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# Hbuild Coiled Tubing Drilling System (HbuildCTD)
# Common Coiled Tubing Drilling System (ComCTD)

3-3/8 in. Common Coiled Tubing Drilling System (ComCTD-3RSS) (Mud Pulse)
3-3/8 in. Common Coiled Tubing Drilling System-Wireline (ComCTD-3WRSS)
3-1/8 in. Common Coiled Tubing Drilling System-Wireline (ComCTD-3W)
2-1/4 in. Common Coiled Tubing Drilling System-Wireline (ComCTD-2W)

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# 3-3/8 in. Hbuild Coiled Tubing Drilling System (HbuildCTD-3RSS) (Mud Pulse)

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## Features

- Flexible setup the integrated CTD system
- Data transmission & communication via mud pulse
- Selectable directional system with reliable and automated closed-loop steering control
- Azimuth GR service
- Depth control and circulation capability by specific BHA services

## Benefits

- On-location BHA adjustments based on customer requirements
- Precise directional control for maximized reservoir contact, optimized wellbore placement and reduced drilling time
- Increased section length in horizontal reservoir section by adjustable steering control and flexibility for high dogleg requirements in build sections
- Optimized formation evaluation and geosteering capability for increased production and improved well placement
- Drilling parameter optimization for improved ROP and drilling efficiency

## Introduction

The 3.375 in. tool use coiled tubing and rotary steering unit to drill 4.5 -5.5 in. borehole. It has downlink function for steering unit.

## Components

Quick Connector Sub (QCS)

Motor

Bi-directional Communication & Power system While Drilling (BCP-3)

Electromagnetic Propagation Resistivity (EPR-3)(Optional)

Battery Management Unit (BAT)

Rotary Steering Unit (RSU-3)

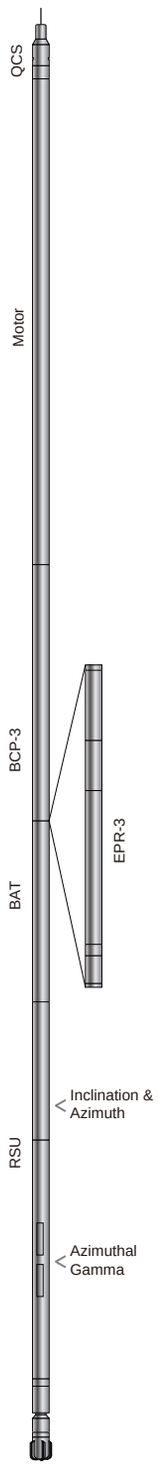
Bit

## Specifications

| | |
|---|---|
| Tool Size OD | 3.375 in. (86 mm) |
| Borehole Size | 4-1/2 in. to 5-1/2 in. (114 to 140 mm) |
| System length | 69.65 ft. (21.23 m)(EPR-3)(Optional) |
| | 58.27 ft. (17.76 m) |
| Power Source | Alternator |
| Communication & telemetry | Mud pulse |
| Maximum Flow Rate | 200 gpm (750 lpm) |
| Maximum Build Up Rate | 13°/100 ft. (13°/30 m) |

## Tool Specifications

| Tool Name | Length | Weight |
|---|---|---|
| QCS | 1.64 ft. (0.5 m) | 66 lbs. (30 kg) |
| Motor | 18.23 ft. (5.6 m) | 331 lbs. (150 kg) |
| BCP-3 | 11.48 ft. (3.5 m) | 210 lbs. (95 kg) |
| EPR-3 | 11.38 ft. (3.47 m) | 269 lbs. (122 kg) |
| BAT | 8.21 ft. (2.5 m) | 133 lbs. (60 kg) |
| RSU-3 | 18.57 ft. (5.66 m) | 452 lbs. (205 kg) |



# Rotary Steering Unit (RSU-3)

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## Features

- Data transmission & communication via mud pulse
- Selectable directional system with reliable and automated closed-loop steering control
- Depth control and circulation capability by specific BHA services

## Benefits

- Precise directional control for maximized reservoir contact, optimized wellbore placement and reduced drilling time
- Increased section length in horizontal reservoir section by adjustable steering control and flexibility for high dogleg requirements in build sections
- Drilling parameter optimization for improved ROP and drilling efficiency

## Specifications

| Measurement | | Range | Resolution | Accuracy |
|---|---|---|---|---|
| Inclination | | 0°-180° | 0.1 | ± 0.15° |
| Azimuth | | 0°-360° | 0.35 | ±1.0 @ INC>10° |
| Toolface | Magnetic | 0°-360° | 1.4 | ± 1.5° |
| | Gravty | 0°-360° | 1.4 | ± 1.5° |
| Temperature | | 50°F-300°F, 350°F optional | 1.1 | ± 3.0°C |
| Total Magnetic Field | | 30,000-66,000 gamma | 100 | ± 200 |
| Directional Probe OD | | 1.75 in. | | |
| Max. Temperature | | 300°F (150°C) | | |
| Max. Pressure | | 20000 psi (137.9 MPa) | | |
| MTF/GTF Switching, Inclination Degrees: MTF/GTF Switching, Operator Selectable (default set at 3°) Inclination Degrees | | | | |
| **Vibration Measurement** | | | | |
| Sensor Type | Axial Vibration | One Accelerometer, Z direction | | |
| | Lateral Vibration | Two Accelerometers, X-Y direction | | |
| Acceleration Range | | 0-15 g | | |
| Frequency Range | | 0-82 Hz | | |
| Realtime Log Options | | Lateral and Axial vibration; Transmitted as severity level (scaled to g-RMS) | | |
| Post Run/Memory Log Options | | Average & Max. lateral and axial vibration in g-RMS and as severity level | | |
| **Rotation & Stick-Slip Measurement** | | | | |
| Sensor Type | | Two Axis Magnetometer | | |
| Rotation Speed | | 0-±1000 RPM | | |
| Accuracy | | ±1% | | |
| Realtime Log Options | | Downhole RPM, Stick-Slip transmitted as severity level | | |
| Post Run/Memory Log Options | | Min., Max., & Average RPM, Stick-Slip & Backward Rotation severity | | |

| **Azimuthal Gamma Ray Specifications** | |
|---|---|
| Sensor Type | Scintillation |
| Measurement | API GR |
| Real Time | Yes |
| Recorded | Yes |
| Range | 0-500 API |
| Section Quantity | 8 |
| Accuracy | ±3% of full scale |
| Statistical Repeatability | ±3 API @ 100 API and ROP=60 ft./hr |
| Vertical Resolution | 6 in. |

# Battery Management Unit (BAT)

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## Applications

- Flow-off directional surveys
- Directional surveys connected downhole motor on BHA top

## Introduction

The Battery Management Unit provides directional sensor power during flow-off, acquire survey data, and store the data. Transmit the survey data to surface after flow-on.

## Specifications

| | |
|---|---|
| Maximum Temperature | 300°F (150°C) |
| Maximum Pressure | 20,000 psi (137.9 MPa) |
| Outside Diameter | 3.375 in. ( 85.7 mm) |
| Length | 8.2 ft. (2.5 m) |
| Connections | NC26 Box Up<br>NC26 PIN Down |

# Electromagnetic Propagation Resistivity Tool (EPR-3)

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## Applications

- Provides formation resistivities
- Provide realtime formation evaluation services.
- Provide wellbore placement
- Improve geosteering capabilities
- Operates at frequency of 2 MHz and 400 kHz Compensated antenna design with dual spacing transmitter pairs.

## Features

- 4 quantitative resistivities with separate depths of investigation works in all mud types.

## EPR-3 Introduction

EPR-3 transmits electromagnetic waves into the formation and measures the changes in the physical characteristics of the returned electromagnetic waves. The changes in the physical characteristics of the electromagnetic waves indicate the formation resistivity.

## Specifications

| | | | |
|---|---|---|---|
| Tool O.D. | | 3.375 in. | |
| Max Operating Temp | | 300°F (150°C) | |
| Max Working Pressure | | 20000 psi (137.9 MPa) | |
| 2 MHz | Phase Difference | Range | 0.1-3000 ohm-m |
| | | Accuracy | ± 1% (0.1-50 ohm-m);<br>±0.5 mmho/m (> 50 ohm-m) |
| | Attenuation | Range | 0.1-500 ohm-m |
| | | Accuracy | ± 2% (0.1-25 ohm-m);<br>±1.0 mmho/m (> 25 ohm-m) |
| | | Vertical Resolution | 8 in. (203 mm) |
| 400 kHz | Phase Difference | Range | 0.1-1000 ohm-m |
| | | Accuracy | ± 1.0% (0.1-25 ohm-m);<br>±1.0mmho/m (>25 ohm-m) |
| | Attenuation | Range | 0.1-200 ohm-m |
| | | Accuracy | ± 5.0% (0.1-10 ohm-m);<br>±5.0mmho/m (>10 ohm-m) |
| | | Vertical Resolution | 12 in. (304 mm) |

# Bi-directional Communication & Power System While Drilling (BCP-3)

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## Applications

- Transmission of downhole data to surface.
- Transmission of surface commands to downhole.

## Features

- Long working time without replacing battery under generator mode

## Introduction

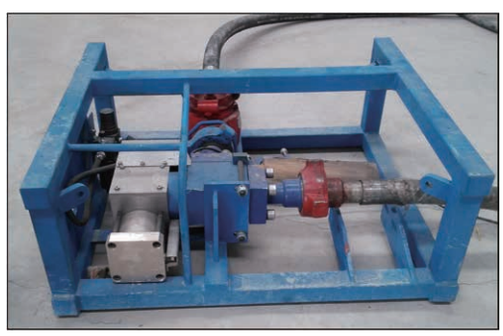
Bi-directional Communication Power Module (BCP-3) and downlink devices (SDD-II, NPG). The BCP-3 (Bi-Directional Communication & Power Module-3) is capable of generating 240 Watt power output, providing 33 Vdc to the HbuildCTD system, providing circuit breaker protection for upper and lower mounted instruments, detecting downlink data by monitoring turbine speed, transmitting data to the surface via a pulser. It can be installed in any position of the instrument string,which provides a lot of conveniences for the logging.

Using the insert mode in the center of the drill collar. The electronic circuit and sensor can be applied to drill collars of different sizes (3.375 inch, 4.75 inch, 6.75 inch and 9.5 inch) only by configuring centralizers of different sizes.
The SDD-II sends commands from the surface to downhole instrument by controlling the NPG (Negative Pulse Generator) which controls the mud flow.

## Specifications

| | |
|---|---|
| Tool O.D. | 3.375 in. |
| Make-up Length | 11.48 ft. (3.5 m) |
| Weight | 321 lbs. (145 kg) |
| Flow Range | 80-200 gpm |
| Max. Temperature | 300°F (150°C) |
| Max. Pressure | 20,000 psi (137.9 MPa) |
| Max. Turbine RPM | 5000 |
| Output | 33 Vdc±1 |
| Max. Power Output | 240 Watts |

Safe Direction Drilling Panel-II (SDD-II)



Negative Pulse Generator (NPG)

# 3-3/8 in. Common Coiled Tubing Drilling System-Wireline (ComCTD-3WRSS)

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## Features

- Flexible setup the integrated CTD system
- Data transmission & communication via wire line
- Selectable directional system with reliable and automated closed-loop steering control
- Azimuth GR service
- Depth control and circulation capability by specific BHA services

## Benefits

- On-location BHA adjustments based on customer requirements
- Precise directional control for maximized reservoir contact, optimized wellbore placement and reduced drilling time
- Increased section length in horizontal reservoir section by adjustable steering control and flexibility for high dogleg requirements in build sections
- Optimized formation evaluation and geosteering capability for increased production and improved well placement
- Drilling parameter optimization for improved ROP and drilling efficiency

## Introduction

The 3.375 in. tool use coiled tubing and rotary steering unit to drill 4.5 -5.5 in. borehole. It has downlink function for steering unit.

## Components

Quick Connector Sub (QCS)

Agitator (Optional)

Power and Communication Tool (PCT)

Electromagnetic Propagation Resistivity Tool (EPR-3) (Optional)

Motor

Rotary Steering Unit (RSU-3)

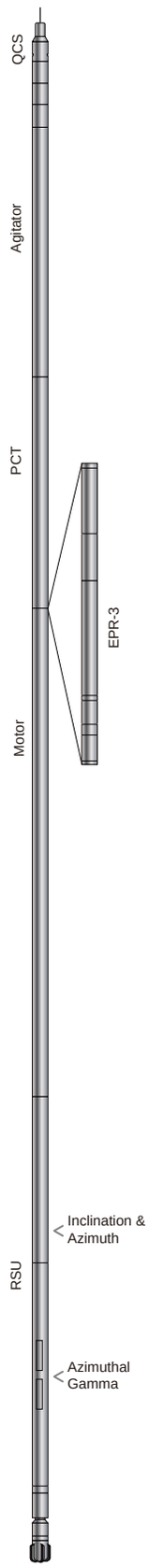
Bit

## Specifications

| | |
|---|---|
| Tool Size OD | 3.375 in. (86 mm) |
| Borehole Size | 4-1/2 in. to 5-1/2 in. (114 to 140 mm) |
| System length | 69.55 ft. (21.20 m)(EPR-3)(Optional) |
| | 58.17 ft. (17.73 m) |
| Power Source | Wireline |
| Communication & telemetry | Wireline |
| Maximum Flow Rate | 200 gpm (750 lpm) |
| Maximum Build Up Rate | 13°/100 ft. (13°/30 m) |

## Tool Specifications

| Tool Name | Length | Weight |
|---|---|---|
| QCS | 1.64 ft. (0.5 m) | 66 lbs. (30 kg) |
| Agitator | 11.67 ft. (3.55 m) | 220 lbs. (100 kg) |
| PCT | 7.94 ft. (2.42 m) | 132 lbs. (60 kg) |
| EPR-3 | 11.38 ft. (3.47 m) | 269 lbs. (122 kg) |
| Motor | 18.23 ft. (5.6 m) | 331 lbs. (150 kg) |
| RSU-3 | 18.57 ft. (5.66 m) | 452 lbs. (205 kg) |



# 3-1/8 in. Common Coiled Tubing Drilling System-Wireline (ComCTD-3W)

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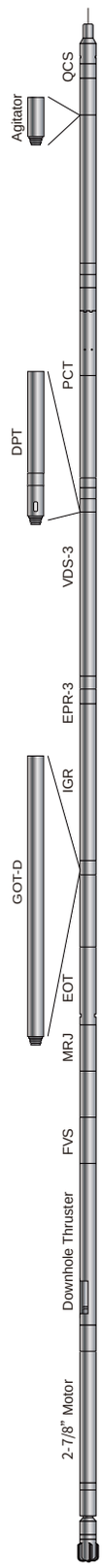
## Features

- Flexible setup the integrated CTD system
- Data transmission & communication via mono conductor CT e-line
- Selectable directional system with reliable and automated closed-loop steering control
- Resistivity & GR LWD service
- Real-time WOB, bore & annular pressure, and vibration data
- Depth control and circulation capability by specific BHA services

## Introduction

The 3.125 in. tool size has been designed to cover hole sizes from 3.5 inches up to 4.75 inches. This system provides flexibility in configuration to allow tailoring the level of service at the rigsite for Coiled Tubing Drilling (CTD) operations in standard and thru-tubing re-entry slimhole applications to meet customer service needs.




## Components

Quick Connnect Sub (QCS)

Agitator (Optional)

Power and Communication Tool (PCT)

Drilling Performance Tool (DPT) (Optional)

Vibration& Shock Digital Attitude Sensor (VDS-3)

Electromagnetic Propagation Resistivity Tool (EPR-3) (Optional)

Inclination and Gamma Ray (IGR)

Gyroscope Orientation Tool-Drilling (GOT-D) (Optional)

Electrical Orienting Tool (EOT)

Mechanical Release Joint (MRJ)

Float Value Sub (FVS)

Downhole Thruster (Optional)

2-7/8 in. / 3-1/8 in. Motor

## Wireline

| Wireline | Wires | OD [in.] | Specified Length |
|---|---|---|---|
| Camesa 1N 32 PTZ | Mono | 5/16 | 23,000 ft. (7,000 m) |
| Camesa 1N 22 PTZ (ETFE) | Mono | 7/32 | 18,000 ft. (5,500 m) |
| Camesa 1K 22 PTZ (ETFE) | Mono | 7/32 | 18,000 ft. (5,500 m) |
| Camesa 7H 42RP (Optional) | Seven | 7/16 | 23,000 ft. (7,000 m) |

## Specifications

| | |
|---|---|
| Tool Size OD | 3.125 in. (80 mm) |
| Borehole Size | 3.5 in. to 4.75 in. (89 mm to 121 mm) |
| System Length | 90.32 ft. (27.53 m) |
| System Weight | 1861 lbs. (860 kg) |
| System Connection top / bottom | 2.375 in. PAC box / pin |
| Power Source | Via CT e-line |
| Communication & Telemetry | Via CT e-line |

# 3-1/8 in. Common Coiled Tubing Drilling System - Wireline (ComCTD-3W)

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## Benefits

- On-location BHA adjustments based on customer requirements
- High real-time data density for operating safety & efficiency improvements
- Precise directional control for maximized reservoir contact, optimized wellbore placement and reduced drilling time
- Increased section length in horizontal reservoir section by adjustable steering control and flexibility for high dogleg requirements in build sections
- Optimized formation evaluation and geosteering capability for increased production and improved well placement
- Drilling parameter optimization for improved ROP and drilling efficiency
- Precise and reliable ECD control and management for risk reduction
- Hole cleaning and precise depth correlation improvements while tripping

## Operating Specifications & Limits (Sliding operation only)

| | |
|---|---|
| Max. Flow Rate | 200 gpm (750 lpm) |
| Max. Build Up Rate | 45°/100 ft. (45°/30 m) |
| Pressure Drop with Water (w/o PDM) | 350 psi at 132 gpm (2.4 MPa at 500 lpm) |
| Max. Operating WOB | 25 klbs. (111 kN) |
| Max. WOB to Failure | 35 klbs. (155 kN) |
| Max. Operating Overpull | 25 klbs. (111 kN) |
| Max. overpull to Failure | 35 klbs. (155 kN) |
| Max. Hydrostatic Pressure | 15,000 psi (103 MPa) |
| Max. Operating temperature | 300°F (150°C) |
| Sand Content | <1% |
| Solid Content (Max) | 7% |
| LCM | 10 ppb = 28 kg/m³, fine nutplug |

## Tool Specifications

| Tool Name | Length | Weight |
|---|---|---|
| QCS | 1.64 ft. (0.5 m) | 33 lbs. (30 kg) |
| Agitator | 6.89 ft. (2.10 m) | 132 lbs. (60 kg) |
| PCT | 7.94 ft. (2.42 m) | 132 lbs. (60 kg) |
| DPT | 3.64 ft. (1.11 m) | 119 lbs. (54 kg) |
| VDS-3 | 5.91 ft. (1.80 m) | 117 lbs. (53 kg) |
| EPR-3 (Optional) | 11.38 ft. (3.47 m) | 269 lbs. (122 kg) |
| IGR | 5.58 ft. (1.70 m) | 113 lbs. (51 kg) |
| GOT-D (Optional) | 12.63 ft. (3.85 m) | 196 lbs. (89 kg) |
| EOT | 5.35 ft. (1.63 m) | 90 lbs. (41 kg) |
| MRJ | 1.64 ft. (0.5 m) | 88 lbs. (40 kg) |
| FVS | 1.67 ft. (0.51 m) | 44 lbs. (20 kg) |
| Thruster | 16.50 ft. (4.94 m) | 308 lbs. (140 kg) |
| 2-7/8 in. / 3-1/8 in. Motor | 9.84 ft. (3.00 m) | 220 lbs. (100 kg) |

# 2-1/4 in. Common Coiled Tubing Drilling System-Wireline (ComCTD-2W)

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## Features

- Flexible setup the integrated CTD system
- Data transmission & communication via mono conductor CT e-line
- Selectable directional system with reliable and automated closed-loop steering control
- Resistivity & GR LWD service
- Real-time WOB, bore & annular pressure, and vibration data
- Depth control and circulation capability by specific BHA services

## Introduction

The 2-1/4 in. tool size has been designed to cover hole sizes from 2.75 inches up to 3.5 inches. This system provides flexibility in configuration to allow tailoring the level of service at the rigsite for Coiled Tubing Drilling (CTD) operations in standard and thru-tubing re-entry slimhole applications to meet customer service needs.


## Components

Quick Connnect Sub (QCS)

Agitator (Optional)

Power and Communication Tool (PCT)

Drilling Performance Tool (DPT) (Optional)

Vibration& Shock Digital Attitude Sensor (VDS-2)

Inclination and Gamma Ray (IGR)

Electrical Orienting Tool (EOT)

Mechanical Release Joint (MRJ)

Float Value Sub (FVS)

Downhole Thruster

2-1/8 in. Motor

## Wireline

| Wireline | Wires | OD [in.] | Specified Length |
|---|---|---|---|
| Camesa 1N 32 PTZ | Mono | 5/16 | 23,000 ft. (7,000 m) |
| Camesa 1N 22 PTZ (ETFE) | Mono | 7/32 | 18,000 ft. (5,500 m) |
| Camesa 1K 22 PTZ (ETFE) | Mono | 7/32 | 18,000 ft. (5,500 m) |
| Camesa 7H 42RP (Optional) | Seven | 7/16 | 23,000 ft. (7,000 m) |

## Tool Specifications

| | |
|---|---|
| Tool Size OD | 2.25 in. (57.2 mm) |
| Borehole Size | 2.75 in. to 3.5 in. (69.85 mm to 89 mm) |
| System Length | 66.27 ft. (20.20 m) |
| System Weight | 818 lbs. (364 kg) |
| System Connection top / bottom | 1.5 in. AMMT box / pin |
| Power Source | Via CT e-line |
| Communication & Telemetry | Via CT e-line |

# 2-1/4 in. Common Coiled Tubing Drilling System-Wireline (ComCTD-2W)

Geo-Vista

## Benefits

- On-location BHA adjustments based on operational needs
- High real-time data density for operating efficiency improvements
- Precise directional control for additional reservoir access, optimized wellbore placement and reduced drilling time
- Increased section length in horizontal reservoir section by adjustable steering control and coverage of high dogleg requirements in build sections
- Geo-steering capability for increased production and improved reservoir contact
- Drilling parameter optimization for improved ROP and drilling efficiency
- Precise and reliable ECD control and management for risk reduction
- Hole cleaning and precise depth correlation improvements while tripping

## Operating Specifications & Limits (Sliding operation only)

| | |
|---|---|
| Max. Flow Rate | 80 gpm (300 lpm) |
| Max. Build Up Rate | 50°/100 ft. (50°/30 m) |
| Pressure Drop with Water (w/o PDM) | 650 psi at 80 gpm ( 4.5 MPa at 300 lpm) |
| Max. Operating WOB | 15 klbs. (67 kN) |
| Max. WOB to Failure | 20 klbs. (88 kN) |
| Max. Operating Overpull | 15 klbs. (67 kN) |
| Max. Overpull to Failure | 20 klbs. (88 kN) |
| Max. Hydrostatic Pressure | 15,000 psi (103 MPa) |
| Max. Operating temperature | 300°F (150°C) |
| Sand Content | <1% |
| Solid Content (Max.) | 7% |
| LCM | 10 ppb = 28 kg/m³, fine nutplug |

## Specifications

| Tool Name | Length | Weight |
|---|---|---|
| QCS | 1.64 ft. (0.5 m) | 22 lbs. (10 kg) |
| Agitator | 6.89 ft. (2.10 m) | 64 lbs. (29 kg) |
| PCT | 7.94 ft. (2.42 m) | 55 lbs. (25 kg) |
| DPT | 3.64 ft. (1.11 m) | 22 lbs. (10 kg) |
| VDS-2 | 5.91 ft. (1.80 m) | 88 lbs. (40 kg) |
| IGR | 5.58 ft. (1.70 m) | 66 lbs. (30 kg) |
| EOT | 5.35 ft. (1.63 m) | 64 lbs. (29 kg) |
| MRJ | 1.64 ft. (0.5 m) | 33 lbs. (15 kg) |
| FVS | 1.67 ft. (0.5 m) | 22 lbs. (10 kg) |
| Thruster | 15.50 ft. (4.94 m) | 242 lbs. (110 kg) |
| 2-1/8 in. Motor | 9.84 ft. (3.00 m) | 140 lbs. (56 kg) |

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