Contents

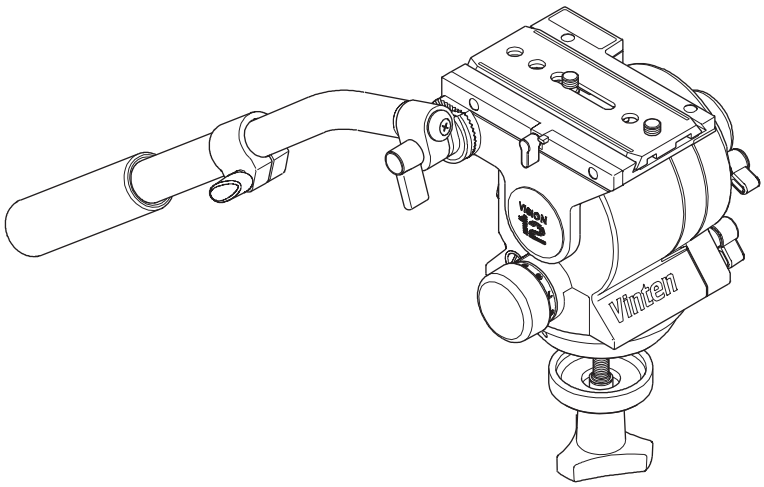
Next Page

Previous View

Maintenance Manual

Vision SD12

Pan & Tilt Head



Vinten

Camera Control Solutions

VISION
SD12
PAN & TILT HEAD
3364

MAINTENANCE MANUAL
AND
ILLUSTRATED PARTS LIST

PUBLICATION PART No. 3364-9A

Issue 2

Foreword

This manual provides full and detailed maintenance and spare parts information for the Vinten® Vision® SD12 pan and tilt head. The SD12 is an obsolete product and this Maintenance Manual is provide for the final production version.

WARNING!: Read the Safety Section on page 5 before using this pedestal or attempting any adjustment or repair.

It is recommended that this manual is read carefully and the illustrations studied prior to operating or servicing the pedestal. Attention to the details contained herein will ensure that the pedestal will operate efficiently with the minimum of attention over a long service life. Particular attention must be paid to cleaning, especially after use in adverse conditions.

To order spare parts or to obtain further information, application should be made to Vinten Broadcast Limited or to your local distributor, or visit our website at www.vinten.com.

Notes to readers

This is an on-line version of ‘Vision SD12 Pan & Tilt Head Maintenance Manual’ (3364-9A). The SD12 is an obsolete product and this Maintenance Manual is provide for the final production version.

Navigation

Clicking the mouse on any blue text will move you around the document. For example, if you click on one of the blue call-outs on an exploded drawing, you will be taken to the appropriate line in the relevant parts list.

Contents Clicking here will take you to the Contents Page.

Clicking here will take you to the first page.

Clicking here will take you to the previous page.

Clicking here will take you to the next page.

Click here to go back to the previous view.

Alternatively, you may use the Acrobat Reader navigation buttons.

Safety - Read This First!

Warning symbols in this maintenance manual

Where there is a risk of personal injury, injury to others, or damage to the pan and tilt head or associated equipment, comments appear, highlighted by the word **WARNING!** and supported by the warning triangle symbol.

Critical data

Mass

Mass	**3 kg (6.6 lb)**

Load

Typical payload	**12 kg at 125 mm C of G (26.5 lb at 5 in. C of G) - see graph (Fig 2.1)**

Contents

Contents (Cont) **Page**

Illustrations **Page**

Abbreviations

The following abbreviations are used in this publication:

Technical Specification

Weight	3 kg (6.6 lb)
Overall dimensions	
Height from top of tripod bowl	150 mm (5.9 in.)
Length	145 mm (5.7 in.)
Width	185 mm (7.3 in.)
Load capacity	See graph (Fig 2.1)
Tilt range from horizontal	±90° max - see graph (Fig 2.1)
Pan range	360°
Horizontal adjustment	100 mm (3.9 in.)
Telescopic pan bar length	403 mm to 592 mm (15.8 in. to 23.3 in.)
Camera fixing	Removable sliding plate with two 3/8 in. BSW fixing screws
Optional camera fixing	Quickfit automatic adaptor
Pedestal/tripod fixing	100 mm ball

Design Improvements

DETAILS	SERIAL No. INFORMATION
Improvements to illumination unit	0442
Changes to constant drag and labyrinths	0526
Constant drag sealing ring improved	0597
Improvements to drag system	1615
Improvements to balance spring assembly	1865
Stainless steel pan drag bell crank	1913
Introduction of static-friction brake shafts	4488
Changes to outrigger to improve stop pin engagement	6392

Section 1

Introduction and Description

Contents **Para**

Introduction

1 The Vision SD12 pan and tilt head is one of a range of heads designed for electronic news gathering (ENG). It is largely constructed in aluminium alloy to produce a robust, lightweight unit. The unique counterbalance system enables a variety of camera/lens combinations to be maintained in perfect balance over the range of tilt movements. A maximum tilt angle of ±90° is available at intermediate loadings, whilst at higher loadings the range of tilt motion is progressively reduced to ±40°. A graph is provided in Section 2 which illustrates the relationship between load and centre-of-gravity (C of G) and should be used to ascertain the suitability of the head for any given combination of ENG camera, lens and accessories.

2 Drag is provided by the patented Vinten serial drag (SD) system. This combines friction elements, which provide stepless adjustment over a wide range, and viscous fluid elements, which provide smoothness and zero stiction. A wide variation of the drag setting to suit operator preference is available on both pan and tilt axes and "whip" movements may be executed irrespective of drag setting. The pan and tilt axes are each provided with a brake.

3 The head is provided with a 100mm ball base. An illuminated level bubble facilitates levelling.

Description

4 The Vision SD12 pan and tilt head embodies a spring counter-balancing mechanism, SD drag assemblies for pan and tilt motions and a camera mounting plate.

5 The balance system is easily adjusted by a crucifying knob (3) on the rear face of the head. The control compensates for differing platform loads by varying the compressive force on the counter-balance spring.

6 Both the pan and tilt mechanisms incorporate SD drag systems to ensure smooth movement of the camera about these axes and are fitted with calibrated control knobs to adjust the drag setting. The pan drag control (8) is mounted on the right-hand side of the head and the tilt drag (13) on the left-hand side. The whip-pan facility is unaffected by the pan drag setting.

7 Friction brakes on each axis allow the head to be locked at any chosen position. The operating levers for both brakes (12)(14) are fitted on the left-hand side of the head.

8 The head is built with a 100mm ball base but an adaptor is available for conversion to a standard flat base. This adaptor permits mounting to a flat surface, either directly, using the tapped holes in the base of the adaptor, or via a Vinten Quickfix adaptor.

9 A level bubble (5) is fitted to the rear of the pan housing and is provided with a touch-operated lamp.

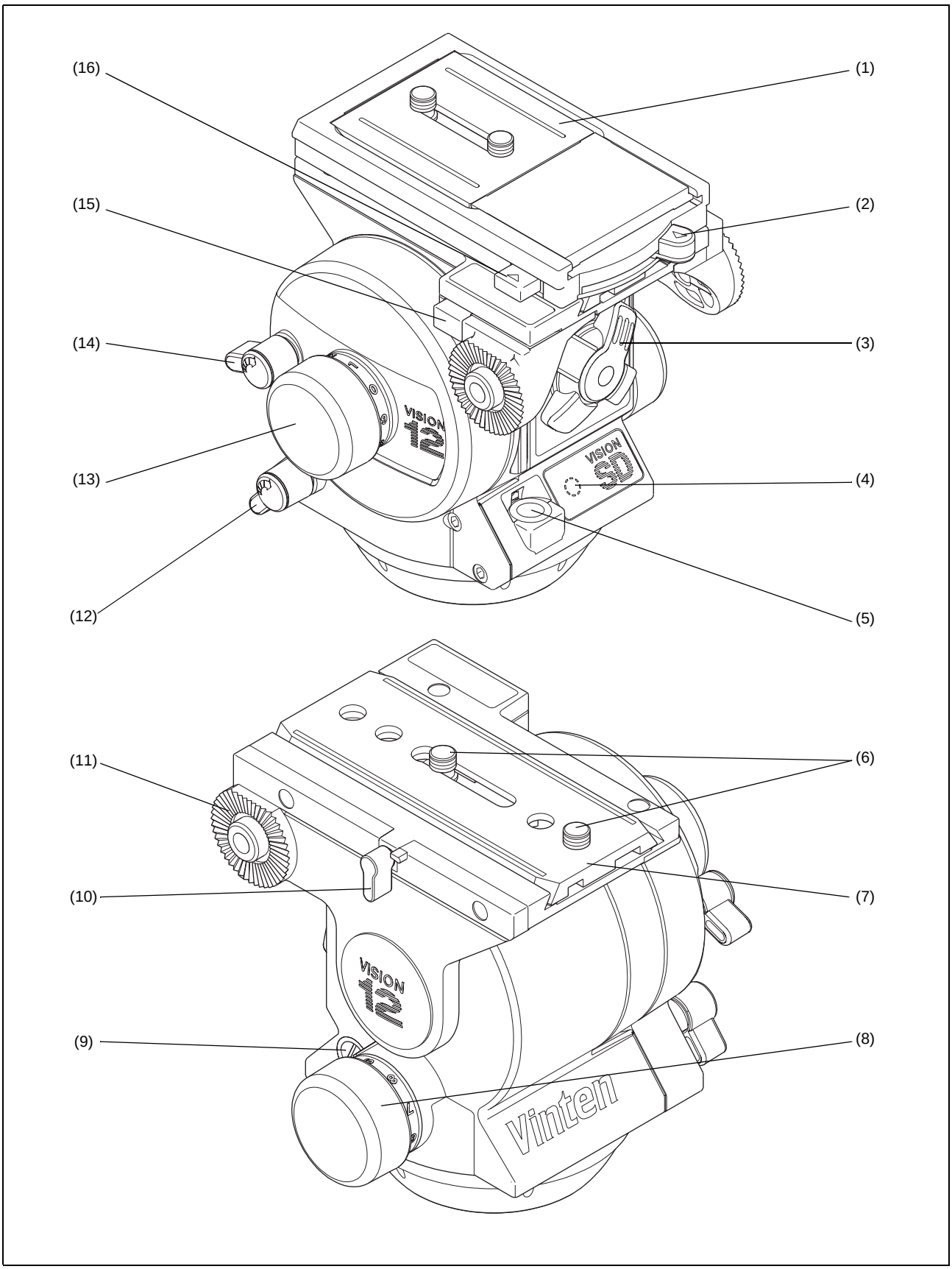


Fig 1.1 Vision SD12 Pan & Tilt Head

10 The camera mounting plate (7) is a sliding fit in the head, adjustable fore and aft by 50 mm from its central position. A slide clamp, operated by a rotary lever (10), is located on the right-hand side of the head for adjustment of the plate position. A slide release (15) on the left-hand side of the head allows removal of the camera and slide plate complete. To remove the slide plate, release the slide clamp and move the slide plate fully rearwards. Operate the slide release by pushing it in and holding. With the release depressed, the end stop which limits the rearward movement of the slide plate is disengaged, and the plate can be slid bodily from the head. This feature is an aid to rapid camera set-up.

11 A Vinten "Quickfit" adaptor (1) may be fitted to the slide plate. This optional extra enables any camera fitted with a "Quickfit" wedge to be rapidly fitted to or removed from the head.

12 Attachment points for the pan bar (11) are located at the rear of the head, on either side of the camera mounting platform. A telescopic pan bar is supplied and is fitted using a pan bar clamp, with angular adjustment available on the mount serrations. A second pan bar may be fitted.

Section 2

Installation and Operation

Contents **Para**

introduction

1 This section includes instructions for mounting the Vision SD12 pan and tilt head, fitting and balancing a camera and operating the head. Refer to Fig 1.1 to identify the parts and controls.

Installation

Mounting the head

2 Carefully remove the head from its packing. Ensure that all small parts are accounted for before disposing of the packing materials.

3 The head is designed to be mounted on to a tripod but an adaptor is available for use with other suitable supports.

4 The spherical base of the head fits a tripod with a 100mm bowl and must be securely clamped after being set level.

5 When fitted to the optional flat base adaptor the head may be attached to a Vinten Quickfix mount, in which case the head is secured using the three knurled screws of the mount. Alternatively, the head may be secured directly to a flat surface using the four tapped holes in the adaptor base.

6 As part of the mounting operation, the head should be accurately levelled using the level bubble at the rear of the head.

Pan bar attachment

7 Loosely attach the quadrant assembly to the head and turn the pan bar and the quadrant assembly to achieve the required position. Tighten the clamp knob.

Operation checks

8 Release the pan and tilt brakes (12)(14) and exercise the head about both pan and tilt axes using various drag settings.

9 Position the head with the platform horizontal and apply the pan (12) and tilt brakes (14). Without applying great force, check that there is resistance to movement about the pan and tilt axes.

10 Release the slide plate lock (10). Check that the slide plate is free to move in the platform but will not slide completely out of the rear end of the platform, and that it is securely held when the slide plate lock is applied. Release the slide plate lock (10), push in the slide plate release (15) and check that the slide plate can be withdrawn from the rear end of the platform.

11 Press the level bubble touchpad (5) and ensure that the lamp remains lit for approximately 15 seconds. Replace the battery (See “Level bubble lamp battery installation and replacement” on page 23) if the illumination is considered inadequate.

12 If the head is fitted with the optional Quickfit adaptor (1), push in the adaptor safety catch (16) and move the adaptor wedge release knob (2) to the left against spring tension. Whilst holding the adaptor wedge release knob in this position, lift the rear end of the adaptor wedge and withdraw it from the adaptor. Check that the adaptor wedge release knob is retained in the release position. Position the front end of the adaptor wedge in the adaptor and press down the rear end. Check that the adaptor wedge release knob returns to the right and that the adaptor wedge is securely retained in the adaptor. Check also that the adaptor safety catch knob returned to its normal position when the adaptor wedge release knob moved to the right.

Fitting a camera to the head

WARNING!: The pan and tilt brakes must be applied before any attempt is made to fit or remove any equipment mounted on the head.

13 The load range for the Vision SD12 (i.e. the loads which can be fully counterbalanced) is defined by the graph (Fig 2.1). Always check that equipment is within the design operating range for the head before attempting to mount it.

14 Before attempting to balance a camera, ensure that all ancillary equipment (lens, zoom and focus controls, prompter etc) has been fitted. It will be necessary to repeat the balancing procedure if these items are fitted at a later stage. Changing the position or length of the pan bars may require adjustment of balance.

15 Cameras may be mounted directly on the slide plate or to an intermediate adaptor, such as the Vinten Quickfit adaptor. The standard screw fixing is used to attach a camera to the sliding plate; intermediate devices may be attached using either the two-screw fixing or four to six M4 screws. Cameras attached directly to the sliding plate may be quickly removed from the head, together with the plate, by use of the slide release.

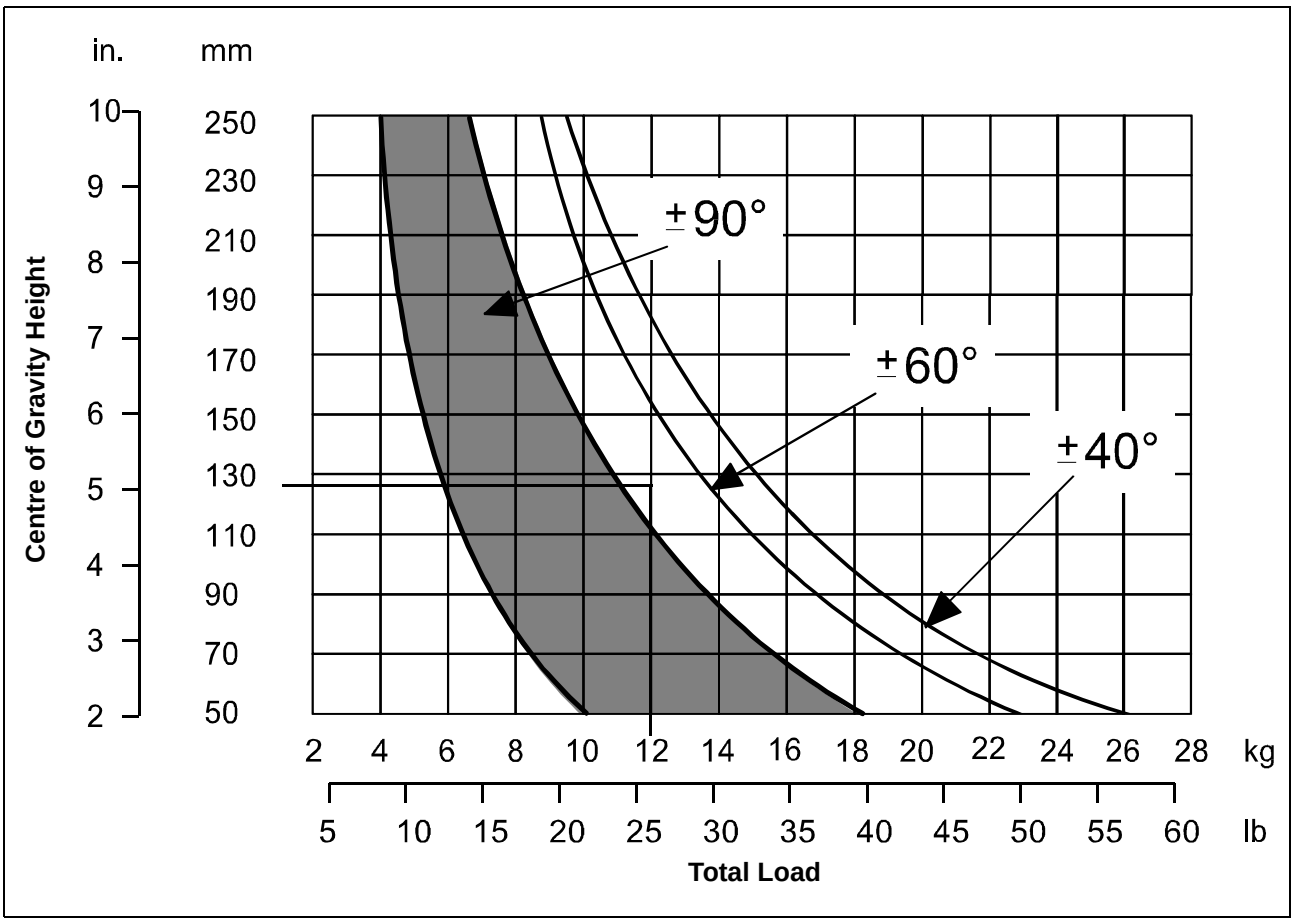


Fig 2.1 Balancing Graph

Balancing the camera

16 Fig 2.1 shows the range of load and centre of gravity (C of G) height above the mounting plate which can be maintained in balance by the Vision SD12 head. The shaded area of the graph corresponds to those loads/C of G heights which can be balanced over the full range of tilt (±90°). The area to the right of the ±90° curve but under the curve ±40° indicates the progressively reducing tilt range over which the head can fully balance higher loads. The intermediate curve (±60°) indicates the maximum load/C of G range which the head can balance over a tilt range of ±60° and the final curve (±40°) indicates the maximum load/C of G range which the head can balance.

17 To ascertain whether a particular load can be balanced, use Fig 2.1 as follows:

17.1 Locate the total load to be balanced on the horizontal axis of the graph, and the height of its C of G on the vertical axis. Project lines from these points. If the intersection lies inside the ±40° curve the load can be balanced over the tilt range indicated. If the intersection lies outside the ±40° curve the camera will not be perfectly balanced on the Vision SD12 head

17.2 Example - A camera weighs 12 kg (26 lb) and has a C of G 125 mm (5 in.) above the mounting plate. The lines intersect under the ±60° curve, therefore the head can balance the load over at least ±60° of tilt movement.

18 To balance the camera, proceed as follows:

18.1 Set the head horizontal and engage the tilt brake (14).

18.2 Fit the pan bar or bars (with zoom and focus controls if used) to the head.

18.3 Turn the balance adjustment knob (3) as far as it will go counter-clockwise, then turn it approximately 5 revolutions in a clockwise direction to apply some counter-balance.

18.4 Assemble the camera and ancillary equipment on the slide plate and fit the slide plate to the head.

18.5 Release the slide plate lock (10) and position the slide plate to bring the C of G of the load approximately over the head tilt axis. Re-engage the slide plate lock but do not overtighten.

18.6 Release the tilt brake (14). Turn the balance knob (3) counter-clockwise until the head falls away from horizontal under the weight of the load.

18.7 Adjust the fore-and-aft position of the slide plate until the load will balance when the head is horizontal. Apply the slide plate lock (10).

18.8 Turn the balance knob (3) clockwise until the load does not fall away when the head is tilted and released.

18.9 Repeat the adjustment steps until the load will remain set at any angle within the range of tilt defined by the graph (Fig 2.1). Provided the load is within the recommended range, the correctly balanced assembly will retain any degree of tilt within this range with the tilt brake released and the tilt drag set to zero.

18.10 Apply the tilt brake (14).

Operation

Adjusting pan bars

NOTE: Adjusting the position or length of the pan bars may necessitate fine adjustment in the fore and aft position of the camera and the balance.

19 With the pan brake and tilt brake applied, adjust the position of the pan bar to suit the operator's requirements by slackening the quadrant clamp knob and moving the pan bar and quadrant to the desired position. Tighten the clamp knob.

20 Adjust the length of the telescopic pan bar by releasing the pan bar clamp knob and sliding the bar in or out. Tighten the clamp knob.

Setting pan and tilt drag

21 Drag setting is entirely a matter of operator preference, and does not affect the ability to perform a whip pan. Set the pan and tilt drag as follows:

21.1 Release the pan and tilt brakes (12)(14).

21.2 Turn the tilt drag control knob (13), on the left-hand side, to the required amount of drag; clockwise to increase, counter-clockwise to decrease.

21.3 Set the pan drag in a similar manner by adjustment of the pan drag control (8) on the right-hand side of the head.

21.4 It is advisable to apply the pan brake and the tilt brake if the camera is to be left on a static shot for any period of time to prevent inadvertent movement.

Section 3

Tools and Materials

General

1 The following tools and consumable materials will be required for servicing, disassembly, repair, assembly and adjustment.

Tools

ITEM	PART No.	PROCEDURE
Spring insertion tool	T39827	Platform slide release spring
Guide pin ejection tool	T39300,	Balance mechanism guide pin removal
Shim setting tool	T61463	Setting shim pack thickness
Spot face tool	3321-912SP	Refurbishment of serrations on tilt drag housing or RH side plate using 3364-907SP

Consumable materials

NOTE: Adhesives and lubricants are not supplied by Vinten Broadcast Ltd and should be obtained under local arrangements

ITEM	PART No.	USE
Loctite 222E	Z002-075	Thread locking
Loctite 241	Z002-022	Grub screw retaining balance unit guide pin
Loctite 270	Z002-034	Balance mechanism assembly
Loctite 380	Z002-078	Platform slide
Loctite 406	Z002-086	Drag knob sleeves
Loctite 415	Z002-062	Pan brake cup, level bubble illumination graphic
Loctite 601	Z002-020	Adhesive
Loctite 638	Z002-058	Pan drag knob shaft, balance adjustment knob
Loctite 641	Z002-074	Tilt bearing installation
Loctite Primer 757	Z002-087	Primer for Loctite 406
3M VHB Surface cleaner, or locally available equivalent	Z004-029	Cleaning friction rings and friction faces in drag assemblies
Gasket sealant, blue Hylomar	Z100-025	Spherical base stud carrier

Consumable materials (Cont)

ITEM	PART No.	USE
Silastic RTV silicone adhesive	Z100-034	Retaining wiring and PCB
Silcoset 153	Z002-036	Sealing pan bearing in spherical base
Grease, Moly-Paul	Z150-081	Spring actuator and other moving contact surfaces
Grease, Easyrun 50	Z150-081	Balance mechanism
Grease, Rocol M240G	Z150-072	Lubrication
Grease, white Chesterton	Z150-105	Lubrication

Section 4

Servicing

Contents **Para**

General

1 The Vision SD12 head requires a minimum of periodic servicing. Its rotational and drag mechanisms are totally enclosed to prevent the ingress of dirt or foreign bodies. If the head becomes faulty reference should be made to Section 5 of this manual, or the unit may be returned to Vinten Broadcast Limited or your local distributor for overhaul.

Cleaning

2 It is important that the external surfaces of the head and accessories are kept as clean as possible. After use in normal conditions the equipment should be thoroughly wiped using a clean dry cloth. After operations in dusty, muddy or sandy conditions use a stiff non-metallic brush and an industrial vacuum cleaner to clean the head. Special attention should be paid to the spaces between the tilting platform and the body and between the body and the base, where the presence of dirt could interfere with the smooth movement of the pan and tilt functions. After cleaning inspect the head for wear or damage. When the head is to remain unused for a long period of time thorough cleaning is recommended prior to placing it in storage.

Lubrication

3 The bearings in the pan and tilt head are packed with grease. Under normal operating conditions they will only require re-greasing if there is any harshness or stiffness in movement.

4 To check the bearings, turn the balance control as far as possible counter-clockwise, turn the pan and tilt drag controls fully counter-clockwise and release the brakes. At these settings both pan and tilt axes should move smoothly and without perceptible drag.

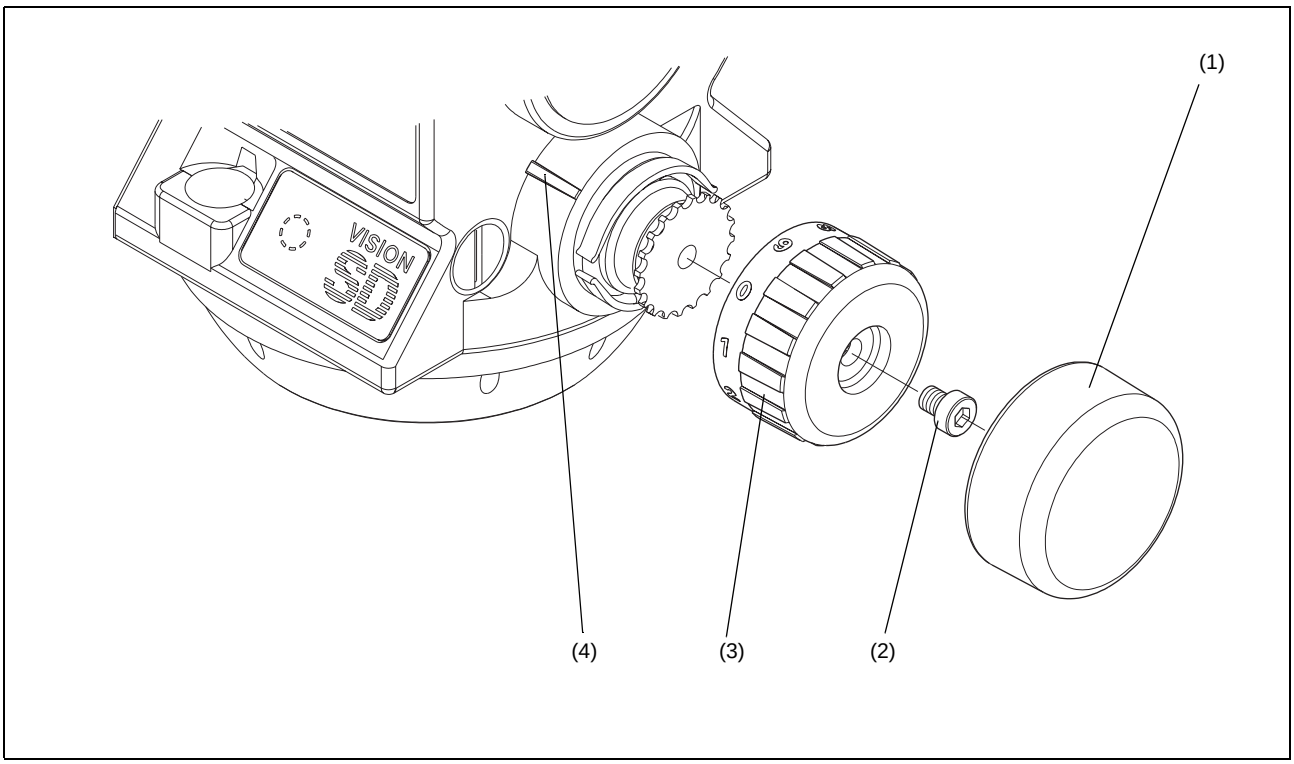


Fig 4.1 Resetting the drag knobs

Adjustments

Resetting the drag knobs

5 The Vision SD12 pan and tilt drag controls will not normally require adjustment. However, in the unlikely event that bedding-in of the mechanism occurs, the following procedure should be followed to reset the drag knobs (Fig 4.1):

5.1 Release the pan and tilt brakes.

5.2 Prise off the drag knob sleeve (1) from the pan or tilt drag knob

5.3 Remove screw (2) securing drag knob (3). This screw is secured with Loctite.

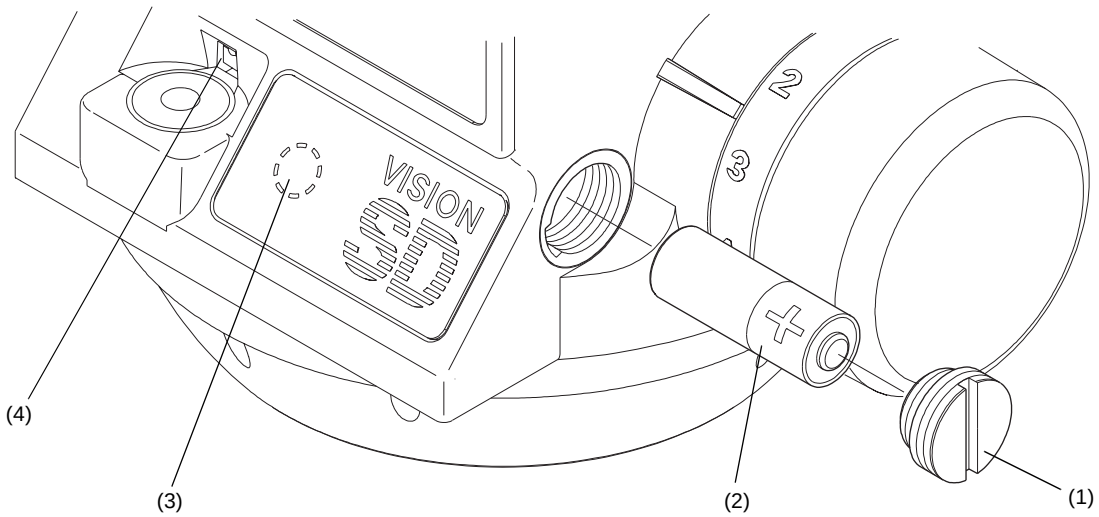
5.4 Turn the drag knob fully counter-clockwise to 0, then, while panning or tilting the head, slowly turn the knob clockwise until drag begins to be felt.

5.5 Pull off the drag knob (3) and refit so that 1 is aligned with the datum (4). During refitting, ensure that the knob is eased over the drag knob detent and is seated squarely on the face of the drag adjustment boss.

5.6 Operate the knob over its range and ensure that drag begins to be felt between 0 and 1.

5.7 Apply Loctite 222E to the thread of screw (2) and secure knob (3) in position.

5.8 Using Loctite 406 and primer 757, secure rubber cover (1) over knob (3).



Battery Type: 12V, 33mAh, Alkaline Manganese

Vinten Part No.	Duracell	GPI	Hi-Tech	Panasonic	VARTA
C550-021	MN21	GP23A	VR22	RV08	VG23GA

Fig 4.2 Level bubble lamp battery installation and replacement

Level bubble lamp battery installation and replacement

6 The level bubble on the Vision SD12 is illuminated by a battery-powered light-emitting diode (LED) operated by a touchpad. The battery (See Table, Fig 4.2) should be installed when the head is first put into use and replaced whenever the illumination is considered inadequate.

7 To install or replace the battery (Fig 4.2):

7.1 Unscrew and remove the battery cover plate (1).

NOTE: Installing the battery incorrectly will not damage the head, but the lamp will not operate

WARNING!: Do not overtighten the battery cover plate.

7.3 Replace the battery cover plate (2).

7.4 Press the touchpad (3) and ensure the lamp (4) is lit for approximately 15 seconds.

Section 5

Repair

Contents **Para**

General

1 This section details procedures for disassembly and assembly of the Vision SD12 Head, where such operations are not self-evident. Reference is made in the procedures to figures in Section 6 - Illustrated Parts List.

2 The head is constructed from precision components, many of which are of aluminium alloy. Several of the assembly procedures require the use of specific sealants, adhesives or lubricants. It is advised that only experienced and properly equipped personnel with access to all necessary materials and tools should attempt

to overhaul, repair or replace components on these heads. The special tools and consumable materials required for work on Vision SD12 heads are listed in Section 3 - Tools and Materials.

WARNING!: To prevent damage to socket screw heads, use the correct hexagonal wrenches and ensure they are in good condition

Disassembly

WARNING!: The labyrinth assembly (3364-44), the constant drag assembly (3364-45) and the spring actuator (part no. 3364-908SP) require special equipment for assembly and should not be dismantled. Any faulty assembly must be replaced. If the labyrinth assemblies, constant drag assemblies or spacers (3364-300) are replaced, it will be necessary to adjust the thickness of the pan shim pack (Para 14.14) or tilt shim pack (Para 17.18). This requires the use of shim setting tool (T61463).

Platform

3 To remove the platform (Fig 6.2):

3.1 Remove platform slide (1) (See “Operation checks” on page 15).

3.2 Remove graphic (37).

3.3 Remove one screw (36) and four screws (4), noting that all these screws are secured with Loctite. Carefully lift the LH side of the platform and retain the platform slide release spring (35) which will be released as the platform is lifted.

3.4 Turn the platform slide clamp lever (12) upwards and separate the platform from RH side plate (15).

3.5 Remove the platform slide release (34) by feeding it up through the hole in the platform.

Balance mechanism guide pin

WARNING!: Before attempting to remove the tilt unit assembly or the RH side plate, the balance mechanism guide pin must be removed to release the preload on the balance mechanism. Failure to release the balance mechanism preload may result in serious damage to the head.

4 To remove the balance mechanism guide pin (Fig 6.2):

4.1 Turn the balance knob (24) counter-clockwise until it is unloaded.

4.2 Prise up a corner of balance graphic (26), remove it completely and discard it.

4.3 Using circlip pliers, remove Spirol ring (25) from the groove in mechanism housing (16) and allow it to rest on the neck of balance knob assembly (24).

4.4 Unscrew and remove balance knob assembly (24) together with Spirol ring (25).

4.5 Remove grub screw (19), which is secured with Loctite, from the RH side of mechanism housing (15).

4.6 Remove the sliding pin from tool T39300 and install the body of the tool in place of the balance knob assembly, aligning the hole in the tool with the hole in the end face of adjustment slide (38). Tighten the tool securing screw until solid, ensuring that the alignment of the hole in the tool is maintained. As the tool securing screw is tightened, the preload on the balance spring assembly will be transferred from guide pin (20) to the tool.

4.7 Using a syringe filled with white bearing grease, completely fill the hole in the tool with grease.

4.8 Position the sliding pin in the hole in the tool and drive it in to eject guide pin (20) from the side of mechanism housing (16).

4.9 To release the screw securing tool T39300, temporarily insert a 3.0mm diameter pin, not less than 30 mm long, in the hole in the side of the mechanism housing vacated by the guide pin. Ensure that the pin is fully engaged in the slot in the adjustment slide. The temporary pin must be removed as soon as the securing screw starts to turn or it will prevent release of the spring preload.

Tilt unit assembly

WARNING!: Before attempting to remove the tilt unit assembly or the RH side plate, the balance mechanism guide pin must be removed to release the preload on the balance mechanism. Failure to release the balance mechanism preload may result in serious damage to the head.

5 To remove the tilt unit assembly:

5.1 Remove the platform (Para 3).

5.2 Remove the balance mechanism guide pin (Para 4).

5.3 Referring to Fig 6.4, prise off pan brake knob cap (19) and remove the old adhesive from the knob and cap.

5.4 Release the pan brake. Remove screw (18) and pan brake knob (17).

5.5 Unscrew and remove pan brake shaft (16).

5.6 Referring to Fig 6.2, remove two screws (29), one screw (31) and one screw (32) which secure the outrigger of the tilt unit to the mechanism housing. Note the positions from which the screws were removed. These screws are secured with Loctite.

5.7 Withdraw the tilt unit assembly in the direction of the tilt axis until the boss of tilt housing (Fig 6.4 item 1) is clear of bearing (17) in the mechanism housing cover.

6 To dismantle the tilt unit assembly:

6.1 Referring to Fig 6.6, remove drag knob sleeve (1), which is secured with adhesive.

6.2 Turn the drag knob counter-clockwise to the stop, remove screw (2), which is secured with Loctite, and drag knob (3).

6.3 Unscrew drag knob boss (4) and remove two shim washers (5) and eight disc springs (6). Note arrangement of disc springs and shim washers for re-assembly.

6.4 Remove grommet (8) complete with drag detent ring (7).

6.5 Referring to Fig 6.4, remove four screws (15), which are secured with Loctite.

6.6 Prise off tilt brake knob cap (19) and remove the old adhesive from the knob and cap.

6.7 Release the tilt brake. Remove screw (18) and tilt brake knob (17). Unscrew and remove tilt brake shaft (22) complete with tilt brake insert (23).

WARNING!: The outrigger must be turned so that the cast features in the outrigger are aligned with the cutout in the brake disc.

6.8 Turn outrigger (14) clockwise relative to tilt housing (1) until the tilt brake boss lies on an imaginary line from the tilt drag boss to the centre of the pan bar mounting.

6.9 Apply masking tape or similar padding to the faces and tips of two large flat-bladed screwdrivers and insert them in the gap between the outrigger and the tilt drag housing. Taking care to avoid damage to the surface finishes, draw the outrigger off two Spirol pins (25) in the tilt drag shaft.

6.10 Remove Spirol pin (31) from tilt drag actuator shaft (2).

6.11 Support the constant drag assembly (8) with inboard end of tilt drag shaft (26) upwards, ensuring that supports are clear of tilt brake disc (11).

6.12 Loosen two screws (13).

6.13 Remove six screws (9). Using a soft-faced mallet, gently tap the constant drag assembly (8) until it may be removed. Drive out Spirol pin (6).

6.14 Remove two screws (13). gently tap the tilt drag shaft (26) to remove the labyrinth assembly (7), spacer (28) and shim pack (29). Retain the shim pack (29) for reassembly. Ensure that the surfaces of the friction rings on the labyrinth are not damaged or contaminated.

6.15 If access is required to bearing (27) remove six screws (24), which are secured with Loctite, and two Spirol pins (10) to release tilt brake clamp (12) and give access to bearing (27).

6.16 If access is required to tilt drag thrust bearing (4), remove six screws (30) and drive out two Spirol pins (6) which secure friction plate (5) in tilt drag housing (1).

6.17 Lift out tilt drag actuator shaft (2) complete with friction plate (5), thrust bearing (4) and thrust washer (3).

Balance mechanism

NOTE: It is not necessary to remove the balance mechanism for access to the pan drag mechanism.

7 To remove the balance mechanism (Fig 6.2):

7.1 Remove the platform (Para 3).

7.2 Remove the balance mechanism guide pin (Para 4).

7.3 Remove the tilt unit assembly (Para 5).

7.4 Remove three screws (33) which secure mechanism housing cover (30) to the mechanism housing and lift out the mechanism housing cover complete with bearing (17).

7.5 Remove thrust bearing (23).

WARNING!: Ensure that the mechanism housing and balance mechanism are not damaged during removal of the adjustment slide sleeve.

7.6 Remove three screws (27) which secure adjustment slide sleeve (21) in the mechanism housing. From within the mechanism housing, push the adjustment slide sleeve out until the locating Spirol pin is disengaged and remove the sleeve. Ensure that the mechanism housing and balance mechanism are not damaged during removal of the adjustment slide sleeve.

7.7 Using circlip pliers, remove circlip (18) from the boss of RH side plate (15) and allow it to rest on the end face of the boss.

7.8 Using hand pressure, push the balance assembly bodily into the mechanism housing to displace RH side plate (15) outwards until the boss which projects through bearing (17) is level with the inner face of the bearing.

7.9 Tilt the RH side plate counter-clockwise when looking on the open side of the mechanism housing and lift the balance assembly out of the mechanism housing.

7.10 Remove two shim washers (40) from the balance assembly and circlip (18) from the mechanism housing.

WARNING!: Assembly of the balance mechanism requires special tools. Do not dismantle unless necessary.
The spring actuator assembly (3364-908SP) requires special equipment for assembly and should not be dismantled. If faulty, it must be replaced.

8 Disassembly of the balance mechanism is self evident (Fig 6.2), but the trunnion pins of spring actuator (Part No. 3364-908SP) must not be removed. If the spring actuator is damaged or faulty it must be replaced.

RH side plate and RH side plate bearing

NOTE: Do not attempt to remove the RH side plate bearing from the mechanism housing unless it is damaged or faulty.

9 To remove the RH side plate and the RH side plate bearing:

9.1 Remove the platform (Para 3).

9.2 Remove the balance mechanism guide pin (Para 4).

9.3 Remove the tilt unit assembly (Para 5).

9.4 Remove the balance mechanism (Para 7).

9.5 Withdraw the RH side plate from its bearing in the mechanism housing.

9.6 Referring to Fig 6.5, press RH side plate bearing (7) inwards from its seating in mechanism housing (1) using a press fitted with a suitable adapter on the mandrel and ensuring that the bearing seat in the mechanism housing is properly supported.

Pan unit assembly

10 To dismantle the pan unit assembly (Fig 6.3):

10.1 Remove the platform (Para 3).

10.2 Remove the balance mechanism guide pin (Para 4).

10.3 Remove the tilt unit assembly (Para 5).

10.4 Turn the pan drag knob counter-clockwise to the stop.

10.5 If not already removed, remove the mechanism housing as follows:

10.5.1 Referring to Fig 6.2 remove three screws (33) which secure mechanism housing cover (30) to the mechanism housing.

10.5.2 Lift out the mechanism housing cover complete with bearing (17).

10.6 Referring to Fig 6.3, loosen four screws (1), which are secured with Loctite, using a 90° ratchet or hexagon key.

10.7 Loosen six screws (29), which are secured with Loctite, turning the spherical base as necessaries for access.

10.8 Remove three screws (20) and remove spherical base stud carrier (23) complete with stud (24). Remove all traces of sealant from mating faces of spherical base and spherical base stud carrier, taking care to avoid damaging the surface finishes.

10.9 Using a 1 in. AF open-ended or box spanner, remove pan shaft screw (22), which is secured with Loctite.

10.10 Remove the centre screw (20).

10.11 Remove six screws (29) turning the spherical base as necessary for access.

10.12 Identify the 3.0mm (0.118in.) dia hole which houses Spirol pin (8). Using a suitable punch, tap the Spirol pin downwards to separate the spherical base from the pan top plate.Discard gasket (13)

10.13 Remove Spirol pin (8) from the spherical base if required.

10.14 Remove bearing (21) if required. The bearing is sealed by silicone rubber adhesive, all traces of which should be removed from the bearing and the spherical base.

10.15 If access is required to pan drag thrust bearing (17) or thrust washer (18), remove six screws (25) and drive out two Spirol pins (15) which secure friction plate assembly (16) in the spherical base (19).

10.16 Support the mechanism housing securely with the pan axis spigot pointing upwards.

10.17 Referring to Fig 6.6, remove the drag knob components as follows:

10.17.1 Remove the drag knob sleeve (1), which is secured by adhesive.

10.17.2 Remove screw (2) and pan drag knob (3).

10.17.3 Unscrew drag knob boss (4) and remove two shim washers (5) and eight disc springs (6), noting the arrangement of the disc springs.

10.17.4 Remove grommet (8) complete with detent ring (7).

10.18 Referring to Fig 6.3, withdraw pan drag knob shaft (4) from mechanism housing.

10.19 Remove four screws (1), which are secured with Loctite, and withdraw pan drag bell crank trunnion (3) complete with bell crank (2), pan drag actuator adaptor (41) and two dowel pins (5).

10.20 Start two M3 screws, with threads at least 20 mm long, in the threaded holes in the boss of labyrinth (14). Turn the screws into the threaded holes until they contact the shoulder of the pan axis spigot. Tighten the screws equally to draw labyrinth (14) off the pan axis spigot.

10.21 Remove shim pack (27) and spacer (28). Retain shim pack for reassembly

WARNING!: Do not attempt to pull constant drag assembly (12) from the pan axis spigot as this will damage the pan brake disc.

10.22 To remove the constant drag assembly, or if access is required to bearing (11) or to pan brake disc (10) it is necessary to remove pan brake plate (37). Proceed as follows:

10.22.1 In the constant drag assembly (12), identify the 3.3 mm (0.130 in.) hole which lies between two of the six holes for the fixing screws. Turn the pan unit top plate to align this hole with screw (30) which secures the pan brake plate (31) to the mechanism housing. Pass a 2.5 mm hexagon wrench through the hole and engage it in the socket of screw(36).

10.22.2 Progressively undo the screw whilst drawing the pan top plate, complete with the pan brake disc (10) and bearing (11) off the pan axis spigot and at the same time easing the pan brake plate off dowel pin (32).

10.23 Remove six screws (7), which are secured with Loctite, and two Spirol pins (8) to release pan brake clamp (9), pan brake disc (10) and give access to bearing (11).

Bubble illumination unit

11 Remove the bubble illumination unit from the mechanism housing as follows (Fig 6.5):

11.1 Prise up a corner of graphic (4), remove it completely and discard it.

11.2 Remove old adhesive securing PCB and wiring into mechanism housing.

11.3 Remove screw (6) and withdraw bubble illumination unit assembly (2) from mechanism housing.

Assembly

Bubble illumination unit

12 Install the bubble illumination unit in the mechanism housing as follows (Fig 6.5):

12.1 Feed PCB part of the bubble illumination unit (2) into the round hole in the side of the mechanism housing, then out through the rectangular hole in the back face of the housing.

12.2 Ensuring that the wires are not trapped, seat the cylindrical plastic moulding in the housing and secure it with self-tapping screw (6). Lay any surplus wiring on top of the PCB, away from the switch.

12.3 Seat the PCB in the rectangular recess and secure it with Silcoset RTV 738, keeping the adhesive away from the switch, but using sufficient to support the graphic at the centre.

12.4 Position the self-adhesive graphic (4) in the seating on the rear face of mechanism housing (1) and press the edges into position. Allow to cure for 24 hours.

RH side plate bearing

13 Referring to Fig 6.5, if RH side plate bearing (7) has been removed from mechanism housing (1), a replacement bearing may be installed without heating the housing, but it is essential that a suitable press, fitted with a mandrel adapter and support ring to match the bearing, is used. Proceed as follows:

13.1 Remove all traces of old adhesive from the bearing seating in mechanism housing (1) and from bearing (7). Degrease bearing seating and outer race of bearing.

13.2 Apply Loctite 641 to outer race of bearing and press bearing into mechanism housing, ensuring that it is properly seated.

Pan unit assembly

WARNING!: The labyrinth assembly (3364-44), the constant drag assembly (3364-45) and the spring actuator (part no. 3364-908SP) require special equipment for assembly and should not be dismantled. Any faulty assembly must be replaced. If the labyrinth assemblies, constant drag assemblies or spacers (3364-300) are replaced, it will be necessary to adjust the thickness of the pan shim pack (Para 14.14) or tilt shim pack (Para 17.18). This requires the use of shim setting tool (T61463).

14 To assemble the pan unit (Fig 6.3):

14.1 Degrease four screws (1).

14.2 Install bearing (11) in constant drag assembly (12), ensuring that it is fully seated.

14.3 Ensure that both faces of pan brake disc (10) are free from grease and position the pan brake disc and pan brake clamp (9) on boss of constant drag assembly (12), ensuring that it is fully seated. Rotate both components to align holes for screws and Spirol pins, noting that there is only one position in which all the holes are aligned.

14.4 Secure pan brake disc (10) and pan brake clamp (9) to constant drag assembly (12) with six screws (7). Do not tighten the screws at this stage.

14.5 Install two Spirol pins (8) through pan brake clamp (9) and pan brake disc (10) into constant drag assembly (12) ensuring that ends of Spirol pins are driven flush to surface of clamp. Tighten six screws (7). Ensure both faces of pan brake disc are free from grease.

14.6 If removed, install dowel pin (32) in seating for pan brake plate (32) in underside of mechanism housing (6) using Loctite 601.

14.7 If separated, assemble steel ball (35) into pan brake cup (33) using Loctite 415.

14.8 Ensure that the end face of pan brake cup (33) is free from grease. Apply a small quantity of white bearing grease to the bore for the pan brake cup in the underside of mechanism housing (6) and install the pan brake cup with the steel ball inwards.

14.9 In constant drag assembly (12), identify the single 3.3mm (0.130in.) diameter hole which lies between two of the six 3.3mm (0.130in.) diameter holes for the fixing screws. Pass a 2.5mm hexagon wrench through this hole so the end appears close to the pan brake disc.

14.10 Position screw (36) in the countersink of pan brake plate (31). Holding the screw by the thread, slide the chamfered corner of the pan brake plate between the pan brake disc and the pan top plate and engage the socket in the screw head on the hexagon wrench.

14.11 Locate the constant drag assembly on the pan axis spigot, turn it to align the thread of screw (30) with the hole in the underside of the mechanism housing and start the screw. Guide the pan brake plate onto dowel pin (32) and push bearing (11) in the constant drag assembly onto the pan axis spigot whilst turning screw (30) into the mechanism housing.

14.12 Ensure that bearing (11) is fully seated and tighten screw (30).

14.13 If constant drag assembly (12), labyrinth (14) or spacer (28) has been replaced it will be necessary to check that the thickness of shim pack (27) is correct. Otherwise, examine the shims for damage and replace as necessary. Do not use any shims that are not completely flat. Use a micrometer to measure the thickness of an undamaged area of the old shim and select a replacement of the same thickness.

14.14 To adjust the thickness of the shim pack:

14.14.1 Fit the 3 mm setting piece to the shim setting tool (T61463) and fully tighten the screw, Zero the dial indicator. Remove the setting piece.

14.14.2 Ensure that spacer (28) is positioned on the pan axis spigot, with the counterbore towards the constant drag assembly, then install the mechanism housing in the shim setting tool.

14.14.3 Fully tighten the screw and read off the figure on the dial indicator. Convert from millimetres to inches by dividing by 25.3, This is figure (A). Write the figure on the mechanism housing for future reference.

14.14.4 Remove the assembly from the setting tool.

14.14.5 Figure (B), in thousandths of an inch, will be found written on the labyrinth. This may be positive or negative figure, or zero.

14.14.6 Add figure (A) to figure (B). This gives the required thickness of the shim pack.

EXAMPLE: A = 0.020 in., B = -2(-0.002 in.). A-B = shim pack thickness = 0.018 in.

14.14.7 Using shims Part No. 3364-253 (0.05mm (0.002in.)), Part No. 3364-254 (0.08mm (0.003in.)) and Part No. 3364-255 (0.25mm (0.010in.)), assemble a pack of shims of the required thickness.

14.15 Position the mechanism housing (6) so that the pan axis spigot vertical.

14.16 Fit a suitable temporary pin (4 mm dia x 30 mm long) in the constant drag assembly to aid alignment of spacer, shim and labyrinth.

14.17 Install the shim pack on the pan axis spigot and align the holes in the shims with the holes in the spacer and the constant drag assembly.

14.18 Using a degreasing fluid which does not contain an oil-based corrosion inhibitor (See “Consumable materials” on page 19), thoroughly clean the face of the constant drag assembly (12) and the faces of the friction ring and six threaded holes in the labyrinth assembly (14).

14.19 Locate labyrinth assembly (14) on the pan axis spigot, ensuring that the groove in the outside diameter is towards the constant drag assembly. Turn the labyrinth assembly to align the holes in the centre part with the holes in shim pack and push it into position.

14.20 Remove the temporary pin.

14.21 Apply Loctite 222E to the threads of two screws (1) and pass them through the holes in the pan axis nearer to the open side of mechanism housing (6) to secure labyrinth assembly (14). Do not tighten screws (1) at this stage.

14.22 Lubricate dowel pin (5) and dowel pin (32) with white bearing grease.

14.23 Assemble pan drag actuator adaptor (36) to bell crank (2) using dowel pin (5).

14.24 Assemble bell crank (2) to bell crank trunnion (3) using dowel pin (32).

14.25 Position the bell crank assembly in recess in mechanism housing, feeding the pan drag actuator adaptor (36) into the central hole.

14.26 Apply Loctite 222E to the threads of two screws (1) and pass them through the holes in the bell crank trunnion and the pan axis spigot of the mechanism housing to secure labyrinth assembly (14), ensuring that the bell crank trunnion is positioned firmly against the vertical face of the recess in the mechanism housing. Do not fully tighten screws (1) at this stage.

14.27 Referring to Fig 6.2, temporarily install mechanism housing cover (30) and hold it in position with screws (33).

14.28 Referring to Fig 6.3, install two Spirol pins (26) in the exposed face of labyrinth assembly (15) and drive them in until the ends are below the face of the centre part of the labyrinth assembly.

14.29 Referring to Fig 6.2, remove mechanism housing cover (30).

14.30 Degrease six threaded holes in inner boss of spherical base (19) and six screws (29).

14.31 Degrease the outer race and the boss of spherical base (19). Install the bearing (21) in the spherical base, ensuring it is correctly seated.

14.32 Seal the outer race of the bearing and the boss with Silcoset 153.

14.33 Lubricate needle roller thrust bearing with white bearing grease and assemble thrust bearing components (17). position thrust washer (18) and thrust bearing (17) in spherical base (19).

14.34 Install friction plate assembly (16) in spherical base (19) and turn it to align holes for screws and Spirol pins, noting that there is only one position in which all the holes are aligned.

14.35 Apply Loctite 222E to threads of six screws (25) and secure friction plate assembly (16) to spherical base (19). Do not tighten screws (31) at this stage.

14.36 Install one Spirol pin (15) through friction plate (16) into spherical base (19), ensuring that the Spirol pin is driven in until the end is below the surface of the friction plate. Tighten six screws (25).

14.37 Using a degreasing fluid which does not contain an oil-based corrosion inhibitor (See “Consumable materials” on page 19), thoroughly clean the face of the friction ring in friction plate assembly (16).

14.38 In the constant drag assembly (12), identify the single 3.0mm (0.118in.) diameter hole which lies between two of the six 3.3mm (0.130in.) diameter holes for the fixing screws. Position a new paper gasket (13) on the constant drag assembly (12), ensuring that it is correctly oriented to align the seven notches with the holes for screws and the single 3.0mm (0.118in.) diameter hole and that the outer edge of the gasket lies within the register.

14.39 As an aid to handling, temporarily insert screws (20) in the threaded holes in the outside boss of spherical base (19).

14.40 Locate friction plate (16) on the projecting part of the pan axis spigot and engage the machined rim of spherical base (19) in the register of the pan top plate, ensuring that the seven holes are aligned and that the paper gasket is correctly positioned.

14.41 Secure the spherical base to the pan top plate using six screws (29), turning the assembly as necessary to gain access to the heads of the screws. Do not tighten the screws at this stage.

14.42 Remove screws (20), if fitted, and stand the assembly on the boss of the spherical base.

14.43 Install one Spirol pin (8) in the pan top plate, ensuring that it is installed in the 3.0mm (0.118in.) diameter hole in the plate. Drive the Spirol pin in until the end is level with the surface of the pan top plate.

14.44 Fully tighten six screws (29).

14.45 Securely support mechanism housing (6) so that the spigot for the pan axis points upwards.

14.46 Degrease threads of pan shaft screw (22) and four screws (20).

14.47 Apply Loctite 222E to the threads of one screw (20) and secure thrust washer (18) to pan drag actuator adaptor (36).

14.48 Apply Loctite 222E to the threads of pan shaft screw (22) and install in the pan axis spigot of mechanism housing (6). Tighten screw to a torque of 2.26 Nm (20 lbfin.), slacken off and retighten to a torque of 1.36 Nm (15 lbfin.).

14.49 Turn the spherical base in both directions relative to the mechanical housing and confirm that the movement is smooth and quiet.

14.50 If dismantled, degrease threads of spherical base stud (24) and spherical base stud carrier (23) and assemble using Loctite 601. Allow Loctite to cure.

14.51 Degrease face of boss and three threaded holes in the boss of spherical base (19), face of spherical base stud carrier (24).

14.52 Apply blue Hylomar gasket sealant to face of spherical base stud carrier (24) and assemble to spherical base, ensuring that the cylindrical location pip engages in the 4.0 mm dia plain hole.

14.53 Apply Loctite 222E to the threads of three screws (20) and secure spherical base stud carrier (24) to spherical base (19).

14.54 Degrease the cross hole in the end of pan drag knob shaft (4) and dowel pin (5).

14.55 Secure dowel pin (5) symmetrically in the cross hole of pan drag knob shaft (4) using Loctite 638 and allow to cure.

14.56 Apply 240G grease to the threads of the pan drag knob shaft (4) and the dowel pin in the shaft and install pan drag shaft in the mechanism housing (6) so that the dowel pin engages in the notches in the bell crank (2) and the threaded portion projects into the boss for the pan drag knob

14.57 Referring to Fig 6.6, install the pan drag knob components as follows:

14.57.1 If removed, install Spirol pin (10) in the face of pan drag knob boss of mechanism housing and drive it in to leave about 11 mm projecting from the face.

14.57.2 Assemble drag detent ring (7) onto grommet (8), with textured side outwards.

14.57.3 Install grommet (8), complete with detent ring (7), on the drag knob boss of the mechanism housing, engaging the location notch on Spirol pin (10), and push it fully home against the face of the boss. Lubricate detent arms on outside of detent ring (7) with white bearing grease.

14.57.4 Holding the pan drag knob shaft in position in the mechanism housing, assemble one shim washer (5), eight disc springs (6) and a second shim washer (5) onto the pan drag knob actuator shaft (9). Ensure that the first four disc springs are assembled with the concave face towards the mechanism housing and the last four are assembled with the concave face outwards, as shown in Fig 6.6.

14.57.5 Screw the drag knob boss (4) onto the pan drag knob actuator shaft (9) to take up the clearances, but do not tighten any further.

14.57.6 Degrease screw (2) and threaded bore of drag knob boss (4).

14.57.7 Lubricate internal serrations of pan drag knob (3) with white bearing grease and install on drag knob boss (4) with zero aligned with index mark on mechanism housing and secure with screw (2). Do not apply Loctite or fully tighten screw (2) at this stage.

14.58 Turn drag knob clockwise to take up slack in the drag mechanism.

14.59 Referring to Fig 6.3, tighten four screws to a torque of 2.82 Nm (25 lbfin.).

14.60 Turn pan drag knob fully clockwise (maximum drag) and allow unit to stand for 24 hours prior to adjusting the pan drag knob (See “Resetting the drag knobs” on page 22) after assembly of the head.

Balance mechanism

WARNING!: The spring actuator assembly (3364-908SP) requires special equipment for assembly and should not be dismantled. If faulty, it must be replaced.

15 If dismantled, assemble the balance mechanism as follows (Fig 6.2):

15.1 Secure buffer (46) to spring end cap (47) using Loctite IS495.

15.2 Lubricate needle roller bearing (39) with white bearing grease and install in actuator shaft (42).

15.3 Trial assemble actuator shaft (42), complete with needle roller bearing (39), into adjustment slide (38) and install sufficient shim washers (40), equally distributed on each side of the bearing, to leave minimum side play between the bearing and the adjuster slide when dowel pin (41) is installed.

15.4 Degrease dowel pin (41) and cross holes in adjustment slide (38), apply Loctite 601 to dowel pin (41) and assemble with shims (40) in position.

15.5 Degrease the threaded bore of actuator shaft (42) and thread of screw (48).

15.6 Lubricate all moving contact surfaces of balance mechanism with Easyrun 50 grease.

15.7 Assemble actuator shaft (42) into spring actuator (43), locate collar (44), spring (45) and spring end cap (47) on spring actuator.

15.8 Apply Loctite 222E to thread of screw (48) and secure spring end cap (47) to actuator shaft (42), ensuring that dowel pin (41) lies parallel to trunnions of spring actuator (43).

16 Install the balance mechanism as follows (Fig 6.2):

16.1 Lubricate two shim washers (40) with white bearing grease and fit one onto each trunnion of spring actuator assembly (43).

16.2 Lubricate needle roller bearing in boss of RH side plate (15) with white bearing grease. Apply white bearing grease sparingly to outside diameter of boss of RH side plate.

16.3 Locate the boss of RH side plate (15) in bearing (17) in mechanism housing (16) but do not push the boss fully home. Lay circlip (18) on the end face of the boss.

16.4 Tilt the RH side plate counter-clockwise when looking on the open side of the mechanism housing and fit the trunnion of the balance mechanism into needle roller bearing in the boss of the RH

side plate. Ensure that the slot in the adjustment slide is towards the RH side plate and that circlip (18) is positioned on the end face of the boss of the RH side plate.

16.5 Using hand pressure, push the RH side plate fully home in its bearing in mechanism housing (16). Using circlip pliers, install circlip (18) on the boss of the RH side plate.

16.6 Lubricate adjustment slide sleeve (21) with Easyrun 50 grease and locate it over adjustment slide (38) in the head. Rotate the adjustment slide sleeve to align holes for screws and Spirol pin with holes in mechanism housing, noting that there is only one position in which all the holes are aligned. Secure the adjustment slide sleeve in position with three screws (27) but do not tighten the screws at this stage.

16.7 Install the Spirol pin (22) in the adjustment slide sleeve. Drive in the pin until the end is below the face of the adjustment slide sleeve.

16.8 Fully tighten three screws (27).

Tilt unit assembly

WARNING!: The labyrinth assembly (3364-20) and the constant drag assembly (3364-21) require special equipment for assembly and should not be dismantled. If faulty, each assembly must be replaced with a new unit.
If the labyrinth assembly (7) constant drag assembly (8) or spacer (28) are replaced, it will be necessary to adjust the thickness of the tilt shim pack. This requires the use of shim setting tool, Part No, T61463.

17 Assemble the tilt unit as follows (Fig 6.4):

17.1 Degrease eight threaded holes in the boss of constant drag assembly (8) and two screws (13).

17.2 Assemble thrust washer (3) onto drag actuator shaft (2).

17.3 Lubricate needle roller bearing (4) with white bearing grease and assemble a thrust washer, the needle roller bearing and a second thrust washer on the tilt drag actuator shaft (2).

17.4 Assemble friction plate assembly (5) onto drag actuator shaft (2).

17.5 Position the tilt drag actuator shaft, complete with thrust bearing components and friction plate assembly, in recess in tilt drag housing (1).

17.6 Turn the friction plate assembly to align holes for screws and Spirol pins, noting that there is only one position in which all the holes are aligned.

NOTE: While tightening screws (30) to secure the friction plate assembly (5), rotate shaft (2) to ensure thrust bearings and washers are not trapped.

17.7 Apply Loctite 222E to threads of six screws (30) and secure friction plate assembly (5) to tilt drag housing (1). Do not tighten screws at this stage.

17.8 Install two Spirol pins (6) through friction plate (5) into tilt drag housing (1). Drive them in until the ends are below the surface of the friction plate. Tighten six screws (30).

17.9 Using a degreasing fluid which does not contain an oil-based corrosion inhibitor, thoroughly clean the face of the friction plate assembly (5).

17.10 Lubricate bearing (27) with white bearing grease and install it in constant drag assembly (8).

17.11 Position tilt brake disc (11) and tilt braked clamp ring (12) on boss of constant drag assembly (8) and rotate both components to align holes for screws and Spirol pins, noting that there is only one position in which all the holes are aligned.

17.12 Secure tilt brake clamp ring (12) and tilt brake disc (11) to constant drag assembly (8) with six screws (24). Do not tighten screws at this stage,

17.13 Install two Spirol pins (10) through tilt brake clamp ring (12) and tilt brake disc (11) into constant drag assembly (8), ensuring the ends of the pins are driven flush to surface of clamp ring. Tighten six screws (24).

17.14 Ensure that both faces of tilt brake disc (11) are free from grease.

17.15 Install tilt drag shaft (26) in bearing (27), ensuring it is fully seated.

17.16 Position the spacer (28) in the constant drag assembly (8), with the counterbore towards the constant drag assembly.

17.17 If constant drag assembly (8), labyrinth (7) or spacer (28) has been replaced it will be necessary to check that the thickness of shim pack (29) is correct. Otherwise, examine the shims for damage and replace as necessary. Do not use any shims that are not completely flat. Use a micrometer to measure the thickness of an undamaged area of the old shim and select a replacement of the same thickness.

17.18 To adjust the thickness of the tilt shim pack:

17.18.1 Fit the 3 mm setting piece to the shim setting tool (T61463) and fully tighten the screw, Zero the dial indicator. Remove the setting piece.

17.18.2 Ensure that spacer (28) is positioned in the constant drag assembly (8), with the counterbore towards the constant drag assembly, then install the constant drag assembly in the shim setting tool.

17.18.3 Fully tighten the screw and read off the figure on the dial indicator. Convert from millimetres to inches by dividing by 25.3, This is figure (A). Write the figure on the spacer and tilt drag shaft for future reference.

17.18.4 Remove the assembly from the setting tool.

17.18.5 Figure (B), in thousandths of an inch, will be found written on the labyrinth. This may be positive or negative figure, or zero.

17.18.6 Add figure (A) to figure (B). This gives the required thickness of the shim pack.

EXAMPLE: A = 0.020 in., B = -2(-0.002 in.). A-B = shim pack thickness = 0.018 in.

17.18.7 Using shims Part No. 3364-253 (0.05mm (0.002in.)), Part No. 3364-254 (0.08mm (0.003in.)) and Part No. 3364-255 (0.25mm (0.010in.)), assemble a pack of shims of the required thickness.

17.19 Fit a suitable temporary pin (4 mm dia x 30 mm long) in the tilt shaft to aid alignment of spacer, shims and labyrinth.

17.20 Install the shim pack on tilt drag shaft (26) and align the holes in the shims with the holes in the spacer and the constant drag assembly.

17.21 Using a degreasing fluid which does not contain an oil-based corrosion inhibitor, thoroughly clean the face of the constant drag assembly (8), the faces of the friction rings and six threaded holes in the labyrinth assembly (7).

17.22 Install the labyrinth assembly (7) on the tilt drag shaft (26). Turn the labyrinth assembly to align the holes in the centre part with the holes in shim pack and push it into position.

17.23 Remove the temporary pin.

17.24 Pass two screws (13) through the tilt drag shaft (26) to secure the labyrinth assembly (7). Do not tighten screws at this stage.

17.25 Install two Spirol pins (25) in the exposed face of labyrinth assembly (7) and drive them in until the ends are about 2.5 mm (3/32 in.) below the face.

17.26 Install complete assembly onto tilt drag actuator shaft (2) and lower it into position on tilt drag housing (1). Rotate the top plate relative to the tilt drag housing to align holes for screws and Spirol pin, noting that there is only one position in which all the holes are aligned.

NOTE: While tightening screws (9) to secure the assembly, rotate shaft (2) to ensure thrust bearings and washers are not trapped.

17.27 Secure constant drag assembly to tilt drag housing with six screws (9). Do not tighten screws at this stage. Install one Spirol pin (6) in tilt drag unit top plate and drive in until the end is 8 mm (5/16 in.) below the face of tilt drag unit top plate. Fully tighten six screws (13).

17.28 Support tilt drag actuator shaft (2) under cross hole near threaded end and install a Spirol pin (31) in the hole. Drive the pin into the actuator shaft until one end is flush to the surface of shaft.

17.29 Degrease four screws (15).

17.30 Turn the tilt drag shaft (26) against the resistance of the drag mechanism until the pattern of holes in the end of the shaft is symmetrical relative to the top face of the tilt drag housing (1), with the two 4.0 mm diameter holes for the Spirol pins vertical and the more widely spaced pair of 4.5mm diameter holes nearer to the top face of the tilt housing. Turn the tilt drag shaft 58 degrees counter-clockwise from this position. This orientation is achieved when the heads of the two M3 cap screws in the tilt drag shaft align with an imaginary line extended from the centre of the tilt drag shaft to the centre of the pan bar mounting on the tilt drag housing.

17.31 Turn tilt drag actuator shaft (2) so that Spirol pin (31) points about 90 degrees clockwise from vertically upwards relative to the top face of tilt drag housing (1). This orientation is achieved when the projecting part of the Spirol pin aligns with the 4.5mm dia hole in the tilt drag shaft.

17.32 Apply Rocol M240G grease to inside face pf boss of outrigger (14)

17.33 Locate outrigger (14) on the tilt drag actuator shaft, oriented about 112 degrees clockwise from its normal position relative to tilt drag housing (1). This orientation is achieved when an imaginary line extended from the centre boss of the outrigger through the tilt brake boss aligns with the centre of the pan bar mounting on the tilt drag housing.

17.34 Slide the outrigger onto the shaft until Spirol pin (31) enters the slot in the boss of the outrigger and the outrigger is felt to seat on the spigot of the tilt drag shaft (26). If resistance is felt, do not apply

force as either the internal detail of the outrigger is not correctly aligned with the cut away section of the tilt brake disc or Spirol pin (31) is not aligned with its slot. Turn the outrigger gently in each direction until it is felt to clear the brake disc, then turn the end of the tilt drag actuator shaft to align Spirol pin (31) with the slot in the outrigger.

17.35 When the inner boss of the outrigger is properly seated on the tilt drag shaft the gap between the outer edge of the outrigger casting and the outer face of the tilt drag housing is about 1.5 mm (1/16 in.).

17.36 Turn the outrigger on the tilt drag shaft as necessary to align the holes for the screws and Spirol pins. Apply Loctite 222E to the threads of four screws (17) and secure the outrigger to the tilt drag shaft. Do not tighten the screws at this stage.

17.37 Install two Spirol pins (25) in the boss of outrigger (14) and drive them in to about 3 mm (1/8 in.) below the face of the boss.

17.38 Tighten four screws (17) to a torque of 4.5 Nm (40 lbfin.).

17.39 Referring to Fig 6.6, install the tilt drag knob components as follows:

17.39.1 If removed, install Spirol pin (10) in the face of tilt drag knob boss on the outrigger and drive it in to leave about 11 mm projecting from the face.

17.39.2 Assemble drag detent ring (7) onto grommet (8), with textured side outwards.

17.39.3 Install grommet (8), complete with detent ring (7), on the drag knob boss of the mechanism housing, engaging the location notch on Spirol pin (10), and push it fully home against the face of the boss. Lubricate detent arms on outside of detent ring (7) with white bearing grease.

17.39.4 Holding the tilt drag knob shaft in position in the mechanism housing, assemble one shim washer (5), eight disc springs (6) and a second shim washer (5) onto the tilt drag knob actuator shaft (9). Ensure that the first four disc springs are assembled with the concave face towards the mechanism housing and the last four are assembled with the concave face outwards, as shown in Fig 6.6.

17.39.5 Screw the drag knob boss (4) onto the tilt drag knob actuator shaft (9) to take up the clearances, but do not tighten any further.

17.39.6 Degrease screw (2) and threaded bore of drag knob boss (4).

17.39.7 Lubricate internal serrations of tilt drag knob (3) with white bearing grease and install on drag knob boss (4) with zero aligned with index mark on mechanism housing and secure with screw (2). Do not apply Loctite or fully tighten screw (2) at this stage.

17.40 Turn tilt drag knob fully clockwise (maximum drag) and allow unit to stand for 24 hours prior to adjusting the tilt drag knob (See “Resetting the drag knobs” on page 22) after assembly of the head.

17.41 Degrease threaded hole in splined end of tilt brake shaft (22) and one screw (18).

17.42 Apply white bearing grease to the external thread of tilt brake shaft (22).

17.43 Install a spring element (20) and friction element (21) in the tilt brake shaft (22). Install tilt brake insert (23) into hole in externally threaded end of shaft and screw shaft into upper boss near front of outrigger (14).

17.44 Screw the brake shaft in as far as it will go and install brake knob (17) on the shaft. The arm of the brake knob should be fitted to the splines so that it is vertical when the brake is fully applied.

17.45 Apply Loctite 222E to the thread of screw (18) and secure the brake knob to the tilt brake shaft.

17.46 Fit brake knob cap (19), securing it with Silcoset 153 adhesive.

17.47 Lubricate the needle bearing in boss of tilt drag housing with white bearing grease.

18 Install the tilt unit assembly as follows (Fig 6.2):

18.1 If bearing (17) has been removed from mechanism housing cover (30), remove all traces of old adhesive from the bearing seating in the mechanism cover and the outer race of the bearing and degrease both surfaces.

18.2 Apply Loctite 641 to the bearing seating and install bearing (17) in the mechanism housing cover, taking care that Loctite does not contaminate the bearing and ensuring that the bearing is correctly seated. Allow the Loctite to cure.

18.3 Degrease four threaded holes in lower part of LH side of mechanism housing (16).

18.4 Install the mechanism housing cover (30) on the mechanism housing (16) and secure it with three screws (33).

18.5 Degrease the threads of two screws (29), one screw (31) and one screw (32).

18.6 Assemble the tilt unit to the mechanism housing, engaging the trunnion of the balance mechanism in the needle roller bearing in the tilt unit and taking care that the pan brake cup is not dislodged from its bore in the mechanism housing.

18.7 Apply Loctite 222E to the threads of two screws (29), one screw (31) and one screw (32) and secure the tilt unit to the mechanism housing. Ensure that both screws (29) (12mm lg) are installed at the rear of the head, screw (31) (25mm lg) is installed nearest to the base at the front of the head and that screw (32) (20mm lg) is installed close to the pan brake boss at the front of the head. Align the external surfaces of the outrigger and the mechanism housing before tightening the screws.

18.8 Referring to Fig 6.4, install the pan brake components as follows:

18.8.1 Degrease threaded hole in splined end of pan brake shaft (16) and one screw (18).

18.8.2 Install a spring element (20) and friction element (21) in the pan brake shaft (16).

18.8.3 Apply M204G grease to the conical point of pan brake shaft (16) and white bearing grease to the threaded part.

18.8.4 Using a flat-bladed screwdriver through the hole for the pan brake shaft, push the pan brake cup (Fig 6.4 item 33) down to contact the pan brake disc.

18.8.5 Screw the brake shaft in as far as it will go and install brake knob (17) on the shaft. The arm of the brake knob should be fitted to the splines so that it is vertical when the brake is fully applied.

18.8.6 Apply Loctite 222E to the thread of screw (18) and secure brake knob to pan brake shaft.

18.8.7 Fit brake knob cap (19), securing it with Silcoset 153 adhesive.

18.9 Lubricate needle rollers and cage of needle roller thrust bearing (23) with white bearing grease.

18.10 Wipe two thrust washers of thrust bearing (23) to remove grease.

18.11 Install one thrust washer, thrust bearing and a second thrust washer of thrust bearing (23) on the spigot of adjustment slide sleeve (21).

18.12 Assemble Spirol ring (25) onto the neck of balance knob assembly (24).

18.13 Lubricate thread of balance knob assembly (24) with M204G grease and screw it into adjustment slide (38) of the balance spring assembly until it is in contact with the thrust bearing. Do not tighten further at this stage.

18.14 Using circlip pliers, install Spirol ring (25) in the groove in mechanism housing (16) to retain the balance knob.

Platform

19 Install the platform as follows (Fig 6.2):

19.1 If removed, install dowel pin (7) in platform (8) to leave the end projecting 3.5 mm. Loctite 638 may be used to secure the dowel pin if required.

19.2 Degrease three threaded holes in the top face of tilt housing (28), two threaded holes in the edge of platform (8), one screw (36). and four screws (4).

19.3 Support the head securely in an upright position and set the top surfaces of the tilt drag housing and the RH side plate approximately level.

19.4 Locate gib strip (10) in the slot in the underside of the platform and hold it in position using the rounded end of tool T39827 inserted from the top face of the platform. Insert slide release (34) downwards through the hole in the platform to locate in the underside of the platform. Ensure that the slide release is free to move and is inserted with its slot towards the centre of the platform.

19.5 Holding the slide release in the fully out position, tilt the RH edge of the platform down and engage the lug on the side of the platform in the notch in the RH side plate. Lower the LH side of the platform into position on the top face of the tilt unit housing, ensuring that the lugs on the underside of the platform enter the corresponding slots in the top face of the tilt unit housing and the 2 mm dia Spirol pin in the top of the tilt unit housing enters the slot in the slide release. Remove tool T39827.

19.6 Position spring (35) on the cylindrical end of tool T39827. Holding the tool so that the cylindrical end points slightly downward, lift the LH side of the platform just enough to allow the spring to be introduced between the top face of the slide release and the underside of the platform. Use the tool to guide the free end of the spring into the slot in the slide release, compress the spring against the 2 mm dia Spirol pin until its outer end drops into the slot in the slide release, lower the platform to rest on the tool and withdraw the tool.

19.7 Apply Loctite 222E to screw (36) and four screws (4) and secure the platform to the RH side plate and the tilt unit housing.

19.8 Confirm that the slide release operates freely and that the spring returns it to the outward position.

19.9 Insert platform slide (1) into the rear end of the platform dovetails, check that it is retained at the front end by the dowel pin and at the back end by the slide release.

19.10 Apply white bearing grease to the threads of clamp screw (11) and screw it into the lug on the RH side of the platform to clamp the platform slide.

19.11 Degrease grub screw (13), apply Loctite 222E to the threads and install in knob (12). Fit knob (12) on the hexagonal part of clamp screw (11) and tighten grub screw (13) to secure it. Set the knob (12) on the hexagon so that the platform slide is clamped when the arm points vertically downwards and is free when the knob is turned counter-clockwise to the stop.

Balance mechanism guide pin

WARNING!: It is essential for the correct operation of the balance mechanism that the balance mechanism guide pin engages in the slot in the balance slide.

20 Install the balance unit guide pin as follows (Fig 6.2):

20.1 Push the end of a 2.5mm hexagon wrench into the hole in the flange of adjustment slide sleeve (21), accessible through the RH side of mechanism housing (16), so that it bears against the side of adjustment slide (38).

20.2 While holding the hexagon wrench against the balance slide, turn balance knob (24) clockwise through about two turns. The wrench should drop into the slot in the balance slide. If it does not drop into the slot, tilt the platform to and fro to align the balance mechanism.

20.3 Lubricate needle roller (20) with white bearing grease and install it in the hole in the flange of balance slide adjustment sleeve (21) in place of the hexagon wrench.

20.4 Degrease the threaded hole in mechanism housing (15) and grub screw (19).

20.5 Apply Loctite 222E to the threads of grubscrew (19) and install it in the RH side of mechanism housing (16) to retain needle roller (20). Tighten grub screw (19) until it reaches a stop then back off half a turn.

20.6 Check that the outer end of grub screw (19) is below the surface of mechanism housing (16) to confirm that the balance mechanism guide pin is correctly engaged in the slot in the balance slide. If it stands above the surface, remove it and repeat Para 20.2 to Para 20.5, but holding the hexagon wrench against the end of needle roller (20).

20.7 Ensure that balance adjustment knob can be turned in both directions without undue resistance. Allow Loctite to cure.

20.8 Degrease the seatings for platform graphic (40) and balance graphic (28) and install new graphics.

20.9 Retouch the end of grub screw (21) with Nimbus Grey paint.

Final adjustment

21 After completion of assembly, prepare the head for final setting of the drag knobs as follows:

21.1 Set both drag control knobs to 9 and leave the head to stand for a minimum of 12 hours.

21.2 Check and, if necessary, re-adjust the drag control knobs (See “Resetting the drag knobs” on page 22).

Section 6

Illustrated Parts List

Contents Para

Illustrations Page

Introduction

1 This parts list is issued for the VISION SD12 pan and tilt head manufactured by VINTEN BROADCAST LIMITED, Western Way, Bury St Edmunds, Suffolk, IP33 3TB, England and is applicable to heads up to and including Serial No. 526.

Ordering spare parts

2 Always quote the head serial number when ordering a spare part.

3 When ordering a spare part, please quote the part number, NOT the item number. Certain part numbers have a -900SP series suffix, which denotes a composite spare part. These items are detailed in Fig 6.8 and indicated in the parts lists by an asterisk (*) against the part number.

4 Due to restrictions placed on the transport of adhesives and other materials, please obtain supplies of consumable materials, listed in Section 3, from your local distributor.

Main assembly part numbers

5 Please ensure that the correct part number is quoted when ordering main assemblies.

Assembly	Part No.
Vision SD12 Pan and Tilt Head, complete with telescopic pan bar and bowl clamp knob	3364-3
Vision SD12 Pan and Tilt Head - main assembly	3364-41
Telescopic Pan Bar Assembly and Clamp	3219-52
Bowl Clamp Knob Assembly	3390-18
Camera Mounting Plate for Vision SD12 Pan and Tilt Head	3364-900SP
ENG Quickfit Automatic Adaptor (c/w one Wedge Plate)	3371-3
Wedge Plate for Quickfit Automatic Adaptor	3763-11
Level bubble illumination unit battery	C550-021

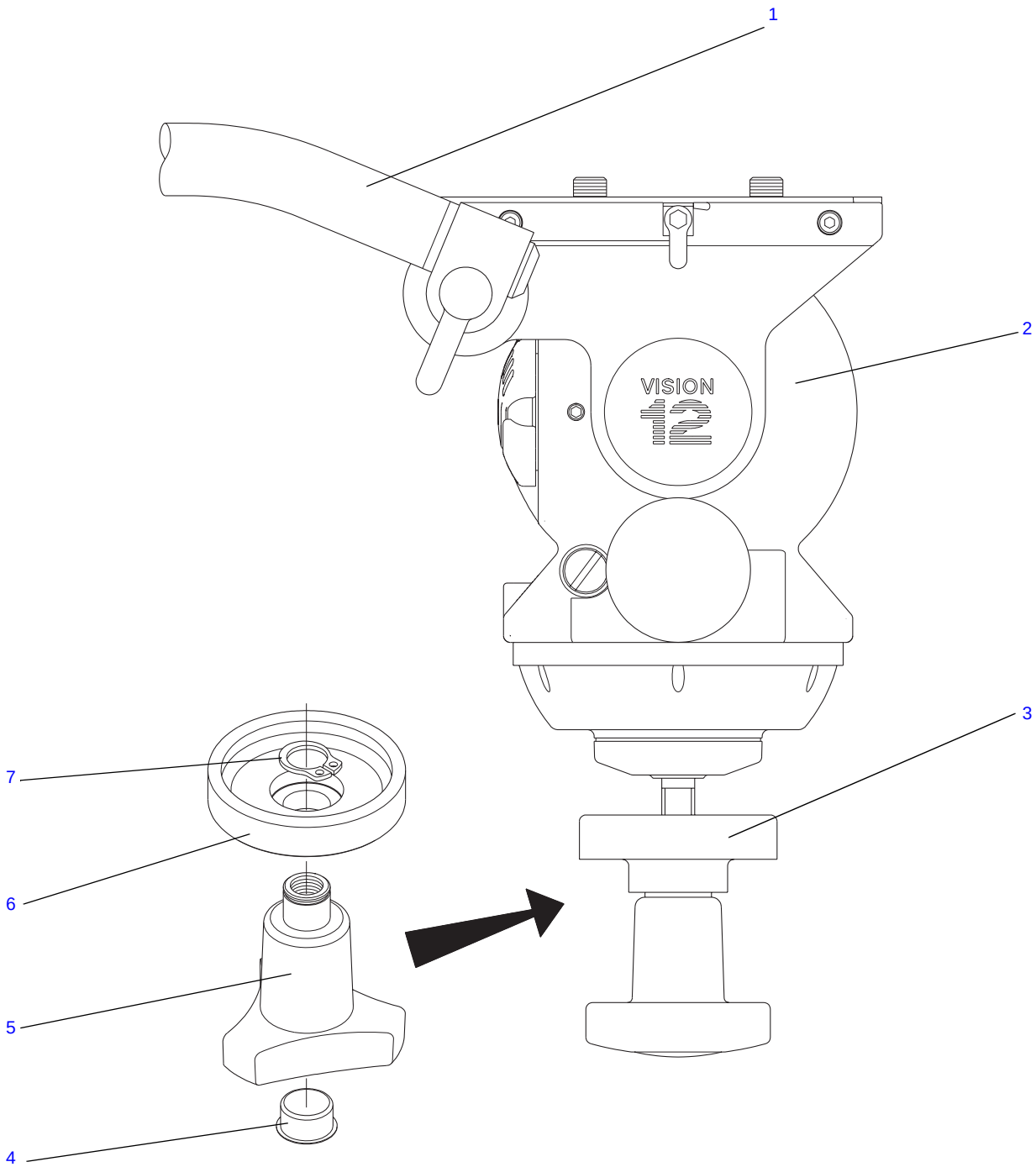


Fig 6.1 Vision SD12 Pan and Tilt Head

Fig 6.1 Vision SD12 Pan and Tilt Head

Item	Part No.	Nomenclature	Qty
1	3219-52	Telescopic pan bar unit (Vision 12SD) (Fig 6.7)	1
2	3364-41	Final assembly (Fig 6.2)	1
NI	C550-021	Battery, 12 Volts	1
3	3390-18	Bowl clamp knob assembly, comprising:	1
4	J550-068	Hole-plug, dome head, 15.9 mm hole dia. x 18.2 mm head dia.	1
5	3390-228	Bowl clamp knob	1
6	3390-229	Clamp cup	1
7	M701-031	Circlip, external, standard, 14 mm shaft dia. x 1.00 mm thick	1

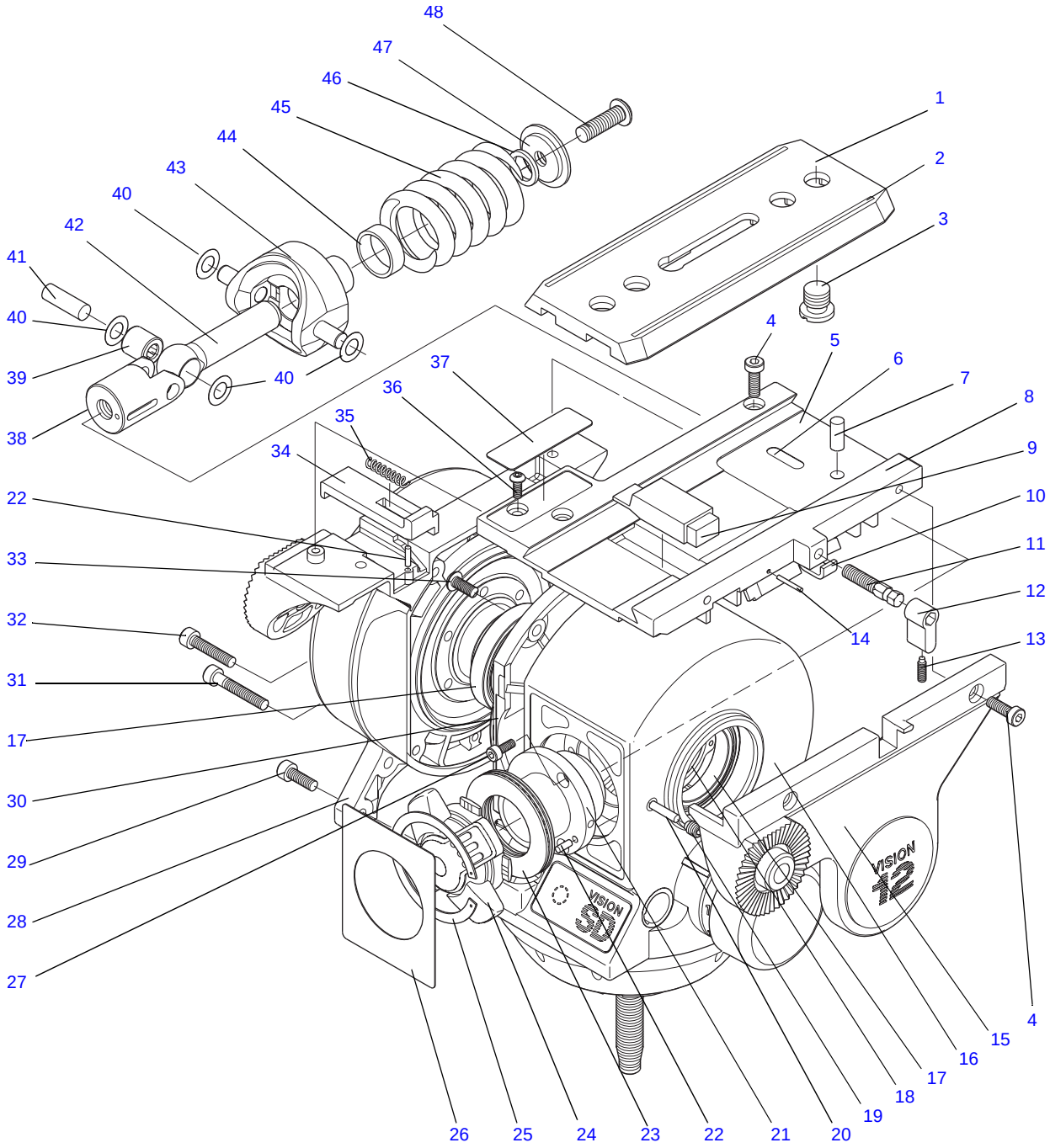


Fig 6.2 Vision SD12 Pan and Tilt Head - Final Assembly

Fig 6.2 Vision SD12 Pan and Tilt Head - Final Assembly

Item	Part No.	Nomenclature	Qty
	3364-900SP*	Platform slide assembly, comprising:	
1	3364-210	Platform slide	1
2	Q300-128	Rubber strip, 1.78 mm dia	2
3	3170-202	Screw (large)	2
4	M005-735*	Screw, low-profile, cap head, socket, M4 x 12 mm long	3
5	3364-235	Platform graphic	1
6	3364-236	Serial no. label	1
7	M801-048	Pin, dowel, 5 mm dia. x 12 mm long	1
8	3364-213	Platform	1
9	3321-284	Platform insert	1
10	3321-255	Platform slide clamp strip	1
11	3321-278	Slide clamp screw	1
12	3325-343	Slide clamp screw knob	1
13	M004-804*	Screw, grub, dog point, socket head, M3 x 10 mm long	2
14	M806-033	Pin, coiled-spring, 1.5 mm dia. x 12 mm long, mdp	1
15	3364-903SP*	Right hand slide plate assembly	
16	3364-42	Pan unit assembly (Fig 6.3)	1
17	P200-105	Bearing, ball, radial, 30 mm ID x 42 mm OD x 7 mm long, two shields	2
18	M701-036	Circlip, external, standard, 30 mm shaft dia. x 1.50 mm thick	1
19	M006-801*	Screw, grub, dog point, socket head, M5 x 6 mm long	1
20	P600-009	Roller, needle, 3 mm x 13.8 mm long	1
21	3364-233	Adjustment slide sleeve	1
22	M806-042	Pin, coiled-spring, 2.5 mm dia. x 8 mm long, mdp	1
23		Thrust bearing, comprising:	
	P602-021	Washer, thrust, bearing, 25 mm ID x 42 mm OD x 1 mm thick	2
	P602-020	Bearing, needle roller, thrust, 25 mm ID x 42 mm OD x 2 mm long, with cage assembly	1
24	3364-19	Balance knob assembly	1
25	L700-001	Spiral retaining ring, internal, single-turn (light-duty) x - in. bore dia. x - in. thick	1
26	3364-257	Balance graphic	1
27	M004-703*	Screw, cap head, socket, M3 x 8 mm long	3

Fig 6.2 Vision SD12 Pan and Tilt Head - Final Assembly (Cont)

Item	Part No.	Nomenclature	Qty
28	3364-43	Tilt unit assembly (Fig 6.4)	1
29	M005-718*	Screw, cap head, socket, M4 x 12 mm long	2
30	3321-233	Mechanism housing side cover	1
31	M005-721*	Screw, cap head, socket, M4 x 25 mm long	2
32	M005-714*	Screw, cap head, socket, M4 x 20 mm long	1
33	M005-504*	Screw, button head, socket, M4 x 10 mm long	3
34	3364-285	Slide release	1
35	J532-109	Spring, compression, 3/4 in. free length, 5/32 in. hole dia., 4.5 lbf/in. rate	1
36	M004-503*	Screw, button head, socket, M3 x 8 mm long	1
37	3364-284	Top graphic	1
	3364-48	Spring assembly (ERAM), comprising:	
38	3364-232	Adjustment slide	1
39	N500-023	Bearing, needle roller, radial, full complement, 1/4 in. ID x 7/16 in. OD x 7/16 in. long	1
40	3321-222	Shim washer	A/R
41	L801-098	Pin, dowel, oversize, 1/4 in. dia. x 3/4 in. long	1
42	3390-231	Actuator shaft	1
43	3364-908SP*	Spring actuator assembly	1
44	3364-287	Sleeve for use with Hanson spring	1
45	3364-331	ERAM compression spring	1
46	3321-223	Buffer	1
47	3364-282	Spring end cap (Hanson spring)	1
48	M007-523*	Screw, button head, socket, M6 x 20 mm long	

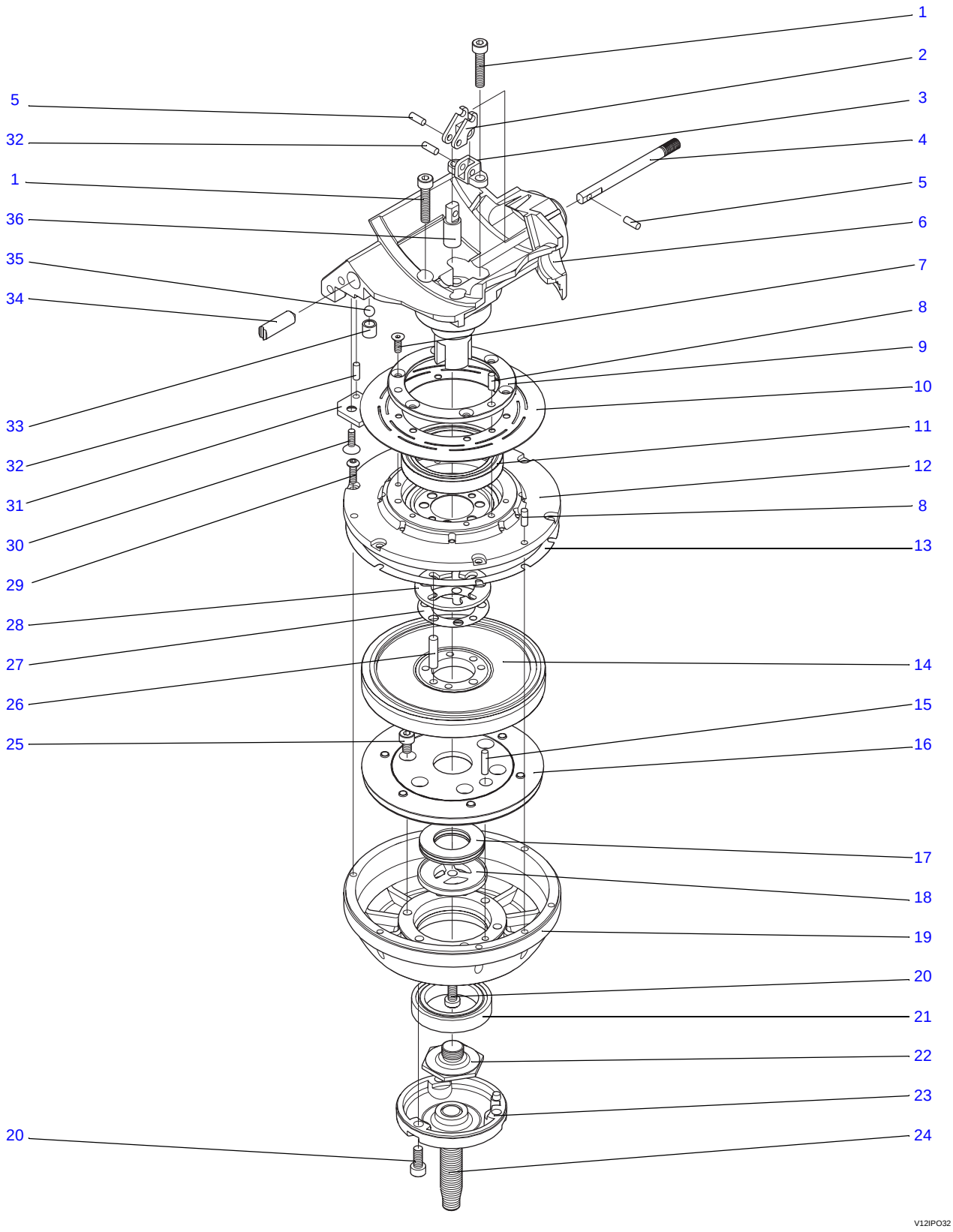


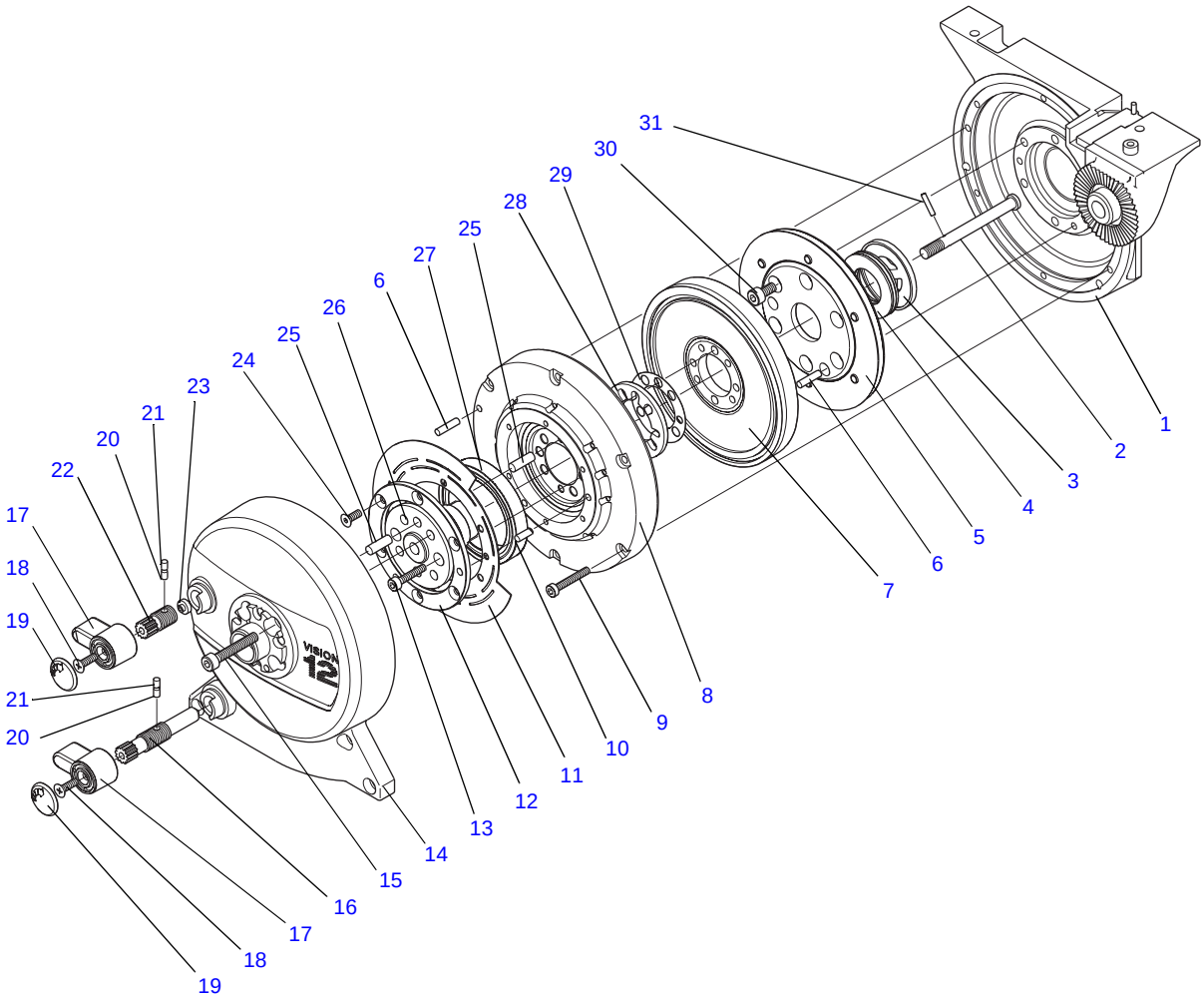
Fig 6.3 Vision SD12 Pan and Tilt Head - Pan Unit Assembly

Fig 6.3 Vision SD12 Pan and Tilt Head - Pan Unit Assembly

Item	Part No.	Nomenclature	Qty
1	M005-707*	Screw, cap head, socket, M4 x 20 mm long	4
2	3364-209*	Bell crank	1
3	3364-216	Trunnion bell crank	1
4	3364-304	Pan drag knob shaft (Fig 6.6)	1
5	M801-001*	Pin, dowel, 3 mm dia. x 10 mm long	2
6	3364-34	Mechanism housing assembly	1
7	M004-906*	Screw, countersunk head, socket, M3 x 6 mm long	6
8	M806-015*	Pin, coiled-spring, 3 mm dia. x 8 mm long, hdp	3
9	3364-221	Brake clamp - pan	1
10	3364-230	Brake disc - pan	1
11	P200-106*	Bearing, ball, radial, 35 mm ID x 47 mm OD x 7 mm long, two shields	1
12	3364-45*	Constant drag unit assembly - pan	1
13	3364-326	Gasket	1
14	3364-44	Labyrinth unit assembly	1
15	M806-001*	Pin, coiled-spring, 3 mm dia. x 12 mm long, hcp	1
16	3364-27	Friction plate assembly	1
17		Thrust bearing, comprising:	
	P602-027	Washer, thrust, bearing, 17 mm ID x 30 mm OD x 1 mm thick	2
	P602-026	Bearing, needle roller, thrust, 17 mm ID x 30 mm OD x 2 mm long, with cage assembly	1
18	3364-306	Thrust washer	1
19	3364-308	Spherical base	1
20	M005-734*	Screw, low-profile, cap head, socket, M4 x 10 mm long	4
21	P202-008	Bearing, ball, radial, 17 mm ID x 35 mm OD x 8 mm long, two shields	1
22	3364-290	Pan shaft screw	1
23	3364-307	Spherical base stud carrier	1
24	3364-319	Stud - spherical base	1
25	M005-736*	Screw, low-profile, cap head, socket, M4 x 6 mm long	6
26	M806-006*	Pin, coiled-spring, 4 mm dia. x 16 mm long, mcp	2

Fig 6.3 Vision SD12 Pan and Tilt Head - Pan Unit Assembly (Cont)

Item	Part No.	Nomenclature	Qty
27		Shim pack, comprising:	
	3364-253*	Shim (0.002")	A/R
	3364-254*	Shim (0.003")	A/R
	3364-255*	Shim (0.010")	A/R
28	3364-300*	Spacer	1
29	M004-514*	Screw, button head, socket, M3 x 10 mm long	6
30	M005-901*	Screw, countersunk head, socket, M4 x 8 mm long	1
31	3364-228	Pan brake plate	1
32	M801-039	Pin, dowel, 3 mm dia. x 8 mm long	2
33	3364-245	Pan brake cup	1
34	3364-324*	Pan brake shaft (Fig 6.6)	1
35	N600-001	Ball, steel, 3/16 in. dia.	1
36	3364-305	Pan drag actuator adapter	1



V12IPO42

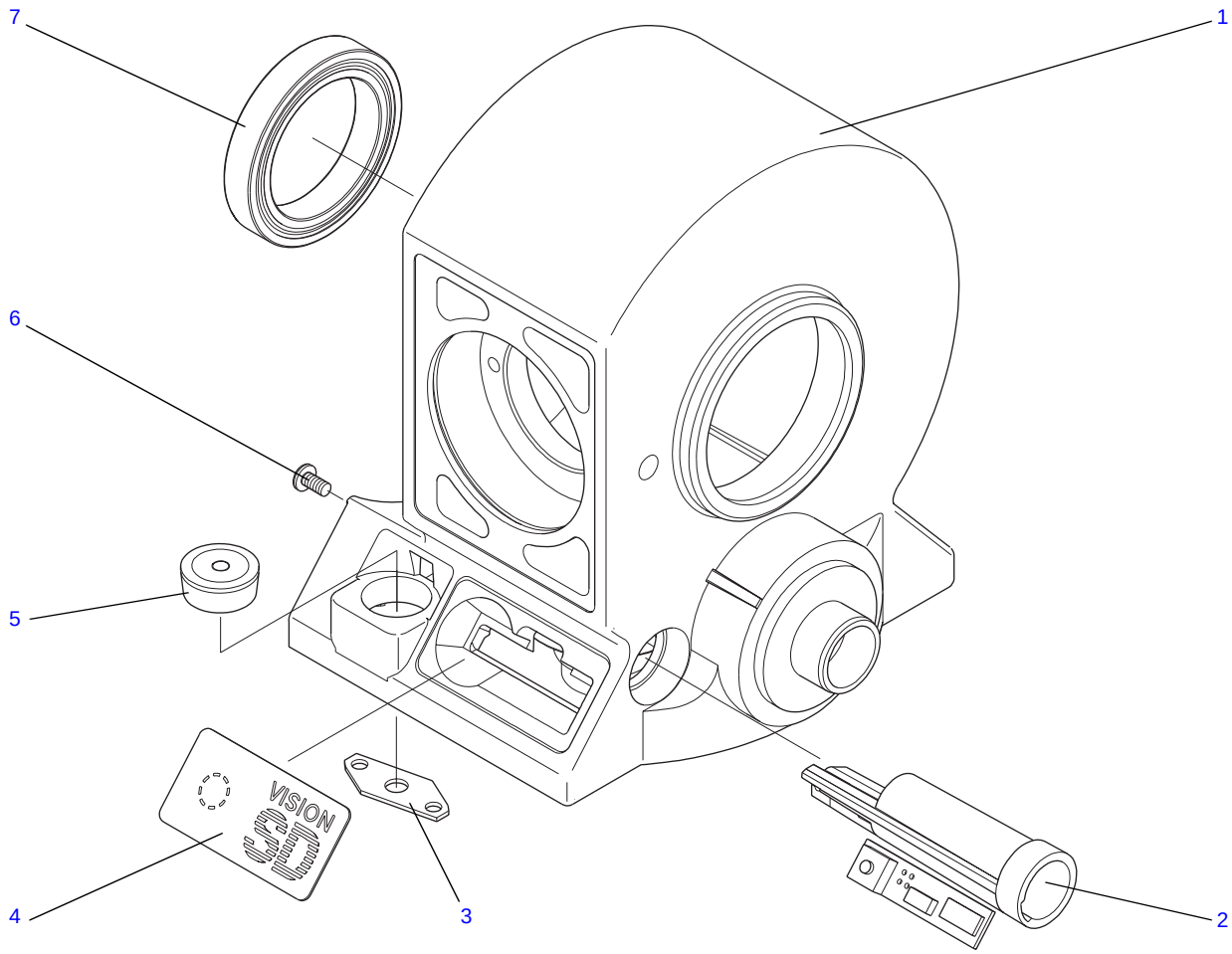
Fig 6.4 Vision SD12 Pan and Tilt Head - Tilt Assembly

Fig 6.4 Vision SD12 Pan and Tilt Head - Tilt Assembly

Item	Part No.	Nomenclature	Qty
1	3364-922SP*	Tilt drag housing assembly	1
2	3364-313	Tilt drag actuator shaft	1
3	3364-306	Thrust washer	1
4		Thrust bearing, comprising:	
	P602-027	Washer, thrust, bearing, 17 mm ID x 30 mm OD x 1 mm thick	2
	P602-026	Bearing, needle roller, thrust, 17 mm ID x 30 mm OD x 2 mm long, with cage assembly	1
5	3364-27	Friction plate assembly	1
6	M806-001*	Pin, coiled-spring, 3 mm dia. x 12 mm long, hcp	3
7	3364-44	Labyrinth unit assembly	1
8	3364-46*	Constant drag unit assembly - tilt	1
9	M004-711*	Screw, cap head, socket, M3 x 20 mm long	6
10	M806-015*	Pin, coiled-spring, 3 mm dia. x 8 mm long, hdp	2
11	3364-251	Brake disc - tilt	1
12	3364-220	Brake clamp - tilt	1
13	M004-716	Screw, cap head, socket, M3 x 18 mm long	2
14	3364-917SP*	Outrigger assembly (spares)	1
15	M005-708*	Screw, cap head, socket, M4 x 25 mm long	4
16	3364-324*	Pan brake shaft	1
17	3364-206*	Brake knob	2
18	M004-103*	Screw, countersunk head, pozidrive, M3 x 8 mm long	2
19	3364-343*	Brake knob cap	2
20	3364-352*	Spring element	2
21	3364-351*	Friction insert	2
22	3364-244*	Tilt brake shaft	1
23	3364-256*	Tilt brake insert	1
24	M004-906*	Screw, countersunk head, socket, M3 x 6 mm long	6
25	M806-005*	Pin, coiled-spring, 4 mm dia. x 12 mm long, hdp	4
26	3364-312	Tilt drag shaft	1
27	P200-106*	Bearing, ball, radial, 35 mm ID x 47 mm OD x 7 mm long, two shields	1
28	3364-300*	Spacer	1

Fig 6.4 Vision SD12 Pan and Tilt Head - Tilt Assembly (Cont)

Item	Part No.	Nomenclature	Qty
29		Shim pack, comprising:	
	3364-253*	Shim (0.002")	A/R
	3364-254*	Shim (0.003")	A/R
	3364-255*	Shim (0.010")	A/R
30	M005-716	Screw, cap head, socket, M4 x 8 mm long	6
31	M800-051	Pin, coiled-spring, 2 mm dia. x 10 mm long, mcp	1

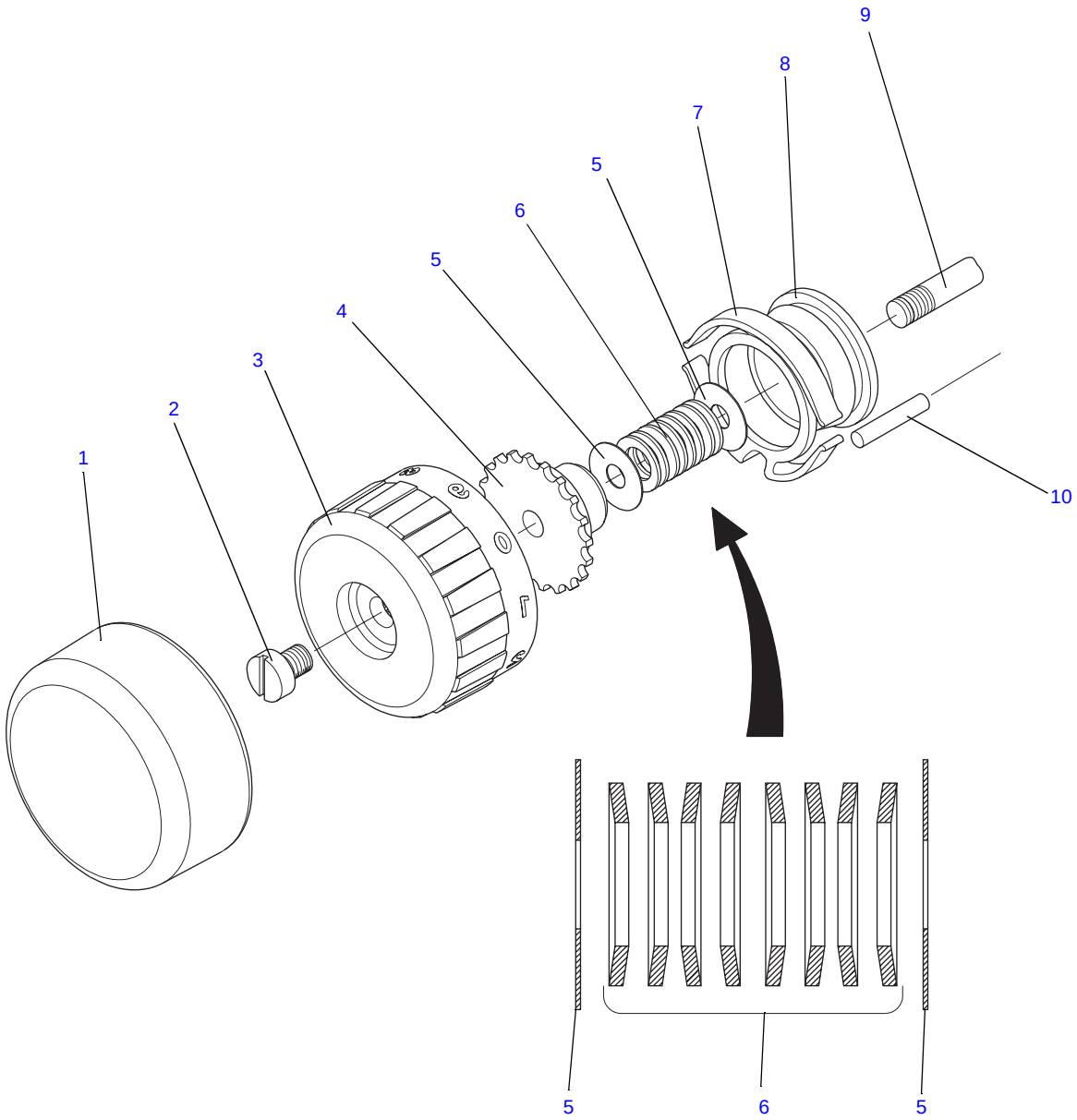


V12IPO5

Fig 6.5 Vision SD12 Pan and Tilt Head - Mechanism Housing Assembly

Fig 6.5 Vision SD12 Pan and Tilt Head - Mechanism Housing Assembly

Item	Part No.	Nomenclature	Qty
1	3364-318	Mechanism housing	1
2	3364-22	Bubble illumination unit assembly	1
3	3321-214	Level bubble seating	1
4	3364-258	Vision SD graphic (bought-out)	1
5	3322-263	Level bubble	1
6	M101-001*	Screw, self-tapping, pan head, pozidrive, M2.5 x 8 mm long	1
7	P200-105	Bearing, ball, radial, 30 mm ID x 42 mm OD x 7 mm long, two shields	1



V12IPO5

Fig 6.6 Vision SD12 Pan and Tilt Head - Pan and Tilt Drag Knobs

Fig 6.6 Vision SD12 Pan and Tilt Head - Pan and Tilt Drag Knobs

Item	Part No.	Nomenclature	Qty
1	3364-229*	Drag knob sleeve	1
2	3364-310	Drag knob screw	1
3	3364-259*, or	Tilt drag knob - number printing	1
	3364-260*	Pan drag knob - number printing	1
4	3364-309	Drag knob boss	1
5	3364-280	Shim washer	2
6	L601-265	Spring, disc, 0.205 in. ID x 0.472 in. OD x 0.024 in. thick	8
7	3364-226	Drag detent ring	1
8	Q300-123	Strip, edging	1
9	3364-304, or	Pan drag knob shaft	1
	3364-312	Tilt drag shaft	1
10	M806-002	Pin, coiled-spring, 3 mm dia. x 16 mm long, hcp	1

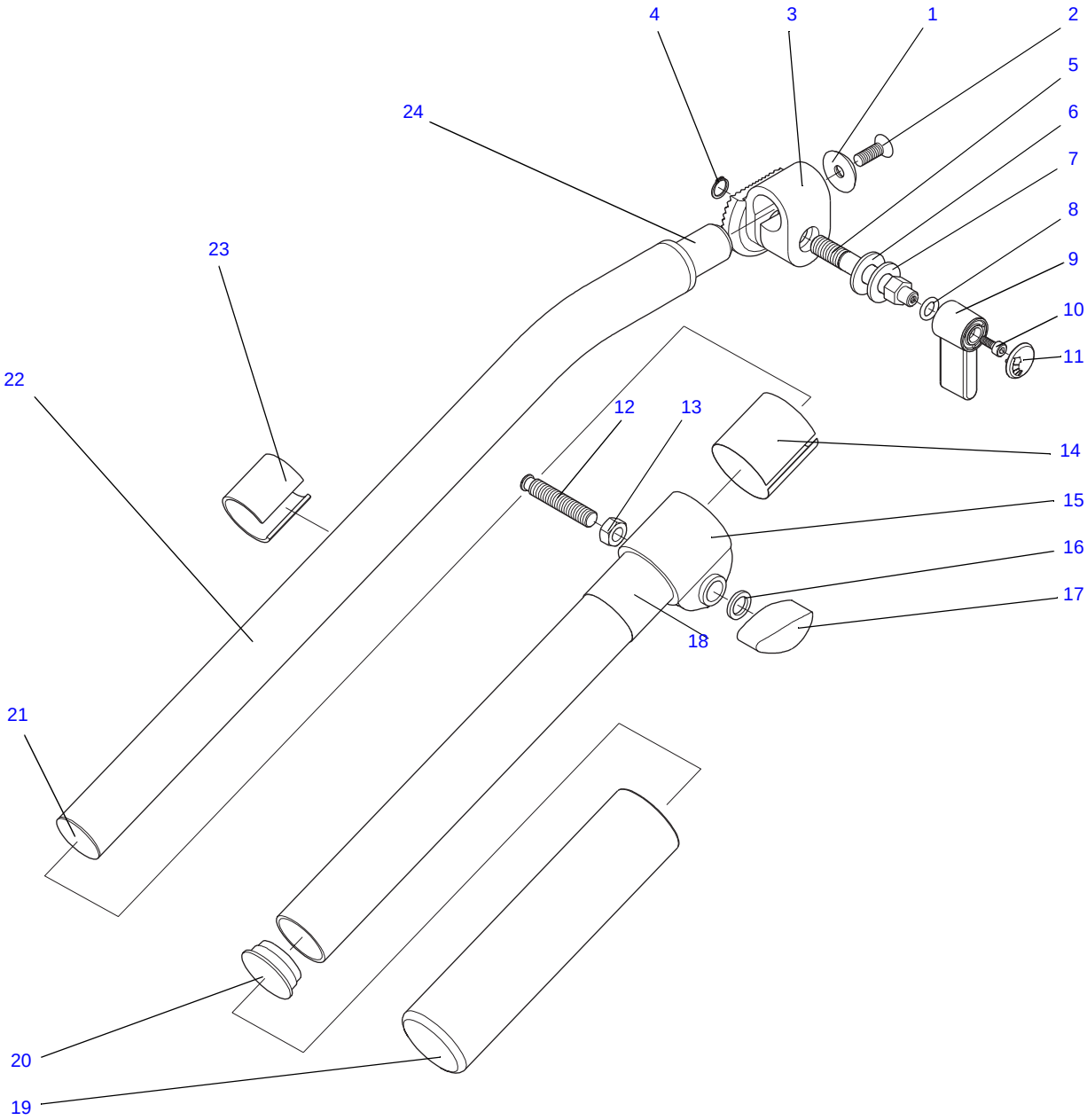


Fig 6.7 Vision SD12 Pan and Tilt Head - Pan Bar

Fig 6.7 Vision SD12 Pan and Tilt Head - Pan Bar

Item	Part No.	Nomenclature	Qty
	3219-52	Telescopic pan bar unit (Vision 12SD), comprising	
1	M606-001	Washer, nylon spacer, 5.3 mm ID x 18 mm OD x 3.8 mm thick	1
2	M006-113	Screw, countersunk head, pozidrive, M5 x 12 mm long	1
	3219-51	Pan bar clamp assembly (Vision 12SD), consisting of:	1
3	3219-298	Pan bar clamp (Vision TF)	1
4	L701-004	Circlip, external, standard, 0.312 in. shaft dia. x 0.025 in. thick	1
5	3219-303	Clamp shaft [similar to 3219-226]	1
6	G249-007	Sleeve, insulation, head diameter 18 mm, body diameter 10.9 mm	1
7	M600-009	Washer, plain, heavy, M8	1
8	Q001-010	'O'-Ring, 1/4 in. nominal ID x 0.070 in. section, hardness 70 IRHD	1
9	3219-270	Pan bar clamp knob (Vision 12SD)	1
10	M004-703*	Screw, cap head, socket, M3 x 8 mm long	1
11	3364-343	Brake knob cap	1
	3219-36	Telescopic pan bar assembly, consisting of:	1
	3219-38	Telescopic pan bar sliding, consisting of:	
12	3219-299	Pan bar clamp (M6)	1
13	M500-082	Nut, M6, standard (hex), full	1
14	3219-267	Clamp lining (telescopic pan bar)	1
15	3219-49	Outer tube / clamp assembly	1
16	M600-007	Washer, plain, heavy, M6	1
17	K403-004	Knob, locking-key, female, M6 thread, 32 mm wide	1
18	3219-312	Pan bar sleeve	1
19	3219-253	Hand grip (telescopic pan bar)	1
20	J550-093	Plug, tube-end, to fit 1 in. tube OD	1
	3219-37	Telescopic pan bar fixed, consisting of:	1
21	J550-074	Plug, tube-end, to fit 7/8 in. tube OD	1
22	3219-255	Fixed tube (telescopic pan bar)	1
23	3219-227	Pan bar sleeve	1
24	3219-229	Pan bar spigot (Vision 10)	1

Fig 6.8 Vision SD12 Pan and Tilt Head - Composite Spare Parts

Part No.	Nomenclature	Qty
3364-900SP	Platform slide assembly, comprising:	
3364-210	Platform slide	1
3170-202	Screw (large)	2
Q300-128	Rubber strip, 1.78 mm dia	2
3364-903SP	Right hand slide plate assembly, comprising:	
3364-204	Right hand side plate	1
L850-032	Threaded-insert, wire thread insert (helicoil), 5/16 in. BSF x 1-1/2 Diameters long	1
N500-023	Bearing, needle roller, radial, full complement, 1/4 in. ID x 7/16 in. OD x 7/16 in. long	1
3364-905SP	Brake knob assembly, comprising:	
3364-206	Brake knob	1
3364-343	Brake knob cap	1
M004-103	Screw, countersunk head, pozidrive, M3 x 8 mm long	1
3364-906SP	Modified serration plate	
3364-907SP	Serration refurbishment kit & instructions, comprising:	
3364-906SP	Modified serration plate	2
M005-911	Screw, countersunk head, socket, M4 x 8 mm long	6
M806-004	Pin, coiled-spring, 4 mm dia. x 10 mm long, hdp	4
3364-908SP	Spring actuator assembly, comprising:	
3364-341	Spring actuator (lm24)	1
3321-280	Actuator pin	2
3364-911SP	Pan drag knob assembly, comprising:	
3364-260	Pan drag knob - number printing	1
3364-229	Drag knob sleeve	1
3364-310	Drag knob screw	1

Fig 6.8 Vision SD12 Pan and Tilt Head - Composite Spare Parts (Cont)

Part No.	Nomenclature	Qty
3364-912SP	Tilt drag knob assembly, comprising:	
3364-259	Tilt drag knob - number printing	1
3364-229	Drag knob sleeve	1
3364-310	Drag knob screw	1
3364-913SP	Set of screws (from #1350), comprising:	
M003-501	Screw, button head, socket, M2.5 x 5 mm long	16
M004-103	Screw, countersunk head, pozidrive, M3 x 8 mm long	2
M004-503	Screw, button head, socket, M3 x 8 mm long	1
M004-514	Screw, button head, socket, M3 x 10 mm long	6
M004-703	Screw, cap head, socket, M3 x 8 mm long	3
M004-706	Screw, cap head, socket, M3 x 16 mm long	2
M004-711	Screw, cap head, socket, M3 x 20 mm long	3
M004-804	Screw, grub, dog point, socket head, M3 x 10 mm long	1
M004-906	Screw, countersunk head, socket, M3 x 6 mm long	12
M005-504	Screw, button head, socket, M4 x 10 mm long	3
M005-707	Screw, cap head, socket, M4 x 20 mm long	4
M005-708	Screw, cap head, socket, M4 x 25 mm long	4
M005-714	Screw, cap head, socket, M4 x 20 mm long	1
M005-718	Screw, cap head, socket, M4 x 12 mm long	2
M005-721	Screw, cap head, socket, M4 x 25 mm long	1
M005-733	Screw, cap head, socket, M4 x 8 mm long	6
M005-734	Screw, low-profile, cap head, socket, M4 x 10 mm long	4
M005-735	Screw, low-profile, cap head, socket, M4 x 12 mm long	4
M005-736	Screw, low-profile, cap head, socket, M4 x 6 mm long	6
M005-901	Screw, countersunk head, socket, M4 x 8 mm long	1
M006-801	Screw, grub, dog point, socket head, M5 x 6 mm long	1
M007-523	Screw, button head, socket, M6 x 20 mm long	1
M101-001	Screw, self-tapping, pan head, pozidrive, M2.5 x 8 mm long	1

Fig 6.8 Vision SD12 Pan and Tilt Head - Composite Spare Parts (Cont)

Part No.	Nomenclature	Qty
3364-917SP	Outrigger assembly (spares), comprising:	
3364-317	Outrigger	1
3364-342	Bush	1
3364-919SP	Constant assembly unit - pan, comprising:	
3364-45	Constant drag unit assembly - pan	1
3364-253	Shim (0.002")	3
3364-254	Shim (0.003")	3
3364-255	Shim (0.010")	3
3364-300	Spacer	1
3364-923SP	Constant drag blanking slug - top	1
3364-924SP	Constant drag blanking slug - bottom	1
M004-514	Screw, button head, socket, M3 x 10 mm long	6
M004-906	Screw, countersunk head, socket, M3 x 6 mm long	6
M005-707	Screw, cap head, socket, M4 x 20 mm long	4
M007-706	Screw, cap head, socket, M6 x 25 mm long	1
M806-006	Pin, coiled-spring, 4 mm dia. x 16 mm long, mcp	2
M806-015	Pin, coiled-spring, 3 mm dia. x 8 mm long, hdp	3
P200-106	Bearing, ball, radial, 35 mm ID x 47 mm OD x 7 mm long, two shields	1
3364-920SP	Constant assembly unit - tilt, comprising:	
3364-46	Constant drag unit assembly - tilt	1
3364-253	Shim (0.002")	3
3364-254	Shim (0.003")	3
3364-255	Shim (0.010")	3
3364-300	Spacer	1
3364-923SP	Constant drag blanking slug - top	1
3364-924SP	Constant drag blanking slug - bottom	1
M004-711	Screw, cap head, socket, M3 x 20 mm long	6
M004-906	Screw, countersunk head, socket, M3 x 6 mm long	6
M005-708	Screw, cap head, socket, M4 x 25 mm long	4
M007-706	Screw, cap head, socket, M6 x 25 mm long	1

Fig 6.8 Vision SD12 Pan and Tilt Head - Composite Spare Parts (Cont)

Part No.	Nomenclature	Qty
M806-001	Pin, coiled-spring, 3 mm dia. x 12 mm long, hcp	2
M806-005	Pin, coiled-spring, 4 mm dia. x 12 mm long, hdp	2
M806-015	Pin, coiled-spring, 3 mm dia. x 8 mm long, hdp	3
P200-106	Bearing, ball, radial, 35 mm ID x 47 mm OD x 7 mm long, two shields	1
3364-921SP	Constant Assemblies - head set, comprising:	
3364-919SP	Constant assembly unit - pan	1
3364-920SP	Constant assembly unit - tilt	1
3364-922SP	Tilt drag housing assembly, comprising:	
3364-316	Tilt drag housing	1
L850-032	Threaded-insert, wire thread insert (helicoil), 5/16 in. BSF x 1-1/2 Diameters long	1
M806-042	Pin, coiled-spring, 2.5 mm dia. x 8 mm long, mdp	1
N500-023	Bearing, needle roller, radial, full complement, 1/4 in. ID x 7/16 in. OD x 7/16 in. long	1
3364-927SP	Brake shafts kit, comprising:	
3364-324	Pan brake shaft	1
3364-244	Tilt brake shaft	1
3364-351	Friction insert	2
3364-352	Spring element	2
3364-206	Brake knob	2
3364-343	Brake knob cap	2
3364-256	Tilt brake insert	2
M004-103	Screw, countersunk head, pozidrive, M3 x 8 mm long	2
3364-930SP	Tilt brake shaft assembly, comprising:	
3364-244	Tilt brake shaft	1
3364-351	Friction insert	1
3364-352	Spring element	1
3364-256	Tilt brake insert	2

Fig 6.8 Vision SD12 Pan and Tilt Head - Composite Spare Parts (Cont)

Part No.	Nomenclature	Qty
3364-931SP	Pan brake shaft assembly, comprising:	
3364-324	Pan brake shaft	1
3364-351	Friction insert	1
3364-352	Spring element	1