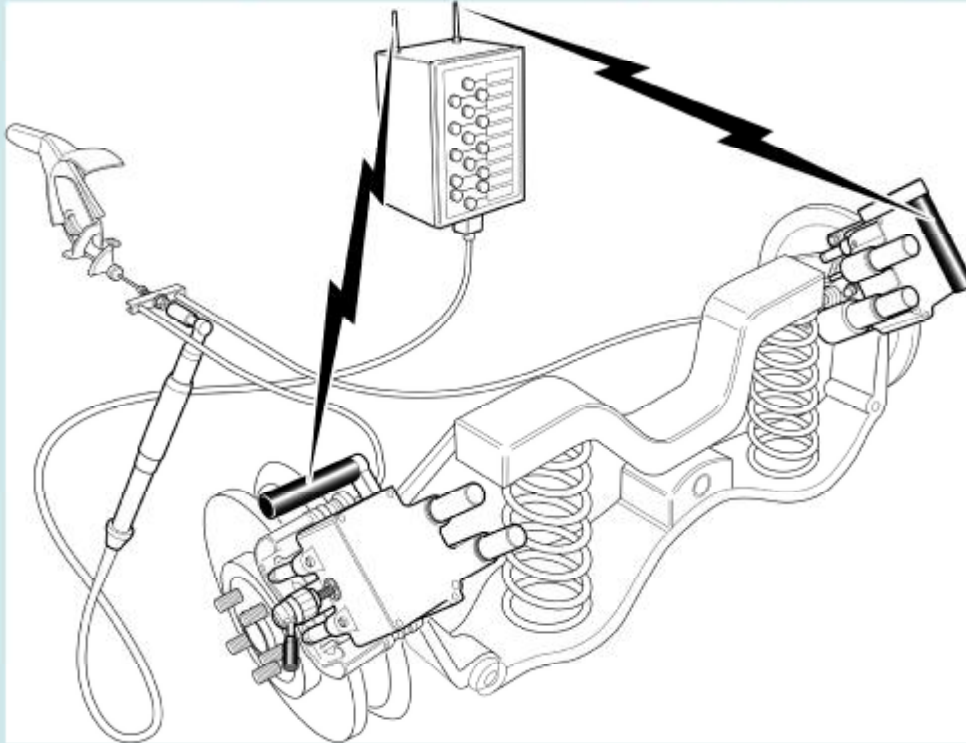




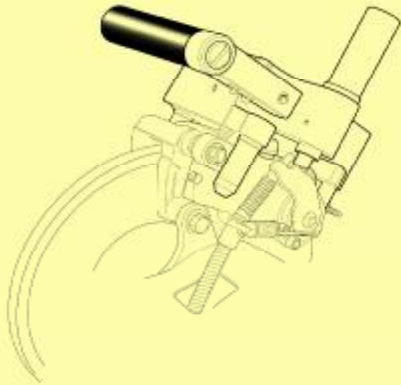
Parking Brake Setting Equipment



- ★ *Unique, patented system for parking brake cable length setting***
- ★ *Sets the length of the parking brake cable with high precision***
- ★ *Performs the 'scragging' operation automatically as part of the cycle***
- ★ *Caliper lever movement restricted by measurement tool so that the caliper is not subject to scragging forces***
- ★ *Equally suitable for disc and drum brake configurations.***
- ★ *One measurement tool able to accommodate differing caliper lever configurations***
- ★ *Intelligent measuring tools able to detect failures in process during parking brake system assembly***
- ★ *System is set with the handbrake lever in the fully off position***
- ★ *High speed operation suitable for continuous 3 shift working.***
- ★ *Low maintenance measuring tools - battery charging is not required***
- ★ *System approved by major brake component manufacturers including Bosch and Continental Teves***

CLAVIS tension setting equipment has been employed worldwide in automotive manufacturing plants for over 15 years. Primarily used for belt tension setting, CLAVIS equipment has a reputation for innovative design, quality and reliability, backed by an outstanding field technical support team.

Optimum parking brake cable adjustment is achieved when the brake pads or brake shoes are at the limit of the safe distance away from the disc or drum. This corresponds to a caliper lever movement typically of 2mm of travel away from the lever rest position.



In this system measurement tools are temporarily locked onto the caliper when the vehicle enters the adjustment station. The tools measure the movement of the caliper lever to an accuracy better than 0.02mm. When a measurement tool is initially located the tool references the measurement system to the position of the caliper lever. All future measurements are made with respect to this reference so that the effects from caliper dimensional variability are eliminated.

The measurement tools (one of the left side caliper and one on the right side caliper) communicate with a control cabinet using UHF radio telemetry links.

The control cabinet interfaces with an electric power tool (Standard interfaces exist for Stanley, Atlas Copco and George Renault tools). After the measurement tools have been located it is only necessary for the operator to place the power tool on the adjustment nut and then hold down the trigger of the power tool. The cycle is complete when the tool stops. If a fault occurs during the cycle the power tool will also stop and alert the operator by audible and visual warnings.

When the operator places the electric power tool on the cable adjustment nut and commences run-down, the cycle begins.

1. The cable is 'scragged' to remove the elastic deformation from the system. Scragging may be terminated by either;
 - a)The caliper lever reaching a pre-determined travel position
 - b)The torque on the adjustment nut reaching a set level
 - c)Or by lever force measurement in situations where lever travel is limited by the measurement tool.

If scragging is terminated by lever position, both the right and left side levers must have made the scragg position before the cycle terminates. This ensures that both sides are adequately scragged even if the cable equaliser is offset.

2. At the end of the scragg cycle, the power tool automatically reverses so that the adjustment nut is wound back. The caliper levers therefore return to their initial rest positions. Both levers must be back at rest before the final adjustment procedure begins.

3. The final adjustment part of the operation advances the caliper levers to the target displacement value, which has been determined by the manufacturer of the caliper.



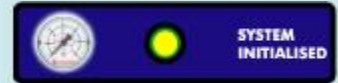
During the whole cycle intelligent monitoring of the position of the caliper levers occurs to detect such process faults as;

Failure to locate the cable termination in either the caliper lever or cable equaliser

Unequal cable lengths either due to a manufacturing fault, or failure to locate the cable outer sheath correctly.

THE ADJUSTMENT CYCLE

LHS RHS



As the vehicle moves into station the controller receives an input from the track PLC signalling that the brake system is to be adjusted



Indicator lamps show when each tool is correctly located onto the calipers



With both tools located the power tool is enabled to start the scragg down sequence



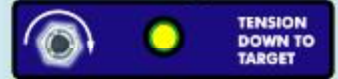
The scragg target is reached when both caliper levers reach the scragg target displacement



The power tool then reverses to return the caliper levers back to their original rest position



Both levers must be back at the rest position before adjustment to the final setting can begin



From the back at rest position the final adjustment to the target setting is made



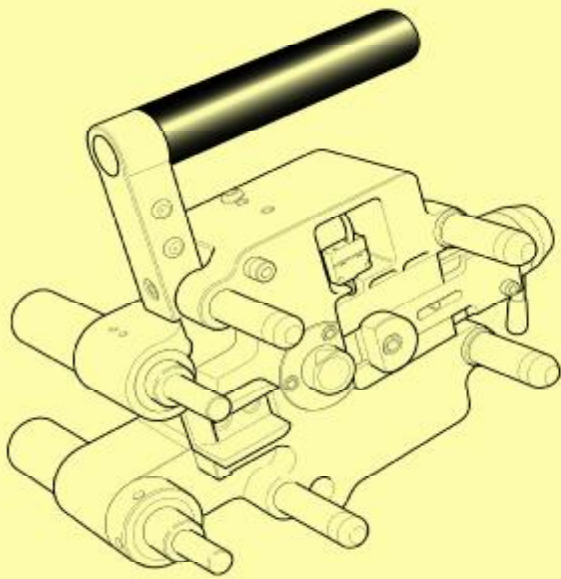
It is unusual if both levers move in perfect synchronism, therefore one lever is always in advance of the other. Both levers however must move a minimum distance and this is the 'Lower Target'



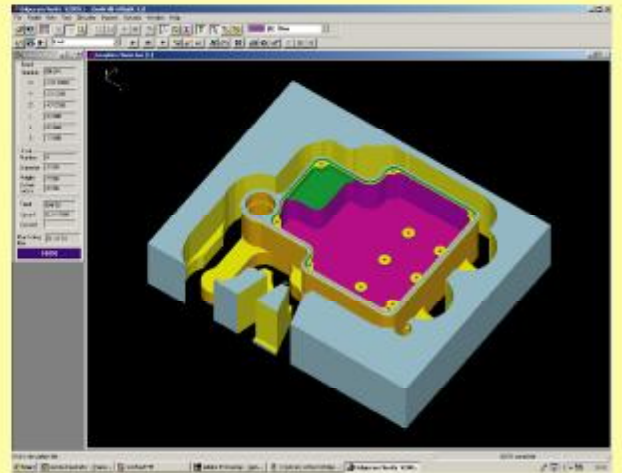
When the 'Upper Target' is reached by a lever the adjustment cycle is complete and the power tool stops automatically



The 'OK' signals the end of a successful cycle



The measurement tools are specifically designed for the caliper set. Key features are the ease of placement/removal and lightweight



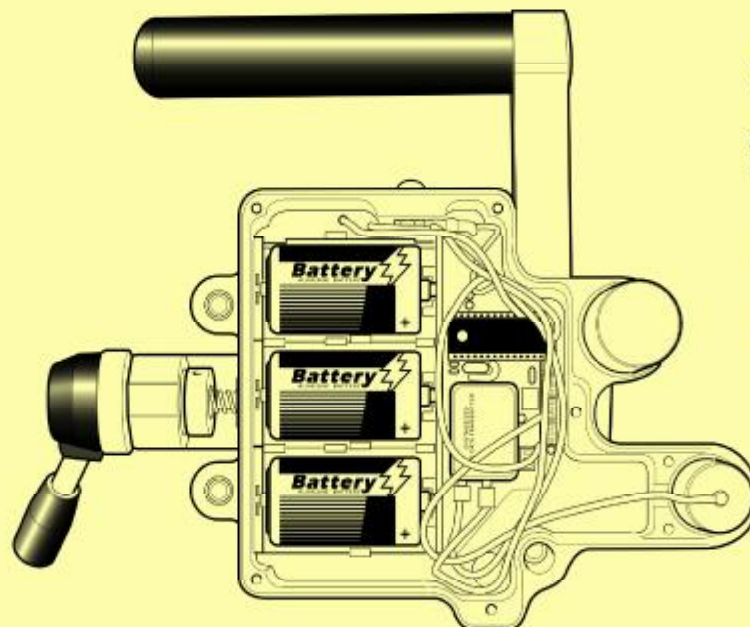
All of our tools are CNC machined in our own machine shop from aluminium billet. This ensures maximum ruggedness able to withstand the rigours of continuous operator use



Calibration Jig



The measurement tools communicate with the CLAVIS control cabinet using a very secure UHF radio telemetry link. 32 channels are available for use. The radio system is fully approved for use throughout Europe




The measurement tools do not need re-charging as they use easily replaceable standard primary cell batteries. Battery life is in excess of 3 months for 3 shift continuous working conditions. A low battery warning alerts the operator when the batteries need replacing. Several days of operation are still available after the low battery alert is active.

Technical Specification

Measurement tool weight	3kg (Typical)
Battery Type	3 x D cell alkaline
Battery Life	50-75,000 operations
Measurement range	0-25mm
Measurement accuracy	0.01mm
Telemetry Frequency	433-434Mhz 32 channels
Radiated Power	10mW
Scrag end point detection	Lever distance/torque/cable tension



The attached  disc shows the use of this equipment at a European Luxury car manufacturer. The disc will play on all computer DVD-ROM drives and most stand alone DVD players. Use Windows 'Explorer' to locate the .pdf Handbrake System Technical Manual.

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