F O R E W O R D

This service instruction includes all explanations necessary for the installation, maintenance and adjustment of the

5 1/4 inches slim line minifloppy drives

TBAE05	(SA455)
TBAE06	(SA465)
SMEA12	(JU475)

The drive is operated as an exchangeable module without cover and handle.

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TA TRIUMPH-ADLER AG

- Service Department Systems -

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I.   G E N E R A L

1.   SURVEY

The minifloppy drives, TBAE05 TBAE06 and SMEA12 are devices of the 5 1/4"
of Slim line series (half construction height 41mm).

They can record data in the formats FM (Single Density) and MFM (double
Density) on both sides of a diskette.

The SMEA12 drive can be switched via the interface to two varying speeds
(300 rev/min or 360 rev./min). In the high numbers, the drive fulfills
the conditions of an 8" standard floppy drive.

In the lower numbers, it offers the conditions of the TBAE06 drive.

Type	Capacity unformatted	Exchange module	Revo-lution	Transfer Rate	Diskette
SA455 48TPI	0.5MB	TBAE05	300U/min	250KBit/s	E700.60033
SA465 96TPI	1.0MB	TBAE06	300U/min	250KBit/s	E700.60035
JU475 96TPI	1.0MB	SMEA12	300U/min	250KBit/s	E700.60035
JU475 96TPI	1.6MB	SMEA12	360U/min	500KBit/s	E700.60047

1.1 Compatibility TBAE06 and SMEA12

The drive mode of operation and the diskette type must be observed.

Diskette	SMEA12 300U /min	SMEA12 360U /min	TBAE06
Double Density E700.60035	yes	no	yes
High Density E700.60047	no	yes	no

2. TECHNICAL DATA TBAE05 (48TPI), TBAE06 (96TPI)

VERSIONS:	TBAE05	TBAE06
CAPACITY		
Per diskette unformatted	500 KB	1 MB
Per diskette formatted	409.6 KB	819.2 KB
TRACK ALLOCATION		
Number of the heads	2	2
Cylinder per diskette	40	80
Track density	48 tpi	96 tpi
Sectors per track	10	10
Sector length	512 bytes	512 bytes
DATA TRANSFER		
Data transfer rate	250 KHz	250 KHz
Recording modes	MFM	MFM
Recording density	5876 bpi	5922 bpi
Middle latent time	100 ms	100 ms
Middle access	93 ms	94 ms
Track for track access	6 ms	3 ms
Head stabilization period	15 ms	15 ms

DRIVE DATA AND INSTALLATION VALUES

Motor starting time	500 ms
Number of revolutions	300 rpm
Diskette size	5.25 inch
Voltages	+12V ±10%
	+ 5V ± 5%
Current consumption	1.2A for +12V
	0.9A for + 5V
Power consumption	12.5W

2.1 Technical data SMEA12

MODE OF OPERATION	300 rpm	360 rpm
CAPACITY		
Per diskette unformatted	1.0 MB	1.6 MB
Per diskette formatted	819.2 MB	1.33 MB
SECTOR ALLOCATION		
Number of the heads	2	2
Cylinder	80	77
Track density	96 tpi	96 tpi
Sectors per track	10	17
Bytes per sector	512	512
Sectors per diskette	1600	2618
DATA TRANSFER		
Transfer rate	250 Kbit/s	500 Kbit/s
Recording modes	MFM	MFM
Recording density	5922 bpi	9870 bpi
Mean access time	94 ms	91 ms
Step time of tracks for track	3 ms	3 ms
Motor starting time	500 ms	500 ms

INSTALLATION VALUES

Voltages
+5V +5%
0.65A (Normal)
0.8A (max.)
50 mVss Ripple
+12V +10%
0.33A (Normal)
1.2A (max.)
10 mVss Ripple

Power consumption
7.2W (operation)
3.8W (standby)

QUALITY

Middle failure rate (M.T.B.F)	10.000 hours.
Reading error (software error)	1 per 10^9 bits
Reading error (hardware error)	1 per 10^{12} bits
Positioner fault (seek error)	1 per 10^6 bits

MEASUREMENTS

Width, depth, height	146.1 mm, 203.5 mm, 41.5 mm
Weight	1.5 kg

ENVIRONMENTAL CONDITIONS

|	Operation	Storage
Temperature	10°C 46°C	-22°C-47°C
Humidity	20%-80%	8%-90%
(Related to 20°C)	Rel. humidity, not condensing	
Shock	max. 0.5 G	40 G
	per 10 ms	per 10 ms
Vibration	max. 0.5 G	max. 3 G
	for 5-55 Hz	for 5-55 Hz

MAINTENANCE

The drive is maintenance-free. A cleaning of the heads would only be
necessary dependent upon the location and environmental conditions. The
cleaning diskettes (order number Z800.10021) approved by the TA
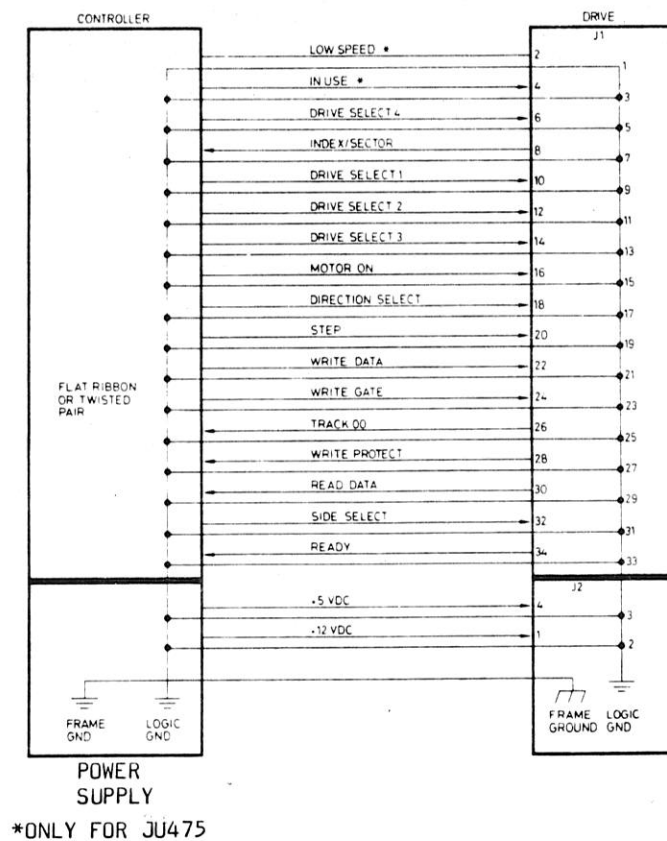accessories should be used for cleaning.

3. INTERFACE AND INSTALLATION

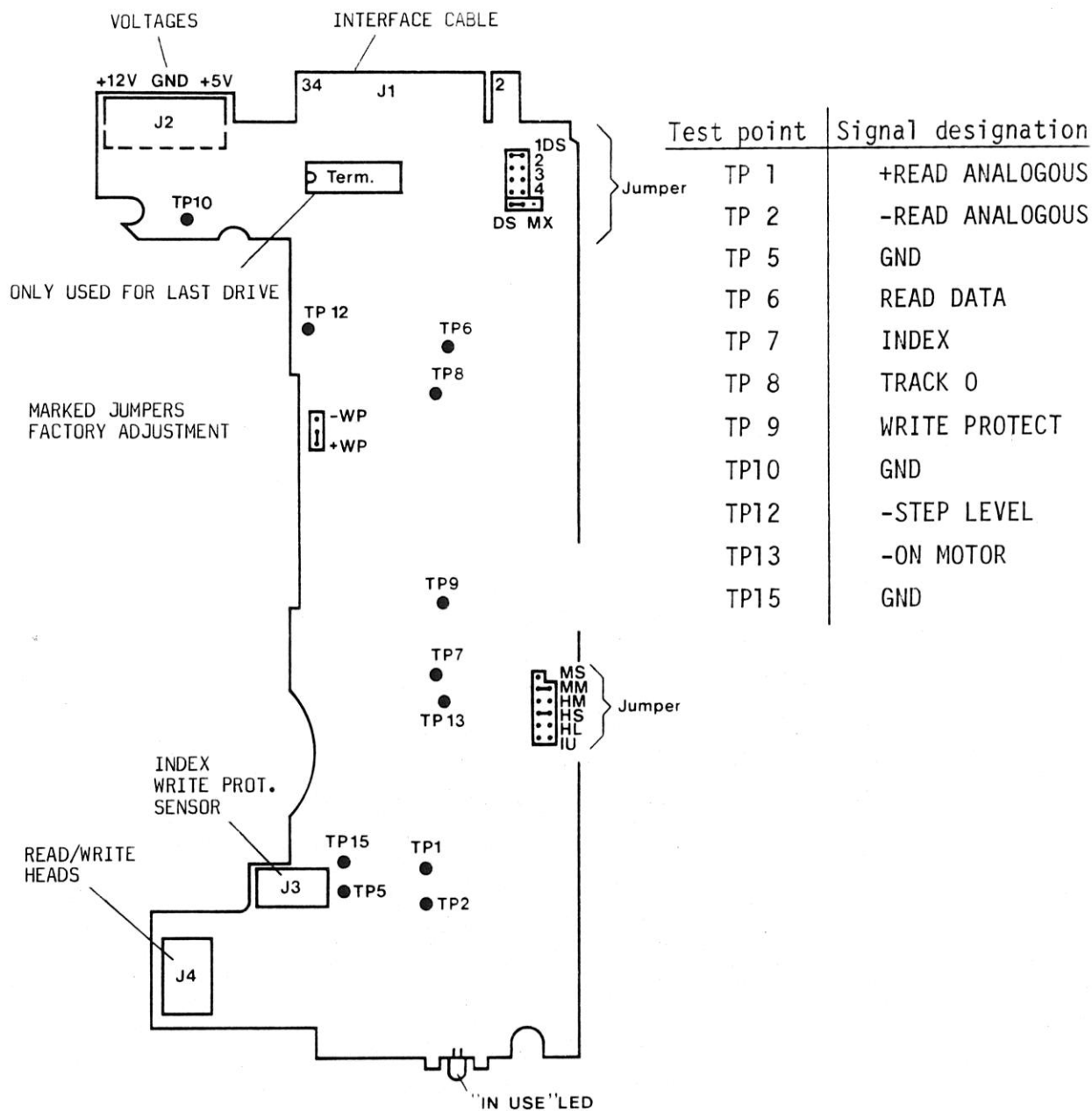Two connecting cables are needed for the connection of the drive.

a) the signal and data cable P1

b) the direct voltage connection P2
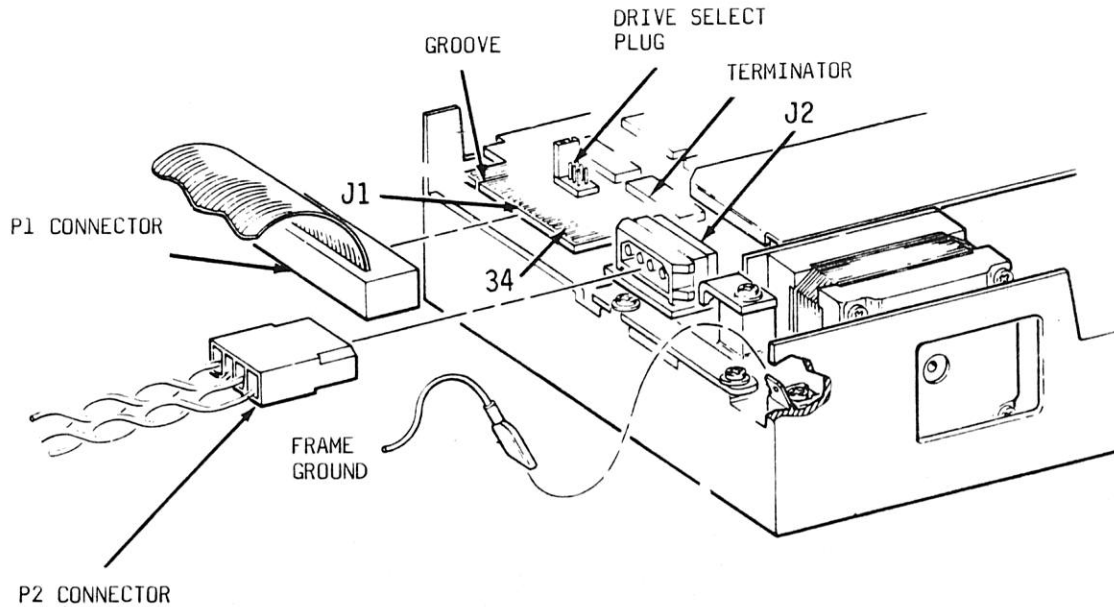
For inspection of signals and voltages, measurement can directly be performed against the plug connections of the drive.
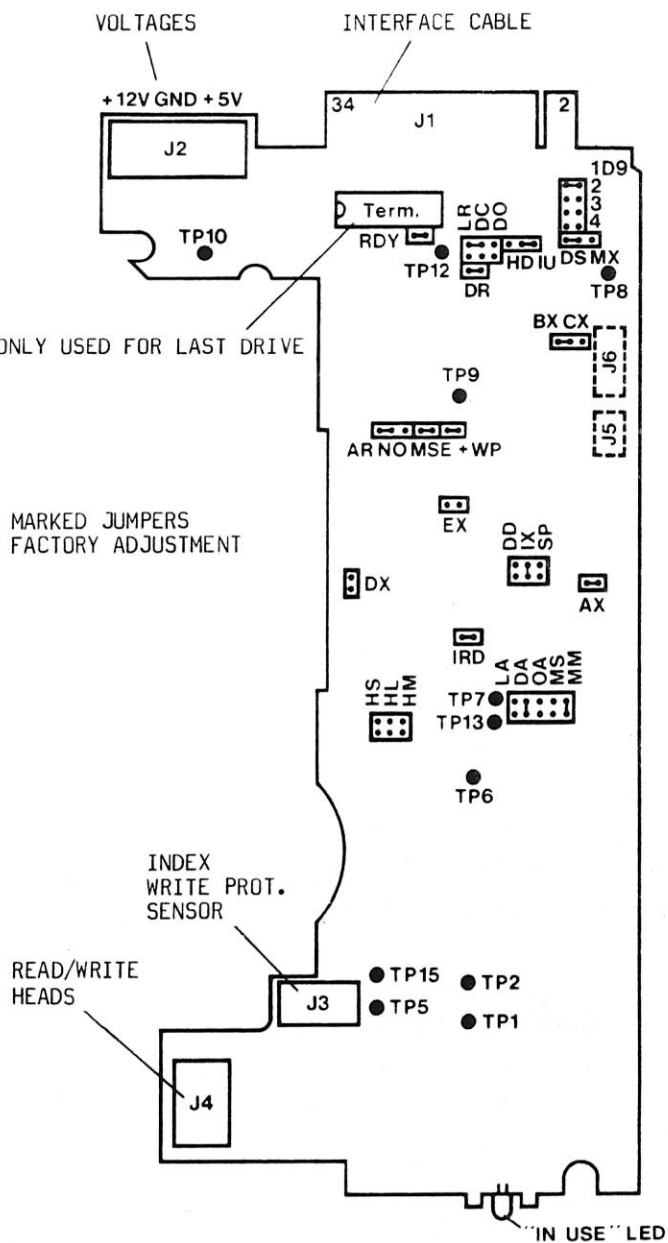

*ONLY FOR JU475

3.1 Plug and jumper function TBAE05/06

Test point	Signal designation
TP 1	+READ ANALOGOUS
TP 2	-READ ANALOGOUS
TP 5	GND
TP 6	READ DATA
TP 7	INDEX
TP 8	TRACK 0
TP 9	WRITE PROTECT
TP10	GND
TP12	-STEP LEVEL
TP13	-ON MOTOR
TP15	GND

JUMPERS	Opened	Closed	FUNCTION
DS1		X	DRIVE SELECT 1
DS2,3,4	X		DRIVE SELECT 2, 3 and 4
DS		X	Makes possible DRIVE SELECT 1-4
MX	X		Drive always selected
MS	X		DRIVE MOTOR with DRIVE SELECT
MM		X	DRIVE MOTOR with ON MOTOR
HM	X		HEAD LOAD with ON MOTOR
HS		X	HEAD LOAD with DRIVE SELECT
HL	X		HEAD LOAD
IU	X		IN USE LED with DRIVE SELECT
+WP		X	Write protect closed

3.2 Plug and jumper function SMEA12 (Index OAAA)

Test point	Signal designation
TP 1	+READ ANALOGOUS
TP 2	-READ ANALOGOUS
TP 5	GND
TP 6	READ DATA
TP 7	INDEX
TP 8	TRACK 0
TP 9	WRITE PROTECT
TP10	GND
TP12	- STEP LEVEL
TP13	- ON MOTOR
TP15	GND

JUMPERS	Opened	Closed	FUNCTION
DS1		X	DRIVE SELECT 1 = drive 1
DS2,3,4	X		DRIVE SELECT 2, 3 and 4
DS		X	Makes possible DRIVE SELECT 1-4
MX	X		Drive always selected
MS	X		DRIVE MOTOR with DRIVE SELECT
MM		X	DRIVE MOTOR with MOTOR ON
HL	X		HEAD LOAD with IN USE
HM	X		HEAD LOAD with MOTOR ON
HS	X		HEAD LOAD with DRIVE SELECT
LA	X		IN USE LED ACTIVE
DA		X	IN USE LED with DRIVE SELECT
OA	X		LED with IN USE
+WP		X	Write protect closed

3.3 Plug and jumper function SMEA12 (Index 1ADG and 1AFK)
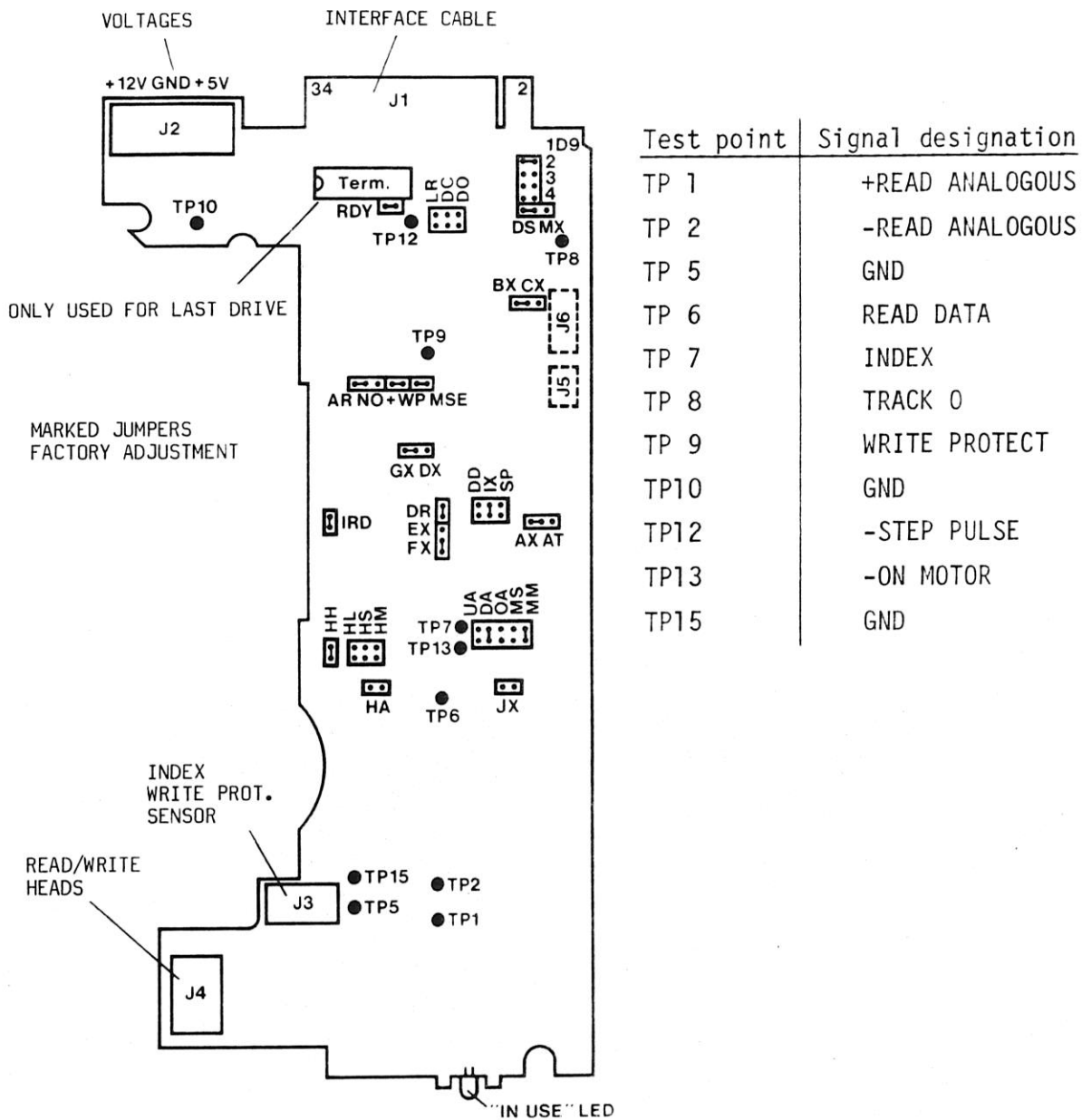
Test point	Signal designation
TP 1	+READ ANALOGOUS
TP 2	-READ ANALOGOUS
TP 5	GND
TP 6	READ DATA
TP 7	INDEX
TP 8	TRACK 0
TP 9	WRITE PROTECT
TP10	GND
TP12	-STEP PULSE
TP13	-ON MOTOR
TP15	GND

JUMPERS	Opened	Closed	FUNCTION
DS1		X	DRIVE SELECT 1 = drive 1
DS2,3,4	X		DRIVE SELECT 2, 3 and 4
DS		X	Makes possible DRIVE SELECT 1-4
MX	X		Drive always selected
MS	X		DRIVE MOTOR with DRIVE SELECT
MM		X	DRIVE MOTOR with ON MOTOR
HL	X		HEAD LOAD with IN USE
HM	X		HEAD LOAD with MOTOR ON
HS	X		HEAD LOAD with DRIVE SELECT
UA	X		IN USE LED ACTIVE
DA		X	IN USE LED with DRIVE SELECT
OA	X		LED with IN USE
+WP		X	Write protect closed

Continuation of jumpers and bridges SMEA12

Bridges	OFF	ON	Function
IU[1]		x	The LED illuminates for DRIVE SELECT
HD[1]	x		The LED illuminates for IN USE or DRIVE SELECT
HA[2]	x		The LED illuminates for DRIVE SELECT and IN USE
RDY		x	Standard Ready
DR		x	Enables DRIVE READY with DRIVE SELECT
LR	x		Switches DRIVE READY with DOOR CLOSED
DC	x		Reports door closed
DO	x		DOOR opened
MSE		x	Motor start up, as soon as a diskette is fed in the chute or removed
IRD		x	Internal READY
DX	x		Locks READY (not used)
EX	x		Locks READY (not used)
FX		x	Enables READY
GX		x	Enables READY
AT	x		Enables the use of the JU475 on the IBM-PC
DD	x		Recognizes diskette change with DRIVE SELECT
IX		x	Recognizes diskette change with INDEX
SP	x		Recognizes diskette change with STEP
AX		x	Reserves if plug is removed
BX		x	300 rpm or 360 rpm
CX	x		Only 300 rpm
JX	x		Only HIGH TRANSFER RATE MODE
AR		x	During switch on position on track 0
NO	x		During switch on do not position on track 0
HH[2]	x		HEAD LOAD with DRIVE SELECT and IN USE

[1] Only index OAAA
[2] Only index 1ADG and 1AFK

4.   DESCRIPTION OF FUNCTION

The electronics of the minifloppy drive are installed on a basic board
and includes the following circuits:

1. Control logic
2. Drive selection
3 Drive status (READY)
4. Track access
5. Stepper motor and control
6. Index recognition
7. Track 0 recognition
8. Write protection
9. Read/write amplifier

The control for the spindle motor is mounted on an extra printed cir-
cuit board.

4.1   Drive functions

The drive works as a Single Drive System or as a Multi Drive System
through selection via DRIVE SELECT jumper.

The drive status is indicated via the READY line.

READY = Diskette inserted and locked.
         Revolution of the drive motor perfect
         INDEX pulse available.
         Drive selected.

Through a door switch a diskette change is recognized and independently
from the jumpers DC and DO is reported via the READY line.

A four-phase step motor moves via a steel belt drive the read/write he-
ads from track to track. The control is effected with signal STEP DIR-
ECTION.

Via a photo cell exterior position of the head carriage is sensed and is indicated through TRACK 00. Upon applying the supply voltage, the the heads are set on track 00, independently from jumper "AR".

Two further photo cells sense the diskette on write protection (Write PROTECT) index hole. The write protect formation can be selected through a jumper (WP) on positive or negative level.

The write protection photo cell starts the drive motor additionally by inserting a diskette. Thus a centering of the diskette is guaranteed.

The write logic is activated through WRITE GATE and transfers the MFM coded data on the diskette. With disconneted WRITE GATE the diskette data MFM are always MFM-coded through the read logic and transferred via the READ DATA line.

Block Circuit Diagram
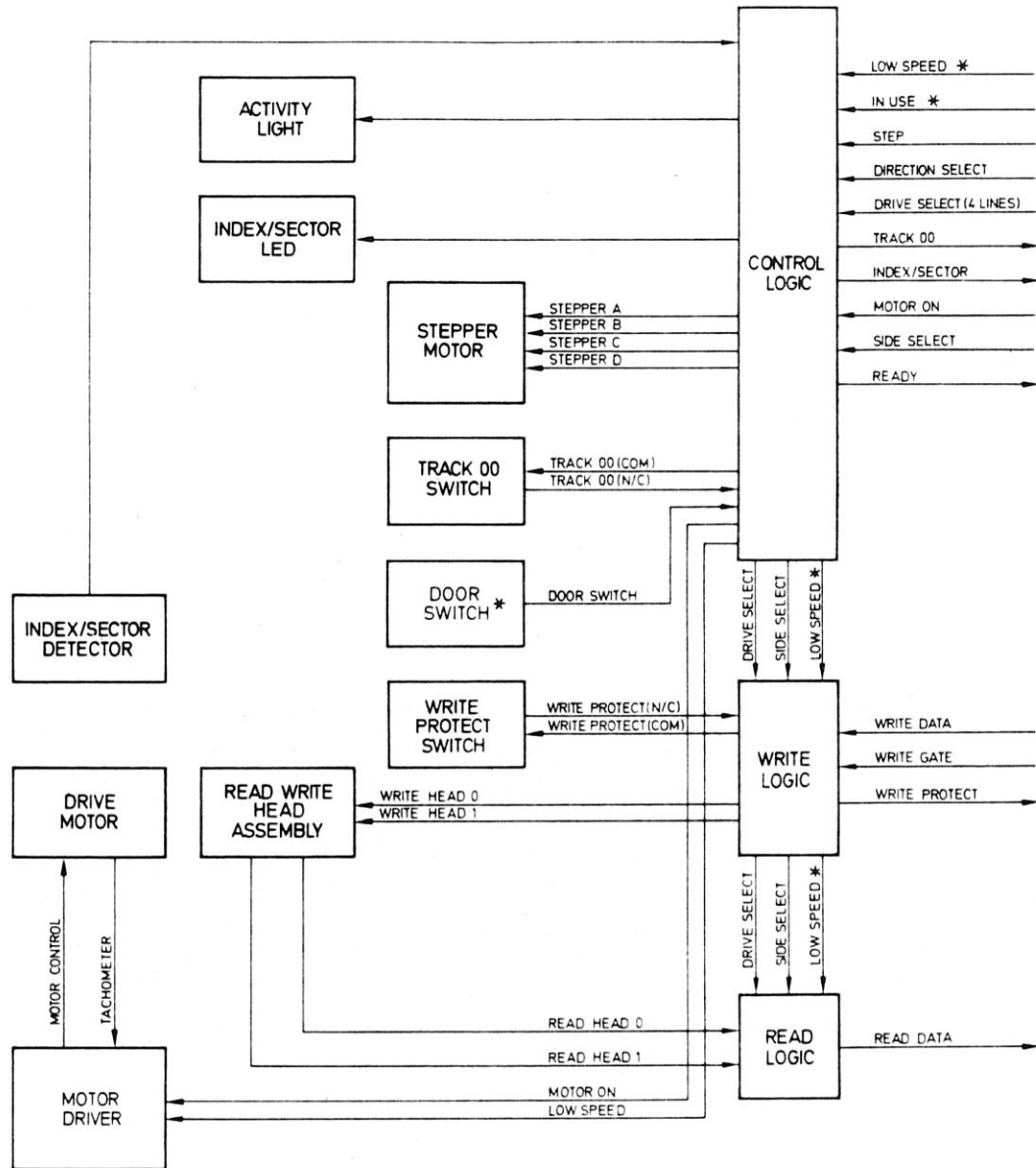
*ONLY FOR JU475

II. S E R V I C E

1. GENERAL

1.1 Error recognition and elimination

Errors are normally caused as follows:

a) Contaminations of the read/write heads (eliminated by cleaning the heads).
b) Electrical errors which occur due to troubles such as static discharges.
c) Faults of the written data which were not recognized with the write operation, can generate errors during reading.
d) Improper ground connection of the power supply unit, drive and system can lead to errors.
e) Incorrect motor revolution.
f) Incorrect diskette type.

1.2 Alignment diskette

The alignment diskette is used for test and for the adjustment of the drives. This drive needs written information on both surfaces.
The following controls and adjustments are effected with the alignment diskette.

a) Read/write head radial Alignment   TRK 64
b) Azimuth angle (not adjustable)   TRK 64
c) Track zero adjustment   TRK 00
d) Index adjustment and inspection   TRK 76 + 02

In order to protect the alignment diskette against an unintentional writing it must have a write protect.

2.   ADJUSTMENTS

2.1   Read/write head radial alignment

In the SMEA12 drive, the adjustment in the mode of operation takes place with 300 U/min.

Attention: During this adjustment, the drive and the alignment diskette should have room temperature.

a) Select drive and position heads on track 64
b) Trigger externally negative from TP7 (index)
   Timer div. 20 ms
c) CH1 on TP1 AC
   CH2 on TP2 AC
   Ground on TP10
   CH1 and CH2 inverted, ADD
   Volt div. 50 mV
d) The two amplitudes of the measurement picture must be symmetric in the ratio of 1:1
e) Tolerance: 80% of the amplitude to the left and to the right to each other (see figure)
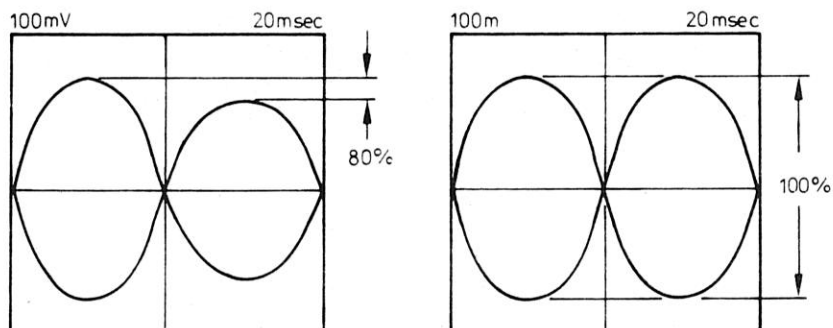
f) Loosen two securing screws and the move stepper motor on the basic
   frame so that the amplitudes show same illustration. Tighten motor
   securing screws (see figure)

Securing screws

Support
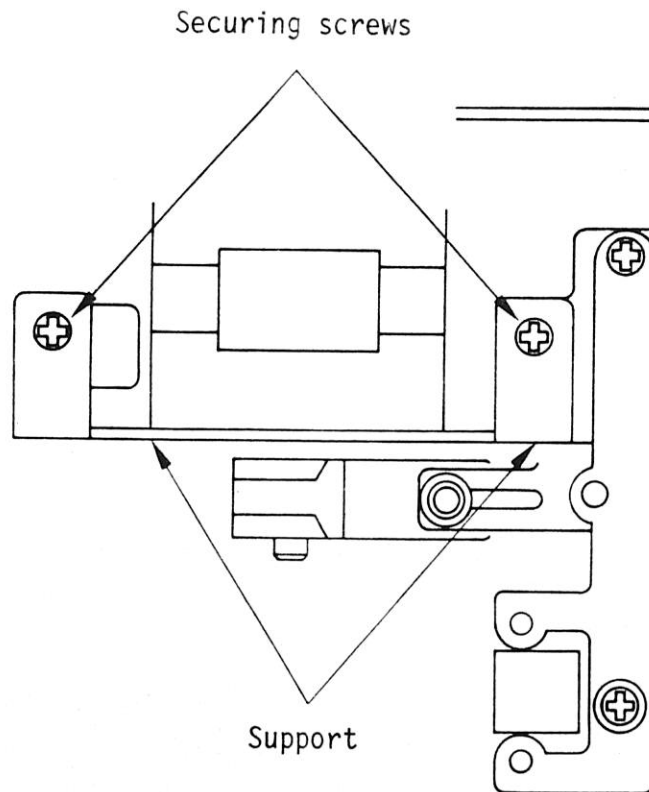
g) Control: Step the heads outwards to track 00 and inwards to track 64
   and repeat the measurement.

h) Whenever the head alignment was set, track 00 adjustment must be
   checked.

Caution: When the securing screws are tightened, the motor bearing must
          be pushed to the frame.

2.2   Read/write head azimuth adjustment

The azimuth cannot be adjusted. When the pulse shape lies outside the
period of 21 minutes during inspection, the read/write head unit must
be exchanged.

a) Alignment diskette in the drive to be tested enclose
b) Step read/write heads to track 64
c) Trigger externally negative from TP7 (index)
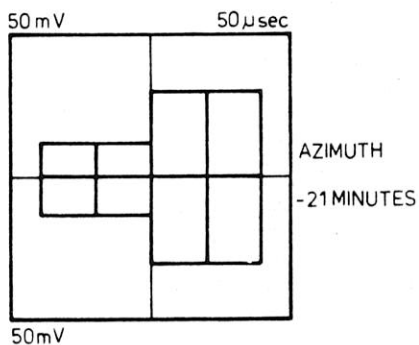   CH1 on TP1 AC
   CH2 on TP2 AC
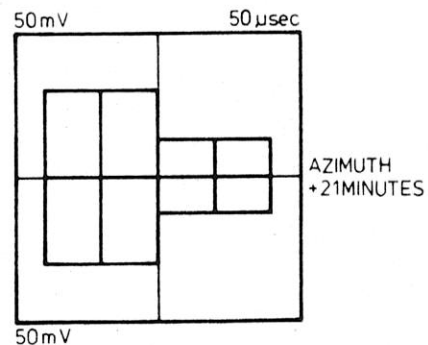   Volt div. 50 mv
   Time div. 500 μs
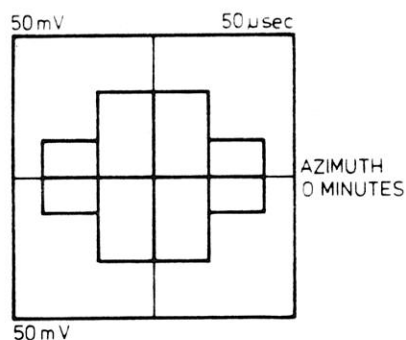   CH1 and CH2 inverted, ADD
   Ground on TP10
   (See figure)

WRONG

AZIMUTH
-21 MINUTES

WRONG

AZIMUTH
+21 MINUTES

CORRECT

AZIMUTH
0 MINUTES

2.3 Head amplitude control

Before reading a diskette must be rewritten (initialized) for this measurement, whereas possibly a new diskette should be used.

a) Insert diskette
b) Select drive on track 79
C) Trigger externally from TP7 (index)
   CH1 on TP1 AC
   CH2 on TP2 AC
   Volt div. 50 mV (100 mV)
   Time div. 20 ms
   CH1 and CH2 inverted, ADD
   Ground to TP10
e) The read-output signal should amount to at least 100 mVss on track 70.
f) If the amplitude is not reached, the following measures should be taken:
   1. Clean head
   2. Exchange head unit
   3. Check motor speed

2.4 Track zero adjustment

Prerequisite for this adjustment is a correct Head Radial Alignment.

a) Insert alignment diskette in the drive
b) Step read/write heads on track 00
c) Trigger externally negative from TP7 (index)
   Time div. 20 ms
   CH1 on TP1 AC
   CH2 on TP2 AC
   Ground on TP10
   CH1 and CH2 inverted, ADD
   Volt div. 100 mV
d) A read analog signal (125 KHz) is available on track 00. Adjust read analogous signal by altering track.
e) Connect oscilloscope to TP8.
f) The drive between track 00 and track 01 can be stepped. The signal on TP8 must switch log "0" and log "1" (50% to 50%).
g) Adjust track zero bearing in the case of error.

Labels: Securing screws, Rotation point, Track 00 Sensor
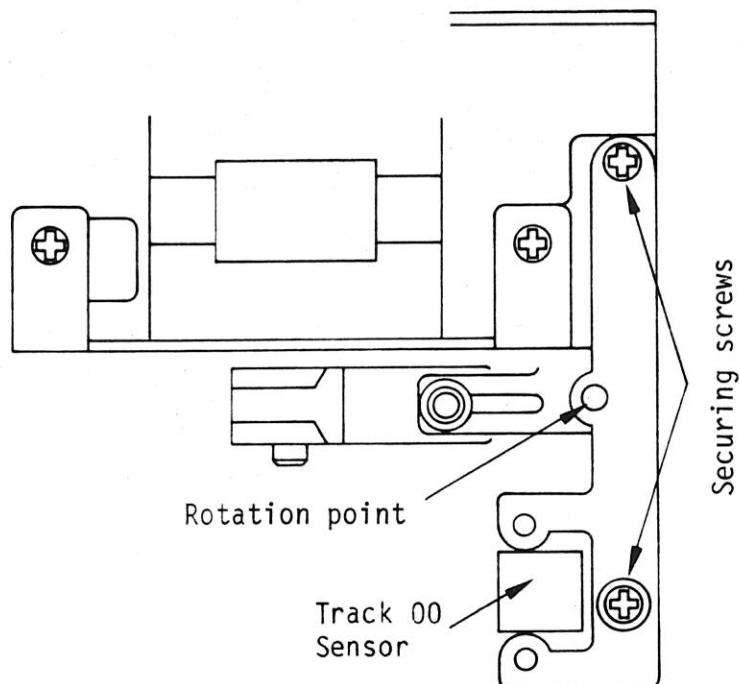
2.5   Index adjustment

a) Insert Alignment diskette
b) Step heads on track 76
c) Trigger externally positive from TP7 (index)
   Time div. 50 µs
d) CH1 on TP1 AC
   CH2 on TP2 AC
   Ground at TP10
   CH1 inverted
   CH1 and CH2, ADD
   Volt div. 100 mv
e) The distance between trigger start and the first data pulse should amount to 200 µs (+100/-100 µs).
f) Step heads on track 02 and repeat measurement.
g) Adjustment: Loosen index sector block, step heads on track 76.
                Check the 200 µs (+100/-100 µs) and if nescessary,
                adjust index sector block. Repeat this inspection
                again for track 2.

INDEX BURST
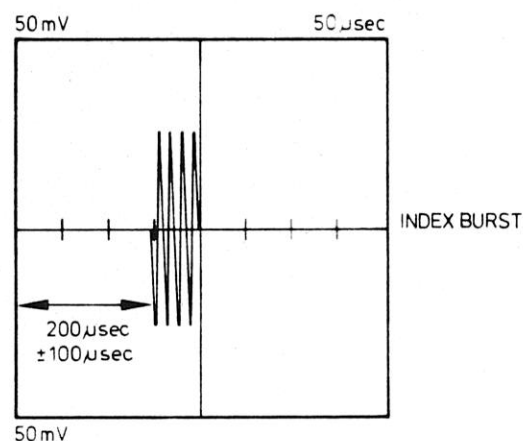
2.6   Motor speed adjustment

a) Enclose diskette.

b   Measure frequency against the TP7 (index).

Period = 200 ms ±2 ms

Frequency 54 hertz 0.05 hertz

c) Adjustment: The potentiometer for the adjustment of revolutions, accomplished by a bore in the board, is located on the drive bottom on the motor board.

2.7   Write protection

a) Enclose diskette to the drive, write protection must be open.

b) CH1 on TP9

Volt div. 2V

Measures at TP10

c) Check whether the logic level is changed, when the diskette is inserted (TTL level).