7.0 CONTROL BOX
Type CR 900-6.

IMPORTANT !

Read this section on the function and operation of the control box thoroughly BEFORE using the machine!

IN GENERAL

DELTA CR 900-6 for Auto Wrap bale wrappers is a new control box specially designed for the new 1510 and 1514 machines produced for the 1996 season. These machines have a number of working operations and consequently several different operations are programmed in the control box. This control box also replaces previous models and is therefore interchangeable with regard to connections, etc.. The control box automatically detects which wiring circuit it is connected to and consequently which machine it will be controlling.

NOTE !

In order for the software in the control box to identify the machine to which it is connected and run the correct program, the service technicians and end user must follow the instructions for upgrading or changing machines and they must not make their own connections which could disrupt or damage this facility.

IMPORTANT !

To avoid damaging or short-circuiting the control box it is very important that the electrical connections are made correctly, especially for the power supply from the tractor. Do not attempt to make any connections other than those described in section 4.9.

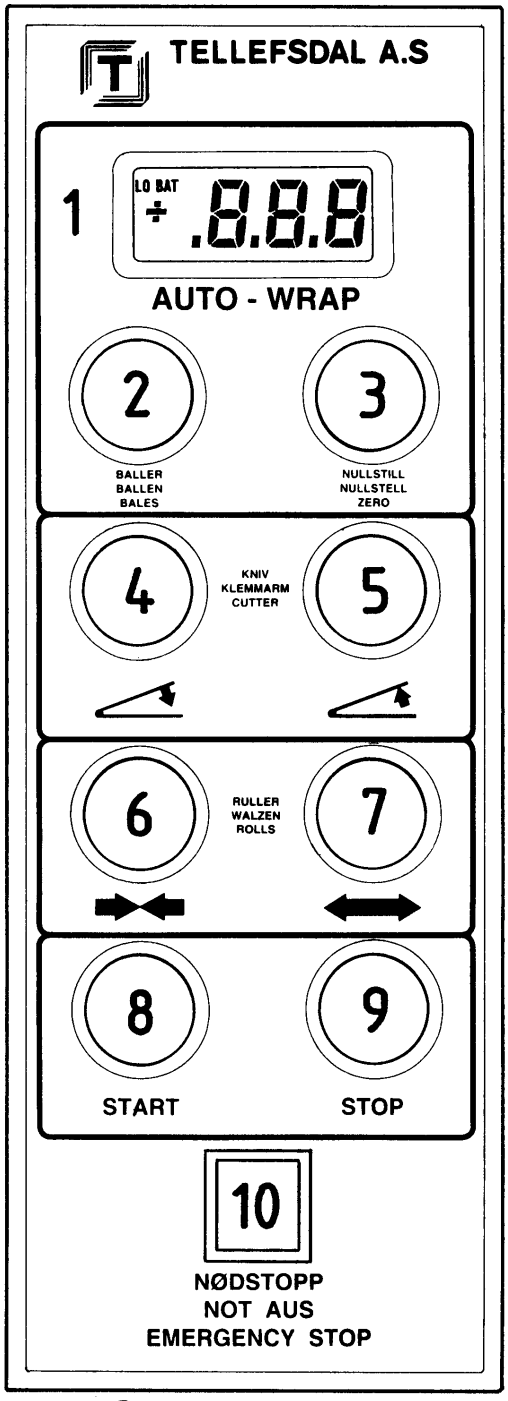


Fig. 7-1

*** Emergency stop: see chapter 2.1**

INTRODUCTION

In this section from point 7.1 up to and including 7.11 we first of all describe the working operations and single functions that are selected by the various buttons. **The operator must study this part of the control box instructions as it covers everything that will be used on a regular basis.**

The second part, from point 7.12 up to and including 7.16, is concerned with reprogramming the control box and trouble-shooting. This, together with table 1, is necessary for anyone who wishes to alter any of the variable settings or values. These are chiefly to do with the length of time a sequence lasts: the time the wrapping arm, for example, takes from start-up to full speed.

NOTE !

Alterations to the settings should only be carried out by service technicians as both skill and experience are required. If something is pressed accidentally so that the settings are altered or a particular alteration is not as intended, all the positions can be "reset" to the default values which were set up at the factory. This is done by pressing "BALES" (2) and "ZERO" (3) at the same time and keeping them pressed for about 3 seconds. (See section 7.13 for more information.)

STARTING UP

If a machine is attached when power is connected to the control box, the display will indicate u01 until "**STOP" (9)** is pressed. Then the program version is displayed, either u01, u02 or u03. This remains on the display until "**START" (8)** is pressed. Then the display shows the number of revolutions that have been programmed, and when "**START**" is pressed again the machine starts its wrapping sequence.

The program which is displayed will be automatically saved and used in the next wrapping sequence as long as the power is not disconnected.

IMPORTANT!

If the power is disconnected on a machine which is not fitted with the new auto-detecting valve-operating cables, and the program is altered to u02 or u03, press "STOP" (9) three times. The machine will then be ready to start the wrapping sequence with the program that was entered before the power was disconnected.

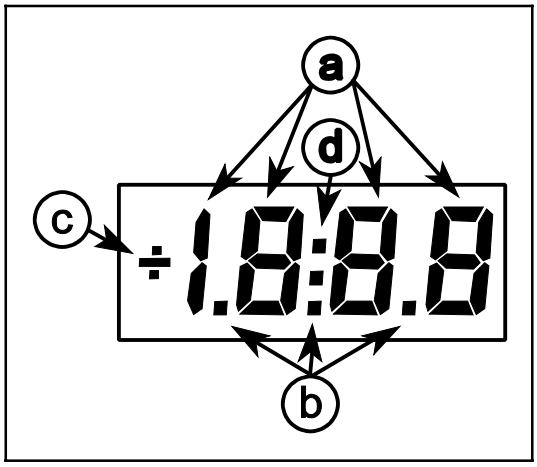
Before the operator presses "START" (8), he/she must make sure that the selected program version is appropriate for the type of machine that is attached. (See further in section 7.12.)

If the wrapping arm rotates too fast, the display will start to flash. When the speed exceeds the **danger limit of 27 rpm** the wrapping arm stops automatically. To restart the process, the same procedure must be followed as is used after "**EMERGENCY STOP**" (10) has been activated. Pressing "**STOP" (9)** and "**START" (8)** once starts the process at the point at which the wrapping arm was stopped, while pressing "**STOP" (9)** and "**ZERO" (3)** once signals that the present sequence should be terminated, and that the sequence should start again at the beginning when "**START" (8)** is pressed.
The control box is factory-programmed to cut out when the speed exceeds 27 rpm. If this programming is altered so as to increase the speed of the wrapping arm, **THE TELLEFSDAL GUARANTEE WILL NO LONGER APPLY.**

DESCRIPTION OF FUNCTIONS

Description of buttons on the control box.

On the front panel of the control box there are 8 press-buttons for the functions, an LCD display and an emergency stop button. We will go through the various functions of the display and the different buttons, and describe the different combinations that are possible. Each particular button is described in the text both in terms of its function, e.g. "START", and in terms of its position as shown in the drawing of the control box (fig. 7.1), e.g. (2).



Explanation of fig. 7-2
The display has the following elements:

a) 3 ½ digits, which means that it can display values up to 1999.

b) 3 dots/full stops, which are used to indicate different situations.

c) Plus or minus sign (+ or -).

d) Colon (:).

Fig. 7-2

7.1 LCD DISPLAY (1).

The digital display (fig. 7-2) has the following functions:

a) During normal operation indicates the number of revolutions made by the wrapping arm at any particular time.

b) If control box button **"BALES" (2)** is pressed briefly, the display indicates the number of bales that have been wrapped. This remains on the display for about 10 seconds. The display then returns to the number of revolutions made by the wrapping arm during the current wrapping sequence.

c) If the control box button **"ZERO" (3)** is pressed briefly, the display indicates the voltage supplied. If the voltage falls below 10 volts this is regarded as a break in the power supply and all functions are stopped. At the same time the display indicates the measured voltage and three dots are illuminated to show that the emergency stop* has been activated.

d) The display indicates if the wrapping arm is rotating too quickly. All the figures on the display start to flash if the speed is too high. If the rotation speed exceeds the danger limit, the arm will stop automatically and the three dots, (e), will light up. In order to start the system again, the wrapping arm's speed must first be reduced and then press **"STOP" (9)**, and then **"START" (8)**.

e) If **"EMERGENCY STOP" (10)** is pressed, or the safety guard on the wrapping arm is activated, three dots light up. When the emergency stop* is reset again, the dots are no longer illuminated.

f) A dash lights up when the control box button **"ZERO" (3)** is pressed briefly. This indicates that the operator has chosen the number of revolutions indicated on the display as the selected value for the next wrapping sequence.

g) Two dots light up when the selected value for the wrapping sequence is set to zero by pressing the control box button **"ZERO" (3)**.

7.2 "BALES" (2)

This button has the following functions:

a) ***When the machine is stopped***: Pressing the button briefly makes the display indicate the number of bales that have been wrapped, up to 1,999 bales. This remains on the display for 10 seconds.
If the "**ZERO**" (3) button is pressed while the number of bales is displayed, the counter will be returned to zero.

b) ***If additional equipment for "Rotation of bale after wrapping is completed" is fitted:*** When the button is pressed for more than 0.3 of a second, it will activate a new valve, K10, which will rotate the bale. This valve is activated together with K7. (This function is disconnected on the u01 program). When the number of bales is indicated on the display, the "bale rotation" function is disconnected.

c) ***If additional equipment for "Rotation stop" is fitted:*** The rotation of the rollers is stopped

*** Emergency stop: see chapter 2.1**

for as long as the button is pressed. This activates relay K8. (This function is disconnected on the u01 program).

d) If the "BALES" (2) and "ZERO" (3) are pressed simultaneously for about 3 seconds, all the settings are reset to the factory-programmed settings. See section 7.15 about programming.

7.3 "ZERO" (3)

Functions that are active when a machine is stopped:

a) If the button is pressed briefly after a wrapping sequence and when the number of revolutions is indicated on the display, the number of revolutions on the display will be saved and used as the **selected value** for the next wrapping sequence. When this has been saved, the minus sign (-) lights up on the display (when the button is released).

b) When the button is pressed and held in for **more than 3 seconds**, the number of bales which is indicated on the display **will be cancelled and permanently lost**. After the cancellation the colon (:) lights up on the display.

c) If interference or the random pressing of buttons has muddled up the settings that have been saved, press **"BALES" (2)** and **"ZERO" (3)** simultaneously for about 3 seconds. Then the colon (:) lights up, and the display shows 035. All settings are returned to the values programmed at the factory. See section 7.15. (Program u01 must have been selected in the first place, and the control box may have to make adjustments for the correct program version before the machine can be started.)

Functions that are active only when the machine is operating:

d) When the **"ZERO" (3)** button is pressed briefly, the voltage measured on the machine is indicated on the display until the wrapping sequence is finished or until the button is briefly pressed again. When the machine is stopped, the button indicates the number of revolutions made by the machine, as usual.

7.4 "CLOSE CUTTER" (4)

This button has the following functions:

a) The cutter is closed (Relays K2 and K7) when the button is pressed. This function is disconnected when the machine is performing a wrapping sequence.

b) When the machine is standing idle and this button is pressed simultaneously with **"OPEN CUTTER" (5)** and **"START" (8)**, the operator will be able to alter important parameters (values) which apply to the wrapping sequence. See section 7.15 which deals with this.

NOTE ! THE EMERGENCY STOP IS AUTOMATICALLY ACTIVATED IN THIS MODE. AS AN EXTRA SAFETY MEASURE "EMERGENCY STOP" (10) MAY BE PRESSED BEFORE GOING IN TO THE PROGRAMMING MODE.

7.5 "OPEN CUTTER" (5)

This button has the following functions:

a) The cutter opens (Relays K1 and K7) when the button is pressed. When the machine is performing a wrapping sequence this function is disconnected.

b) When the machine is standing idle and this button is pressed simultaneously with **"CLOSE CUTTER" (4)**, and **"START" (8)**, the operator will be able to alter important parameters (values) which apply to the wrapping sequence. See section 7.15 which deals with this.

7.6 "ROLLS IN" (6)

When the button is pressed, the distance between the rolls is reduced. This function is always active except during emergency stop. (Relays K3 and K7.)

7.7 "ROLLS OUT" (7)

When the button is pressed, the distance between the rolls is increased. This function is always active except during emergency stop. (Relays K4 and K7.)

7.8 "START" (8)

This button has the following functions:

a) When the machine is ready to wrap, the sequence is started by pressing this button briefly. If the machine has been stopped by **"EMERGENCY STOP" (10)**, the machine will not start before **"STOP" (9)** is pressed and the 3 illuminated dots disappear from the display.

b) When the machine is performing a wrapping sequence, but before it has reached the final part of the sequence, the operator can press **"START" (8)** and let the machine continue to wrap for as long as the button is pressed down. The number of extra revolutions increases by 1 each time the counter switch is passed. The number which appears on the display will be added to that of the original wrapping sequence.

c) If the **"START" (8)** button is pressed quickly a given number of times during the wrapping sequence, the display will count the number of times it has been pressed, and this number will be added to the wrapping sequence. For a number of revolutions to be added the **"START" (8)** button must be pressed before the stopping sequence has commenced. If required this new value for the number of revolutions can be stored as the new selected value by pressing the **"ZERO" (3)** button briefly when the machine has stopped.

d) If this button is pressed simultaneously with buttons **(4) and (5)** in order to start the programming sequence in the programming mode, the machine will be disabled by the emergency stop to protect against accidental start-up.

7.9 "STOP" (9)

This button has the following functions:

a) When the machine is standing idle, this button can be pressed to make the machine run at slow speed for as long as the button is pressed. (Relays K5 and K7.)

b) When the machine is performing a wrapping sequence, the machine will stop by following the normal stopping sequence when this button is pressed briefly. The stopping sequence commences the next time the counter switch is passed.

c) When the machine has been stopped by the **"EMERGENCY STOP" (10)** and the 3 dots light up on the display, **"STOP"(9)** must be pressed briefly to cancel this status before **"START" (9)** can be pressed and the wrapping sequence be started at the point at which it was stopped. If the wrapping sequence is to be terminated and a new sequence started from the beginning, **"ZERO" (3)** must be pressed before **"START" (8)** is pressed.

7.10 "EMERGENCY STOP" (10)

This button has the following functions:

a) It stops the wrapping sequence instantly, and cuts out all the power supply to the machine (via K11). Emergency stop is indicated on the display by 3 dots. An emergency stop can only cancelled by pressing **"STOP" (9)** briefly. Then the three illuminated dots disappear from the display and the machine is ready to start again in the wrapping sequence. If another function is to be used, **"ZERO" (3)** must be pressed first.

NOTE !

The Emergency Stop for the machine is activated either by button number [10] on the control box, or by the emergency stop lever on the machine (two emergency stop levers on the TWIN machines). Whichever is activated, both the processor and an independent circuit will ensure that a relay, K11, will physically interrupt all power supply to the machine. This disconnects all the functions.

*** Emergency stop: see chapter 2.1**

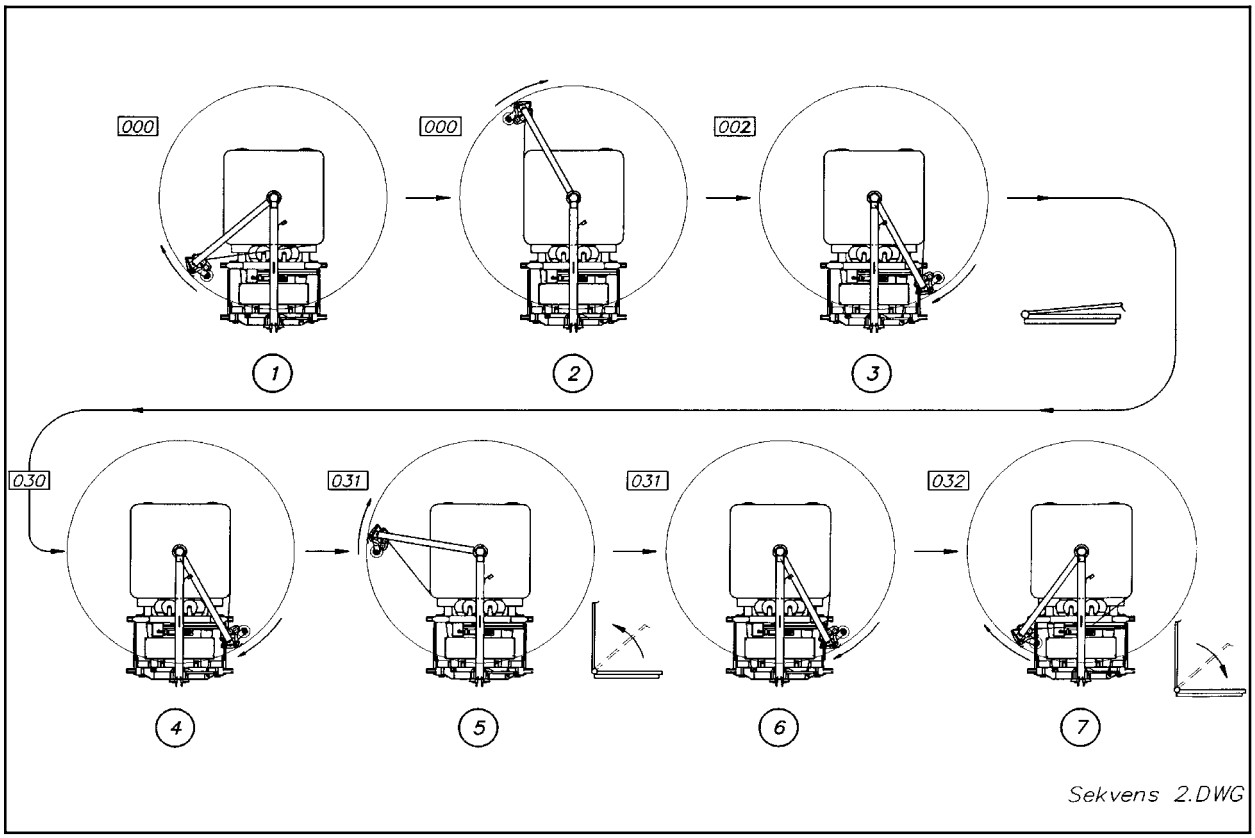


Fig. 7-3 WRAPPING SEQUENCE

7.11 WRAPPING SEQUENCE FOR THE 1510 / 1514 MACHINE

This section describes a normal wrapping sequence for the AUTO WRAP 1510/1514/TWIN. "S" is an abbreviation for wrapping sequence and the number after the S is the sequence number as illustrated in 7-3. This figure shows by means of drawings and display messages all the sequences of the wrapping process.

NOTE !

THE STATED TIMINGS ARE THE STANDARD TIMINGS PROGRAMMED IN AT THE FACTORY. THE TIMINGS IN BRACKETS SHOW THE RANGE OF ADJUSTMENTS THE USER CAN MAKE TO THESE GIVEN STANDARD TIMINGS.

The program for the 1510/1514 and TWIN machines, u02 and u03 respectively, can only be used on 1500 machines supplied during or after the 1996 season.

Wrapping sequence

S1: Press **"START" (8)**, and the machine starts at slow speed.

S2: The machine reaches full speed after approximately 3 seconds. (0.1 to 6.0 sec.)

S3: After 2 revolutions (program u01/u02) and 1 revolution for TWIN machines, (program u03) plus 0.4 sec. (0.0-0.5 sec.), **cutter up in 0.5 sec**. (0.0-1.0 sec.) is activated. When this time is completed, the cutter drops in a fixed timing of 3 seconds. The selection of number of revolutions is made automatically as above, as long as table 1 address 0:26 is not adjusted. The automatic values, 001 or 002, are stored here. If the values are altered to anything else, the new values will be used whatever machine-type of control box is being used.

S4: The machine wraps with a speed determined by the hydraulic oil flow. Every revolution is shown on the display, and the speed is calculated. During wrapping the following may occur:

Wrapping speed exceeds certain limits:

a) At a speed of over 2.7 sec. per revolution, i.e. 22 revolutions per second, the display will start to **flash on and off**.

b) At a speed of over 2.2 sec. per revolution, i.e. 27 revolutions per second, the

machine is stopped by the emergency stop function.

Voltage supplied falls below certain limits:

a) When the voltage is below 10 V the voltage is automatically shown on the display.

b) When the voltage is below 9 V the machine is stopped by the emergency stop function.

If the **"ZERO" (3)** button is pressed briefly after a sequence has started, the voltage measured on the machine is shown on the display below the rest of the wrapping sequence information. When the button is pressed again, the number of revolutions will return to the display.

S5: When the wrapping sequence has reached the programmed number of revolutions less 1, **cutter up after 0.4 seconds**, (0.0- 10.0 sec.) is activated. For TWIN machines (prog. u03) the timing is set to **1.3 sec**.

S6/S7: At the next counter pulse the programmed number of revolutions will be completed, and **the speed will be reduced to half speed within 0.25 seconds**. (0.0-10 sec.). After this has happened, **cutter down in 2 seconds** (0.0-10.0 sec.) is activated. For TWIN machines this value is set to **0.85 seconds**.

ONLY FOR TWIN MACHINES

After this the half speed valve (Relay K5) and the reverse valve (Relay K9) are activated, together with the circulation valve (Relay K7). This makes the wrapping arm turn in the opposite direction and pass the counter switch on its way back. When the switch has been passed, the arm will turn for 0.0 sec. (0.0-10.0 sec.) and then stop.

7.12 TESTING THE CONTROL BOX

This part of the description of the control box functions deals with the more technical aspects of programming and, as mentioned earlier, is intended for service technicians who need to alter any of the variable programmed values.

There is a program in the control box for the wrapping process. The program has been altered and refined so as to achieve the best possible operation and suitability for the various AUTO-WRAP machines. In the course of time these machines have had various functions added which have required alterations to the program which is stored in the control box. Table I shows a so-called parameter which indicates which program has been selected.
At the present time there are 3 different versions of the program.

For ease of reference, the first program is called **u01**, and this is intended for both 1200 and 1500 machines supplied up to and during the 1995 season.

The second program, **u02**, is for the new 1510/1514 machine **without** the TWIN function.

The third program, **u03**, is for 1510/1514 **TWIN machines**.

The program version can either be selected manually by altering the parameter in table 1, or the new test program can determine which machine is attached.

Checking functions, which automatically discover which machine is attached, are built in to the new control box DELTA CR 900-6 together with the new type of valve-operating cable, CV903-3.

The test program functions as follows:
When power is connected to the control box, the following will always take place:

a) The display lights up and indicates with **three dots** that **"EMERGENCY STOP"** is activated. This means that no functions can be started immediately. The following points require **"EMERGENCY STOP"** to be activated.

b) When **no** machine is attached, the display shows: **u01**, i.e. program u01. This is the program that is normally selected at the factory. I.e. it is for 1200 and 1500 type machines, versions up to and including 1995.

c) When a machine is **attached**, the display will show u01, until **"STOP" (9)** is pressed. Then the control box will test the contacts for the **counter-pulse** field to establish which type of machine (which type of valve-operating cable) is attached. This test is only performed when the power has been disconnected. When the test is completed, the program version is shown on the display, for example u01, u02 or u03. This remains on the display until **"START" (8)** is pressed. Then the display shows the number of revolutions that have been programmed, and when it is pressed again the machine will start the wrapping sequence.

The version which is shown on the display will be automatically saved and used for the next wrapping sequence as long as the power is not disconnected.

Before the operator presses "START" (8), he/she must make sure that the selected program is suitable for the machine that is attached.

If the version is not suitable, "START" (8) must not be pressed. Instead, press "STOP" (9) one more time. This will call up table 1, address 22, where you can enter the correct version.
If you call up table 1, address 22 accidentally, press "STOP" (9) again and the parameter table will be cleared.

NOTE !

IN ORDER FOR THE SOFTWARE IN THE CONTROL BOX TO IDENTIFY THE MACHINE TO WHICH IT IS CONNECTED AND RUN THE CORRECT PROGRAM, THE SERVICE TECHNICIANS AND END USER MUST FOLLOW THE INSTRUCTIONS FOR UPGRADING OR CHANGING MACHINES AND THEY MUST NOT MAKE THEIR OWN CONNECTIONS WHICH COULD DISRUPT OR DAMAGE THIS FACILITY.
The wrapping sequence is now completed, and the number of recorded bales will increase by 1.

*** Emergency stop: see chapter 2.1**

7.13 PROGRAM FOR THE WRAPPING PROCESS

NB! If you are not sure how to alter the variable values, contact your dealer. The machine could be quite unusable if the variable values are set too far from the recommended values.
If this should occur, it is simple to reset the normal factory-programmed values which can be used in the interim. This is done by pressing the "BALES" (2) and "ZERO" (3) buttons simultaneously for 3 seconds.

7.14 PROGRAMMING

A table is stored in the control box which shows the important parameters which are used during the wrapping sequence. (See section 7.16.)

7.15 PROGRAMMING EXAMPLE

NOTE !

Table 1 contains all the values which the operator himself/herself can alter within given limits.

To call up the table, the following combination of buttons must be pressed simultaneously: **"CLOSE CUTTER" (4)**, **"OPEN CUTTER" (5)** and **"START" (8)**. The normal functions for the control box buttons will now be disconnected, and the buttons can only be used for altering the parameters which are stored in the table.
When in programming mode the control box is set to **Emergency stop** to ensure that no functions can be accidentally started.

When the button-combination has been pressed, and everything is ready for altering the values, the display will indicate **0:00 or 2:56.**

A colon signifies that the address is being shown for the current parameter (here the address means the line in the table). The address is altered by pressing **"CLOSE CUTTER" (4)** to reduce the value, while **"OPEN CUTTER" (5)** increases the value.

Press **"START" (8)** to show the value for the selected address. The colon sign disappears and the display now shows the values of the selected address. To alter the value, press **"OPEN CUTTER" (5)** to increase it, and **"CLOSE CUTTER" (4)** to reduce it. To store the value, press **"START" (8)** again. At the same time the display will return and show the address.

Buttons **(4)** and **(5)** may now be used to go to new addresses.

When you wish to leave the programming level, press **"STOP" (9)** when the page number, i.e. the colon, is displayed, and then the control box is ready for use with the new values stored.

REMEMBER!

If you wish to program in all the default values, i.e. those set at the factory, the control box should be in the normal operating mode without a wrapping sequence being performed, and the "BALES" (2) and "ZERO" (3) buttons should be pressed simultaneously and held in for 3 seconds. Then all the values will be reset to the standard values as programmed in at the factory.

7.16 TABLE 1.

The particular addresses and data which can be altered are listed in the table below.
(Addresses with an asterisk (*) can be updated by "reset").

NOTE !

The stated timings are the standard timings programmed in at the factory. The timings in brackets show the range of adjustments the user can make to these given standard timings.

Adr-esse	Normal value		User values	Range of adjustments	Commentary
	1510/14	TWIN			
* 0:05	**085**	**085**			
* 0:06	**238**	**238**			Constant, do not alter.
0:07	**000**	**000**		No. of bales, lsb	Constant, do not alter.
0:08	**000**	**000**		No. of bales, mid digit	Read only.
0:09	**000**	**000**		No. of bales, msb	Read only.
0:10	**XXX**	**XXX**		No. of bales, lsb	Read only.
0:11	**XXX**	**XXX**		No. of bales, mid byte	Total counter, read only.
0:12	**XXX**	**XXX**		No. of bales, msb	Total counter, read only.
* 0:13	**070**	**070**		Constant	Max. No. of revolutions in one wrapping sequence.
* 0:14	**005**	**005**		000-010, where 005=0,5sec.	Time for cutter up at film release.
* 0:15	**030**	**030**		001-060, where 030=3,0 sec.	Time from start to full speed.
* 0:16	**004**	**004**		000-050, where 004=0,4 sec.	Time after revolution pulse until cutter lifts up.
* 0:17	**030**	**030**		001-100,where 030=3,0 sec.	Time for cutter lifting up.
* 0:18	**025**	**085-100**		000-100, where 025=0,25sec.	Time from full speed to stop.
* 0:19	**020**	**020**		000-100,where 020=2,0 sec.	Time for cutter lowering at stop.
* 0:20	**120**	**120**		Constant	Max. Time for one revolution. (In addition to address 0:15)
* 0:21	**035**	**035**		0-70	No. of revolutions in wrapping sequence.
* 0:22	**002**	**003**		001-005 (001=u01, 002=u02, 003=u03)	Program selection.
* 0:23	**003**	**003**		001-010, where 003=0,3 sec.	Time delay for “bale rotation”. (Additional equipment).
* 0:24	(000)	**000**		000-100, where 000=0,0 sec.	Reverse time after switch is activated (TWIN).
* 0:25	(013)	**020**		000-050, where 013=1,3 sec.	Time between revolution pulse and cutter lifting up (TWIN).
* 0:26	**002**	(002)		001-009 (standard: u01=u02=2)	No. of revolutions before the cutter releases the film.
* 0:27	(001)	**001**		001-009 (standard: u03=1)	No. of revolutions before the cutter releases the film (TWIN).

*** Emergency stop: see chapter 2.1**