# CV 6034
# CV 6035
# CV 6036

Specification MOA/CV6034,5,6.
Issue 1 dated 23.3.60
To be read in conjunction with K1006

Security: Specification Unclassified | Valve Unclassified

**Type of Valve** X Band, fixed frequency, pulse magnetron, with integral magnet.

**Prototype** VX3276

**Cathode** Unipotential, indirectly heated.

**Cooling** Forced Air

**Climatic** See T A.Requirement Page 6

**Weight** 7½ lbs. nominal.

**Packing** Pan-climatic, see T.A. Requirement Page 7

**Marking**
As K1001/5 with CV Number as appropriate, and Serial No.

**Dimensions and Connections**
Page 11

**Mounting Support**
Face Plate (see page 11)

**Mounting Position**
Any

## RATINGS

Not for inspection purposes.
All limiting values are absolute.

| Parameter | Units | Symbol | Max. | Min. | Notes |
|---|---|---|---|---|---|
| Heater Voltage | Volts | EF | 2.2 | 1.8 | A |
| Heater Current (Surge) | Amps | If | 30 | - | A |
| Warm-up time for instant start | Seconds | tk | - | 180 | A |
| Pulse length | uS | tp | 1.0 | 0.25 | |
| Mean Input Power | Watts | Pi | 360 | - | F |
| Peak Input Power (1) tp = ¼ uS | kW | pi | 360 | 150 | D.E. |
| Peak Input Power (2) tp = 1 uS | kW | pi | 200 | 150 | D.E. |
| Minimum efficiency into a match | % | | | 30 | D |
| Frequencies:- CV6034 | Mc/s | F | 9590 | 9500 | |
| CV6035 | Mc/s | F | 9645 | 9555 | |
| CV6036 | Mc/s | F | 9700 | 9610 | |
| Rate of rise of Anode Voltage | kV/uS | r.r.v. | 250 | 100 | B |
| Voltage reflection coefficient of load | Ratio | - | 0.2 | - | |
| Anode Temperature | Deg.Cent. | T | 150° | -55° | C |
| Cathode stalk temperature | Deg.Cent. | T | 165° | -55° | C |
| Altitude | Feet | - | 10,000 | - | |

## Notes

A. For mean input powers in excess of 5o watts the heater voltage shall be reduced in accordance with the formula:-

$$Ef = 2\left(1 - \frac{Pi}{300}\right) \pm 0.2 \text{ volts}$$

B. The rate of rise of the pulse voltage (r.r.v.) is defined as the value of $\frac{dv}{dt}$ measured at the onset of oscillation.



Z.20733.

C. The magnetron shall be forced air cooled so that the anode and cathode stalk do not exceed the maximum permitted temperatures. The directions of air blast and points of measurement of the temperatures are indicated on the outline drawing.

D. In the worst phase of a mismatch having a voltage reflection coefficient of 0.2 the minimum R.F. output power may be estimated by assuming an efficiency of 25%.

E. For intermediate pulse lengths pi (max) shall be determined by linear interpolation.

F. The magnetron pulse voltage (epy) will be between 16-18 kV for a pulse current (ib) of 20 amps.

G. INTERSERVICES CATALOGUE NUMBERS: CV NO.

| | |
|---|---|
| 5960 - 99 - 037 - 2180 | CV 6034 |
| 5960 - 99 - 037 - 2181 | CV 6035 |
| 5960 - 99 - 037 - 2182 | CV 6036 |

TESTS See Note 10

To be performed in addition to those in K1006. Notes 19, 20.

Conditions for Oscillation Tests

| Ref | Feature | Notes | Symbol | Value Osc.1 | Value Osc.2 | Units |
|---|---|---|---|---|---|---|
| | R.F.Load Reflection Coeff. | | | 0.025 max | 0.025 max | Ratio |
| | Waveguide | 1 | | No. 16 | No. 16 | |
| | Coupler | 21 | | | | |
| 4.16.3.2 | Heater Start | | Ef | 1.8 max | 1.8 max | Volts |
| | Run | | Ef | 0 | 0.7 ± 7% | Volts |
| | Warm up time | | tk | 180 max | 180 max | Seconds |
| 4.16.3.3. | Pulse Characteristics | | | | | |
| | Pulse Width | 2 | tp | .25 ± 10% | 1.0 ± 10% | uSecs |
| | Duty Cycle | | Du | .001 ± 10% | .001 ± 10% | Ratio |
| | Rate of rise of Pulse voltage | 3 | r.r.v | 250 min | 225 min | kV/uS |
| 4.16.3.4 | Mean Anode Current | | Ib | 20 ± 2% | 12 ± 2% | mA d.c. |

Group A. Acceptance tests at 100% Inspection level.

| Ref. | Tests | Conditions | Symbol | Limits Min. | Limits Max. | Units |
|---|---|---|---|---|---|---|
| 4.10.8 | Heater Current | No Pulse voltages<br>Ef = 2.0 V ± 2%<br>tk = 180 (min) | If | 9.5 | 11.5 | Amps |
| 4.9.13 | Pressuring | 45 psi abs | leakage | | .005 | lbs weight per hour. |
| 4.16.7.3 | Holding Period | | t | 168 | | Hours |
| 4.16.7.1 | Stability<br>Notes 3,12,13,14 | Osc.1 pi=360 kW(min) to be applied instantaneously immediately following the warm up period.<br>Refl.Coeff.0.2 min. | M.P. | | 0.35 | % |
| 4.16.5 | Pulling Figure | Osc.1<br>Refl.Coeff.0.2 min. | ΔF | | 15 | Mc/s |
| | Pulse Voltage<br>Note 16 | Osc. 1 | epy | 16 | 18 | kV |
| 4.16.3.6 | Power Output | Osc. 1 | Po | 100 | 170 | Watts |
| | Frequency | Osc. 1<br>Any anode temperature between 40°C and 70°C | F<br>F<br>F | 9525<br>9580<br>9635 | 9580<br>9635<br>9690 | Mc/s<br>Mc/s<br>Mc/s |
| 4.16.3.7 | Spectrum(1) | Osc. 1<br>Ib=15-22.5 mA | | | | |
| | (a) R.F.Bandwidth<br>(b) Minor Lobes | | BW | 6 | 2.5/tp | Mc/s<br>db |
| | | To be observed over range Max. BW and min. ratio of minor lobes to be recorded. | | | | |
| 4.16.6 | Pushing Factor<br>Note 15 | Osc.1<br>20 ± 1 Amps | | | 0.4 | Mc/s/A |

## Group B. Sample Acceptance Tests

| Ref. | Tests | Conditions | Symbol | Limits Min. | Limits Max. | Units |
|---|---|---|---|---|---|---|
| | | Combined AQL=10% Insp.Level IA<br>No holding period required for these tests | | | | |
| 4.16.3.6 | Power Output | Osc.2 | Po | 50 | - | Watts |
| 4.16.7.1 | Stability<br>Notes 3,12,13,14 | Osc.2 pi=200 kW(min)<br>Refl.Coeff.=0.2min. | MP | | 0.35 | % |
| 4.16.3.7 | Spectrum (2) | Osc.2 Ib=7-15 mA<br>Refl.Coeff.=0.2min. | | | | |
| | (a) R.F. Bandwidth<br>(b) Minor Lobes | | BW | -<br>5 | 2.5/tp | Mc/s<br>db |
| | Spectrum (3) | Osc.1 Ib=15-22½ mA<br>Refl.Coeff.=0.2 min | | | | |
| | (a) R.F. Bandwidth<br>(b) Minor Lobes | | BW | <br>5 | 2.5/tp | Mc/s<br>db |
| | | Observed over all phases and ranges. Max. BW and min.ratio of minor lobes to be recorded | | | | |

## Group C. Sample Acceptance Tests

| | | Combined AQL=10% Insp.Level IA | | | | |
|---|---|---|---|---|---|---|
| | Resonance Search<br>Note 7 | | | | | |
| | Microphony<br>Note 7 | Osc.2<br>(a) Total frequency deviation | ΔF | | 1.0 | Mc/s |
| | | (b) Change in output power | ΔPo | | 25 | % |
| | Fatigue<br>Notes 7,22 | | | | | |
| | Shock<br>Note 8 | | Acc | 50 | | g |
| | Drop<br>Note 9 | In carton (see also Q.A.requirement) | | 4'6" | | Height |
| | Post fatigue, shock and drop test end points.<br>(1) All 100% tests same limits except F and kV | | | | | |
| | (2) Change in frequency | | ΔF | | 10 | Mc/s |
| | (3) Change in pulse voltage | | Δepy | | 0.75 | kV |

Acceptance Life Tests (1)

| Ref. | Tests Conditions | AQL % | Insp. Level | Sym-bol | Limits Min. | Limits Max. | Units |
|---|---|---|---|---|---|---|---|
| | **Survival Rate Life Tests** Combined AQL = 12% | | | | | | |
| 4.11.5 | Survival rate life test Osc. 1, Intermittant. Off period = 8 mins.min. | 6.5% | 1 | | 20 | | Hours |
| | End points Osc. 1:- | | | | | | |
| | (a) Change in mean power | | | ΔPo | | 10 | % |
| | (b) Change in frequency | | | ΔF | | 10 | Mc/s |
| | (c) R.F. Bandwidth | | | BW | | 3/tp | Mc/s |
| | (d) Stability (no holding period required) | | | M.P | | 0.5 | |
| | Survival rate standby life test No pulse voltages Ef = 2.0 volts | 6.5% | 1 | | 22 | | Hours |
| | End points Osc. 1:- | | | | | | |
| | (a) Change in mean power | | | ΔPo | | 10 | % |
| | (b) Change in frequency | | | ΔF | | 10 | Mc/s |
| | (c) R.F. Bandwidth | | | BW | | 2.5/tp | Mc/s |
| | (d) Stability (no holding period required) | | | M.P | | 0.5 | % |

Acceptance Life Tests (2). See also Note 10

| Ref. | Tests Conditions | Sym-bol | Limits Min. | Limits Max | Units |
|---|---|---|---|---|---|
| 4.11.5 4.11.3.2 | Intermittent Life Test Group D | | 500 | | Hours |
| Note 22 | Osc.1 off period 8 minutes (min.) | | | | |
| | Test end points Osc. 1. | | | | |
| | (1) Power output | Po | 90 | | Watts |
| | (2) Change in frequency | ΔF | | (+10 (-25 | Mc/s |
| | (3) R.F. Bandwidth | BW | | 3/tp | Mc/s |
| | (4) Stability (No holding period required) | MP | | 0.5 | % |
| | (5) Change in pulse voltage | Δepy | | 0.75 | kV |
| | Standby Life Test | | 500 | | Hours |
| Notes 18,22 | Group D No pulse voltages Ef = 2.0 volts | | | | |
| | Test end points Osc. 1 | | | | |
| | (1) Power output | Po | 90 | | Watts |
| | (2) Change in frequency | ΔF | | (+10 | Mc/s |
| | | | | (-25 | Mc/s |
| | (3) R.F.Bandwidth | BW | | 3/tp | Mc/s |
| | (4) Stability (no holding period required) | M.P | | 0.5 | % |
| | (5) Change in pulse voltage | Δepy | | 0.75 | kV |

| Ref | Acceptance Life Tests (2) (Cont'd) Test | Conditions | Symbol | Limits Min. | Limits Max | Units |
|---|---|---|---|---|---|---|
| 4.11.3.2 | Shelf Life<br>Note 11 | Group D<br>Test end points as for Standby Life Test | | 28 | | Days |
| | Type Approval Life Tests Notes 10,22<br>All tests and end points as for Acceptance Life Tests (2) but with the following limits.<br>Intermittent Life Test | Evidence on one valve (min.) required | | 1000 | | Hours |
| | Standby Life Test | Evidence on one valve (min) required | | 2000 | | Hours |
| | Shelf Life<br>Note 11 | Evidence on one valve (min.) required | | 90 | | Days |
| 3.1 | Type Approval Design Requirements.<br>Note 10 | | | | | |
| | Altitude<br>Note 4 | Osc. 1 and Osc. 2 | | | 500 | mm |
| | Corona<br>Note 4 | Atmospheric pressure<br>$t_p$ = 1 us ± 10% (min)<br>epy = 25 kV (min)<br>Du = 0.001 (min) | | | | |
| 4.16.1 | Cooling<br>Note 5 | Anode dissipation<br>$P_p$ = 180 watts (min) | $\Delta T$ | | 55 | Cent. |
| | Input capacitance | No voltages measured at any frequency between .001 - 1.0 Mc/s | Cin | 11 | 13 | pf |
| 4.9.15 | Low temperature operation<br>Notes 6,12, 13,14 | Stability<br>Osc. 1 T = -55°C initially<br>Ef = 2.0 V max | M.P. | | 0.35 | % |
| | Thermal Factor | Osc.1<br>T = 85° ± 15°C | $\Delta F / \Delta T$ | | -0.2 | Mc/s /°C |
| | Stability<br>Notes 12,13,14 | No holding period required | M.P. | | 0.35 | % |
| | Refl.Coeff.= 0.2 min.<br>Every combination of Pi,r.r.v., within the trapezia defined in Note 17 for Osc.1 and Osc.2 | | | | | |
| | Tropical Exposure<br>Test end points as for Intermittent Life Test | As K1001, 10.1 first p.p. only | | 10 | | Days |

Packing Requirement.

To reduce the shock reaching the magnetron to 50 g (max) when dropped from 4'6" on to a hard surface. It is required to do this in any ambient within the limits -40°C to + 65°C and relative humidity 0-100%.

NOTES

1. Details of waveguides are given in RCL351 (Waveguide) obtainable from Radio Components Standardisation Committee, 77-91, New Oxford Street, London W.C.1.

2. (a) Modulator Impedance: The output voltage of the test modulator on open circuit shall not be less than 1.3 times the operating voltage and the output current on short circuit shall be at least 1.5 times the operating current measured on isolated pulses.

   (b) Modulator Charging Characteristics: The available energy for every pulse in the period immediately following an arc in the magnetron under test shall not be less than the available energy when the magnetron is operating normally.

3. (a) The rate of rise of the pulse voltage (r.r.v.) is defined as the value of $\frac{dv}{dt}$ at the onset of oscillation.

   (b) A modulator will be accepted as having a suitable rate of rise of voltage if it is demonstrated to the satisfaction of the Inspecting Authority that the maximum rate of rise of voltage measured lies within the specified limits.

   During the measurement of the rate of rise the modulator will be adjusted so that it would give the specified operating conditions if any otherwise acceptable magnetron were fitted. For the test the modulator shall be terminated by a capacitor of a value equal to the nominal input capacitance of the magnetron. The measurements shall be made over the interval between the point when the voltage first reaches 80% and the point when it first reaches 100% of the pulse voltage of the magnetron. The value shall not fall after its maximum in this interval to less than 95% of the maximum value.

   (c) The Approving Authority may waive the requirement to demonstrate compliance with the required rate of rise characteristic, but in lieu will require from the Manufacturer suitable documentary evidence in support of compliance.

4. (a) There shall be no evidence of corona when operating under the required test conditions at a pressure of 500 mm (max.) of mercury.

   (b) With the cathode cold, and at atmospheric pressure, the magnetron shall withstand the required test voltage with the required pulse characteristics from a source of approximately 1000 ohms impedance for five minutes without suffering damage due to external discharges. If necessary this test may be carried out with a magnetron with a dummy target.

5. The anode shall be blown with 15 cu.ft of air per minute so that the anode block runs at 150°C or less. The pressure drop shall not exceed 3 inches of water.

6. 4.9.15 of K1006 shall be read as -55°C. When the block reaches -55°C the heater, at the specified voltage, shall be applied for tk = 180 secs (max.). A stability test shall be carried out under the required test conditions.

7. The magnetron, mounted by attachment of the face plate to a rigid surface by four screws, shall be subjected to a resonance search test. For frequencies 10-150 c/s the maximum acceleration shall be 2 g, for frequencies 150-500 c/s the acceleration shall be $\frac{1}{2}$ g. The test shall be carried out under the required oscillation condition and with vibration applied in three mutually perpendicular directions, one of which shall be the axis of the cathode stem and one of which shall be the axis of the waveguide output. The frequency shall be swept at a rate not exceeding one octave per minute. Resonance shall be detected by acoustic methods, by the presence of microphony or by other means at the discretion of the Approving Authority. During the search the microphony shall not exceed the limits specified. The p.r.f. may be adjusted if necessary to enable microphony to be detected and measured. The magnetron shall be vibrated for 10 hours or $10^7$ cycles, whichever is the less, at the frequency of each resonance found, the direction of vibration being that which gives greatest excitation of the resonance; when this cannot be established the magnetron shall be fatigued in each of the three directions for 10 hours or $10^7$ cycles, whichever is the less, at the acceleration as for the resonance search test.

8. To be carried out on hammer machine as defined in K1001 Issue 5.

9. Drop on to a hard surface. The pack shall hit the surface with four different faces and two diagonally opposite corners making six drops in all.

10. For Type Approval the Manufacturer, at his expense, shall do the following:-

(a) Carry out, on each of four valves, the tests in Group A and Group B and then send the valves with detailed test reports to the Approving Authority. The Approving Authority at its discretion may carry out on these valves any test or requirement within this specification.

(b) Carry out the Type Approval life tests and send the information to the Approving Authority. This requirement may be waived at the discretion of the Approving Authority, and in lieu the Manufacturer will be required to submit evidence of lives to Type Approval limits. The Approving Authority at its discretion may require the Manufacturer, at the Manufacturer's expense, to carry out the Acceptance Life Test (2) to the Type Approval limits either once during the currency of the contract or once per year.

(c) Carry out the Group C Acceptance Tests. This requirement may be waived at the discretion of the Approving Authority and in lieu the Manufacturer will be required to submit evidence of compliance.

(d) Certify that the valves will meet the Type Approval Design Requirements No evidence of compliance will be needed.

The Approving Authority may at any time after Type Approval and at its own expense select a small number of valves in any order from submissions during any period. The selection may be delegated. The Inspecting Authority may at its own expense at any time after Type Approval, select a small number of valves in any order from submissions during any period. The Approving Authority, at its discretion, may carry out on these valves any test within the Type Approval Design Requirements.. Any failure will be deemed to constitute evidence of non-compliance. The Manufacturer may, at his expense, submit test results on further valves within the selected period and from such adjacent periods as the Approving Authority will allow. The decision of the

Approving Authority on compliance will be based on the combined results of all the valves tested.

11. With or without pack at the discretion of the Manufacturer.

12. Stability shall be measured in terms of the number of output pulses missing, expressed as a percentage of the number of input pulses applied during the period of observation. The missing pulses (M.P.) due to any cause are considered to be missing if the r.f energy is less than 70% of the normal energy level.

13. With the peak input set to the specified value the mismatch shall be introduced and the phase adjusted to give the maximum anode current. A missing pulse count shall be made over a period of three minutes. The phase of the reflection shall then be varied through 360° (i.e. equivalent to changing the length of guide between input flange and reference plane of reflection by half a guide wavelength) and then set to the position showing the maximum missing pulse rate. If the value of phase is less than 45° different from the previous setting and if the previous value of the missing pulse ratio was less than 0.1% this will be regarded as satisfactory performance. This part of the test shall be completed within 6 minutes of switching on the H.T. after the specified holding period. If the above two conditions are not satisfied then the bracketing procedure in Note 14 shall be used.

14. The following bracketing procedure shall be used. The phase of the mismatch shall be set to the apparent position showing maximum missing pulse ratio and then the phase altered to two values, one on each side of the previous setting and differing from it by not more than 15°. The missing pulse ratio shall be measured over an interval of not less than one minute in each position. If either of the values of missing pulse ratio found exceeds the value previously found, a further measurement shall be made following the same procedure but in a single position beyond that giving the greater reading. The process shall be repeated until a value of missing pulse ratio is found which is less by at least 0.1% than the highest figure found or is itself less than 0.1%. This test must terminate within 15 minutes of switching on the H.T. after a holding period.

15 The E.H.T. supply to the modulator shall be modulated so as to cause the magnetron pulse current to vary sufficiently about a mean value so as to exclude the effects of thermal expansion of the electrodes. The maximum pulse current modulation shall be $\pm 2\frac{1}{2}$ Amps (peak). The maximum frequency displacement F of the spectrum, as observed on a suitably adjusted spectrometer, shall be noted and the value of $\Delta F/\Delta ib$ in Mc/s per Amp, where ib = peak to peak modulation of pulse current, shall be obtained.

16. The requirements of 4.16.3.5. are waived.

17. Pi and r.r.v are plotted as ordinate and abscissa respectively on rectangular Cartesian coordinates. a,b,c and d are the corners of a trapezium where a,b, c and d for both Osc. 1 and Osc. 2 are as under:-

| Point | Osc. 1 | | Osc. 2 | |
|---|---|---|---|---|
| | Pi | r.r.v. | Pi | r.r.v. |
| a | 360 | 130 | 200 | 100 |
| b | 360 | 250 | 200 | 225 |
| c | 100 | 130 | 70 | 100 |
| d | 100 | 200 | 70 | 150 |

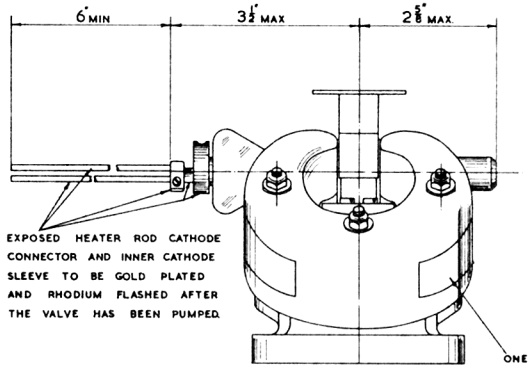
18. The valve shall be operated with heater only T = 125 ± 25°C and shall be tested at intervals of 100 hours (min.). The valve may remain operating for 60 mins. (max.) before renewing the standby condition.

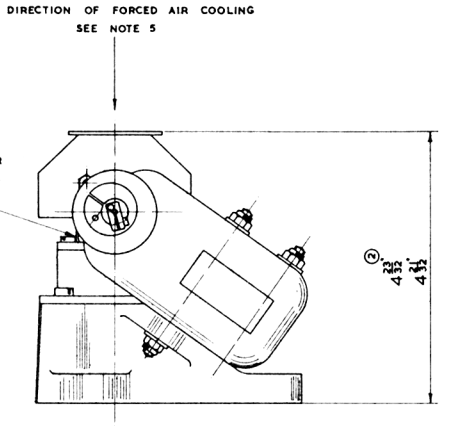
20. Copies of K1006 and Inspection Instructions for use with K1006 can be obtained from:- The Secretary, The Ministry of Aviation, 77/91, New Oxford Street, London W. C. 1.

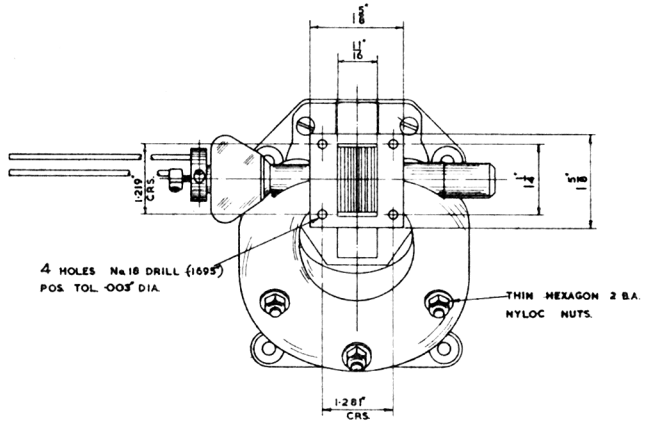
20. Paragraph 60.1.1. of Correlation Tolerances of the Inspection Instruction shall be excluded.

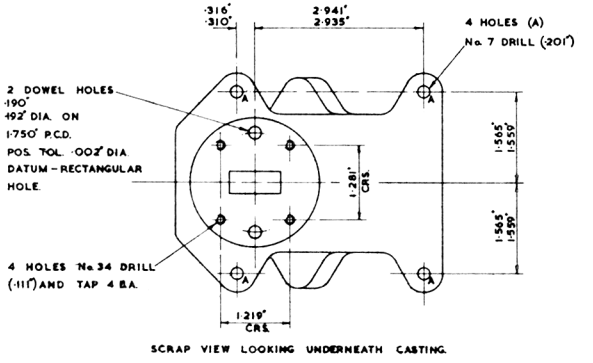
21. A flange similar in essential dimensions to "Flange Choke (WG16) Z830051" shall be used. For further details application shall be made to "The Director, R.R.E., Malvern, Worcs." and the drawing number TR/B 610180 quoted.

22. On completion of these tests the valves shall be considered expended.




OUTPUT TRANSITION SILVER PLATED .0005" THICK TO D.T.D. 919
ALL LOCATING SURFACES OF THE TRANSITION AND THE BRACKET TO BE SEPARATED BY A FILM OF JOINTING COMPOUND J.C. 5A TO D.T.D. 900/4488.