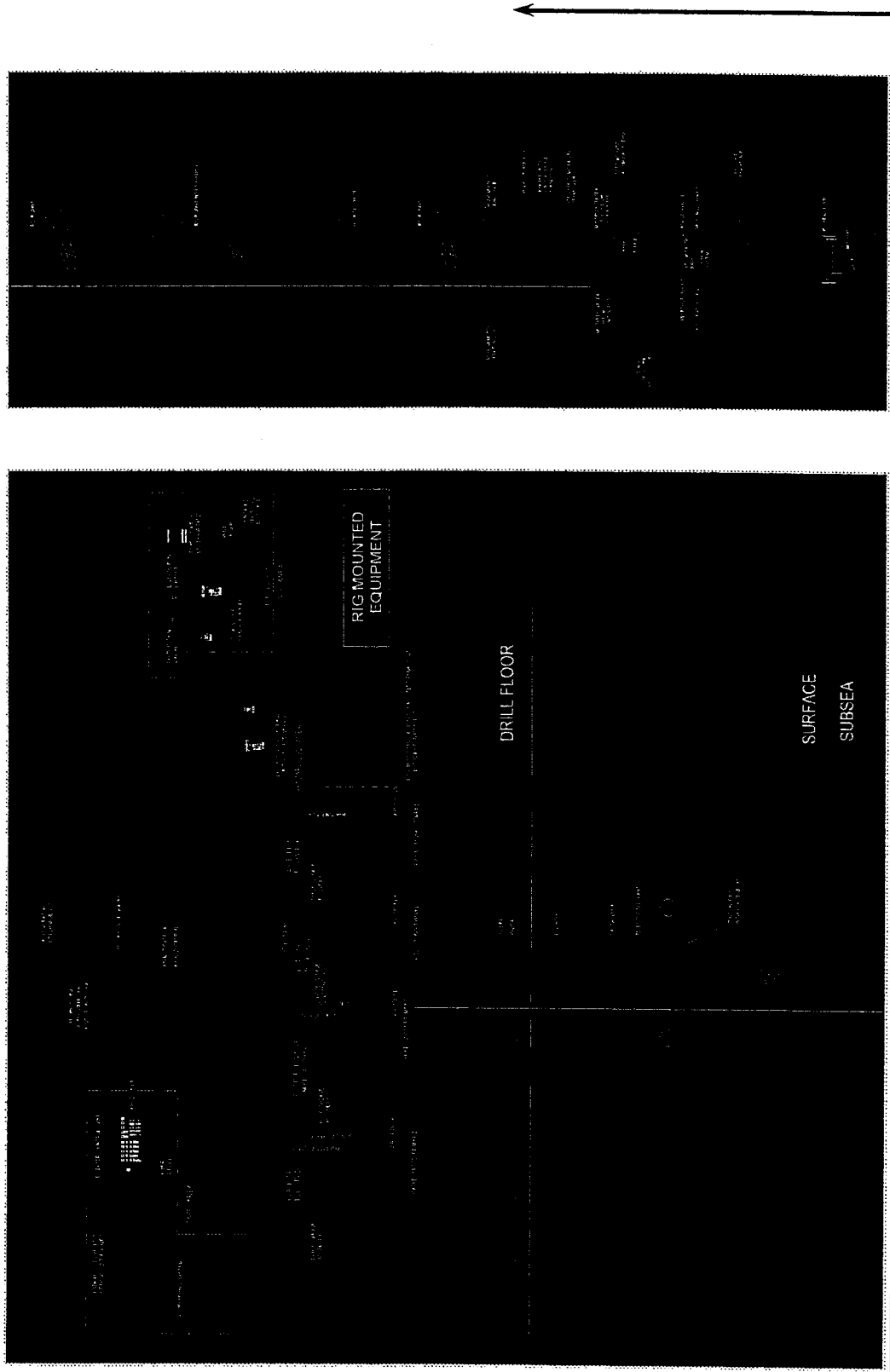
Leader	Mark 1
Celtic Sea	Mark 1
Explorer	Mark 1
Express	Mark 1
Energy	Mark 1
Cajun	Mark 1
Sovereign Explorer	Mark 1
Discoverer Enterprise	Mark II
Nautilus	Mark II
CR Luigs	Mark II
Jack Ryan	Mark II
Horizon	Mark II

12 Systems

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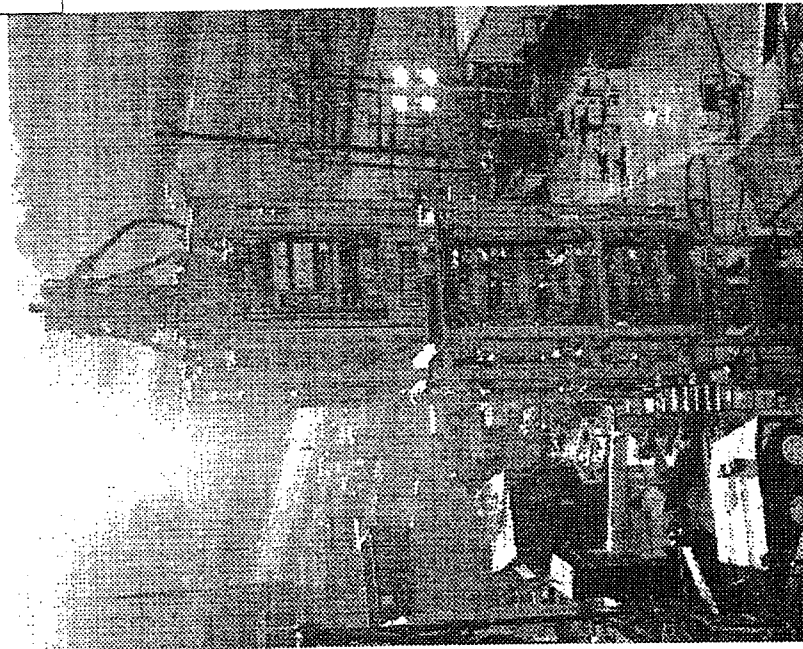
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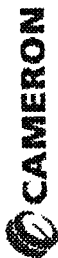
Legacy System vs Mark III System

Main discussion areas

- Surface architecture
- Subsea architecture
- MUX Pods

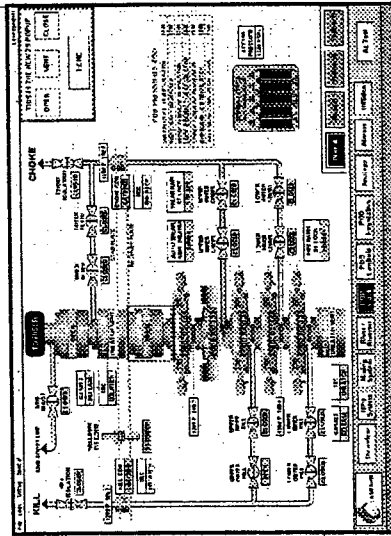


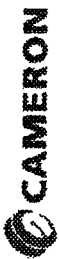




Surface Changes

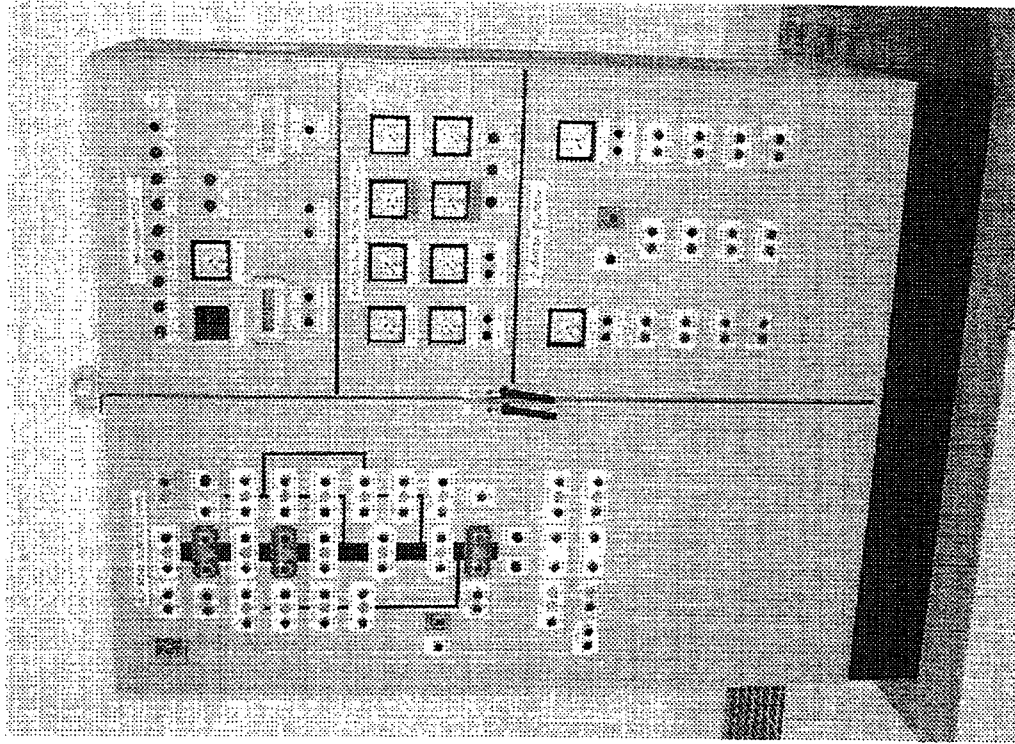
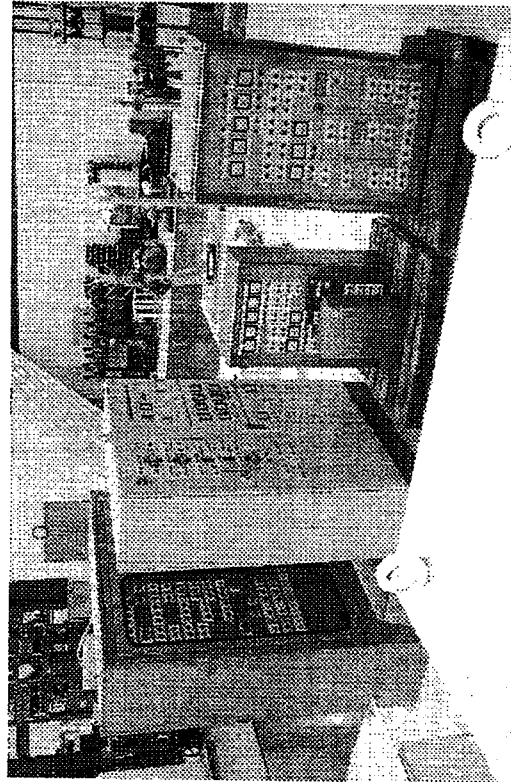
- **Surface Communications**
 - Legacy used Profibus via Fiber Optics with OLM's
(Star type network with poor diagnostic capabilities)
 - Mark III utilizes Ethernet technology via Fiber Optics with field proven Siemens Fiber Converters/Switches
(robust network management for increased uptime with enhanced diagnostics)
- **Touch Screen Panels have been developed to replace hardware push-button panels**
- **Wonderware HMI Software utilized for enhanced graphics and ease of use**
- **Field proven Siemens S7 PLC's utilizing Step 7 software**



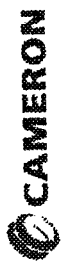


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Legacy Hardwire Push-button Panels

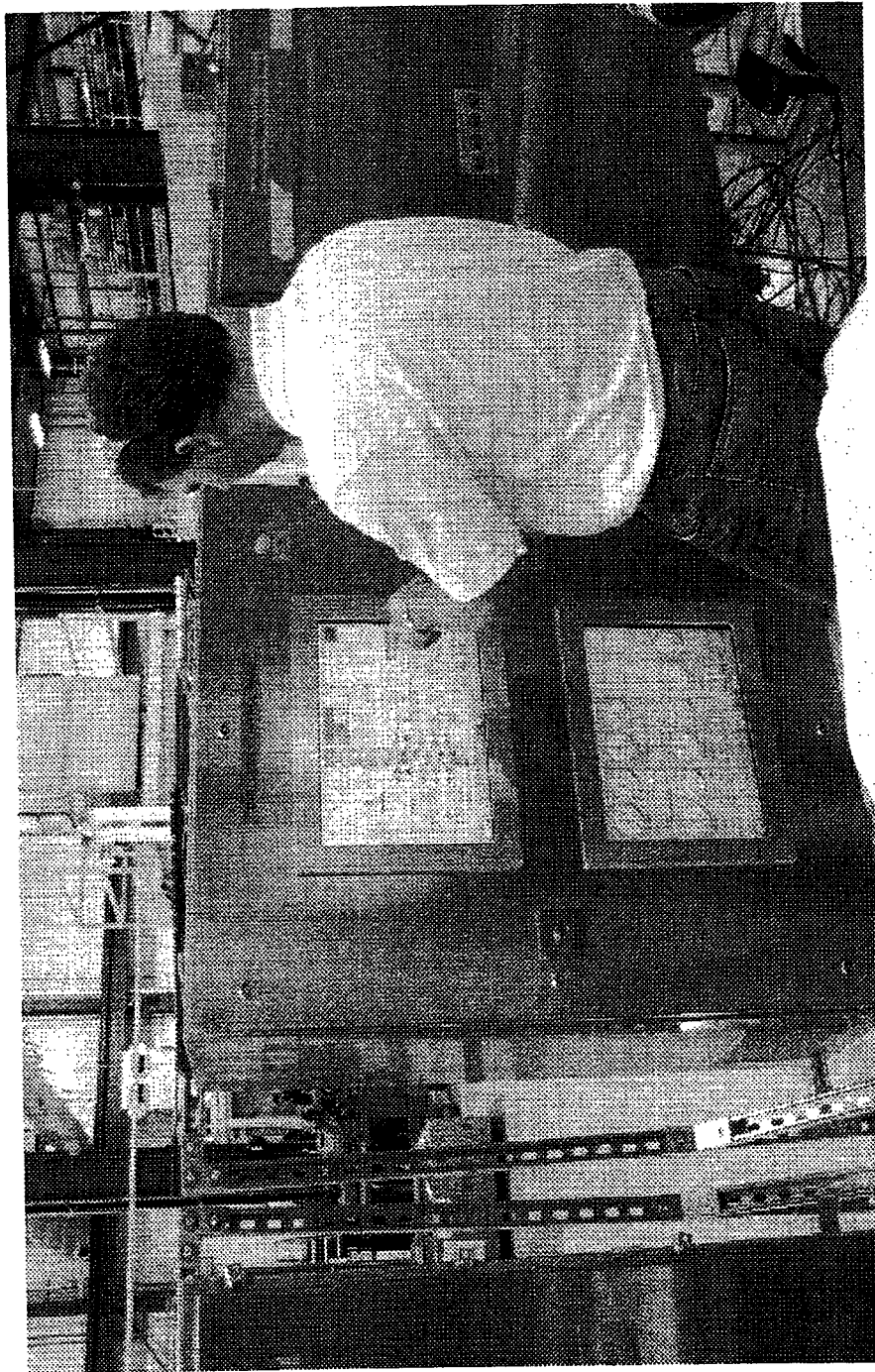


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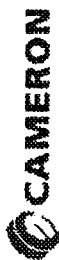


DRILLING & PRODUCTION SYSTEMS

Touch Screen Panels

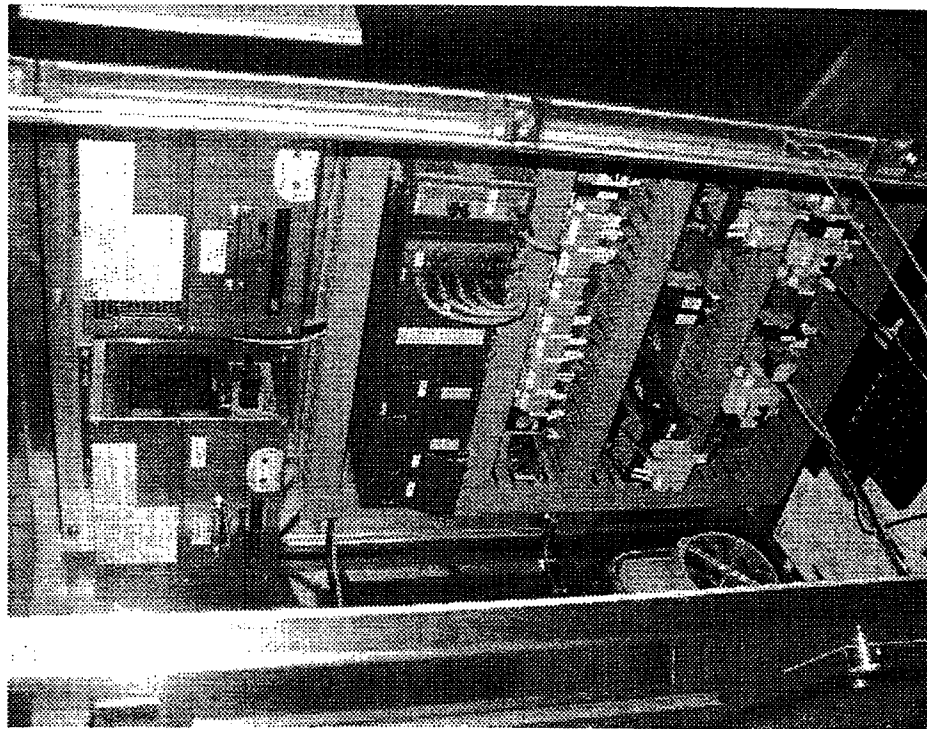
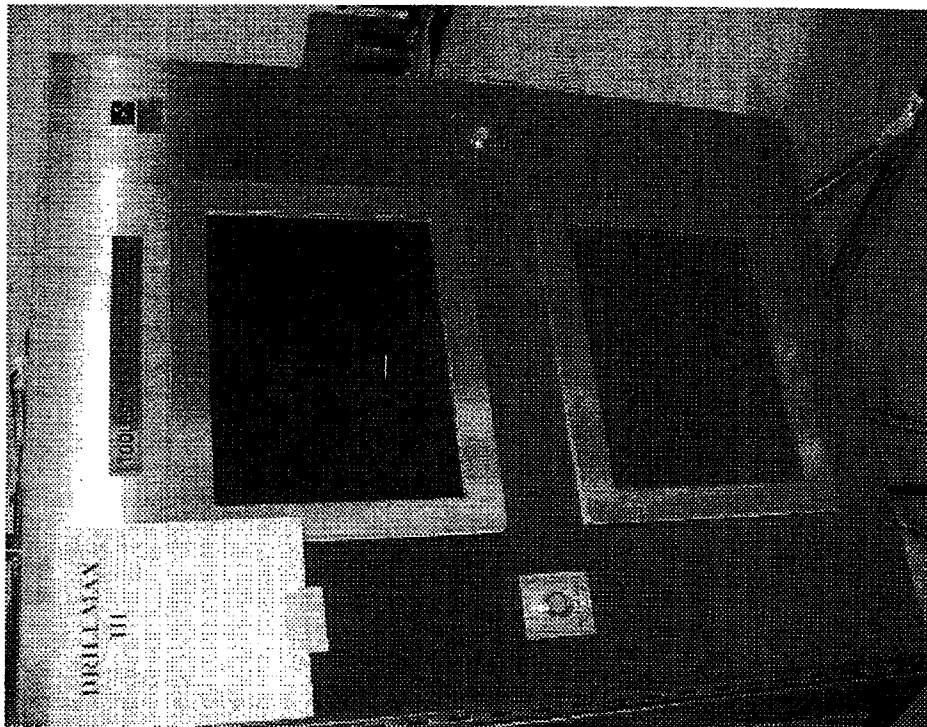


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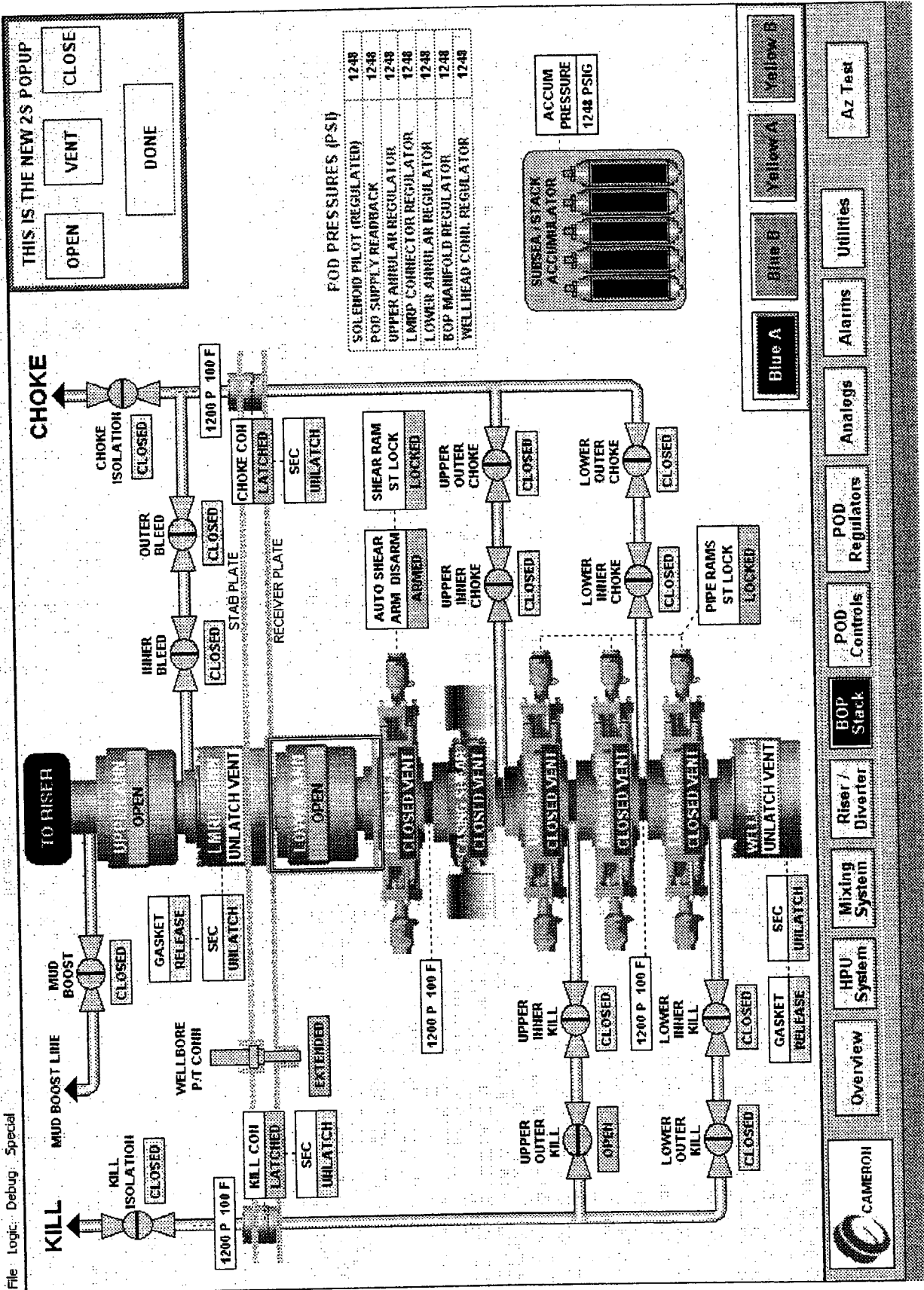


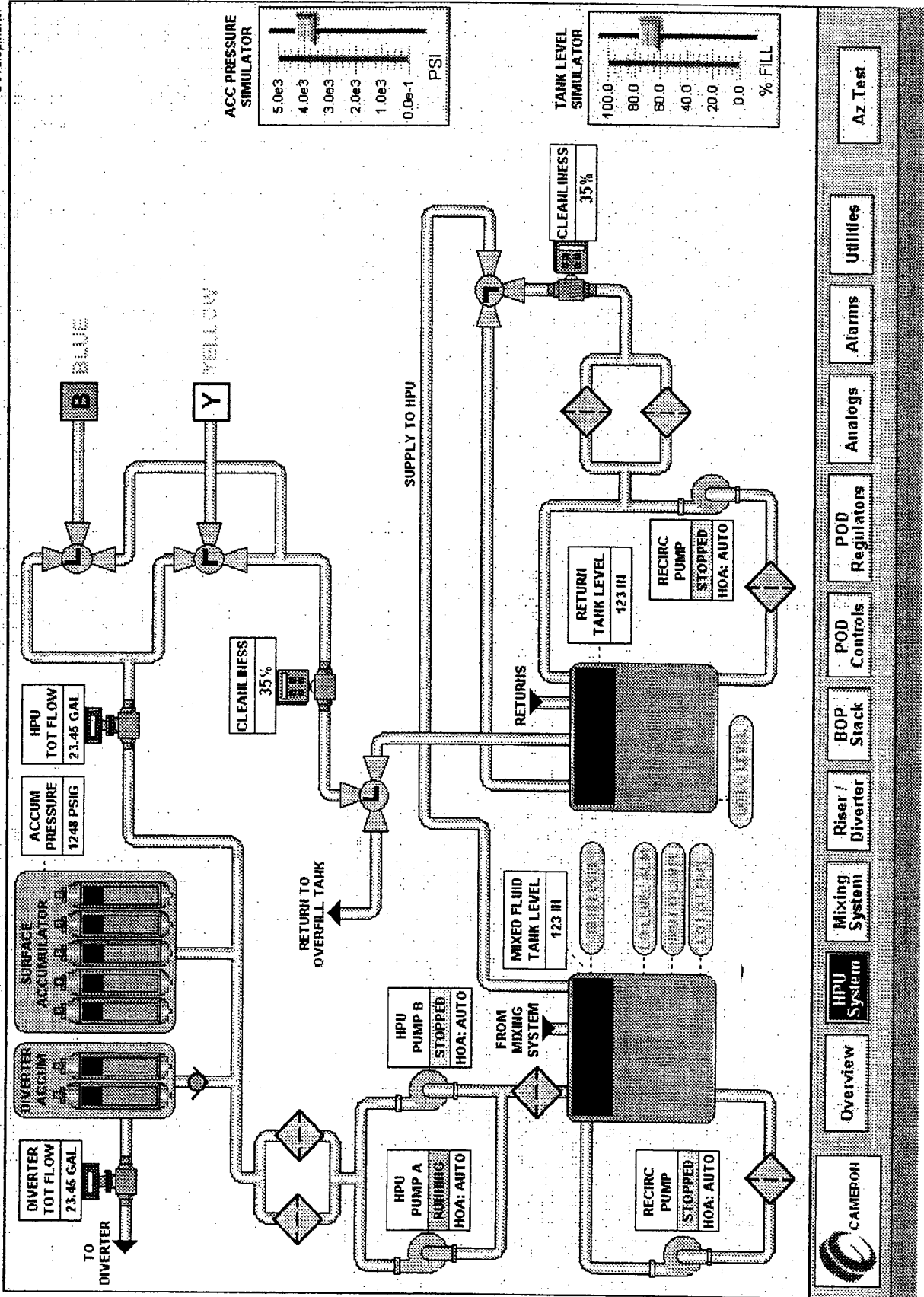
DRILLING & PRODUCTION SYSTEMS

Touch Screen Panels



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CAMERON

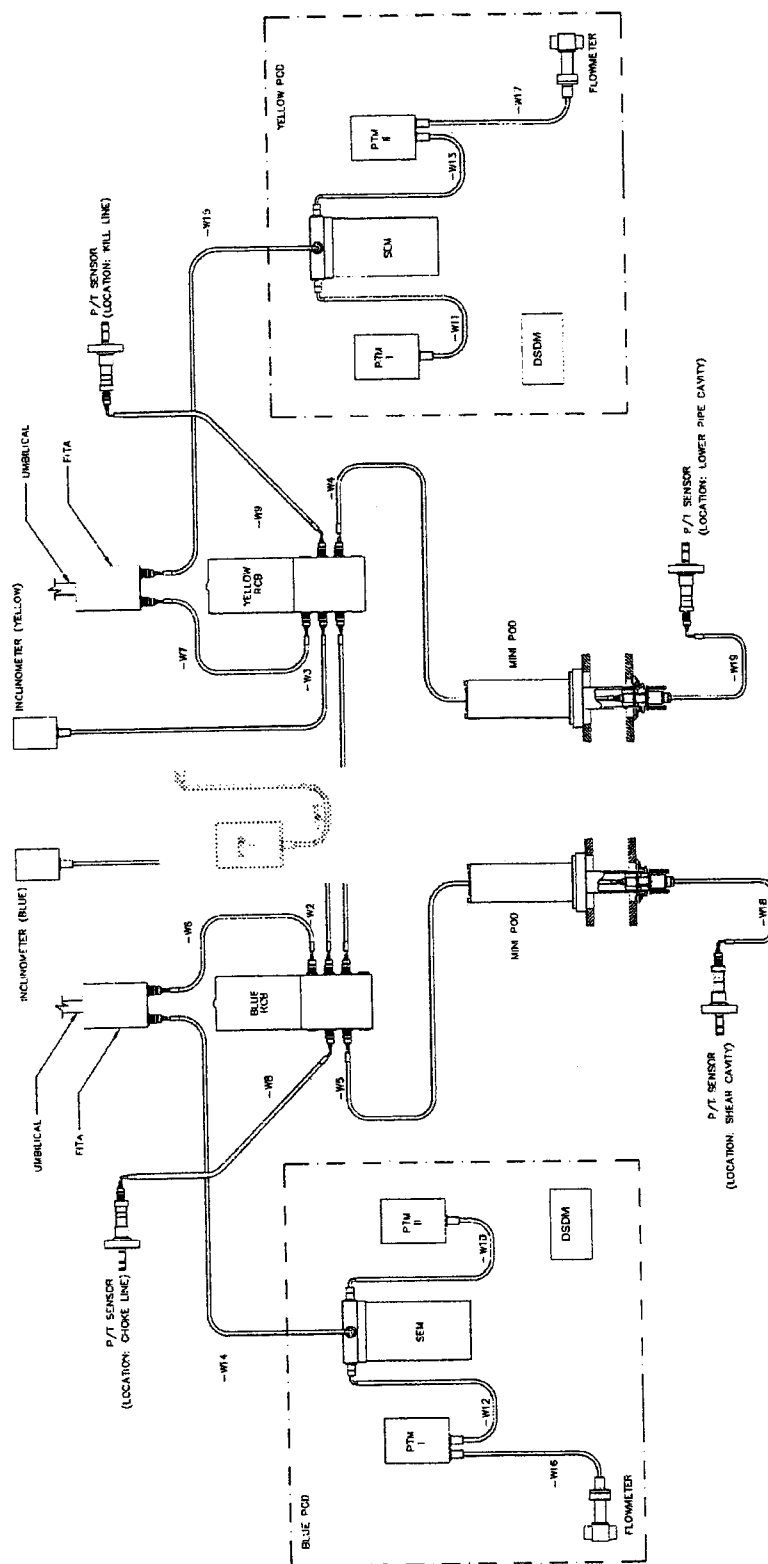
DRILLING & PRODUCTION SYSTEMS

Subsea Changes

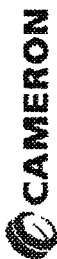
- Number of 1atm chambers reduced
- Power and signal go directly to SEM
- RCB has separate power and signal
- All interconnection cabling is Version 2 PBOF with testable connections and field reparability

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PBOF Interconnection Diagram

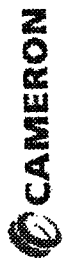


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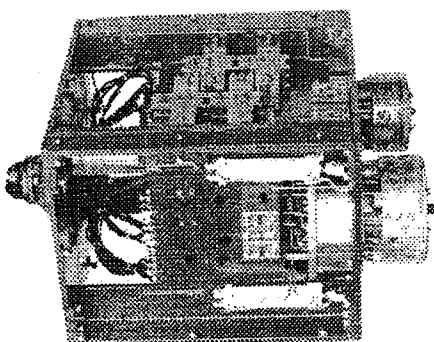


PODS

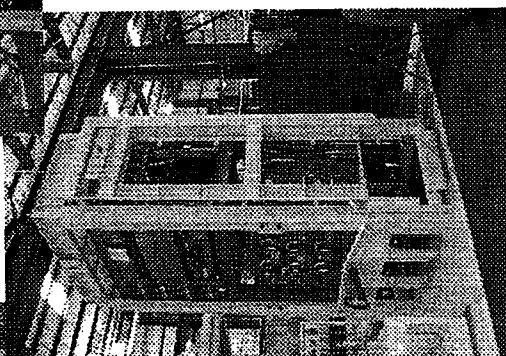
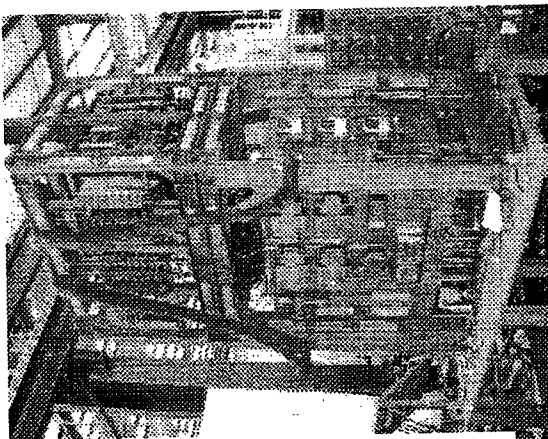
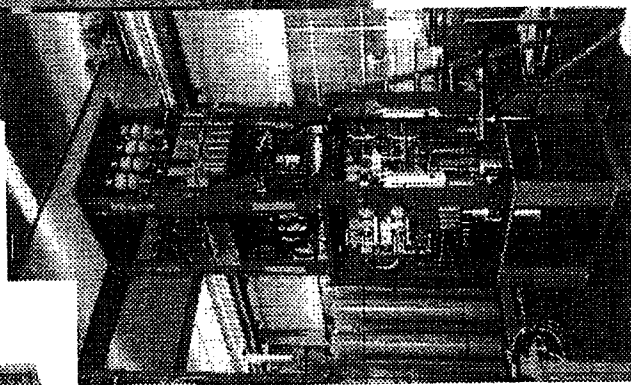
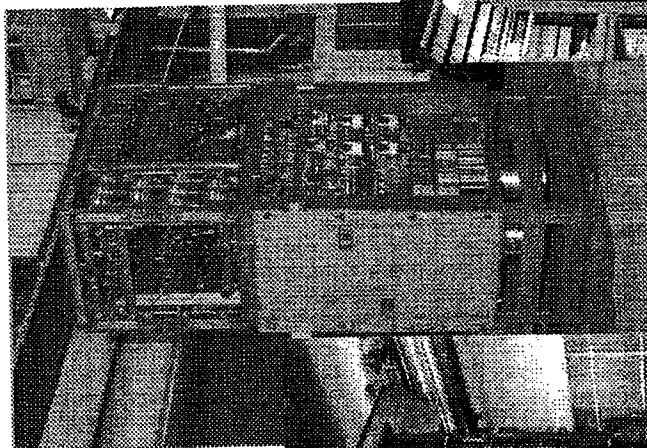
- Ben Ocean Lancer – 1st Gen MUX circa 1976
 - Mark I – 2nd Gen 77 Functions circa 1995
 - Used Direct Hyd Mod Section developed in the
 - Mark II – 2nd Gen Extended 107 functions circa 1998
 - Larger rectangular footprint
- Current Generation (began development 2004)
- Mark III Model 80 (80 functions, base footprint)
 - Mark III Model 120 (120 functions, rectangular footprint)



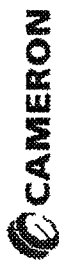
DRILLING & PRODUCTION SYSTEMS



PODS

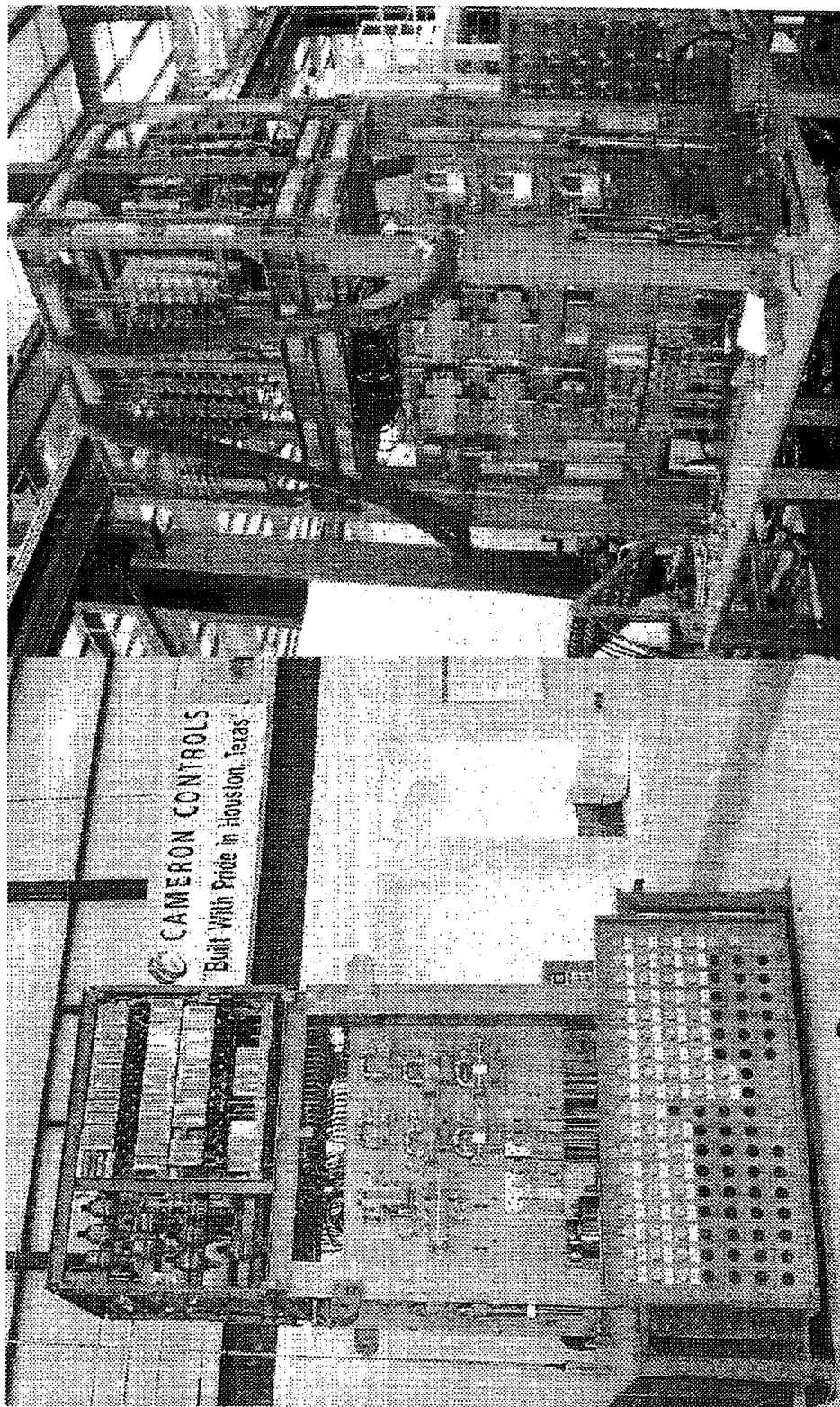


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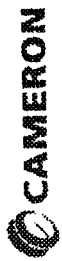


DRILLING & PRODUCTION SYSTEMS

Mark II & Mark III Model 120 Pods

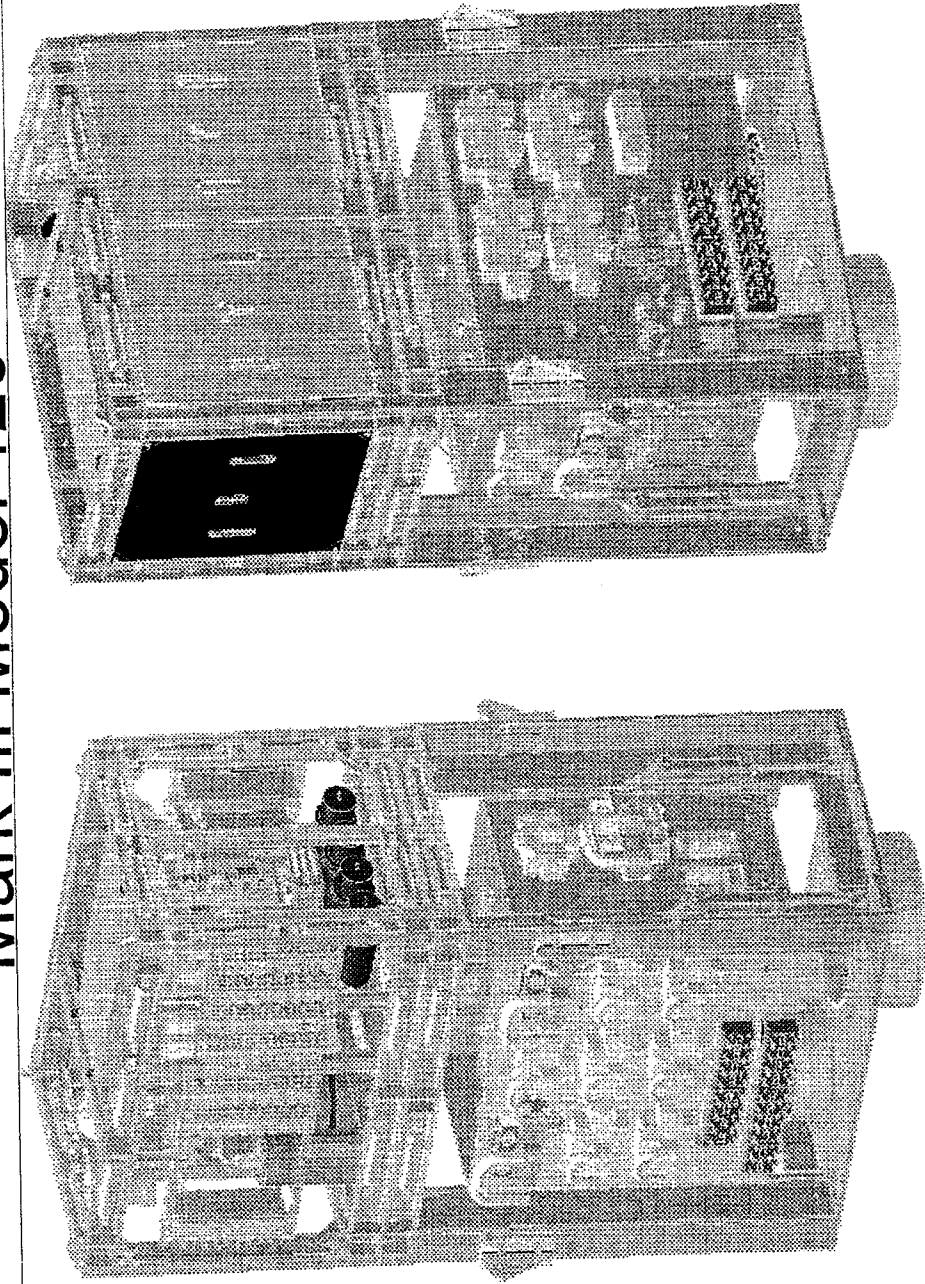


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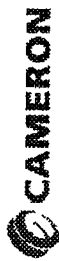


DRILLING & PRODUCTION SYSTEMS

Mark III Model 120



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DRILLING & PRODUCTION SYSTEMS

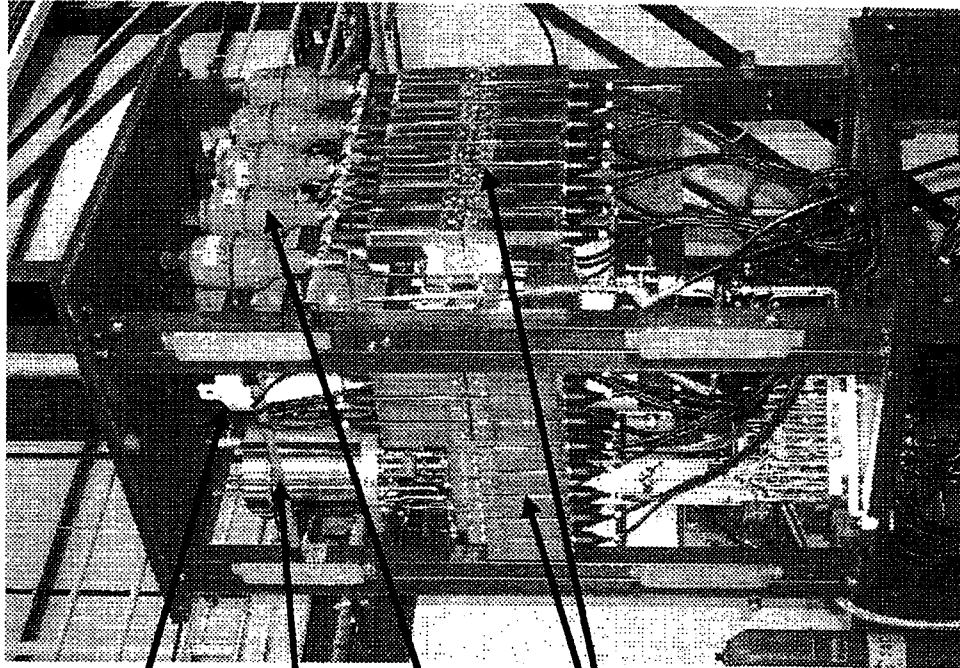
Mark I MUX Package

Subsea Electronics
Module

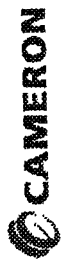
Subsea Transmitter
Module

Accumulators

Solenoid Valves

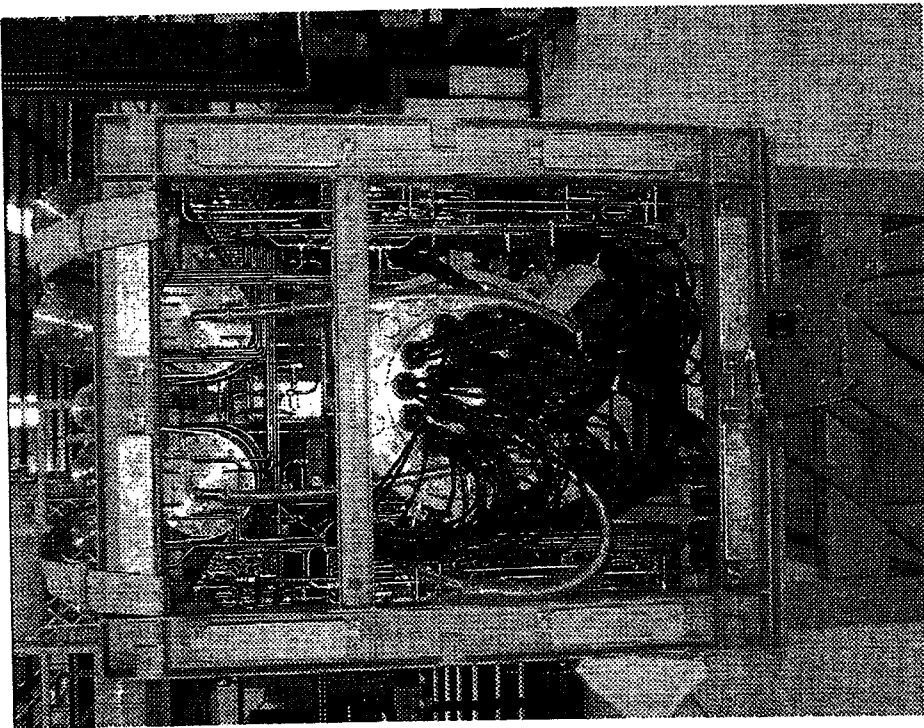
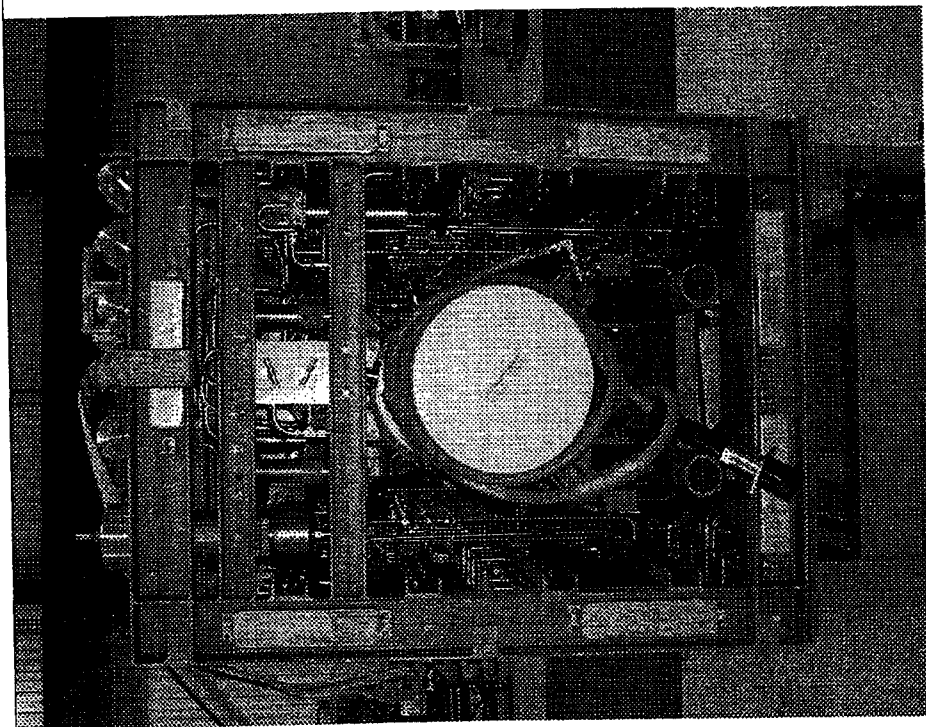


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Mark II MUX Package

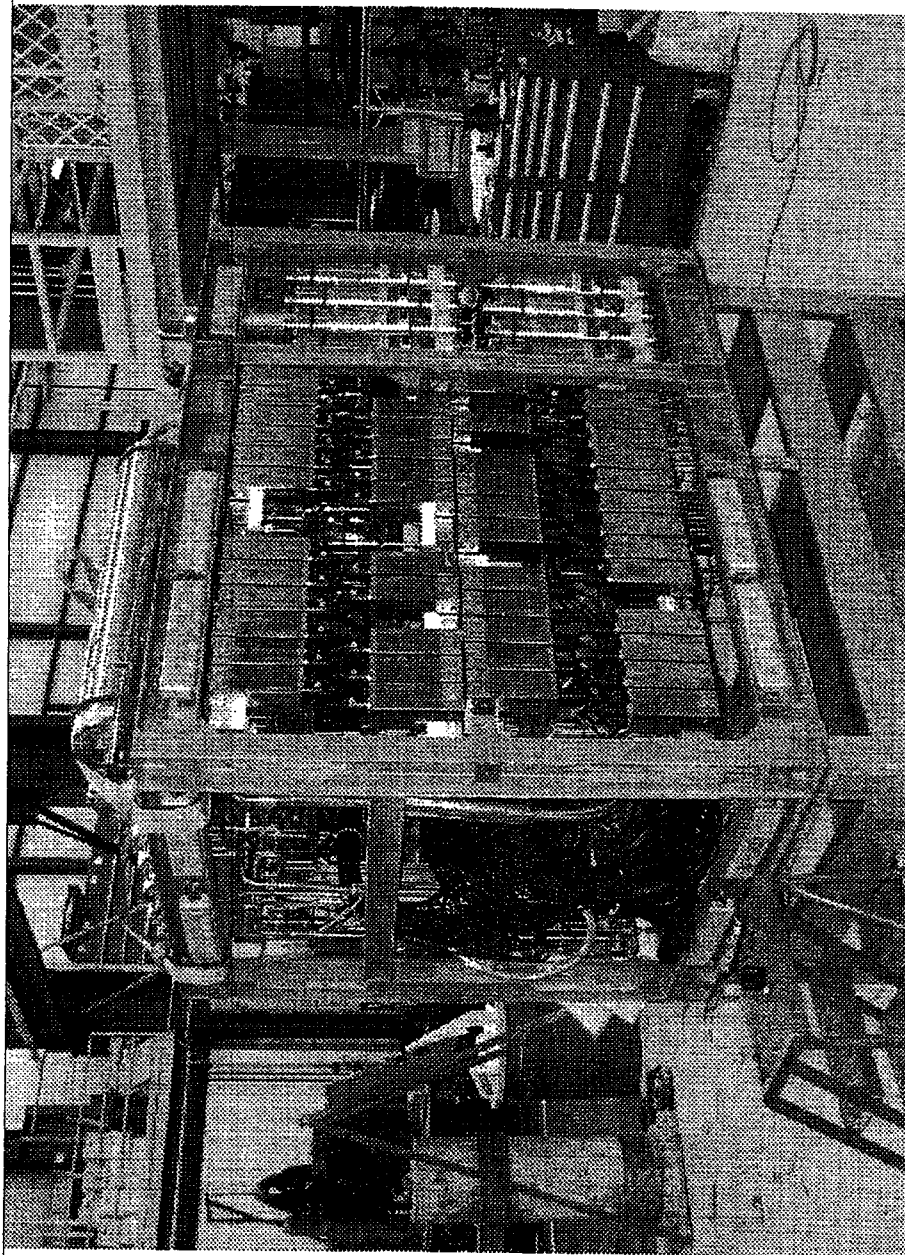


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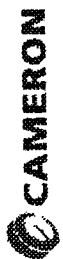
Mark II MUX Package



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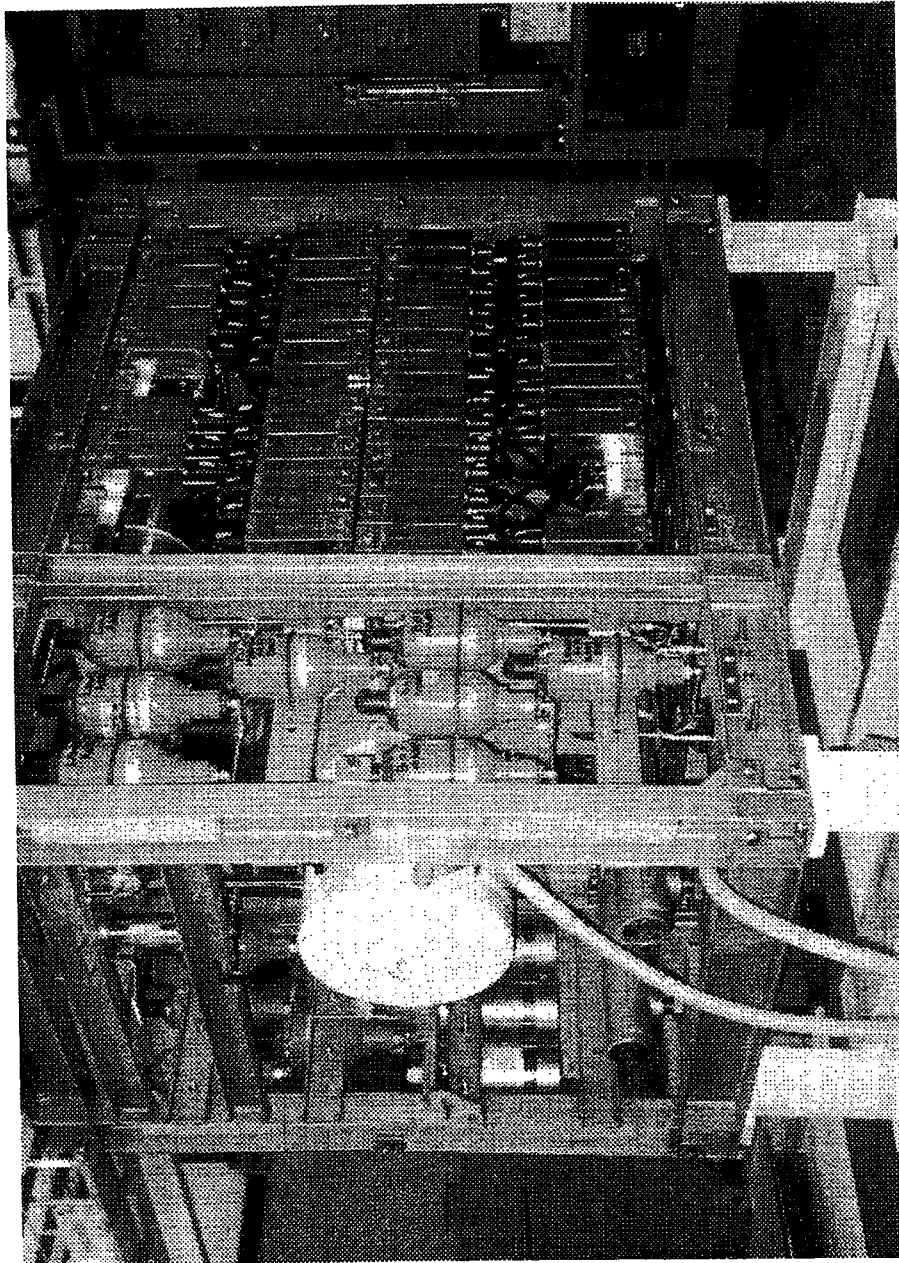
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Mark II MUX Package

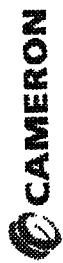


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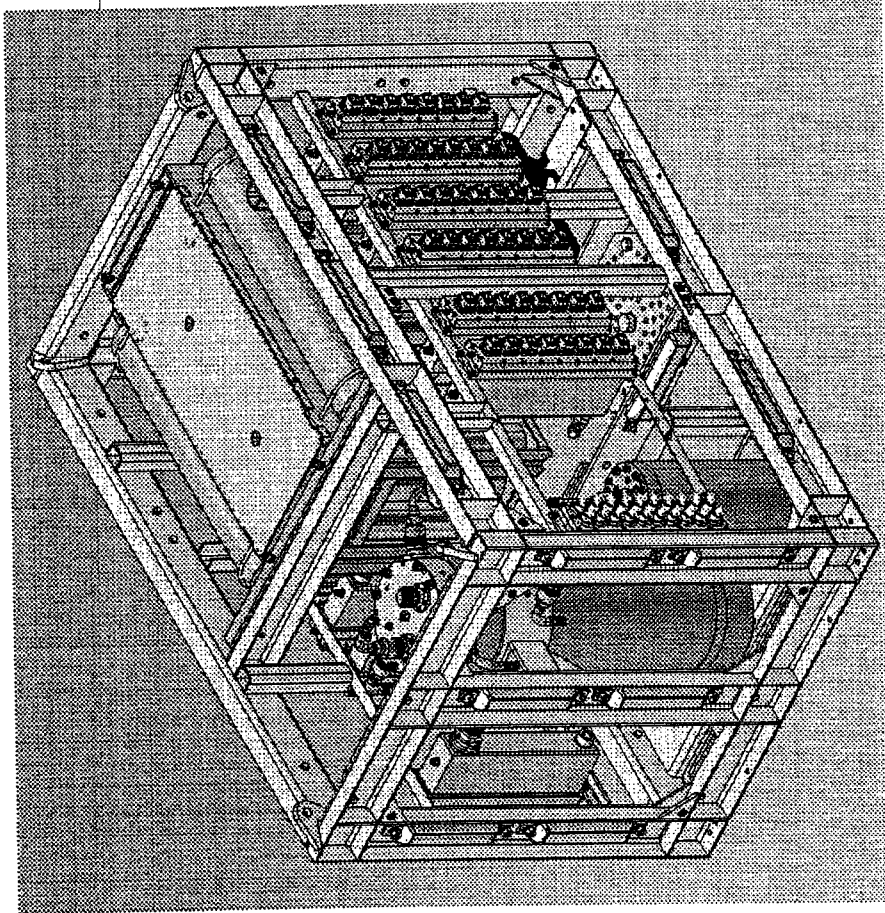
Mark III MUX Section

- Completely Repackaged for ease of maintenance
- Pressure compensated dielectric filled chambers
 - Solenoids
 - Transducers
- Modular construction
 - Solenoid chambers
 - Transducer chambers
 - Pilot Accumulator, Regulator & Filter rack
- Junction Plate for hydraulic interface between MUX / Mod
- New compact SEM design with next-gen electronics
- Rechargeable batteries for AMF/Deadman System



DRILLING & PRODUCTION SYSTEMS

Mark III Model 120 MUX Section

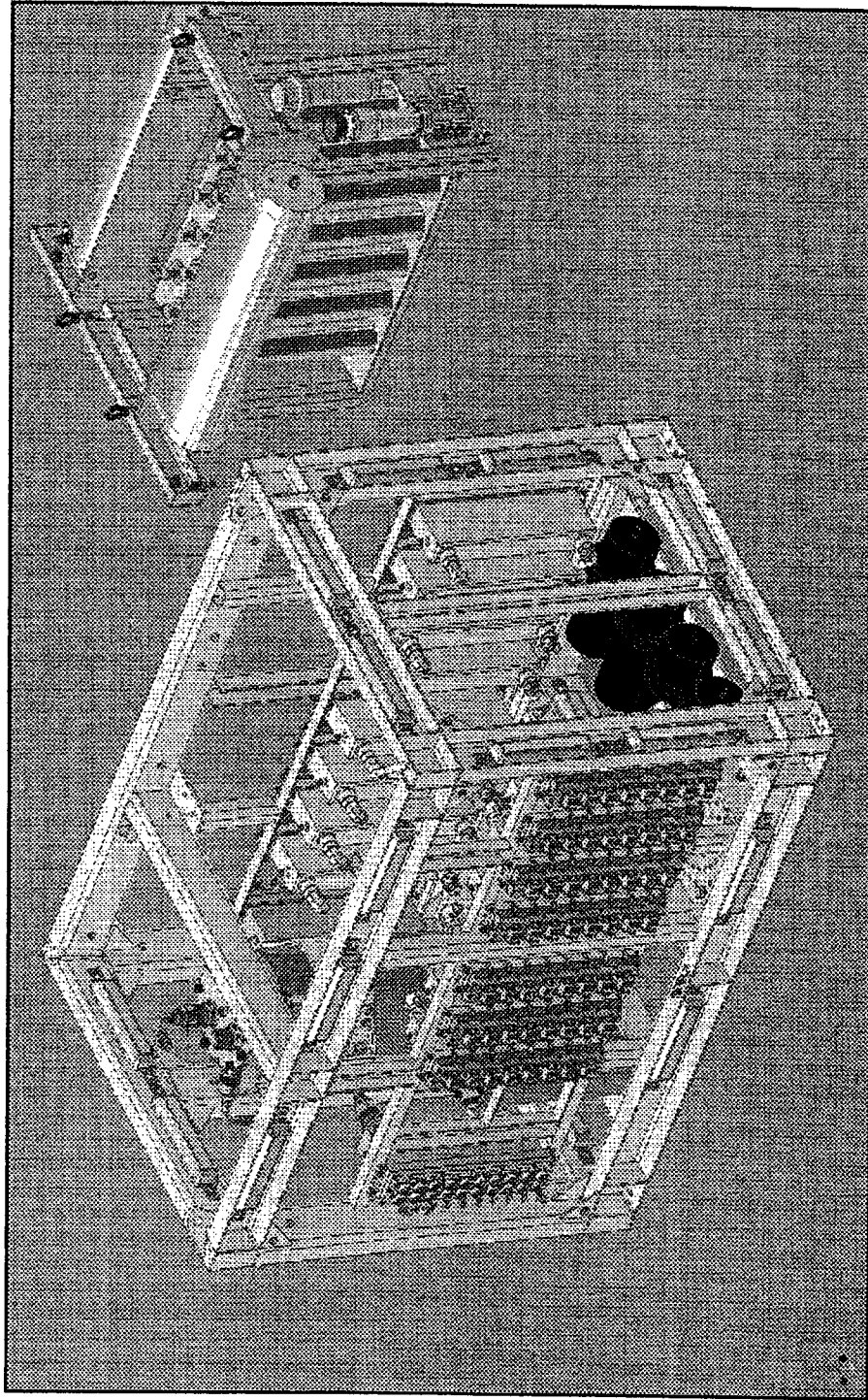


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Mark III Model 120 MUX Section

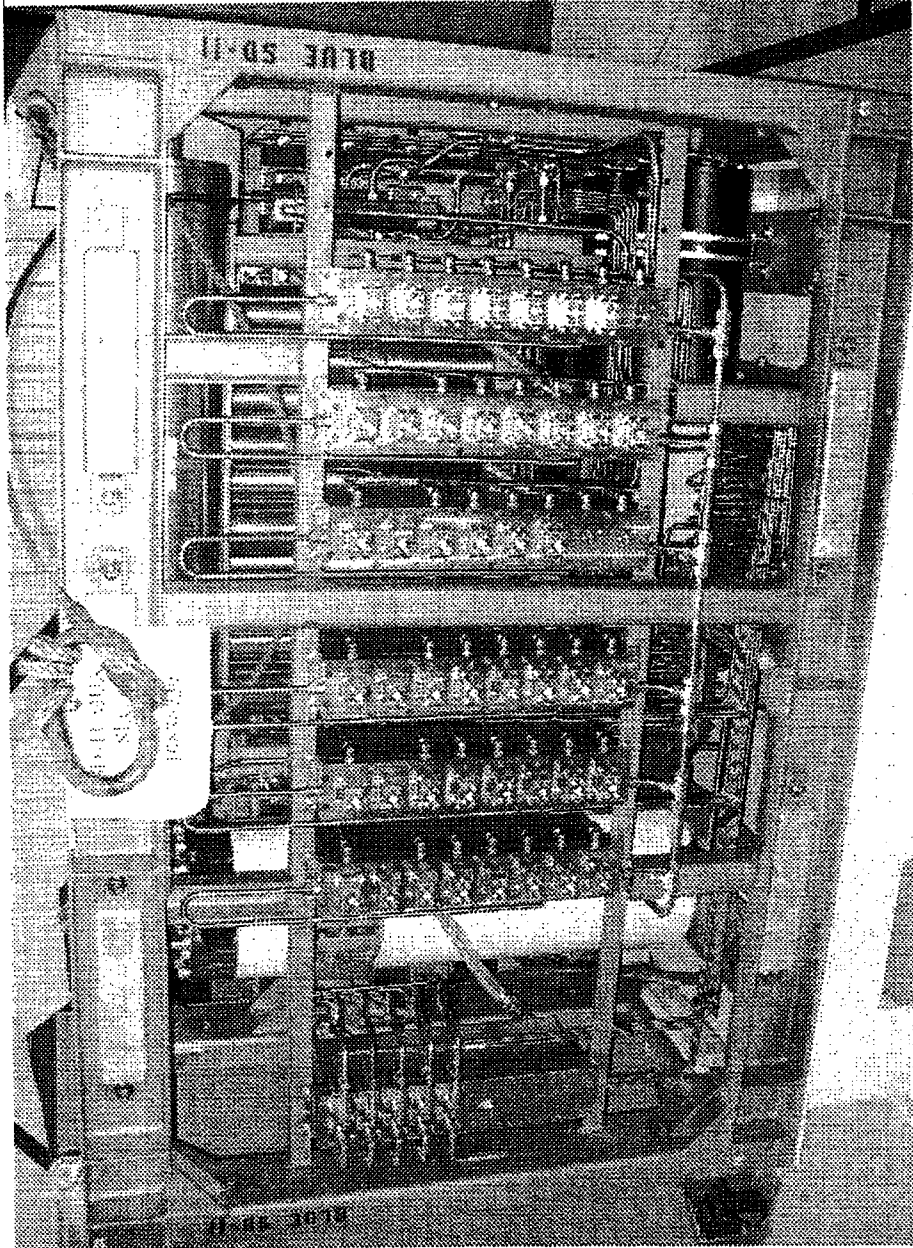


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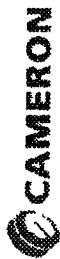
Mark III Model 120 MUX Section



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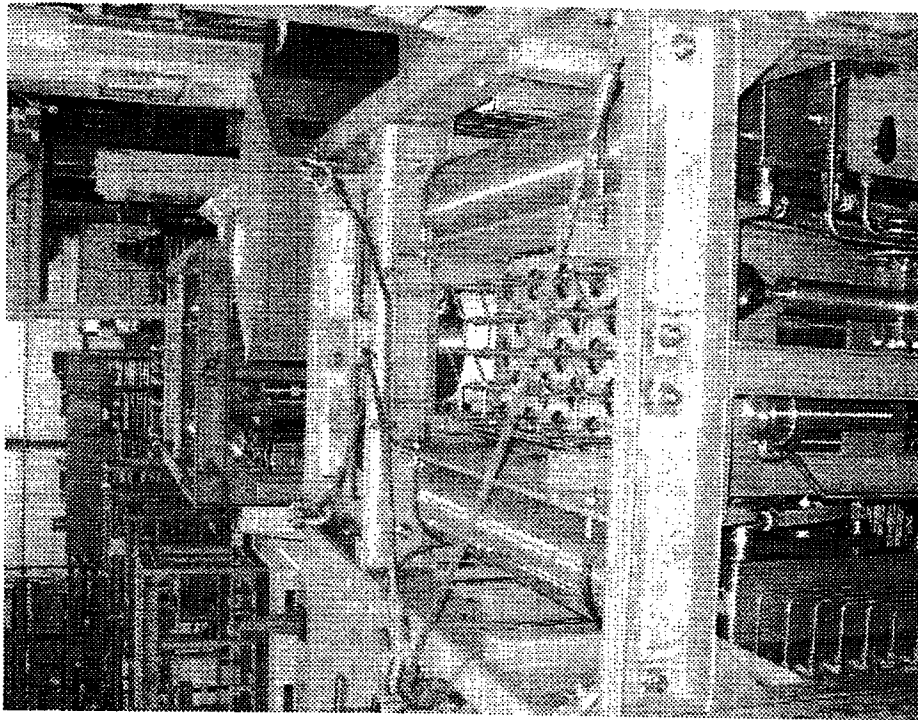
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Mark III Model 120 MUX Section



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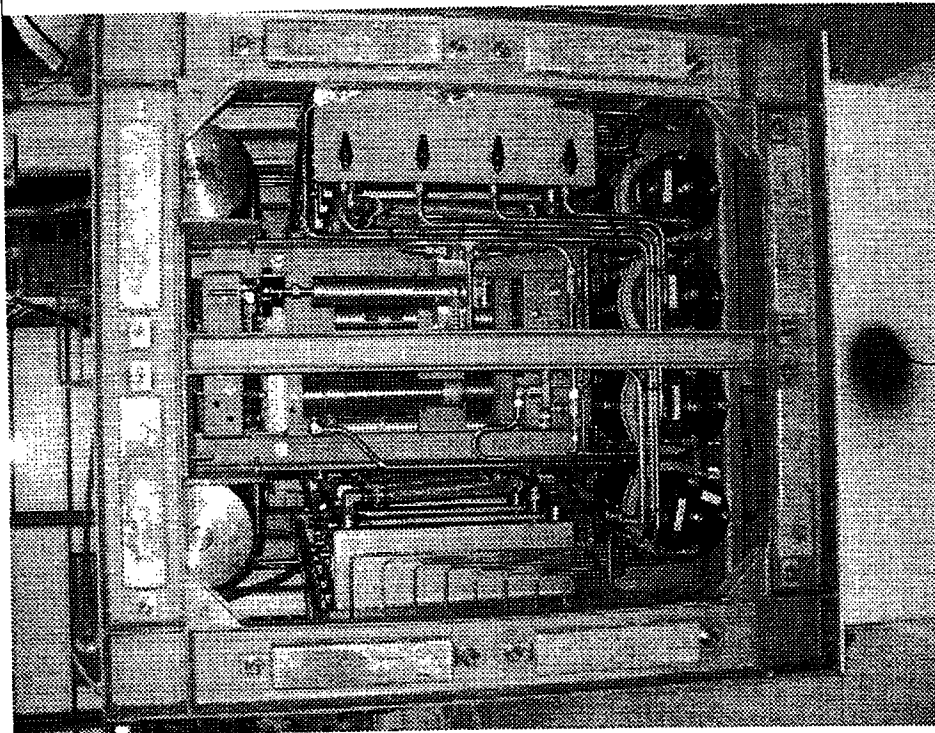
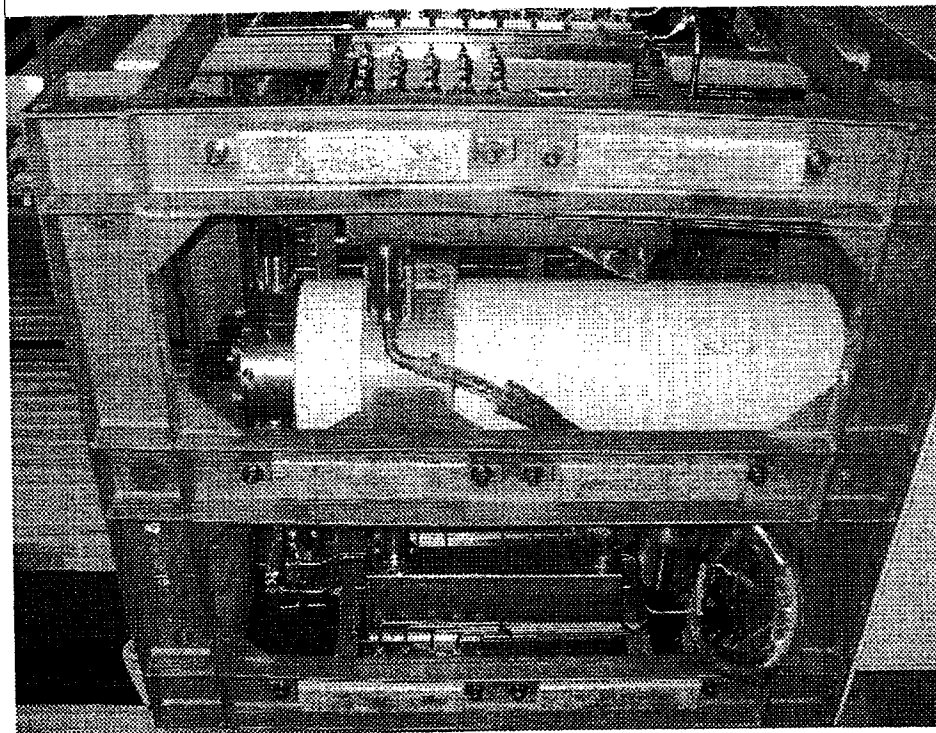
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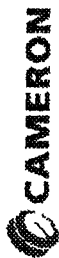
Mark III Model 120 MUX Section



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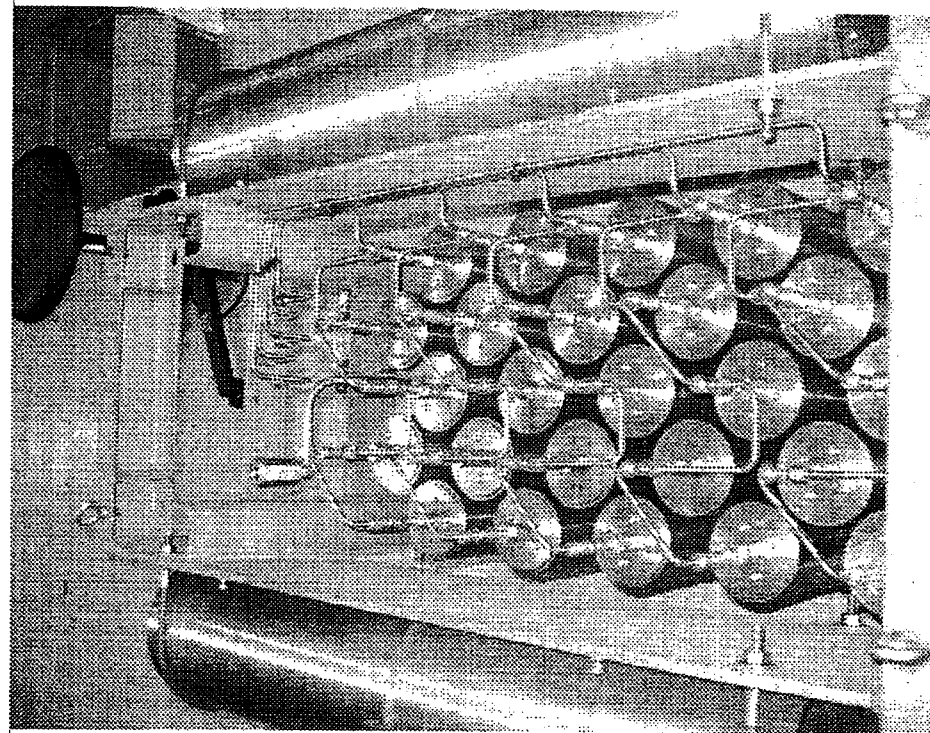
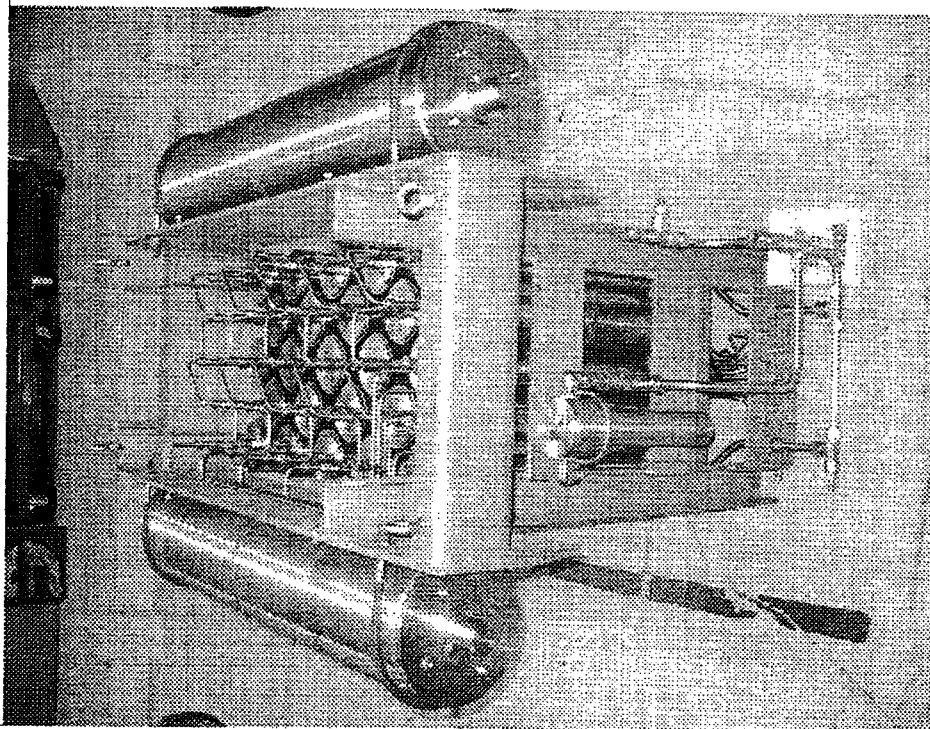
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Mark III Model 120 Pilot Accumulator Rack

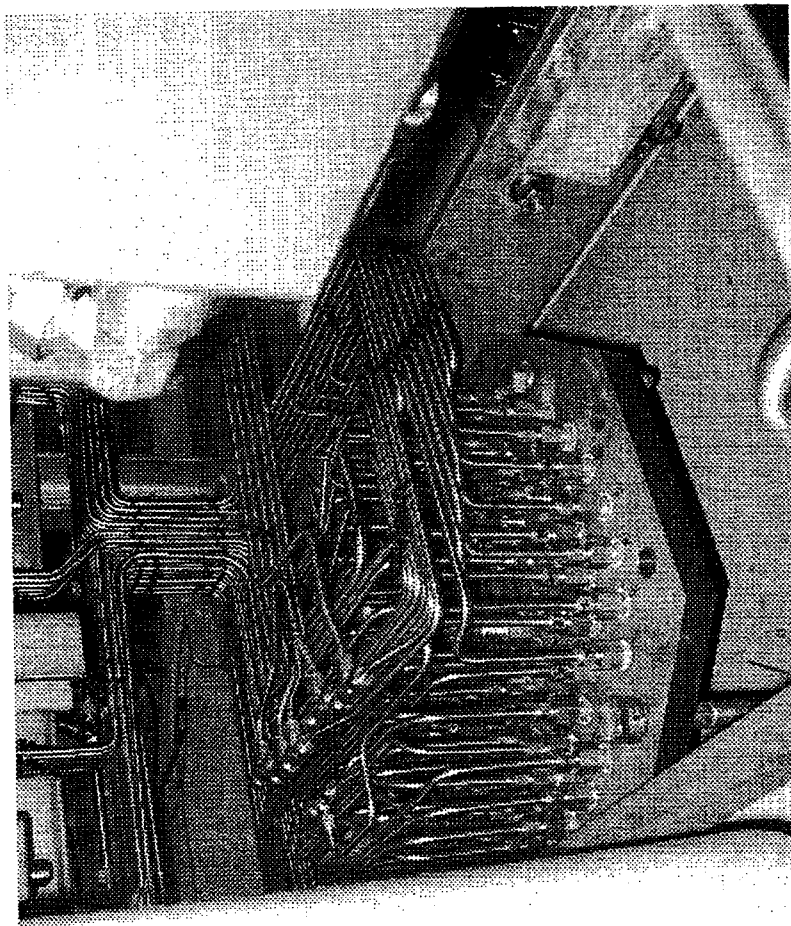
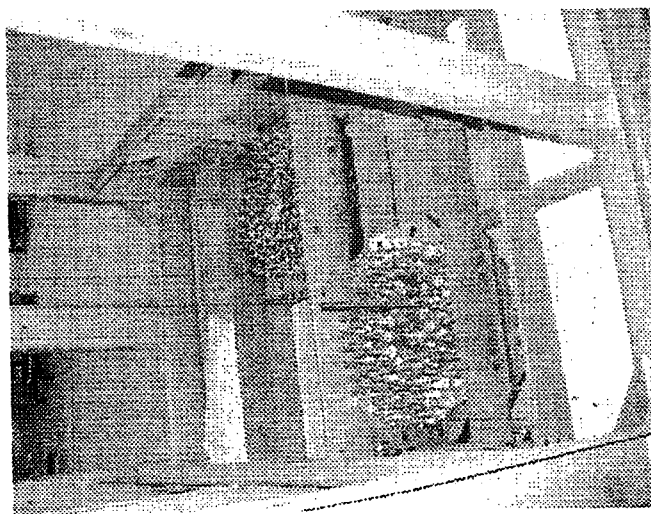


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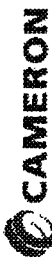


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Mark III Model 120 Junction Plates



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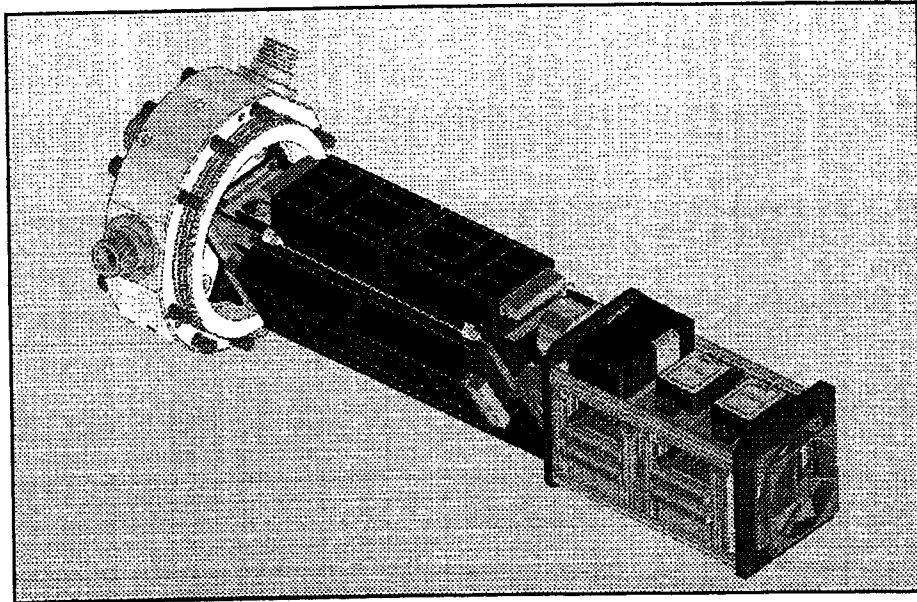
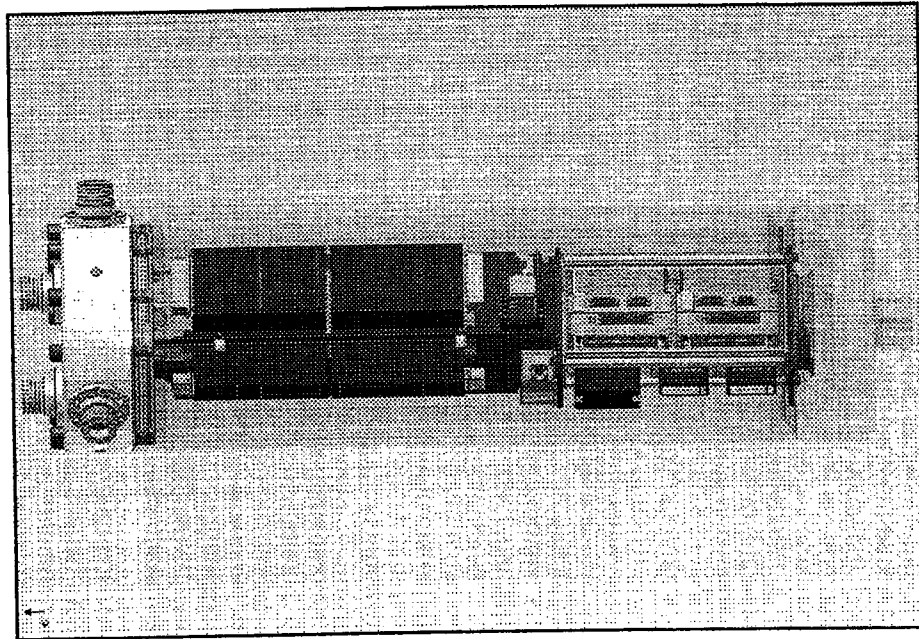
Mark III SEM Features

- Major SEM Electronics, SEM Controller I/O Board, Solenoid Drivers & Pressure Transducers are derivatives of the field proven CamTrol technology and are Proprietary to Cameron
- Electronics packaged to increase efficiency of heat dissipation
- Solenoid driver modules removed from SEM
- Mark III SEM is smaller than Mark I & Mark II
- 1 SEM for both the Model 80 or 120
- Pie connectors eliminated

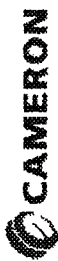


DRILLING & PRODUCTION SYSTEMS

Mark III SEM (Subsea Electronics Module)

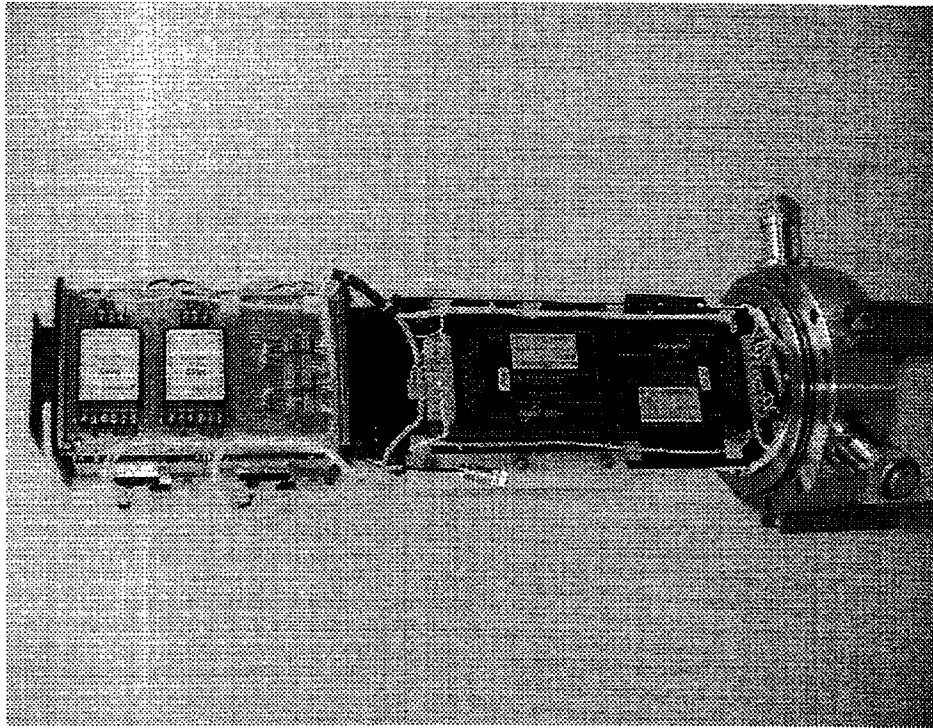
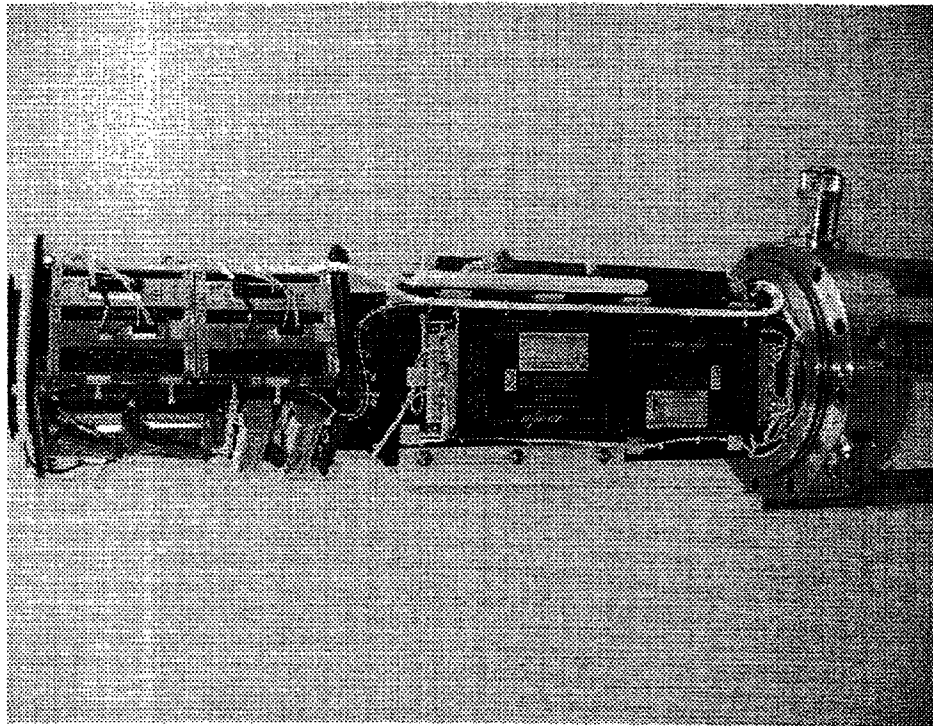


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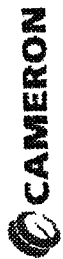


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Mark III SEM (Subsea Electronics Module)

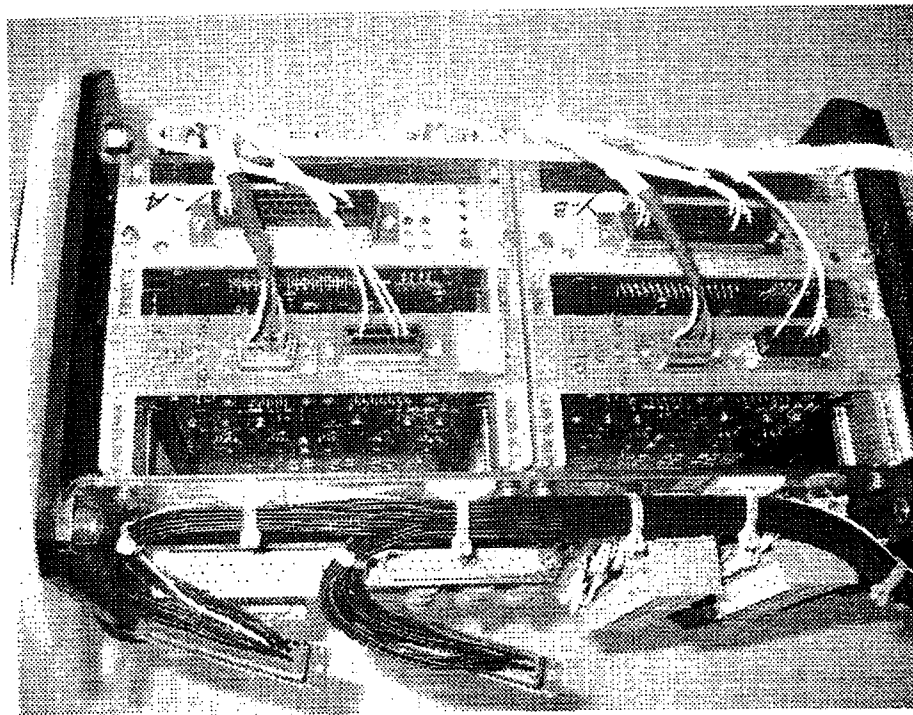
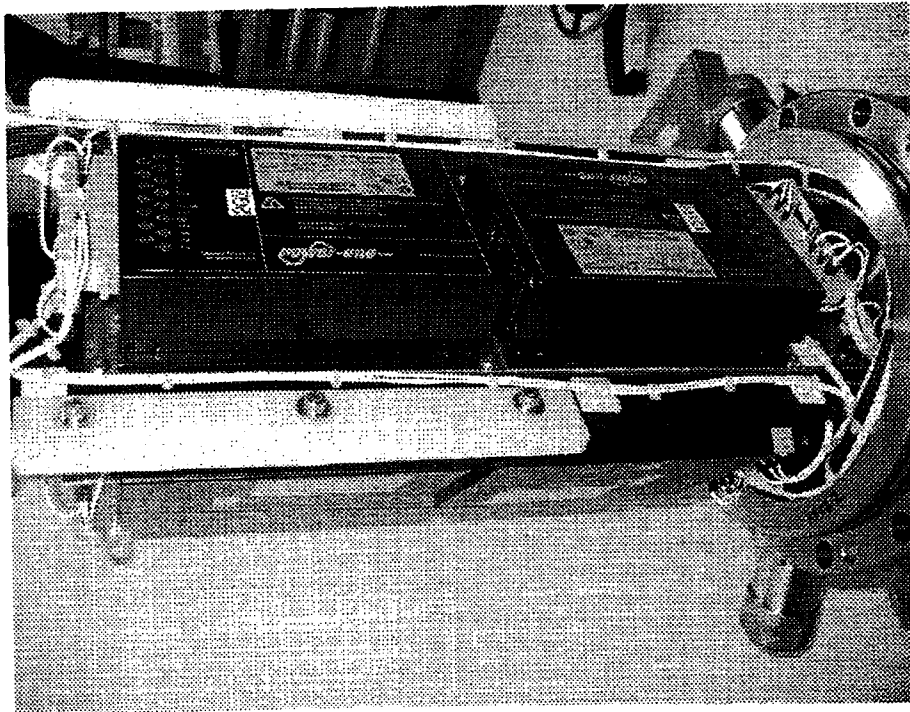


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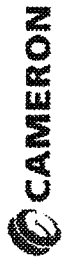


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Mark III SEM (Subsea Electronics Module)

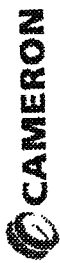


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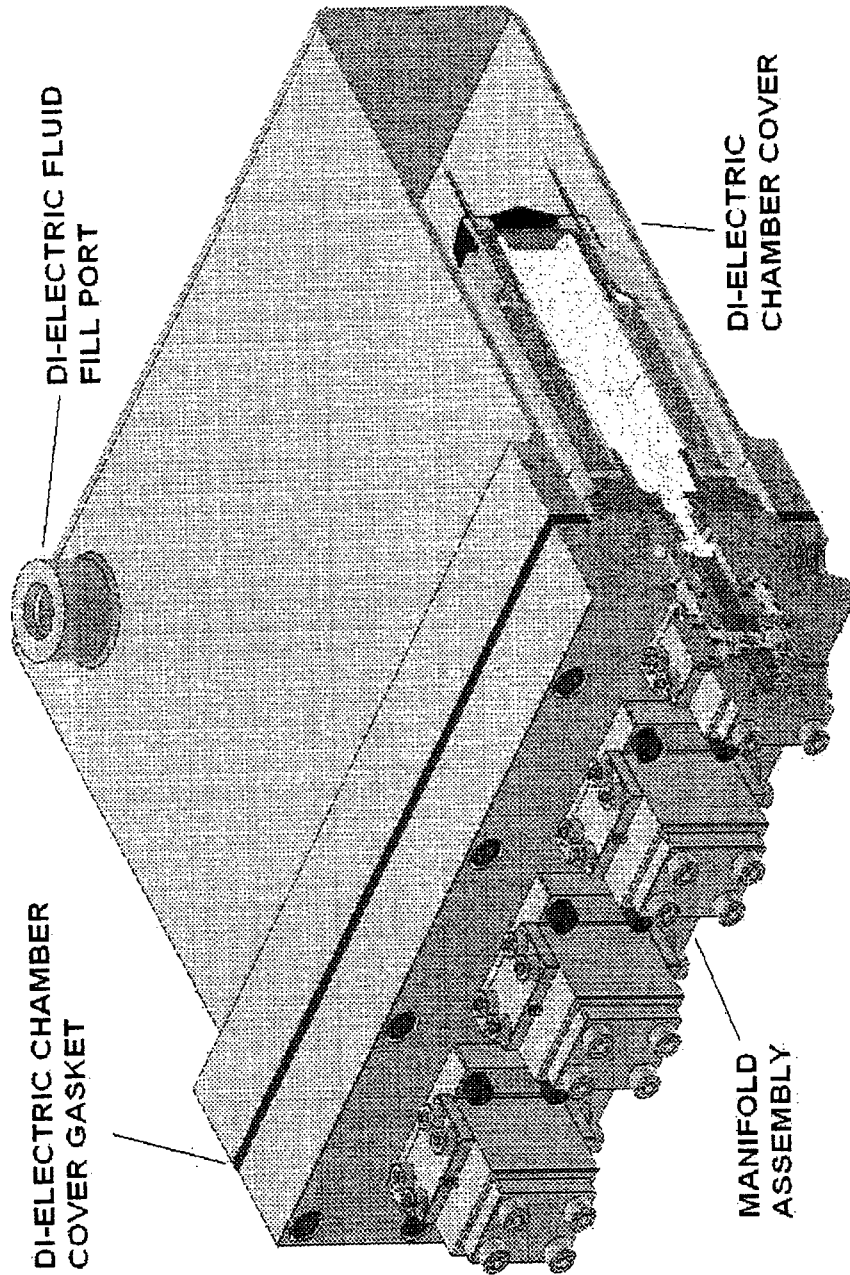


SVM (Solenoid Valve Module)

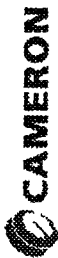
- **SDM (Solenoid Driver Module) included in each SVM**
- **Module is dielectrically compensated**
- **Wires between SDM and coils are booted**
- **PBOF hose for SVM interconnect**
- **CANBUS communication to SEM**



Solenoid Valve Module

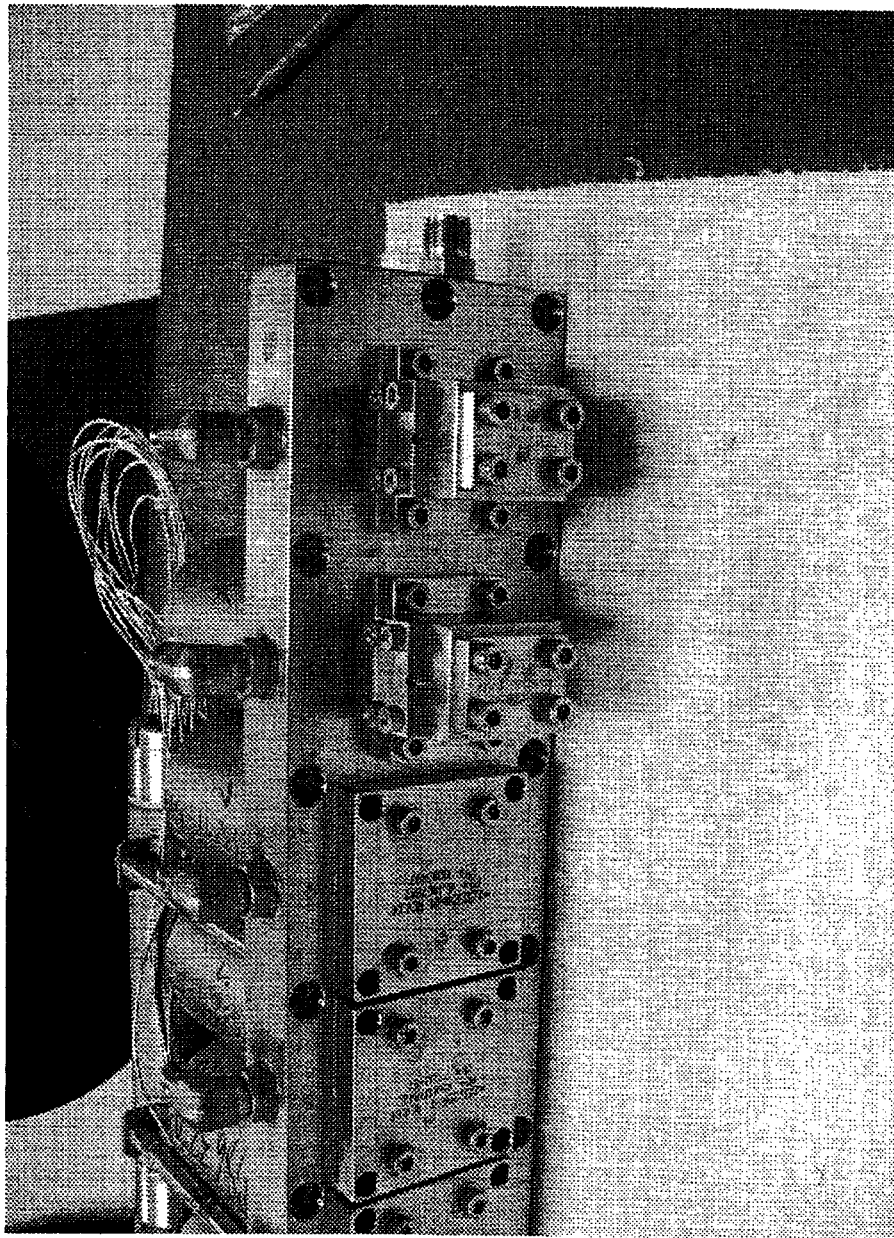


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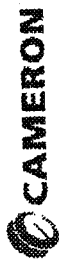


DRILLING & PRODUCTION SYSTEMS

Solenoid Valve Module

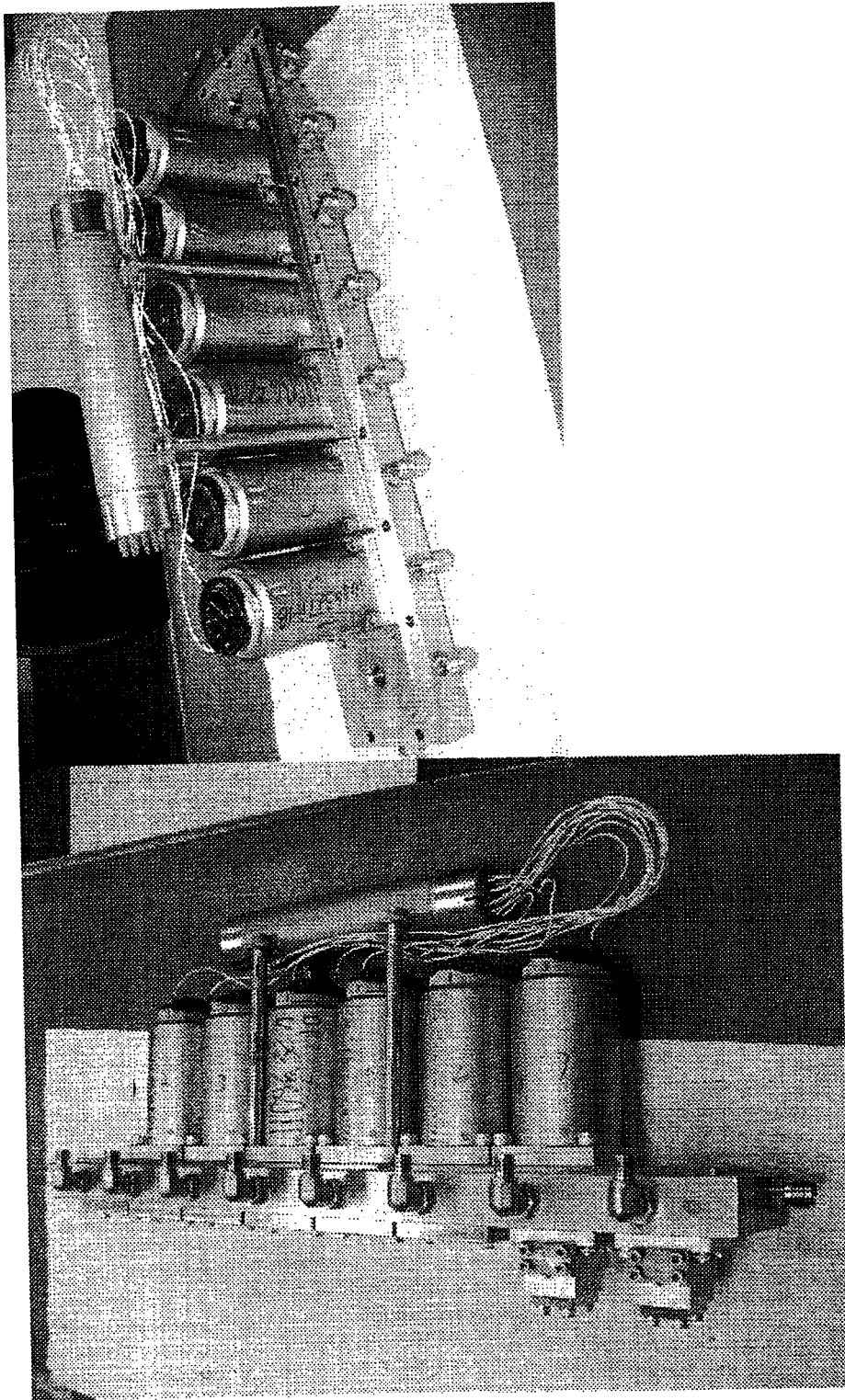


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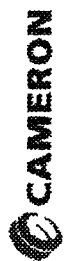


DRILLING & PRODUCTION SYSTEMS

Solenoid Valve Module



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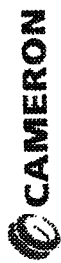


DRILLING & PRODUCTION SYSTEMS

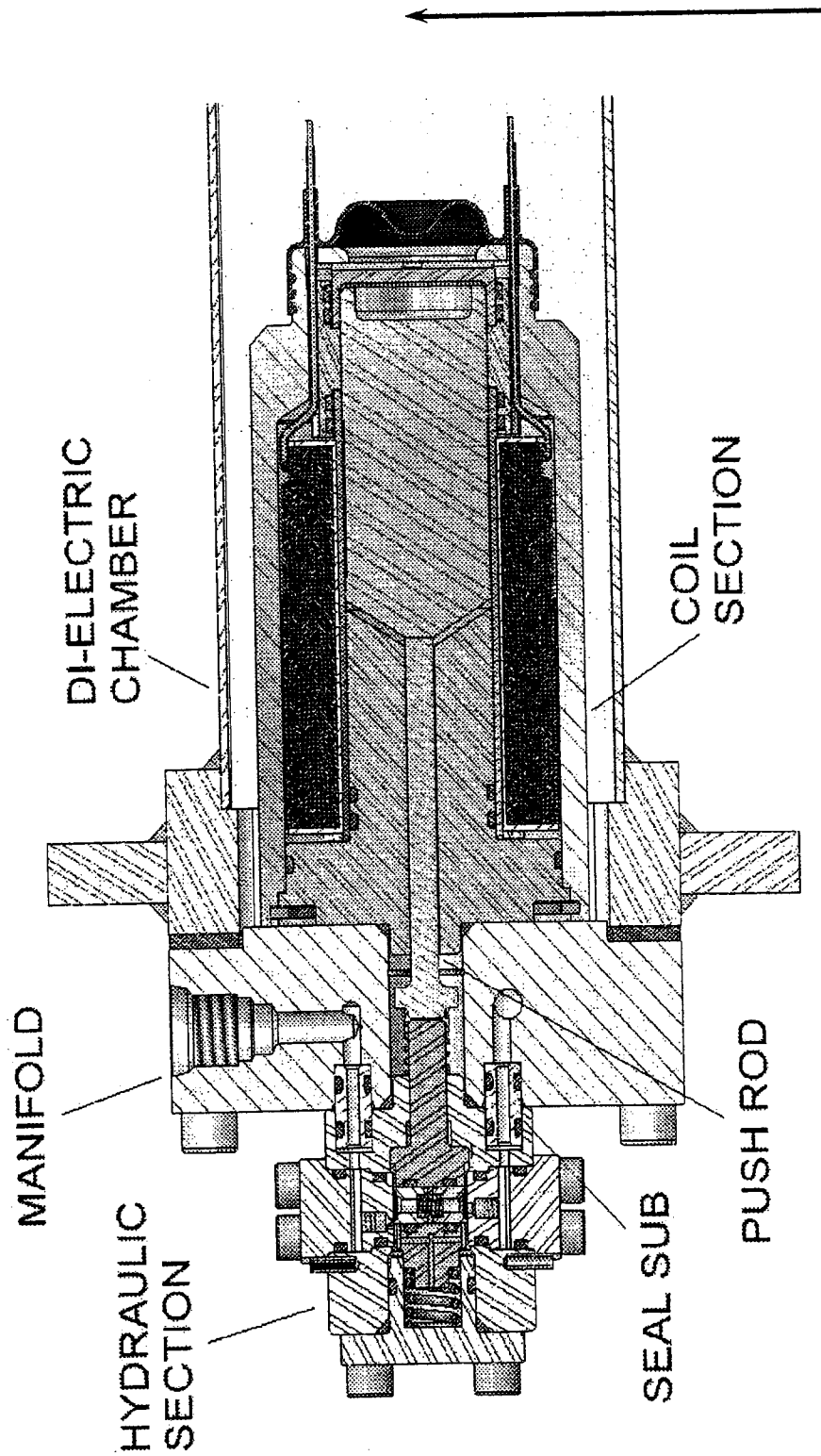
Solenoid Valve Features

- Hydraulic section is divorce mounted
- Coil section is compensated with dielectric
- Single coil design with higher pull-in force
- Premium seal plates and seal ring materials

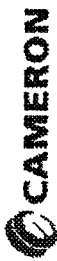
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Solenoid Valve Assembly

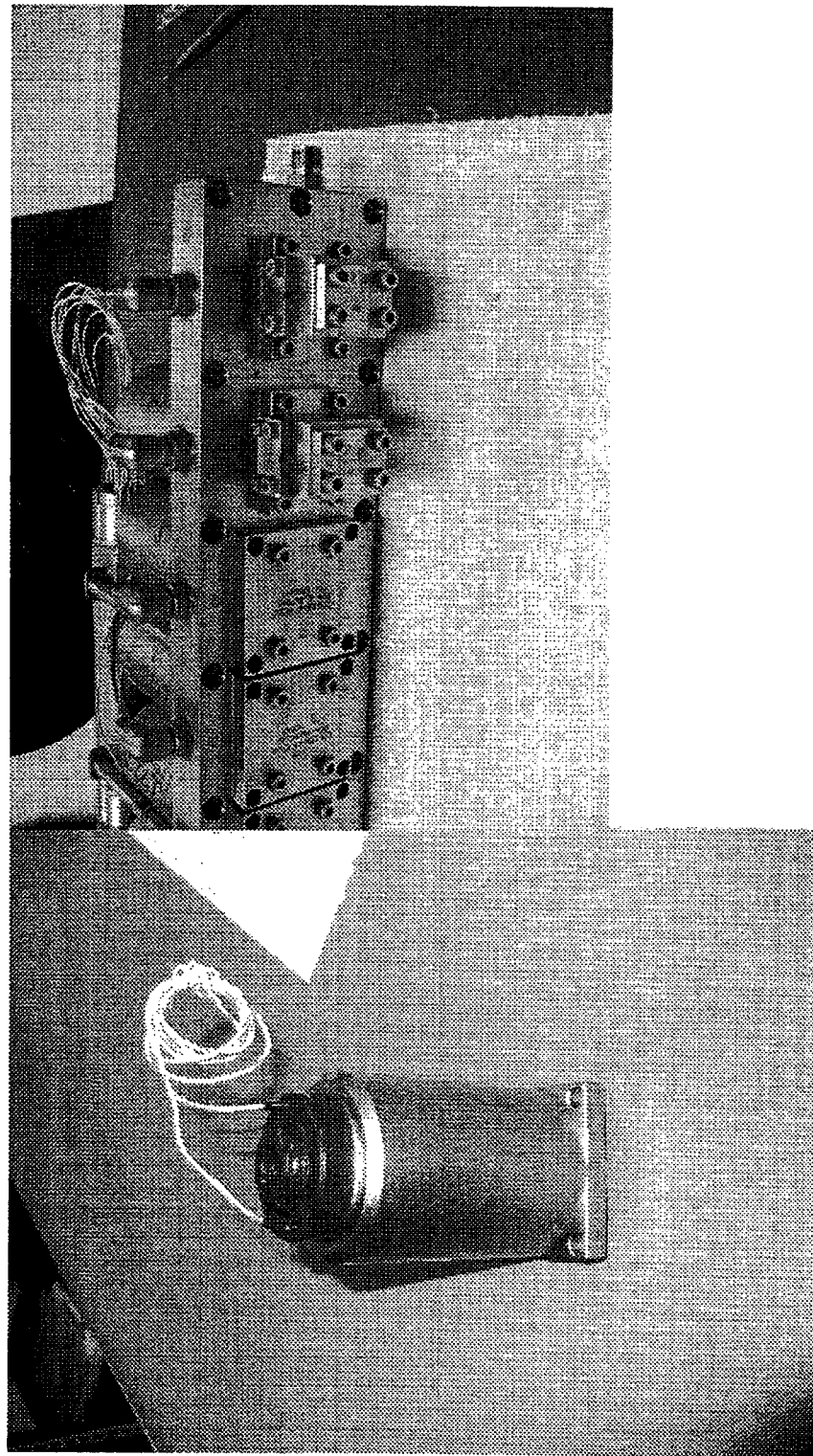


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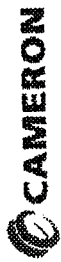


DRILLING & PRODUCTION SYSTEMS

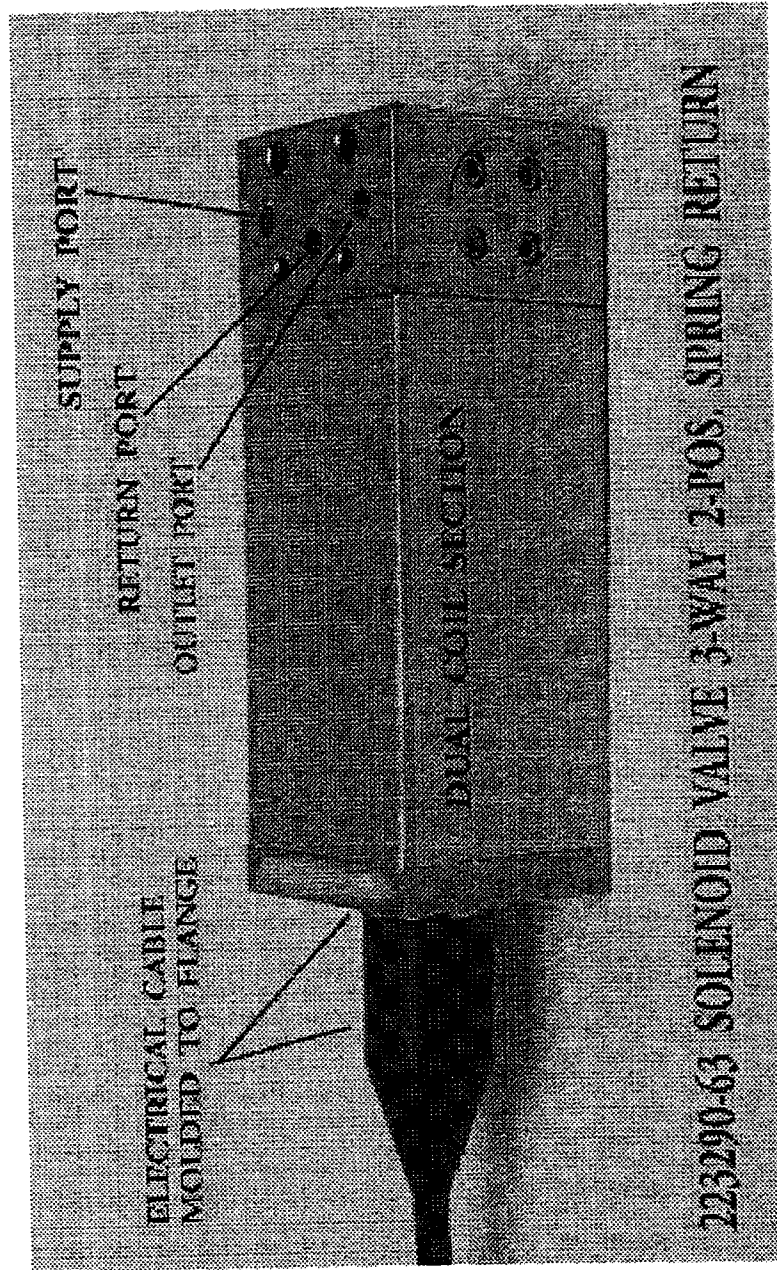
Solenoid Valve Assembly



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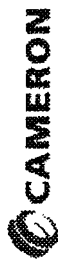


Legacy -63 Solenoid Valve



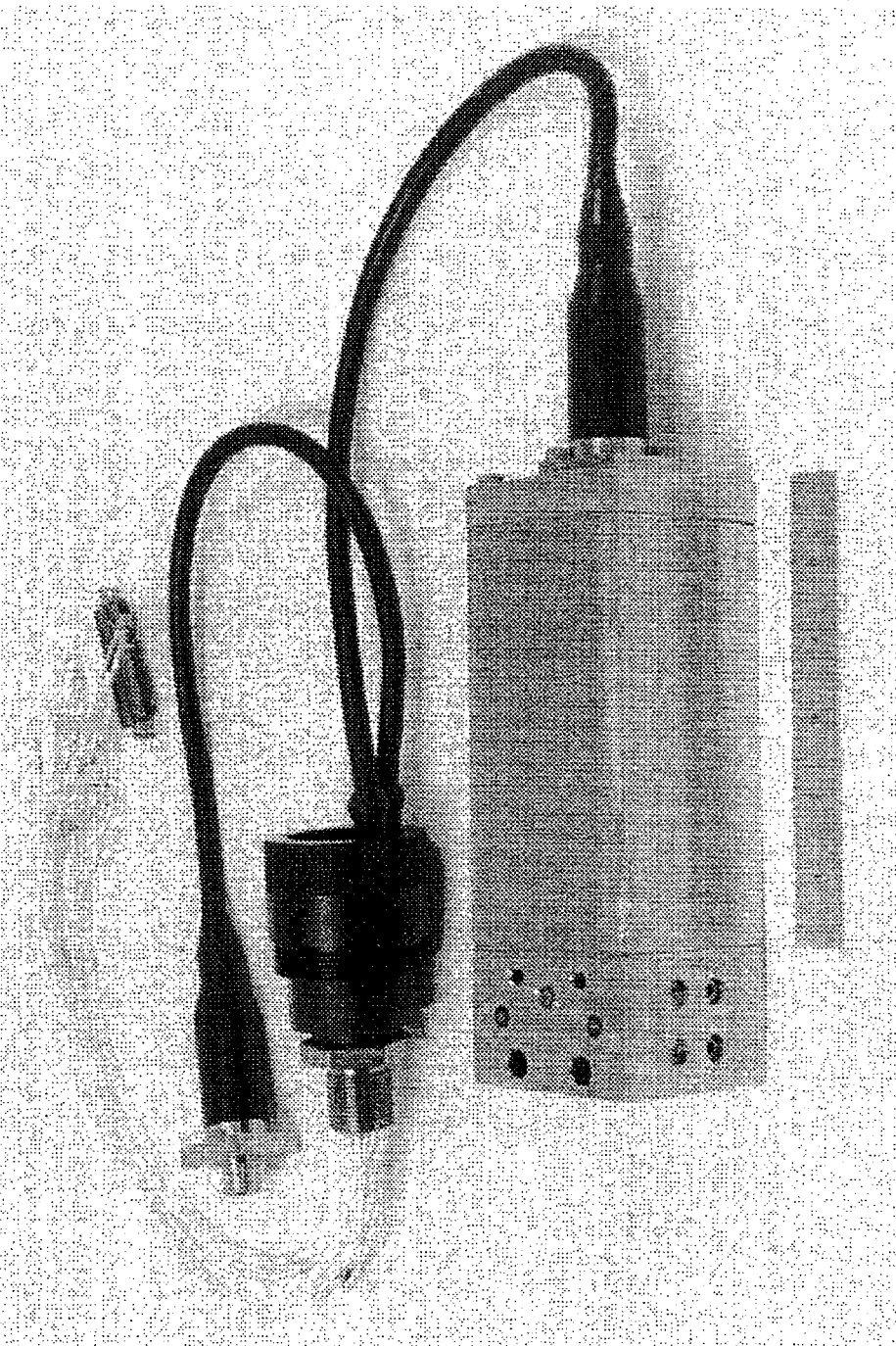
With the -63 you get 77 to 107 1 ATM Chambers per POD

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Legacy -63 Solenoid Valve & Pie Connector



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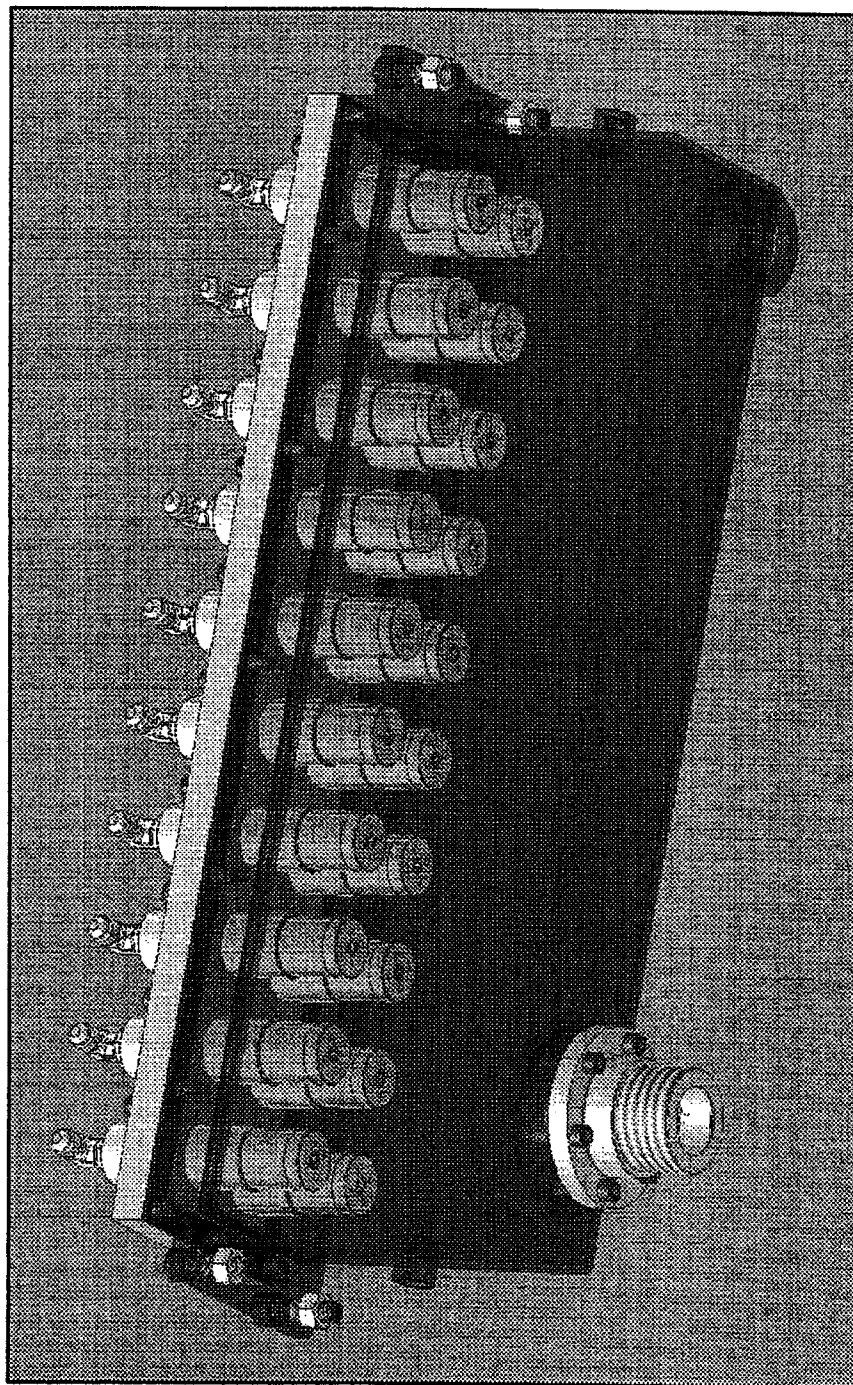
PTM (Pressure Transducer Module)

- Compensated Dielectric chamber
- External mounting
- Wires between Transducers are booted
- CANBUS communication to SEM
- Eliminates 1 ATM chambers



DRILLING & PRODUCTION SYSTEMS

Pressure Transducer Module



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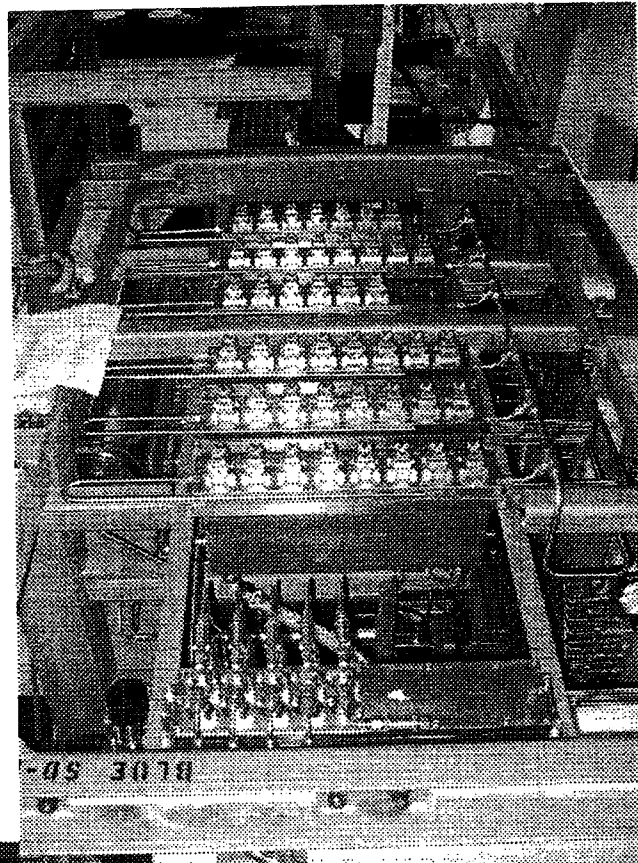
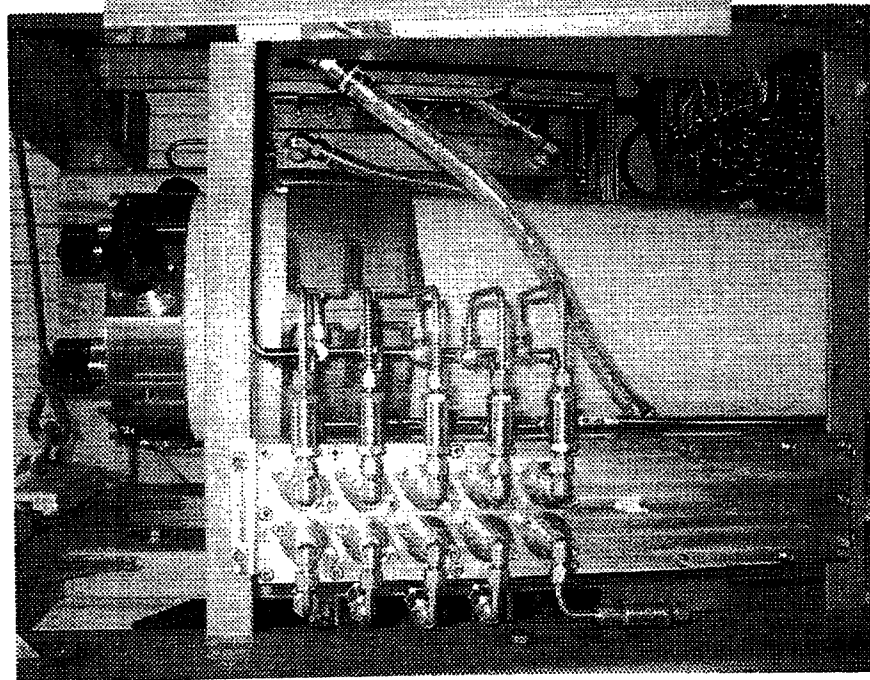
HIGHLY CONFIDENTIAL

CAM_CIV_0043073



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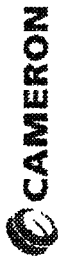
Pressure Transducer Module



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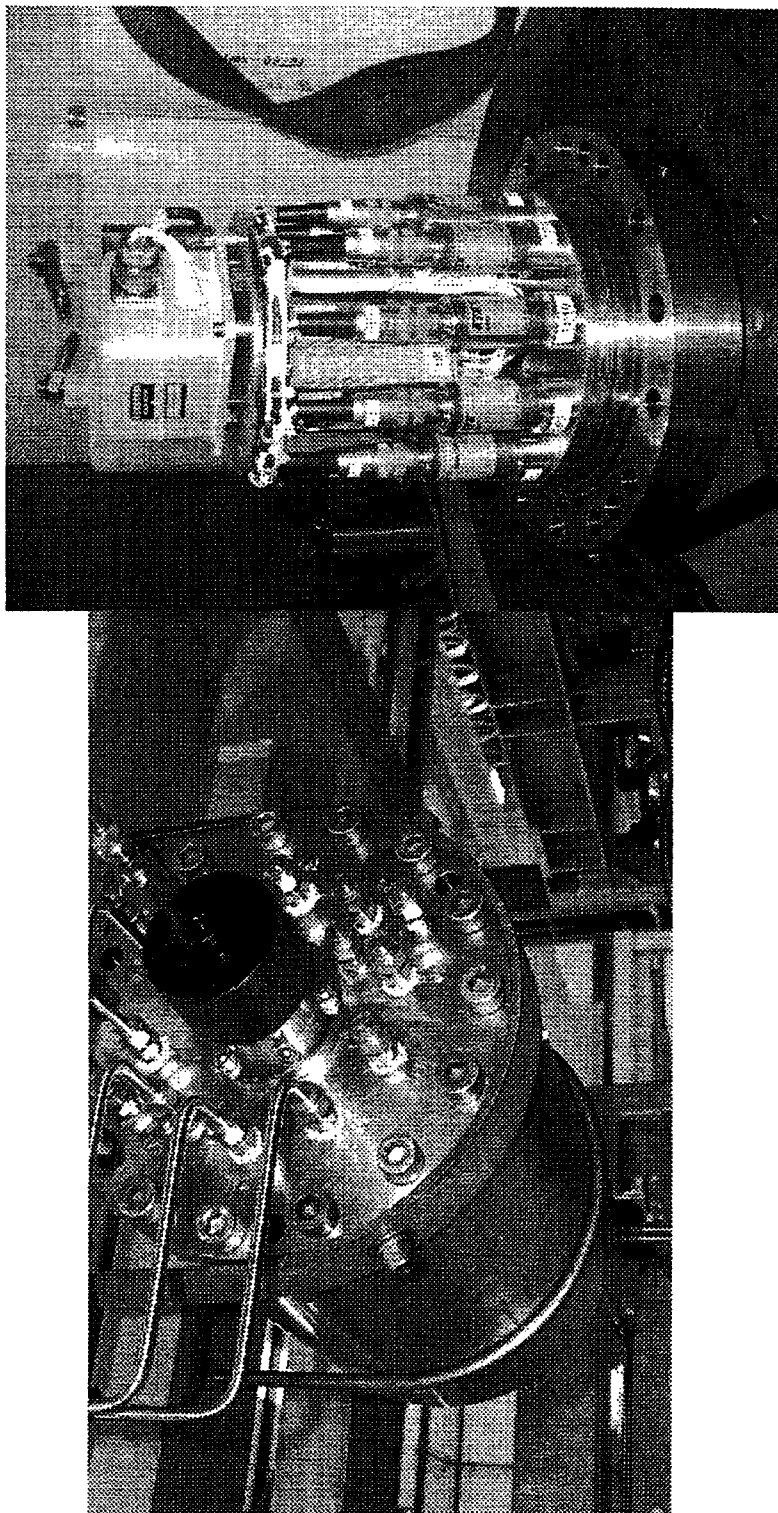
HIGHLY CONFIDENTIAL

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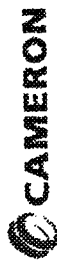


DRILLING & PRODUCTION SYSTEMS

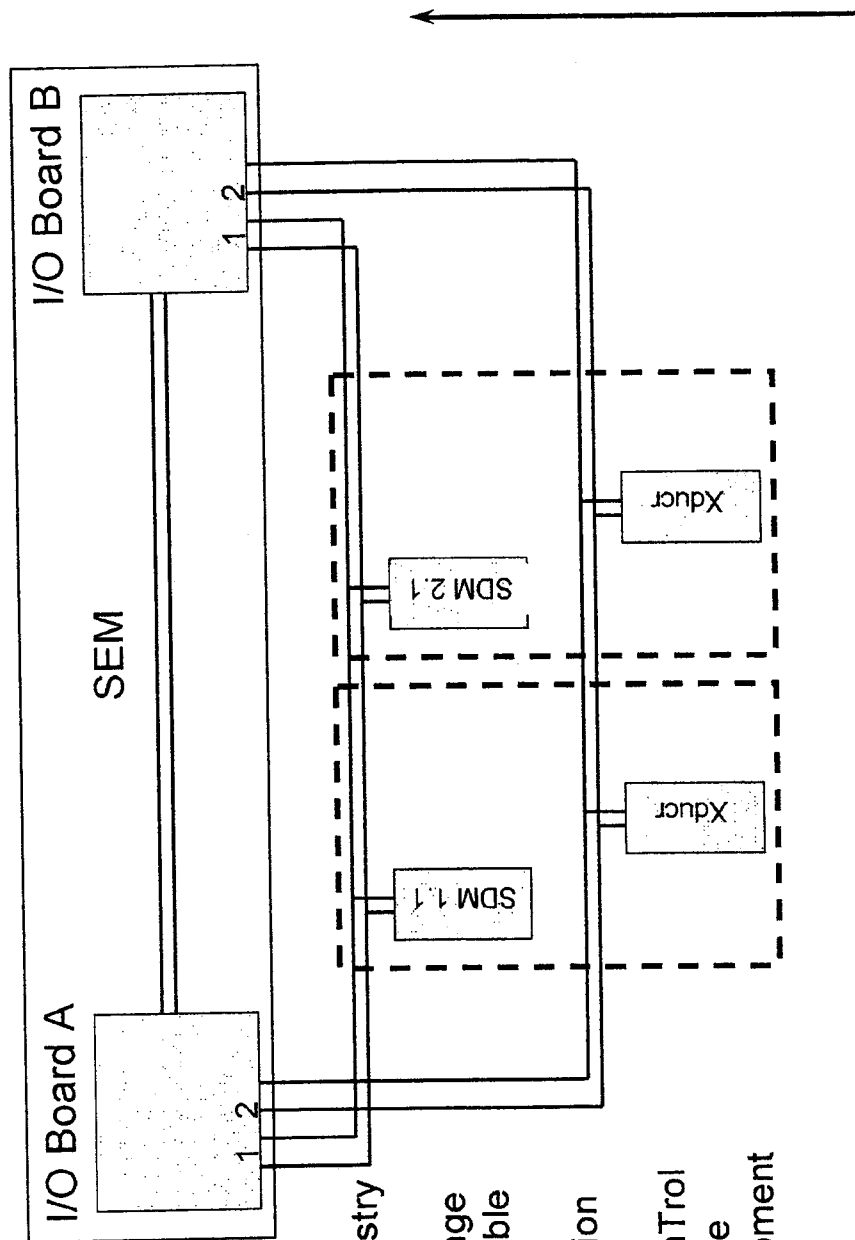
Legacy Pressure Transducer Module



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MUX System Architecture

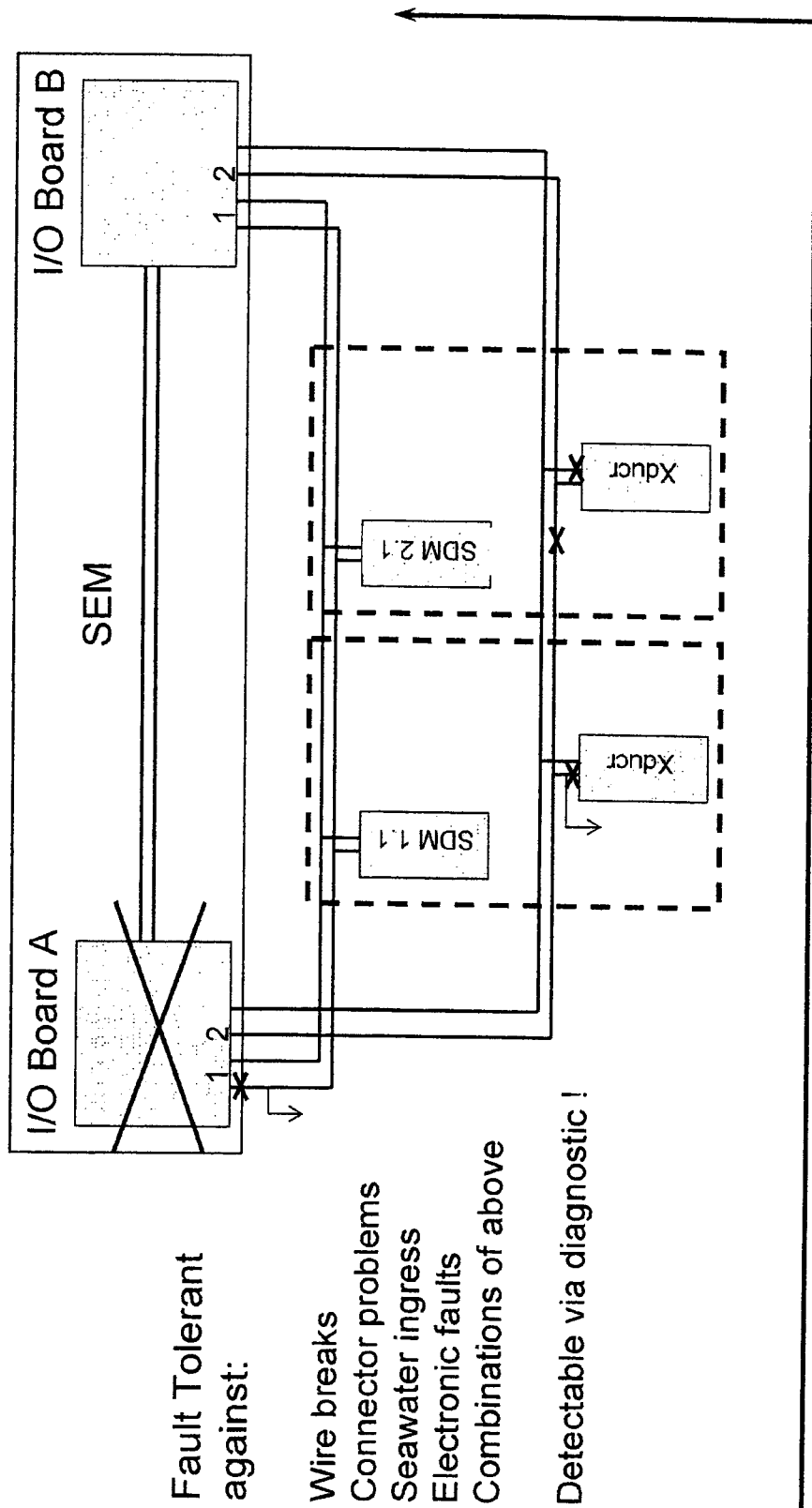


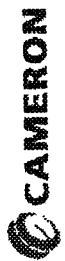
Why CAN?

- used in the auto industry
- fault tolerant
- wide temperature range
- compact chips available
- cost effective
- low power consumption
- industry standard
- used in the new CamTrol SEM, as well as in the Electric Tree development

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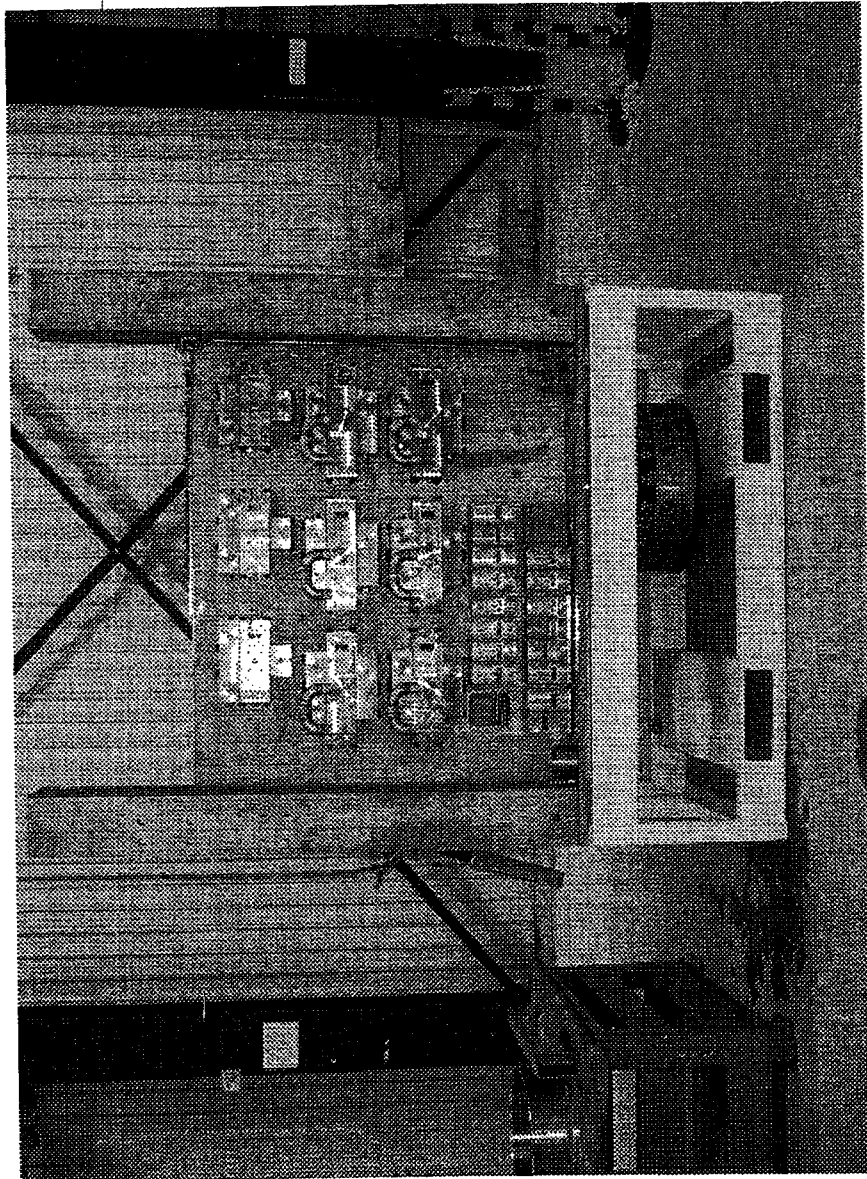
MUX System Architecture





DRILLING & PRODUCTION SYSTEMS

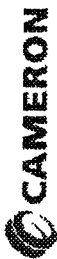
Mod Section



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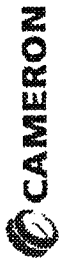


DRILLING & PRODUCTION SYSTEMS

Mark III MOD Features

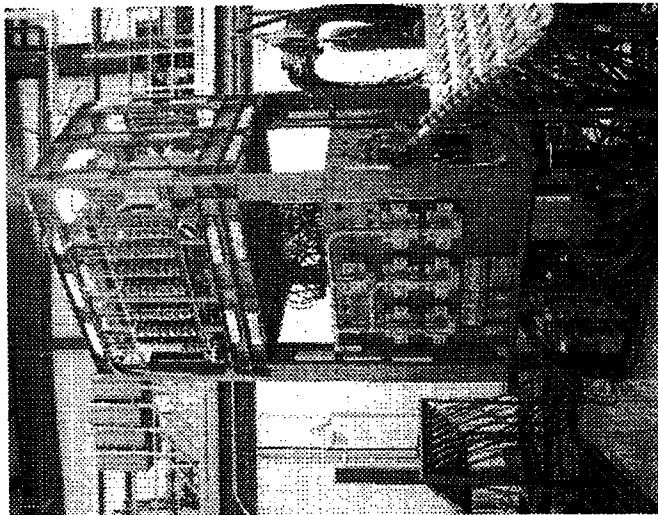
- Premium Deepwater Valve and Regulator series
- 1-1/2" and 3/4" Regulators
- 1-1/2", 1", 3/4", 1/2", and 1/4" Valves
- Field Proven Pressure Balanced Retractable Stingers

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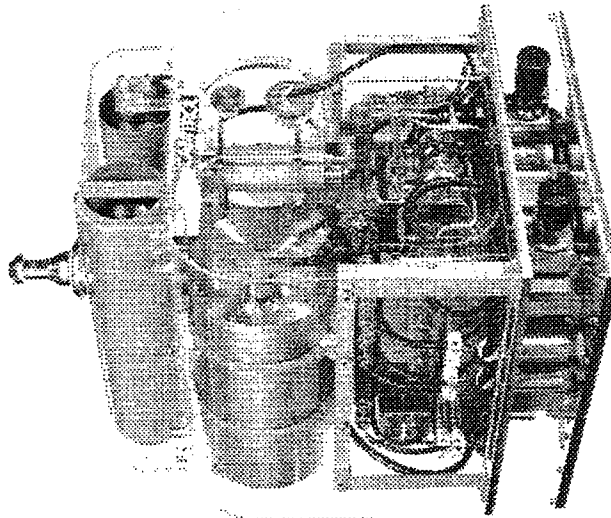


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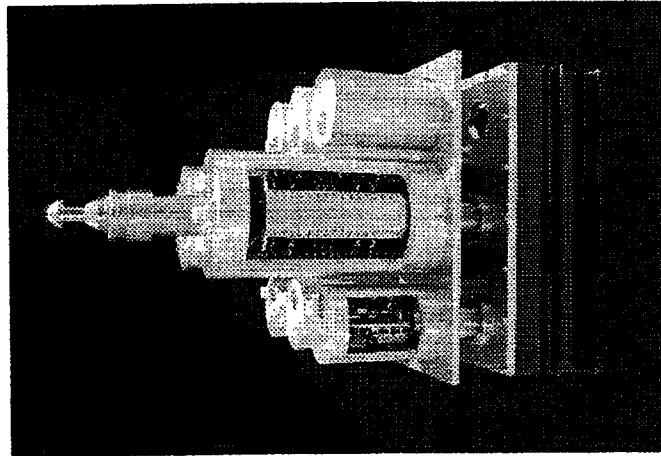
Why Cameron Mark III?



MUX Drilling Systems



Camtrol SCM



Camtrol DC SCM

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WORLDWIDE AFTERMARKET LOCATIONS

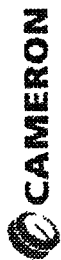


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