Production Control Systems
**Multiplex Control System**

Dril-Quip’s Multiplex Production Control System is a key component of the subsea completion system. The system is designed to meet ISO 13628-6/API 17F standards and is tested to confirm reliability predictions. With Dril-Quip’s system, users have real-time access to tree functions, tree equipment status and sensors monitoring reservoir performance.

The system’s open architecture allows for control and monitoring of over fifty wells and the collection of all data within five seconds. MODBUS protocol allows users to easily link to the platform control system.
A single control module can operate 30 functions and monitor 32 sensors. Modules are constructed from field-proven components and the system is designed for 20 years’ operating life.

A flexible design allows Dril-Quip engineers to create a system for your application employing standard equipment modules. Dril-Quip can package this system for shallow or deepwater applications up to 10,000 feet in depth.

**Innovative Communication**

Dril-Quip’s innovative fiber-optic-based communications system takes advantage of over 10 years of experience using fiber optics in subsea applications. It is the only system on the market that provides four independent channels.

Reliable noise-free communication allows each channel to operate at 115K baud for a total of 460K baud. This provides faster data throughput for measurement of well and equipment performance.

Dril-Quip’s Multiplex Control System uses single-mode fiber-optic technology that provides reliable communications over 100-plus miles of fiber-optic cable.
MASTER CONTROL STATION

Dril-Quip’s Master Control Station (MCS) allows the operator to control and monitor the subsea completion and surface equipment in the production control system.

The station also provides conditioned and protected power for the control system. The unit is configured to monitor input and output supplies.

The station’s open architecture is compatible with the latest industry technology, using high bandwidth Ethernet communications to achieve optimal throughput of data.

Dril-Quip’s design offers the customer a highly reliable, flexible and high-speed field-proven solution.

HYDRAULIC POWER UNIT

Dril-Quip’s Hydraulic Power Unit (HPU) is designed using computerized hydraulic analysis to meet your project specification. Standard designs for differing environmental requirements are available employing Delta V Controllers.

THIRD PARTY UNIT

Dril-Quip’s Third Party Unit (TPU) can be custom-configured with computers to monitor a variety of third party sensors. The Third Party Unit can also be configured to include a data historian with remote access capabilities.

TOPSIDE UMBILICAL TERMINATION UNIT

Dril-Quip’s Termination Unit provides an electrical, hydraulic and optical interface to the umbilical. Each unit is configured to meet customer specifications and industry standards as well as zone and environmental requirements.
Software Support

Dril-Quip’s Control System software runs on a Delta V platform for control and monitoring of the production equipment.

All software programs necessary for reliable operation of the system and to meet each customer’s functional requirements are included.

Dril-Quip’s screen graphics are either P&ID illustrations or user-friendly graphics that model equipment architecture and operation.

The graphics below are examples of user-friendly screen displays of the production control system.
SHALLOW AND DEEPWATER SUBSEA CONTROL MODULES

Dril-Quip’s Shallow and Deepwater Subsea Control Modules offer operators advanced multiplex electrohydraulic systems designed to control and monitor a subsea completion system.

Each module includes a Subsea Electronics Module (single configuration), up to 12 hydraulically latched pilot control valves with pressure transducers, metal-sealing hydraulic couplers, electrical/optic connectors, hydraulic fluid filters and accumulators. The Shallow Water Control Module is attached to the tree with a simple diver-assisted latch mechanism. It is designed for subsea operations in water depths up to 1,000 feet. The module provides control and monitoring of 12 hydraulic functions. It also monitors up to 16 electrical sensors.

The Deepwater Control Module installs into a mounting base that provides guidance, soft landing, coupler make-up and module lock. Dril-Quip’s base and funnel are designed to easily mount to subsea trees, manifolds and distribution units. The deepwater module is designed for subsea operations of up to 10,000 feet, and provides control and monitoring of 30 hydraulic functions (also expandable). Monitoring of 32 or more electrical sensors is provided.

Both control modules communicate via high-speed (115K baud) Fiber-Optic or Signal-On Power (9.6K baud). The modules employ dual modems and power supplies in the Subsea Electronics Module. Each module has a design life of 20 years and is designed to meet ISO 13628-6/API 17F standards.
**Subsea Electronics Module**

Dril-Quip’s Subsea Electronics Module (SEM) is the intelligence hub of the subsea control module. It acquires data from subsea sensors and provides control of the completion system through valve actuation.

The module is microprocessor-based (16 bit) for an optimal combination of capability, reliability and simplicity. Dril-Quip’s design incorporates downloadable software allowing for reprogramming, changing operation, configuration management or diagnosis without requiring retrieval of the module. One communications channel is dedicated to module operation and the remaining channels are available for digital sensors with RS-485 interfaces, such as downhole pressure temperature sensors, intelligent-well sensors and flow sensors.

The module is designed for low power consumption, minimizing the size, weight and cost of the umbilical. The SEM is capable of operating with either single or three-phase power.

Dril-Quip’s SEM can communicate using a number of technologies: fiber-optic wide bandwidth, ethernet or Frequency Shift Keying (FSK), at baud rates of 1,200, 2,400, 4,800 and 9,600 Baud. FSK can be separate from the power line or impressed over the power cores for signal-on-power communications.
FOR TUBING HANGER INSTALLATION

Dril-Quip’s Installation and Workover Control (IWOC) System provides direct control to the tools used to install the tubing hanger, tree and tree cap.

Dril-Quip’s IWOC System incorporates all of the necessary controls required to deliver hydraulic power to each of the functions required. It can accommodate electric pass-through to all of the electric downhole functions that may be required. The IWOC System is designed to the same high-quality standards that are used in Dril-Quip’s Production Control System.

The IWOC System typically includes a Hydraulic Power Unit, Master Control Station, Umbilical stored on a winch-controlled reel, sheaves and junction plates.

Dril-Quip’s Multiplex IWOC System is offered for deep and ultra-deep installation and workover requirements.
**FOR EDP, LRP AND TREE INSTALLATION**

Dril-Quip’s IWOC System is used to install the tree while maintaining necessary control of the Emergency Disconnect Package (EDP) and Lower Riser Package (LRP) when applicable. It is also used to install the tree cap.

The IWOC System utilizes the same control panel and hydraulic power supply as is used to install the tubing hanger. A larger hose umbilical and reel may be required to accommodate the additional functions associated with the tree, EDP and LRP. If so, corresponding sheaves to accommodate the larger hose bundle will also be supplied.

Dril-Quip’s IWOC System is available in Direct Hydraulic and Multiplex configurations.
SINGLEBORE™ PRODUCTION SYSTEM

DRL-QUIP’s SingleBore Production System is an economical, money-saving alternative to traditional completion system design. The SingleBore Completion System eliminates the need to run and retrieve a wireline plug to open and close the annulus.

SB PLUGS AND TUBING HANGER FEATURES

- DRL-QUIP’s patented in-series dual SB Plugs replace the annulus plug profile in the tubing hanger
- Tubing hanger is available for standard or H2S service
- Tubing sizes up to 7” can be accommodated while maintaining a full 2” annulus access

SINGLEBORE TREE FEATURES

- Workover riser system and surface trees are simpler and less expensive than systems for traditional dual bore trees
- Can be run on tubing or drill pipe with an umbilical
- Eliminates the need for an expensive dual bore completion riser system
- Flow through the tree to and from the annulus occurs in a series of connected bores and a 1” OD high-pressure line run with the workover control umbilical
- The SingleBore Tree and Tree Cap Running and Retrieving Tool replace an expensive lower riser package and emergency disconnect system
- The SingleBore Tree is available for through-tree pigging
- The SingleBore Tree body incorporates integral production master and production swab valves and an annulus master valve
**Dual Bore Production System**

The Dual Bore Production System is designed to provide direct overhead access (via completion riser) to the production and annulus bores. This allows the setting of wireline plugs in the tubing hanger to secure the well prior to removing the BOP stack. Dril-Quip’s Dual Bore Production System is available in pressure ratings up to 15,000 psi. All of the components include field-proven technology.

**System Features**

- Accommodates tubing sizes up to 5” with 2” annulus access
- Includes Dril-Quip’s field-proven, high performance gate valves with metal-to-metal sealing standard
- Dril-Quip’s integral field-proven DX® Wellhead Connector is standard
- Valve overrides available with a variety of position indicators and ROV interfaces
- Adaptable to a variety of flowline and control system connections
- Easily adapted to accommodate most casing programs
- Engineering analyzed and tested
- Field-proven performance

**Dual Bore Tubing Hanger Features**

- Easily accommodates electrical, hydraulic and chemical injection downhole functions
- Adjustable Tubing Hanger Lockdown Ring accommodates casing hanger stacking tolerances
- Weight-set metal-to-metal seals standard
- Standard industry tools and procedures for orienting the tubing hanger during installation
- Includes Orientation Pin and Orientation Elevation Check Tool to confirm proper installation
- Field-proven performance