Missouri Dairy Growth Council's

Dairy Cattle Reproductive Manual

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Extension
University of Missouri

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Commercial Agriculture Program

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Chapter 1

Introduction

What is a cow's job? Think of her as your employee. You provide her with housing, food & water, health benefits, etc. In return she comes to the parlor 2-3 times per day to be milked. During her time in the parlor she "works" for approximately 15 minutes. You provide for her needs and in return she "works" for 30 to 45 minutes a day. Her work is to produce high quality milk.

How does she produce high quality milk? Initially, a heifer must have a calf. At the end of gestation there is an increase in prolactin and uterine lactogenic hormones that stimulate mammary development. In subsequent years the process is repeated with each pregnancy. So, the cows must become pregnant to stimulate mammary development.

Similarly, we know that the most productive time of the lactation is during peak milk. That period occurs sometime between 30-150 days in milk (DIM). The more time a cows spends during this part of her lactation during her lifetime, the more profit she will generate. The dairyman needs to maximize this time.

Therefore, to maximize profit, cows need to become pregnant on a regular basis. To accomplish getting a cow pregnant on a consistent basis, the reproductive program of a farm needs to be a high priority. The reproductive program must also be relatively easy to implement. In this booklet you will find a practical way to improve your herd.

Improvement can be measured in a variety of ways, including days open, days to first service, calving interval, etc. However, a relatively new way of examining a herd's reproductive performance includes HEAT DETECTION RATE (HDR) and PREGNANCY RATE (PR). National average, from various databases, for HDR and PR are 35% and 14%, respectively. Herds that are in the top 10% for these parameters will have rates of greater than 60% and 20%. From experience, herds that attain greater than 20% pregnancy rates will ultimately have excess heifers waiting to come into the herd! It creates a new area on the farm to generate more profit.

Let's say there is pen with 100 cows in it and today they are all 60 days in milk (DIM). The farm has decided on 60 DIM as their voluntary waiting period, so all 100 cows are eligible to be bred. Over the next 21 days 35 of the 100 cows are bred. Therefore, the HDR is 35/100 or 35%. Subsequently, 14 of the 35 cows that were bred become pregnant. Now, 14/35 or 40% is the conception rate. However, for pregnancy rate you want to divide 14 by the 100 eligible cows or 14%.

The definition of HDR and PR follows:

HDR = # of cows bred / # of cows eligible to be bred for each 21 day period during a year

PR = # of cows pregnant / # of cows eligible to become pregnant for each 21 day period during a year

Thus, actually PR incorporates HDR and conception rate. PR equals HDR times conception rate. If you do not have a software program that figures PR for you, you can use your DHI reports. It will give you the % of heat observed (equivalent to HDR). You then can multiply this by your conception rate and get a crude estimate of PR.

There have been several articles discussing the decline of fertility in dairy cattle. This especially pertains to the lactating cow. There are several reasons for this decline, including inbreeding, increased production, time management on the farm, nutrition, etc. We do know that as a cow increases her production, two effects on her estrus expression occur. Those two effects are a decreased time in estrus and a decreased intensity of estrus expression. A cow producing 100# of milk will only spend approximately 6 hours in heat rather than the usual 18 hours (more typical of a beef cow) that we have learned. On top of that, she will make far fewer mounts than a lower producing cow. All this leads to a more difficult time for the producer to find the cow in heat.

However, the conception rate among heifers has not declined to near the extent that it has in the milking herd. So there is potential to reverse this trend of poor fertility. There has been increased emphasis on sire selection for increased fertility using daughter pregnancy rate (DPR) and services per conception (SCR). Along the same lines crossbreeding has gained some favor among producers. It is well known that the beef crossbred cows tend to be more fertile than a straightbred. There is now data indicating the same in dairy cattle. Also, the use of estrus synchronization has allowed producers to get more cows pregnant and subsequently start to put some selection pressure on fertility within their herds.

The increase in the number of pregnant cows leads to the opportunity to do more voluntary culling and/or selling of excess breeding stock. There are several ways to economically evaluate better reproduction. An increase in days open can be valued at between $0.50-4.50 per day, a pregnant cow is worth $250 to 600 more than an open cow, or each % point increase in PR is equal to roughly $35 per cow. This last estimate is the basis for the reproductive calculator that is included with this booklet.

Unfortunately, no one is going to give you a bonus check for being successful in getting cows pregnant. However, with time and patience, the increase in the number of pregnant cows will allow the producer to voluntarily get rid of low producers, chronic problem cows, high somatic cell count cows, and poor fertility animals. Likewise, producers that are attaining success with their reproductive programs are now able to merchandise excess bred heifers, which is a great addition to the cash flow of the farm.

Chapter 2
Economics of Reproduction

Five ways to "Find 80 cents a Cow each day"
Mike Hutjens

- Boost Components
- Long Day Lighting
- **Fewer Days Open**
- **Higher Pregnancy Rates**
- Extra Milking

2 out of 5 suggestions pertain to Reproduction

What is the added value of a Pregnancy?

- **A pregnancy is worth $200-500**

What is the cost of an extra day open?

- **$0.42 to $4.95 a day for a day open after 110 DIM.**

For examples let's use:

$2.50/day

What is your average Days Open?

- 336 Herds on DHIA in Missouri
- Average 184 days open
- Range from 84 to 358 days open
- National Average 165.8

What is your average Days Open?

- 184-165=19

- **$47.5 lost due to excessive days open per cow in the herd vs national average**

What is the cost of poor reproduction?

- $35 per cow in the herd for each % point increase in **Pregnancy Rate**

What is Pregnancy Rate?

- 100 cows

How many were bred?

- **33** cows (heat detection rate)
  - Or more importantly
- **67 cows were not bred!**

How many will become pregnant?

- 12
- Therefore
- The Preg rate is

12%

What is Pregnancy Rate?

- 100 cows
- 33 cows bred
- 33/100= 33%, Heat Detection Rate
- 12 diagnosed pregnant
- 12/100= **12%** Pregnancy Rate

- These are Missouri averages!

What is your Pregnancy Rate

- 336 Herds on DHIA in Missouri
- 12.2 annualized average Pregnancy Rate
- National Average 15.1

What is your Pregnancy Rate

- Average herd in Missouri 110 cows
- Increasing Pregnancy rate from 12.2 to 15.1 yields:

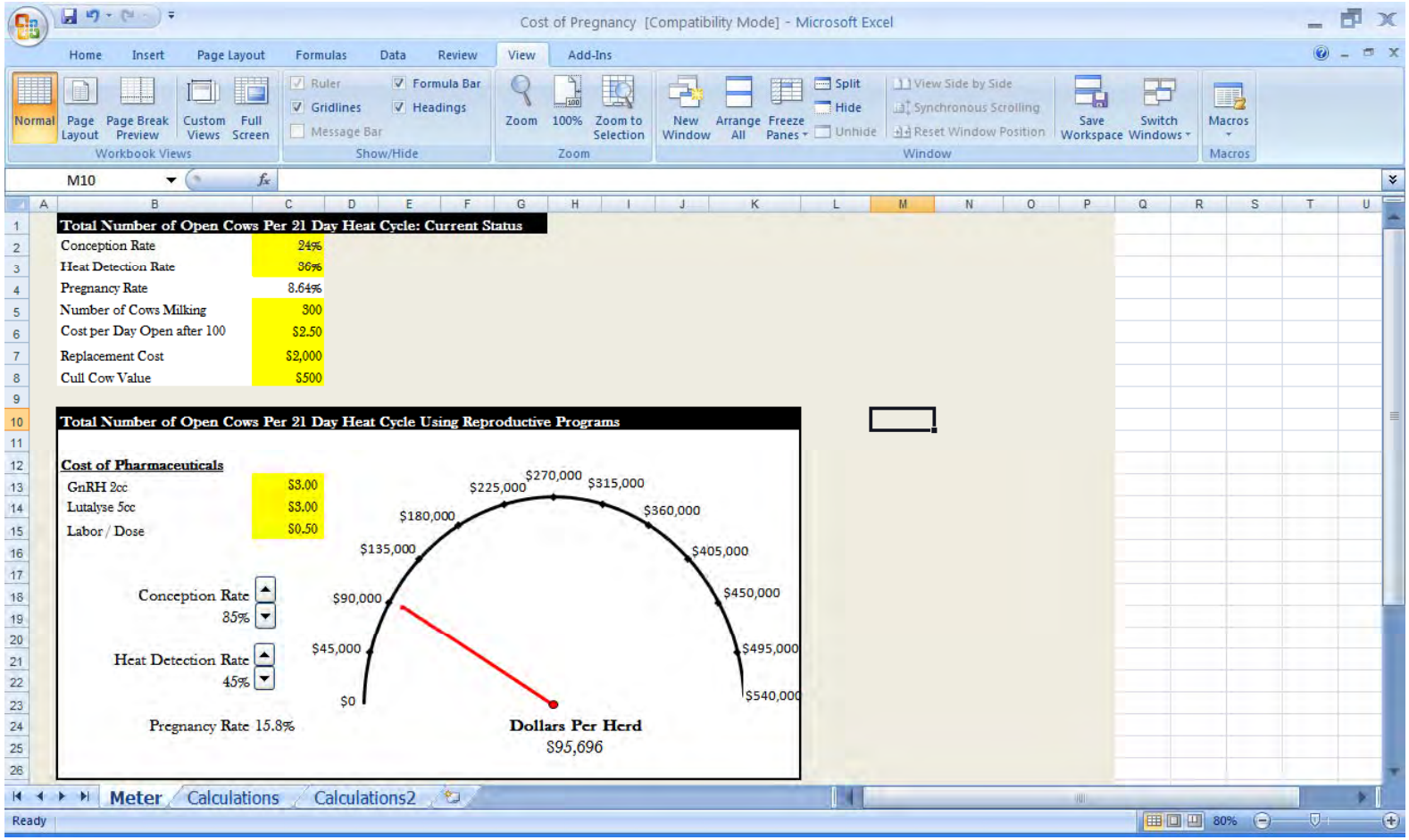
- $**95.40** per cow in the herd

Using the Reproduction Economics Spreadsheet

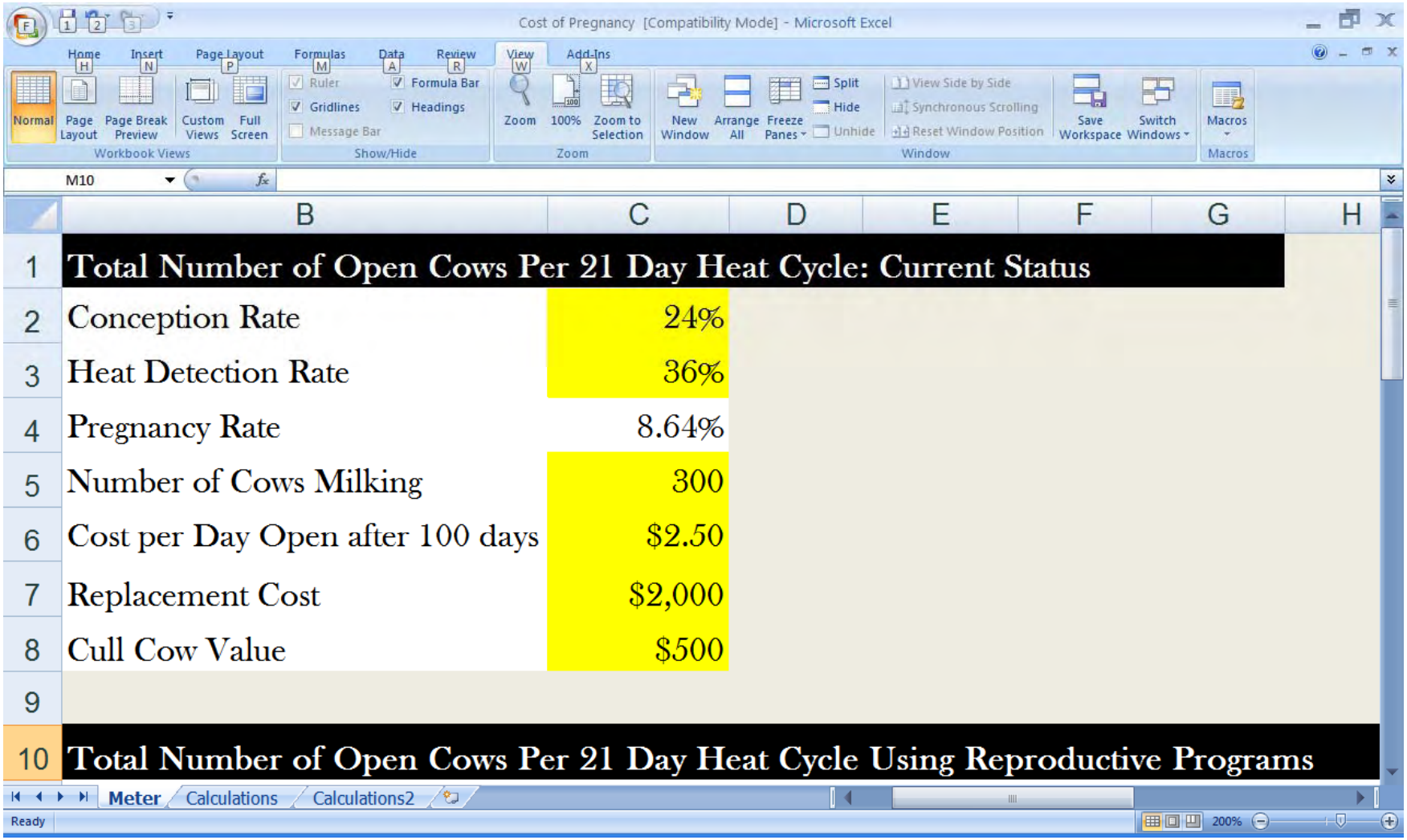
- Go to the following website to use the spreadsheet:

http://agebb.missouri.edu/dairy/reproduction/

Using the Reproduction Economics Spreadsheet



Put in your herd's numbers (yellow boxes)

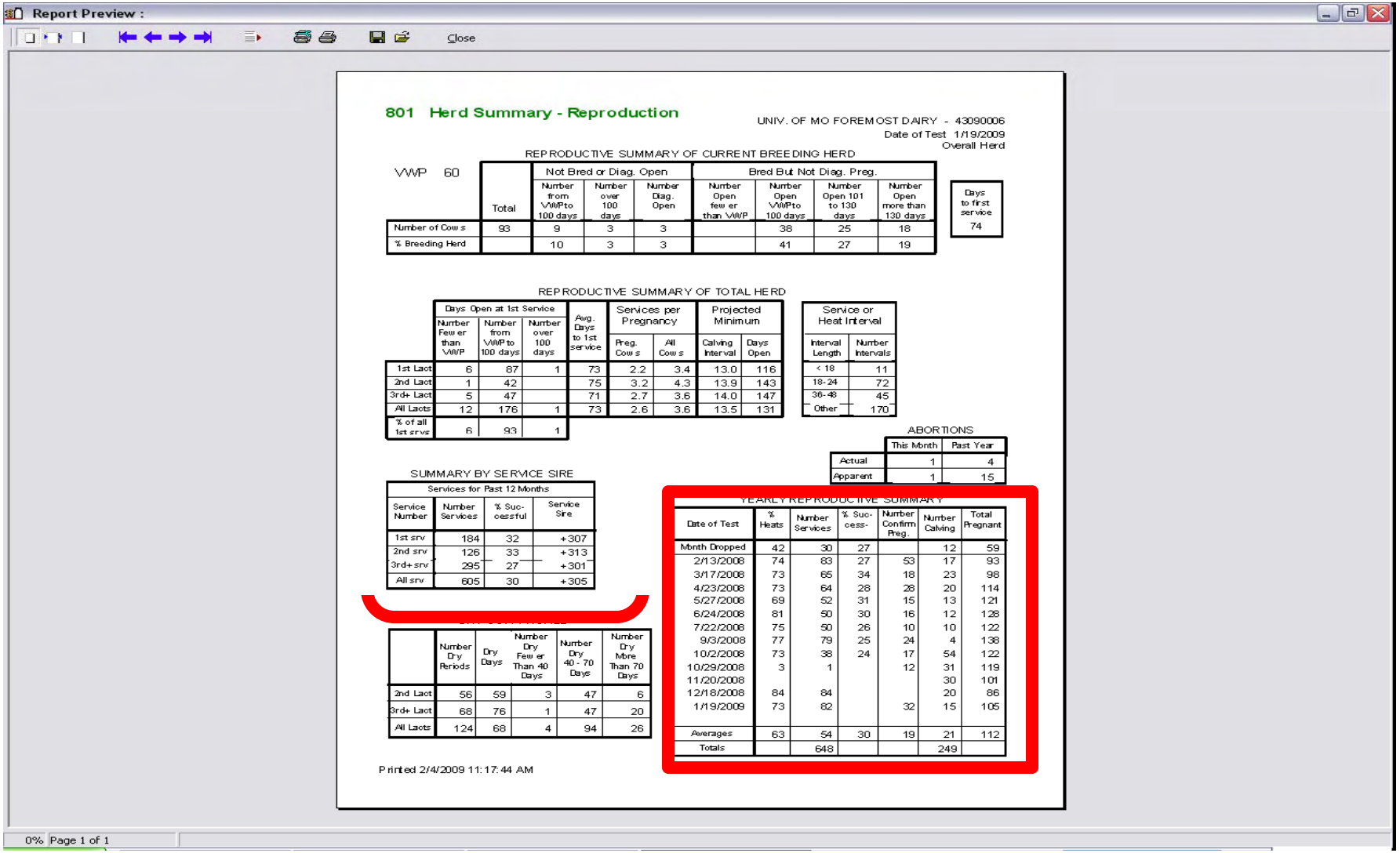


	B	C
1	**Total Number of Open Cows Per 21 Day Heat Cycle: Current Status**	
2	Conception Rate	24%
3	Heat Detection Rate	36%
4	Pregnancy Rate	8.64%
5	Number of Cows Milking	300
6	Cost per Day Open after 100 days	$2.50
7	Replacement Cost	$2,000
8	Cull Cow Value	$500
9		
10	**Total Number of Open Cows Per 21 Day Heat Cycle Using Reproductive Programs**	

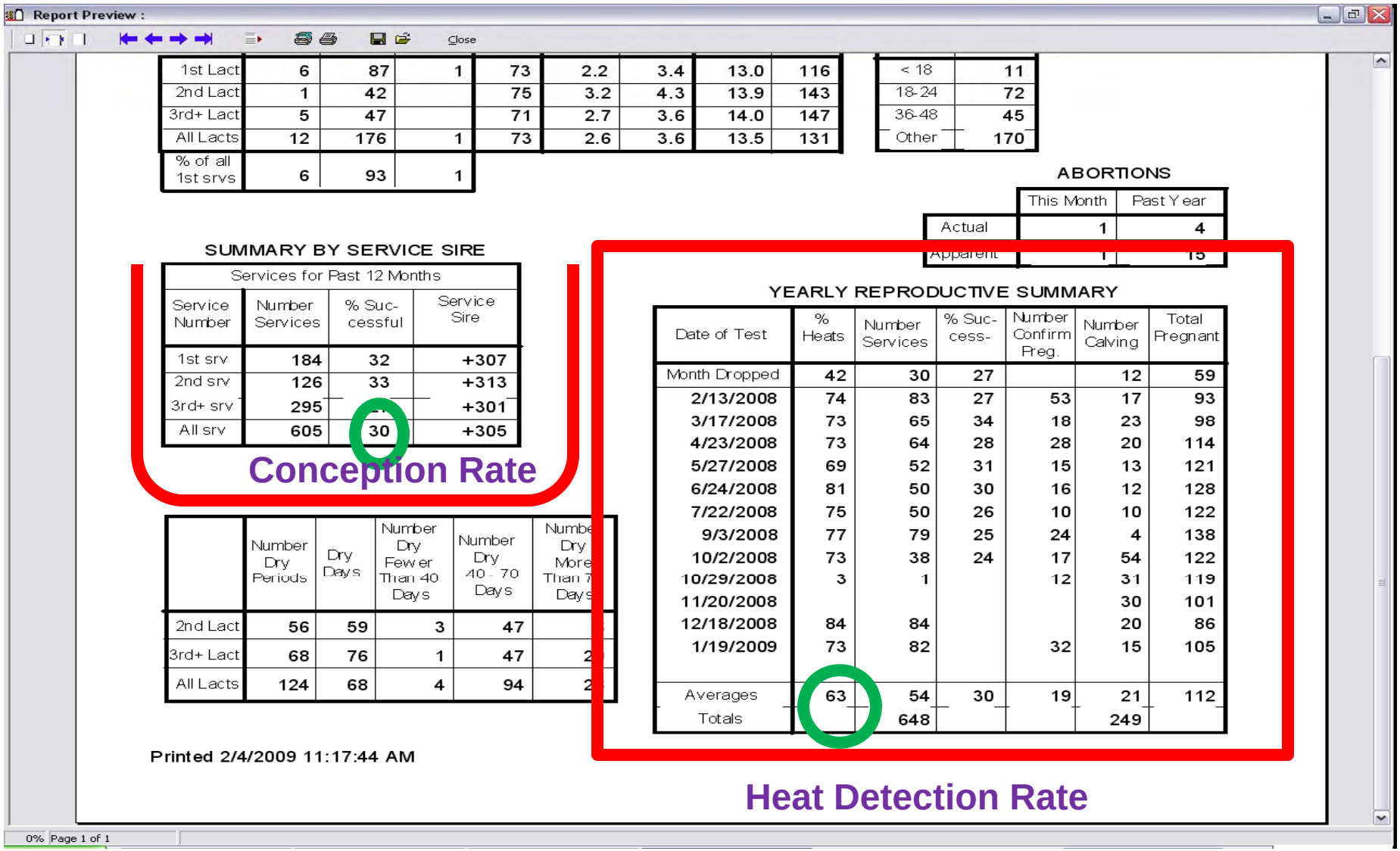
Where do you find your conception rate (CR) and heat detection rate (HDR)?

- For PC Dart users:
- Report 801
- For DHI only users:
- Report 202

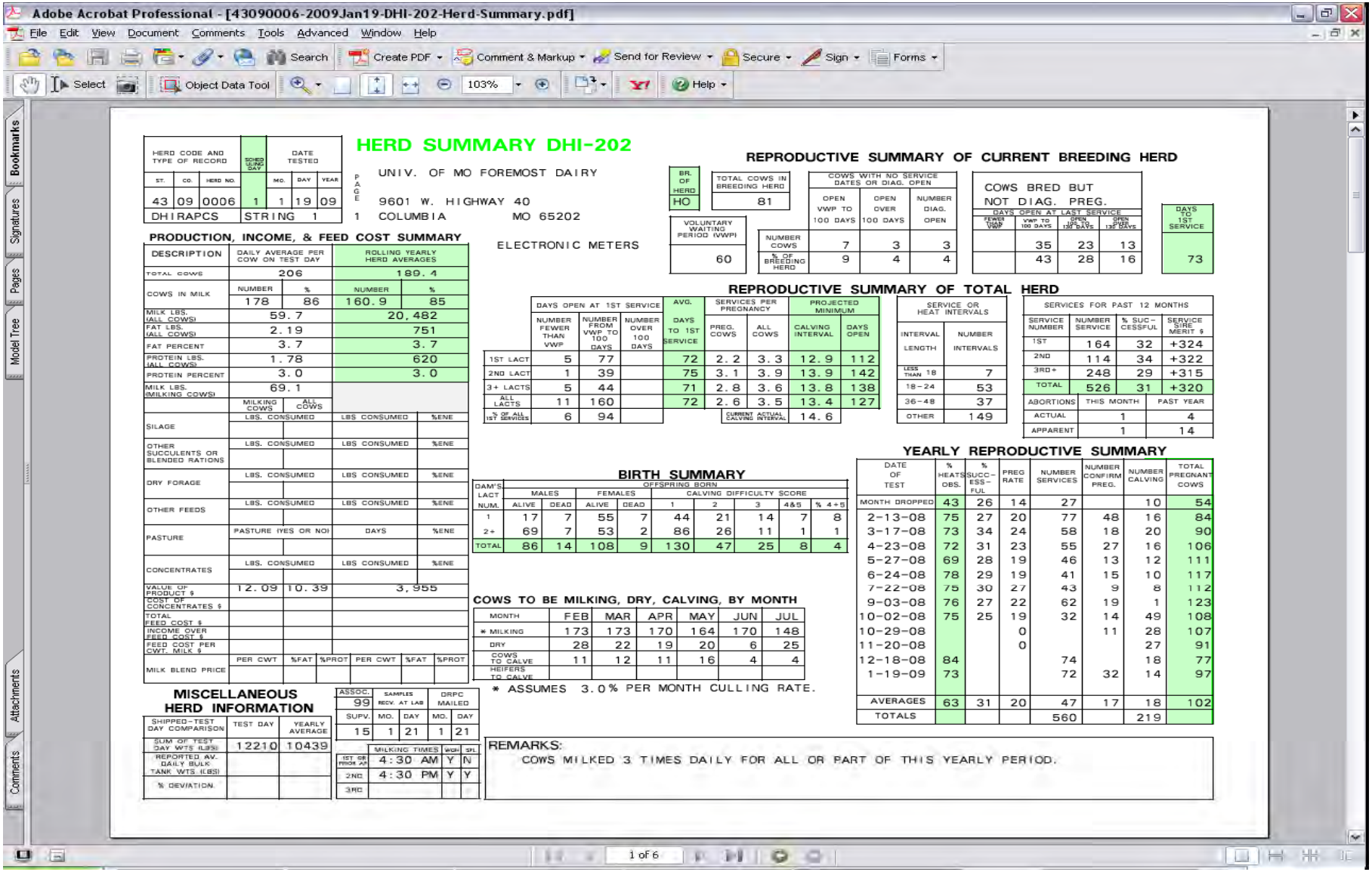
PC Dart Report 801



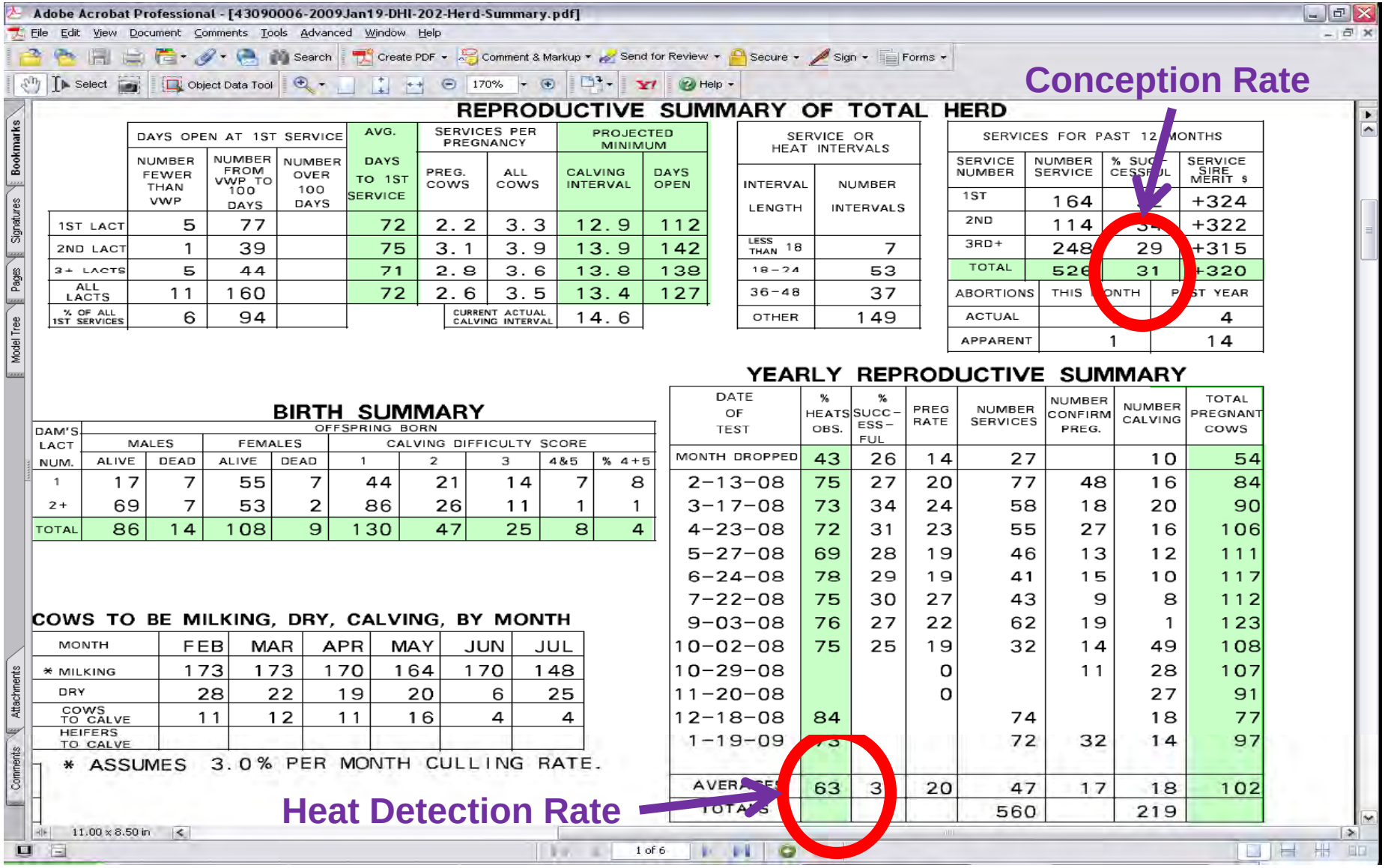
PC Dart Report 801



DHI Report 202



DHI Report 202



REPRODUCTIVE SUMMARY OF TOTAL HERD

	DAYS OPEN AT 1ST SERVICE			AVG.	SERVICES PER PREGNANCY		PROJECTED MINIMUM	
	NUMBER FEWER THAN VWP	NUMBER FROM VWP TO 100 DAYS	NUMBER OVER 100 DAYS	DAYS TO 1ST SERVICE	PREG. COWS	ALL COWS	CALVING INTERVAL	DAYS OPEN
1ST LACT	5	77		72	2.2	3.3	12.9	112
2ND LACT	1	39		75	3.1	3.9	13.9	142
3+ LACTS	5	44		71	2.8	3.6	13.8	138
ALL LACTS	11	160		72	2.6	3.5	13.4	127
% OF ALL 1ST SERVICES	6	94				CURRENT ACTUAL CALVING INTERVAL	14.6	

SERVICE OR HEAT INTERVALS	
INTERVAL LENGTH	NUMBER INTERVALS
LESS THAN 18	7
18-24	53
36-48	37
OTHER	149

SERVICES FOR PAST 12 MONTHS			
SERVICE NUMBER	NUMBER SERVICE	% SUCCESSFUL	SERVICE SIRE MERIT $
1ST	164		+324
2ND	114		+322
3RD+	248	29	+315
TOTAL	526	31	+320

ABORTIONS	THIS MONTH	PAST YEAR
ACTUAL		4
APPARENT	1	14

BIRTH SUMMARY

DAM'S LACT NUM.	OFFSPRING BORN								
	MALES		FEMALES		CALVING DIFFICULTY SCORE				
	ALIVE	DEAD	ALIVE	DEAD	1	2	3	4&5	% 4+5
1	17	7	55	7	44	21	14	7	8
2+	69	7	53	2	86	26	11	1	1
TOTAL	86	14	108	9	130	47	25	8	4

YEARLY REPRODUCTIVE SUMMARY

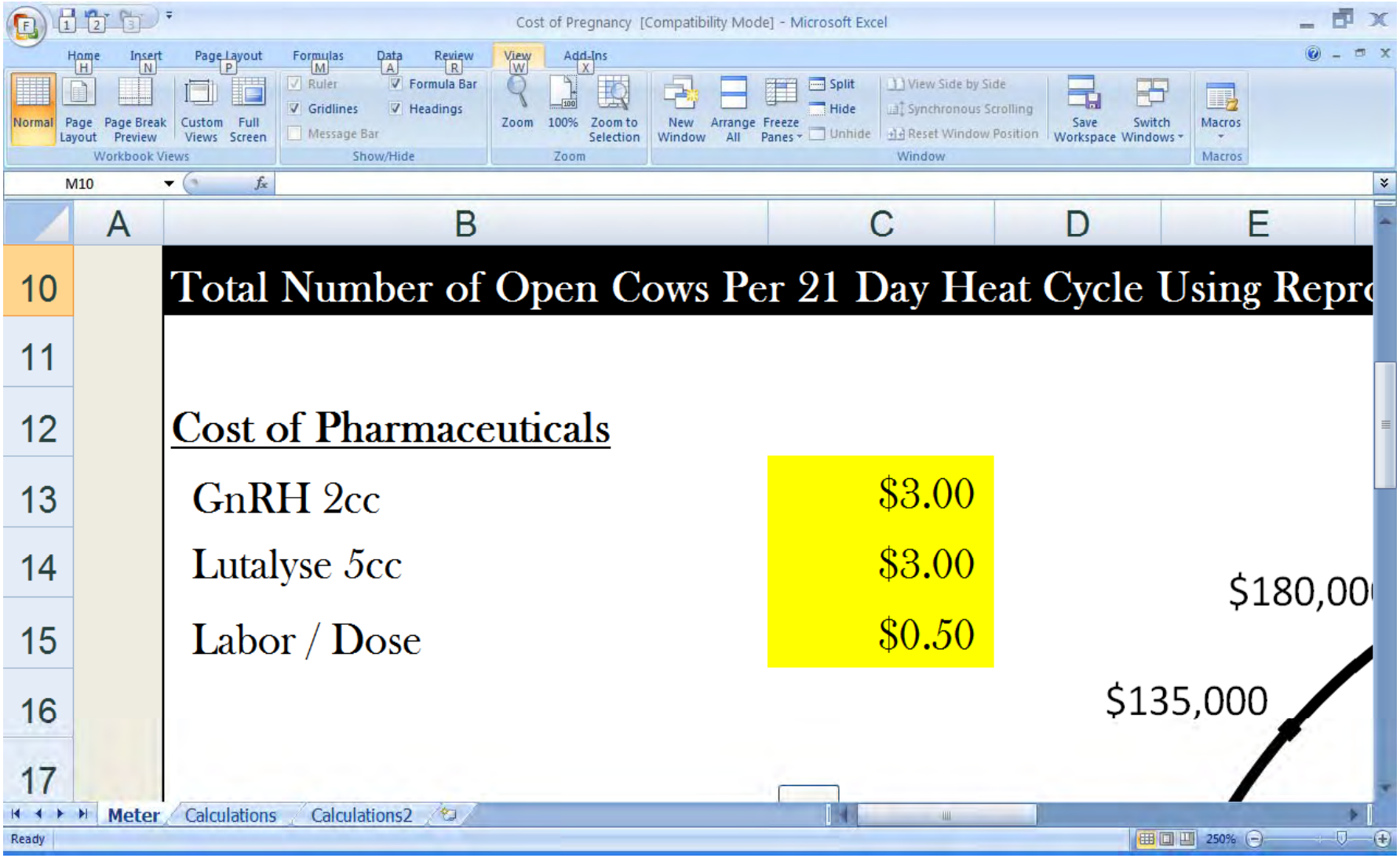
DATE OF TEST	% HEATS OBS.	% SUCC-ESS-FUL	PREG RATE	NUMBER SERVICES	NUMBER CONFIRM PREG.	NUMBER CALVING	TOTAL PREGNANT COWS
MONTH DROPPED	43	26	14	27		10	54
2-13-08	75	27	20	77	48	16	84
3-17-08	73	34	24	58	18	20	90
4-23-08	72	31	23	55	27	16	106
5-27-08	69	28	19	46	13	12	111
6-24-08	78	29	19	41	15	10	117
7-22-08	75	30	27	43	9	8	112
9-03-08	76	27	22	62	19	1	123
10-02-08	75	25	19	32	14	49	108
10-29-08			0		11	28	107
11-20-08			0			27	91
12-18-08	84			74		18	77
1-19-09	[illegible]			72	32	14	97
AVERAGES	63	3	20	47	17	18	102
TOTALS				560		219	

COWS TO BE MILKING, DRY, CALVING, BY MONTH

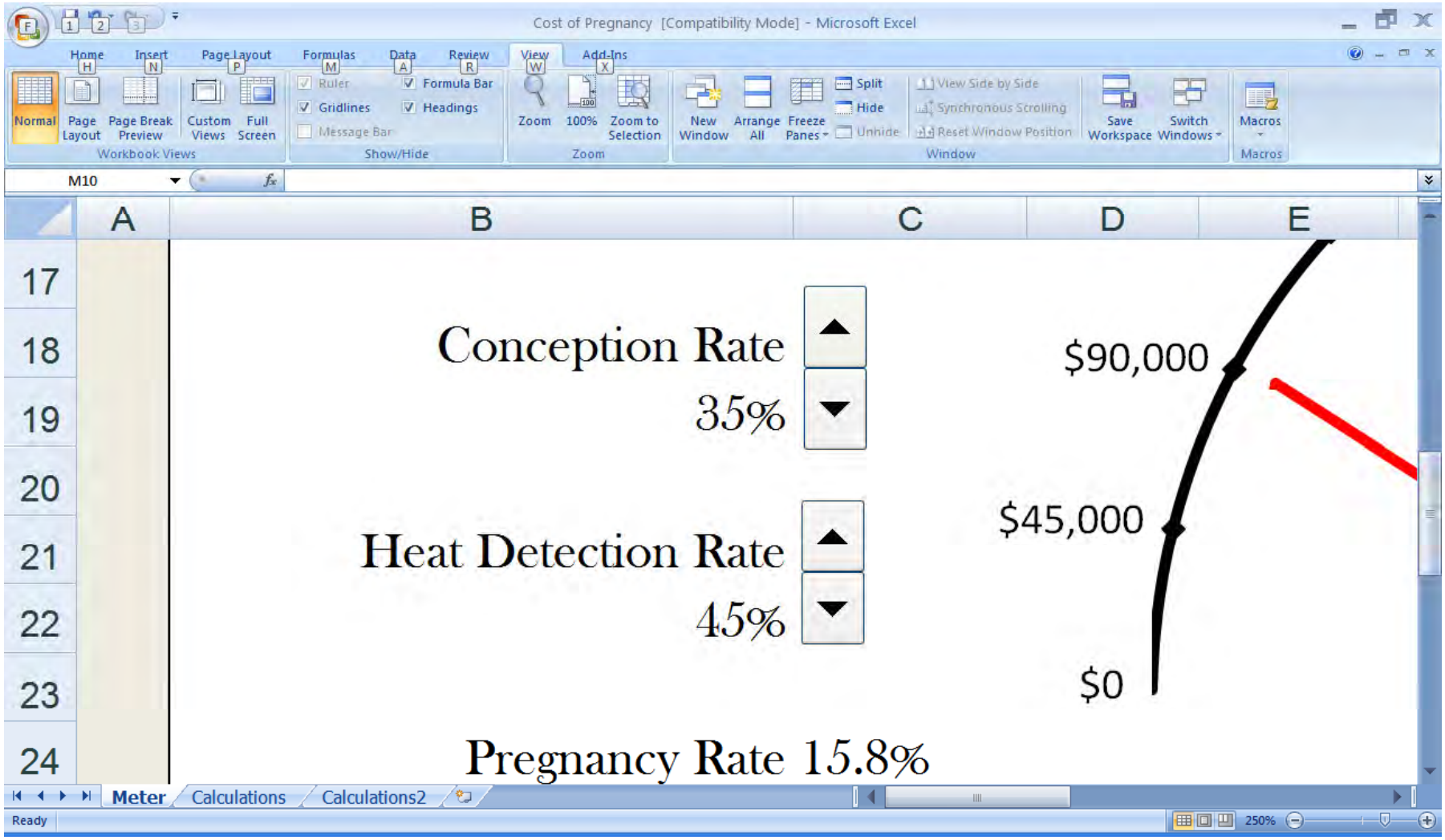
MONTH	FEB	MAR	APR	MAY	JUN	JUL
* MILKING	173	173	170	164	170	148
DRY	28	22	19	20	6	25
COWS TO CALVE	11	12	11	16	4	4
HEIFERS TO CALVE						

* ASSUMES 3.0% PER MONTH CULLING RATE.

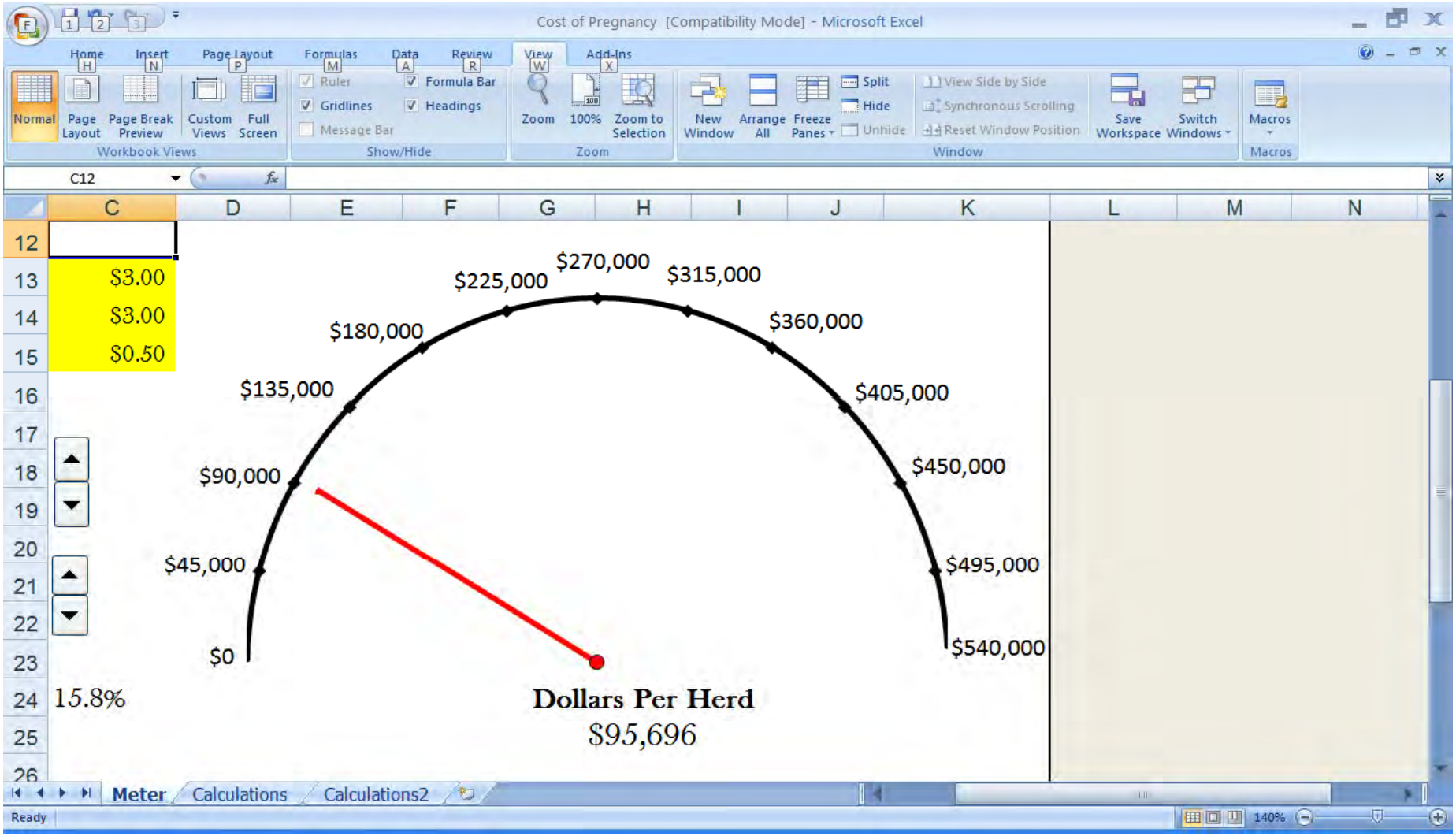
Fill in the cost of the medications and labor



Now change Conception Rate
and
Heat Detection Rate



Observe the change in $/**herd**



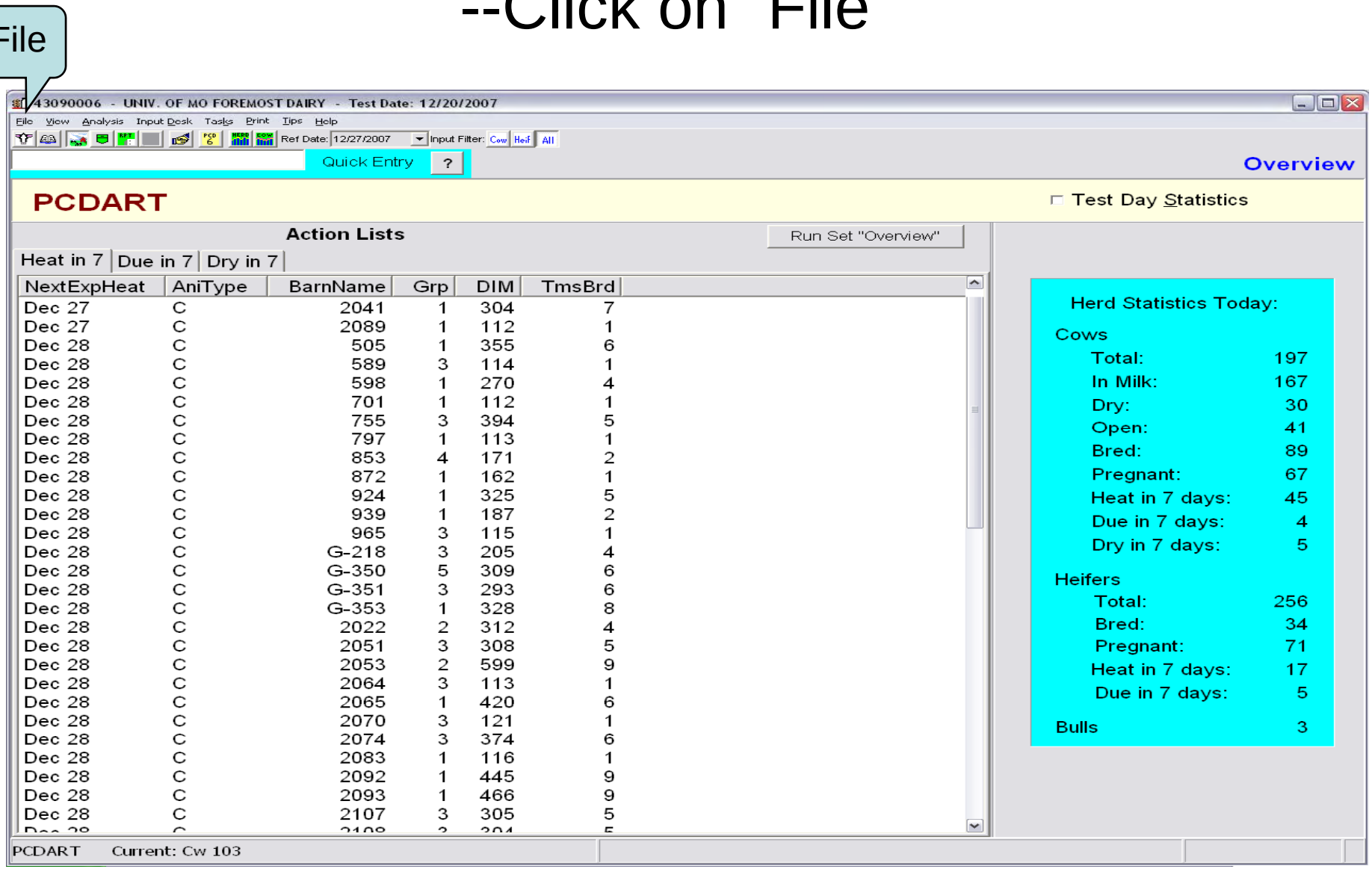
Chapter 3
Creating Presynch/Ovsynch Program in PC Dart

Instructions

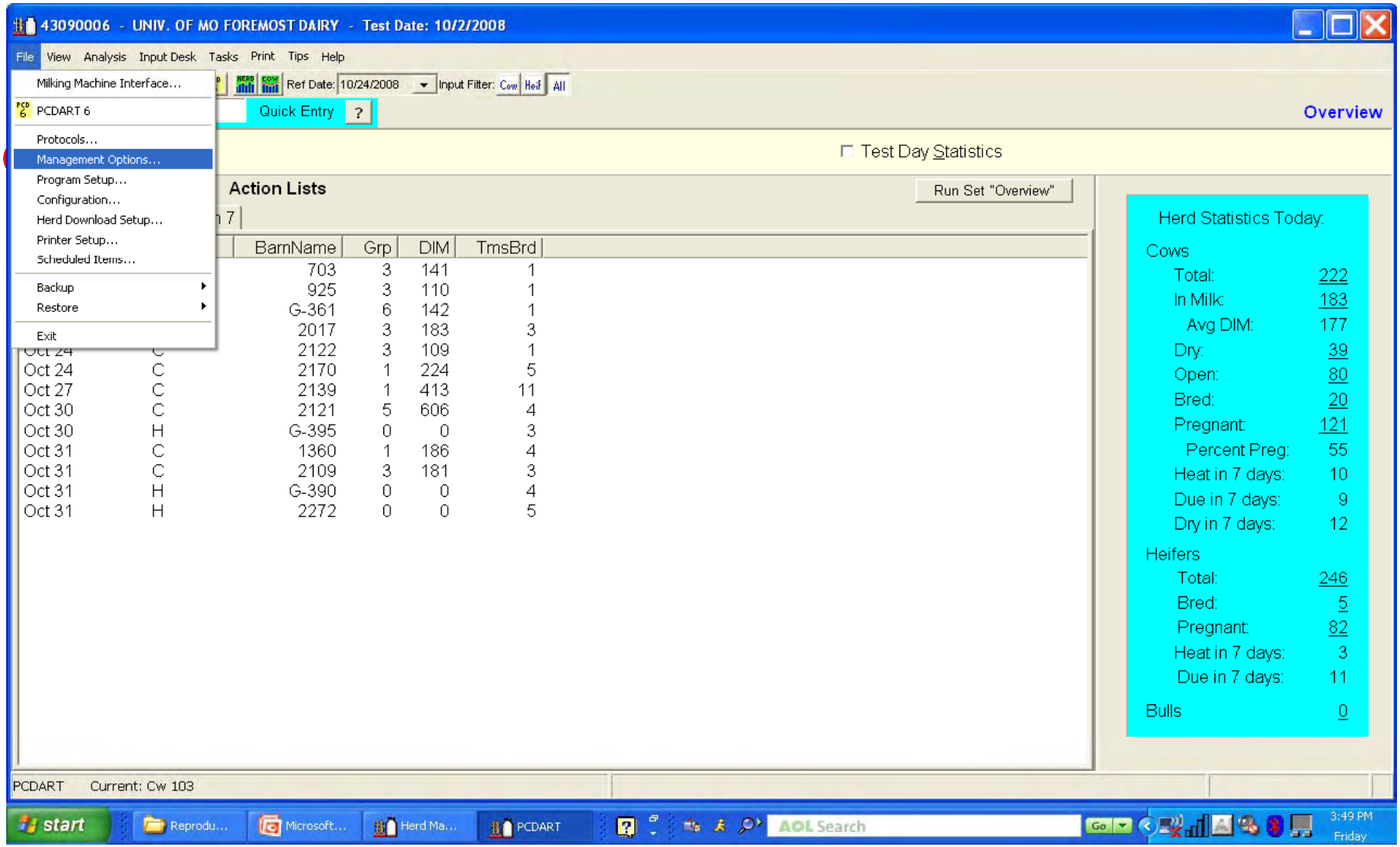
- The following slides will lead you through

Presynch/Ovsynch

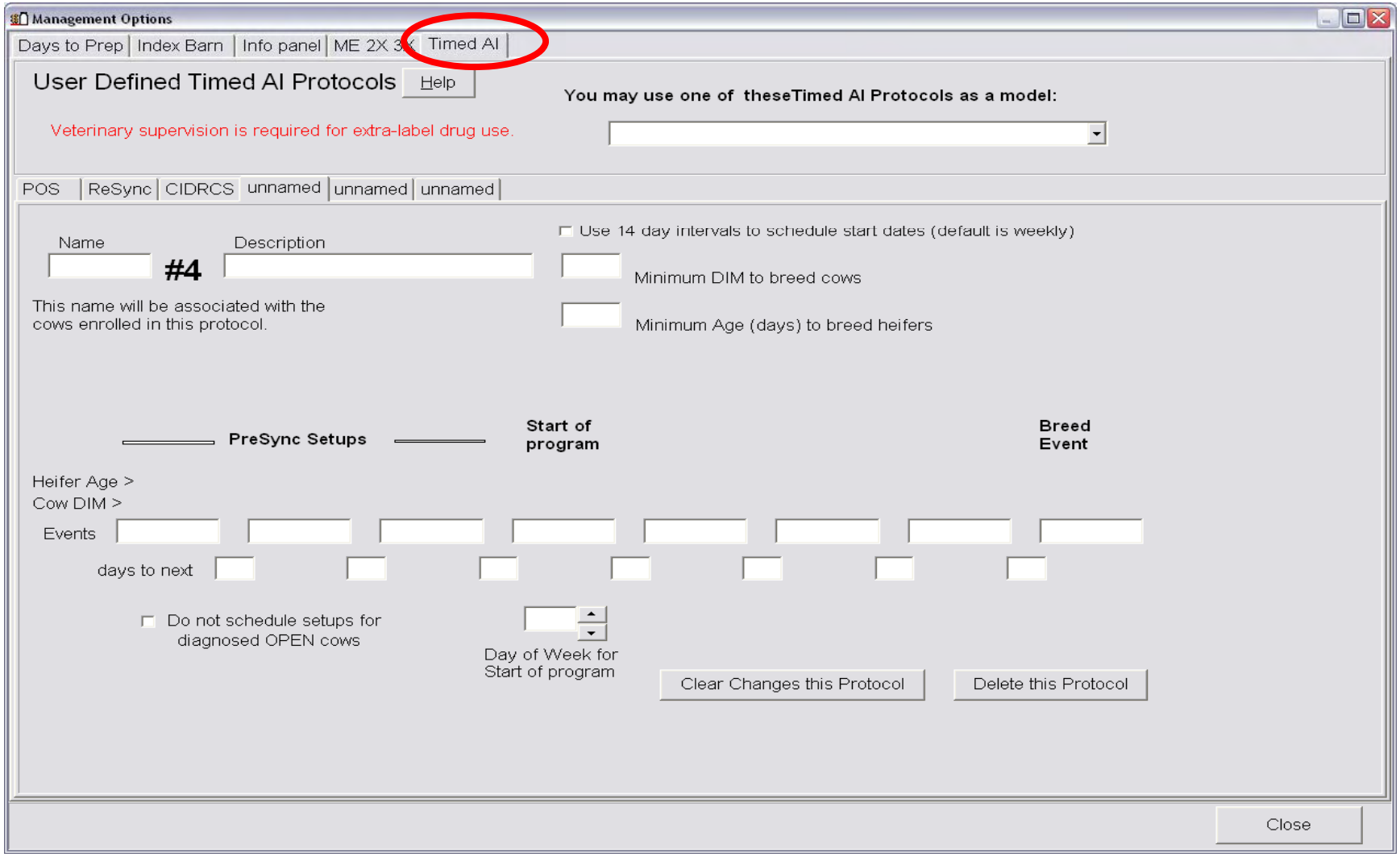
--Click on “File”



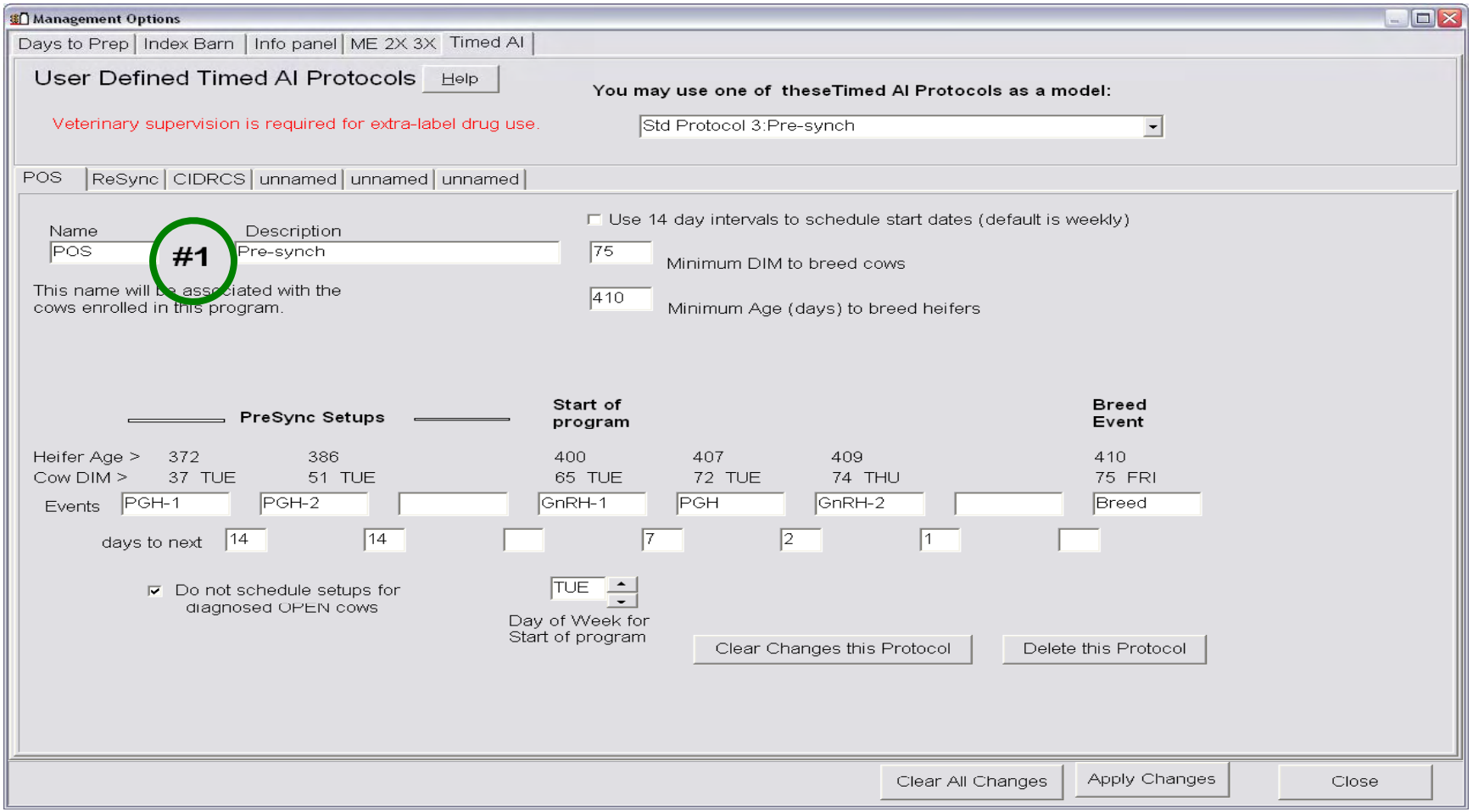
Choose “Management Options”



--Select “Timed AI”

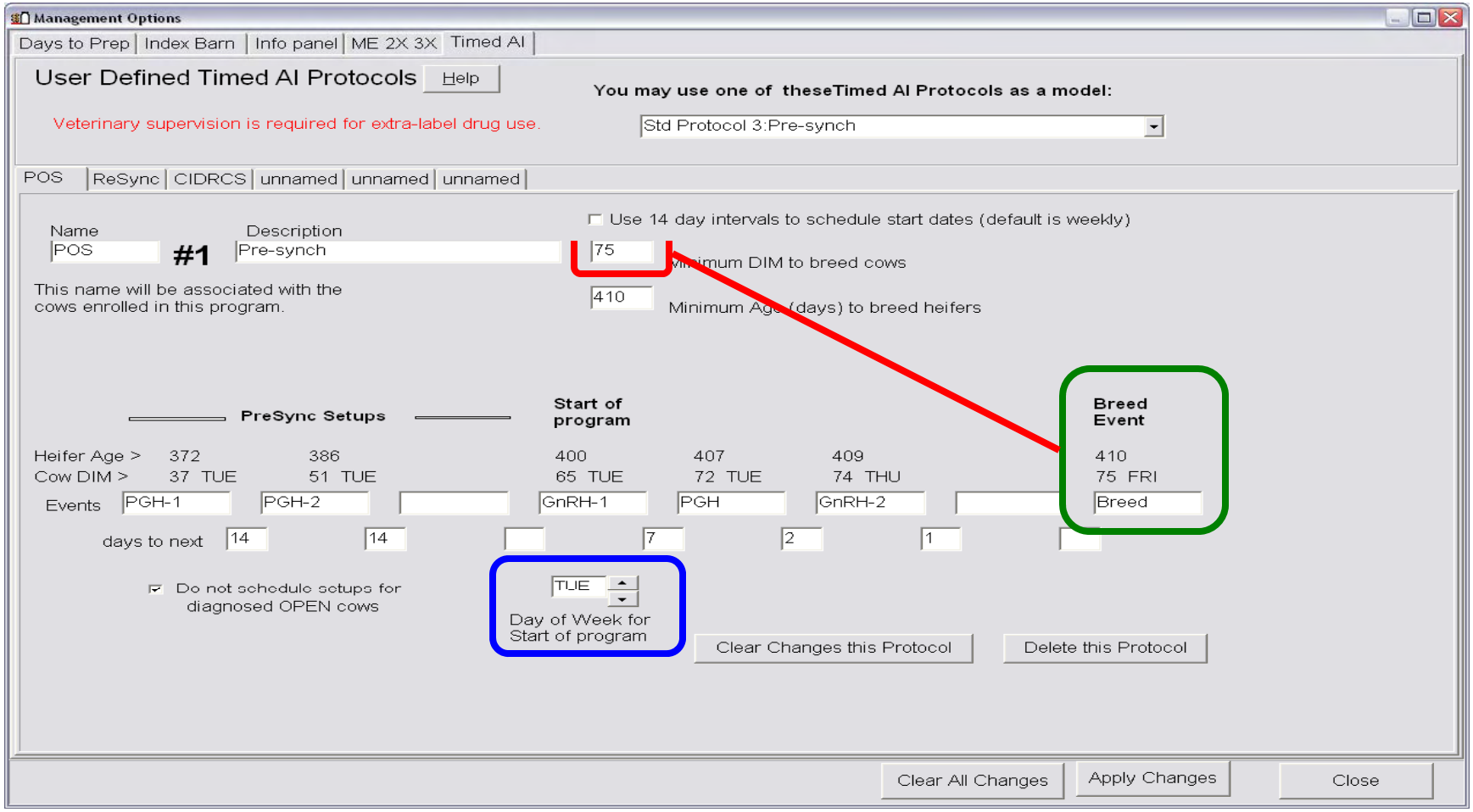


--Name Protocol from drop down menu and at #1

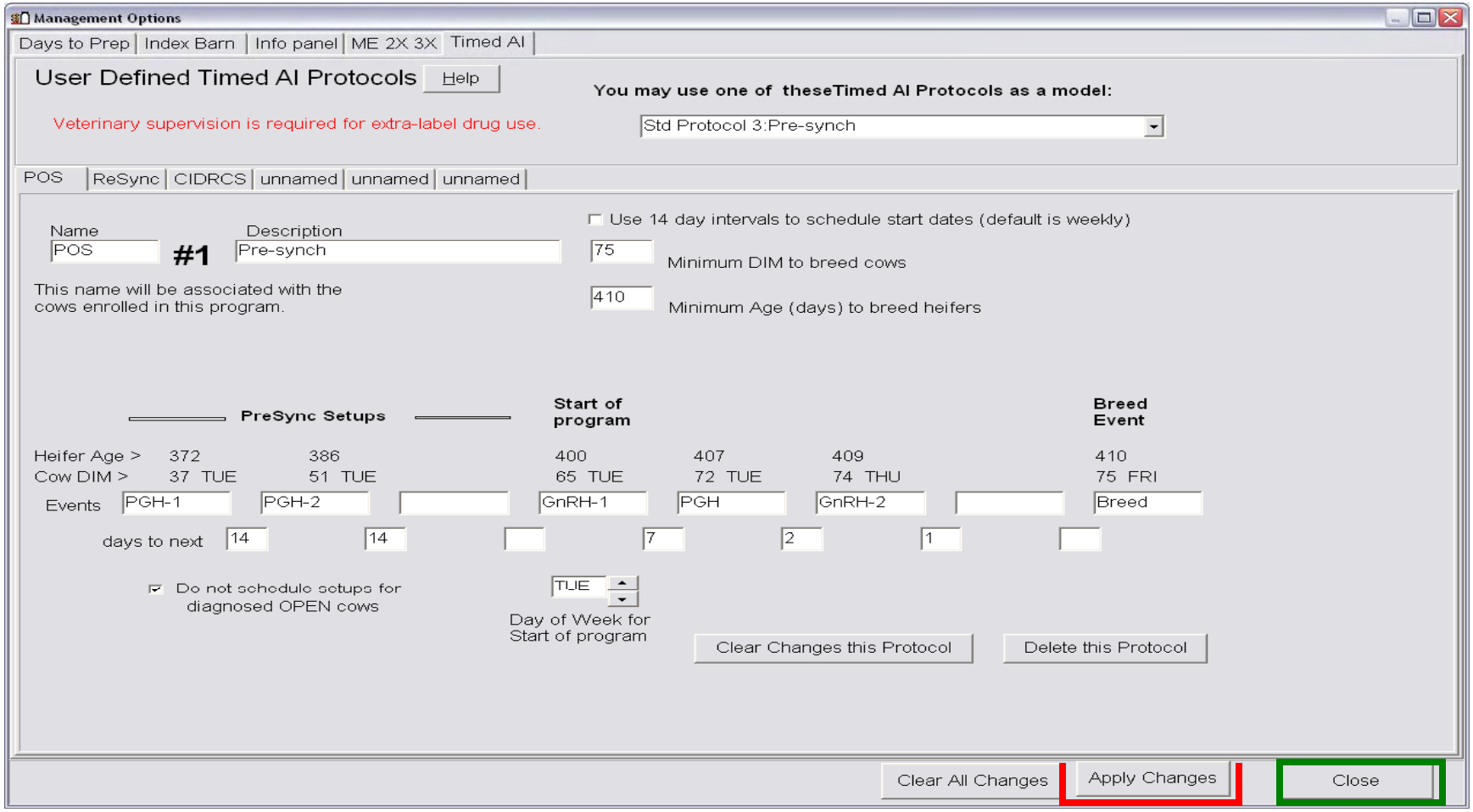


--Select “Minimum DIM to breed cows” (for breed event)

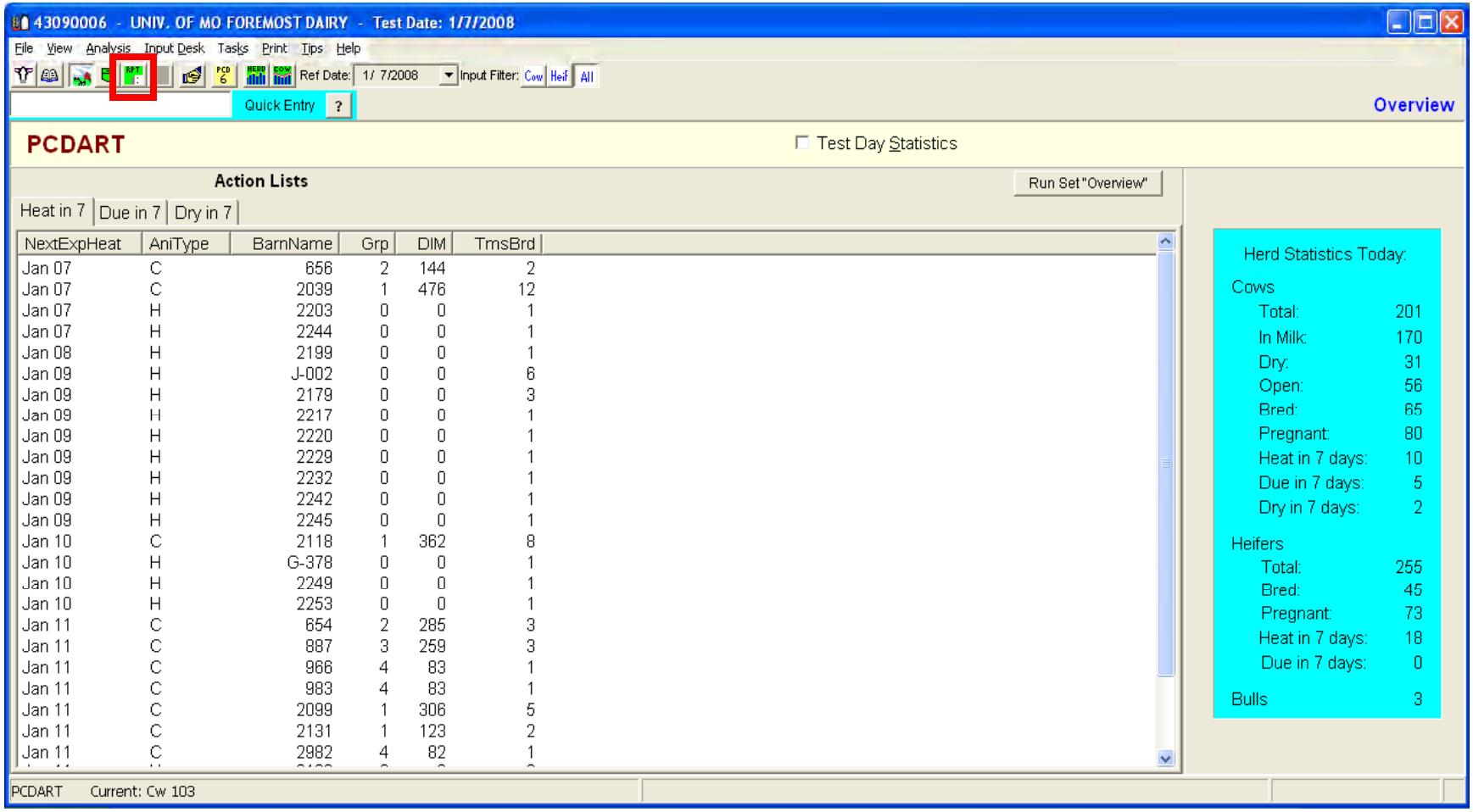
--Select “Day of week for start of program”



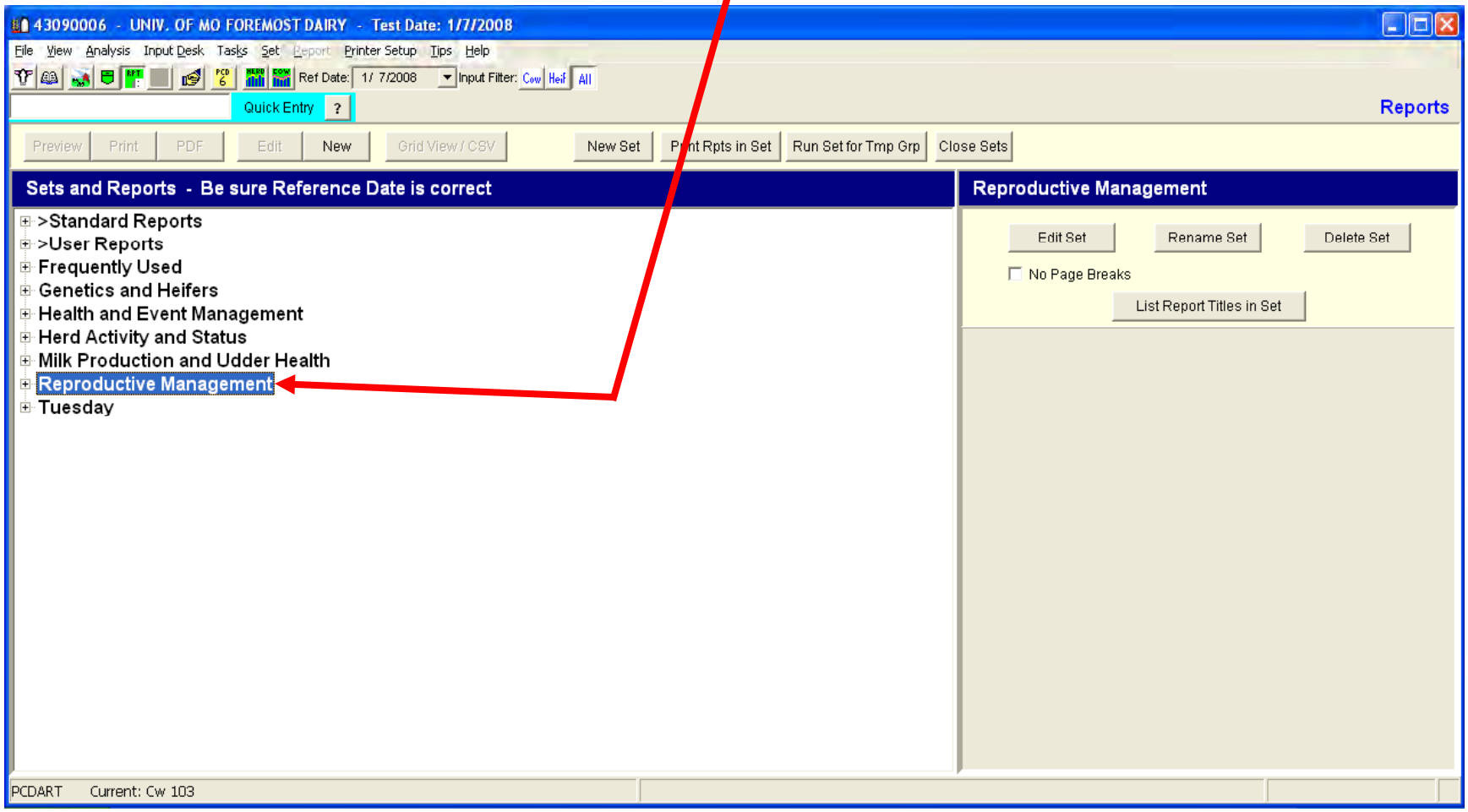
--Apply changes
--Close



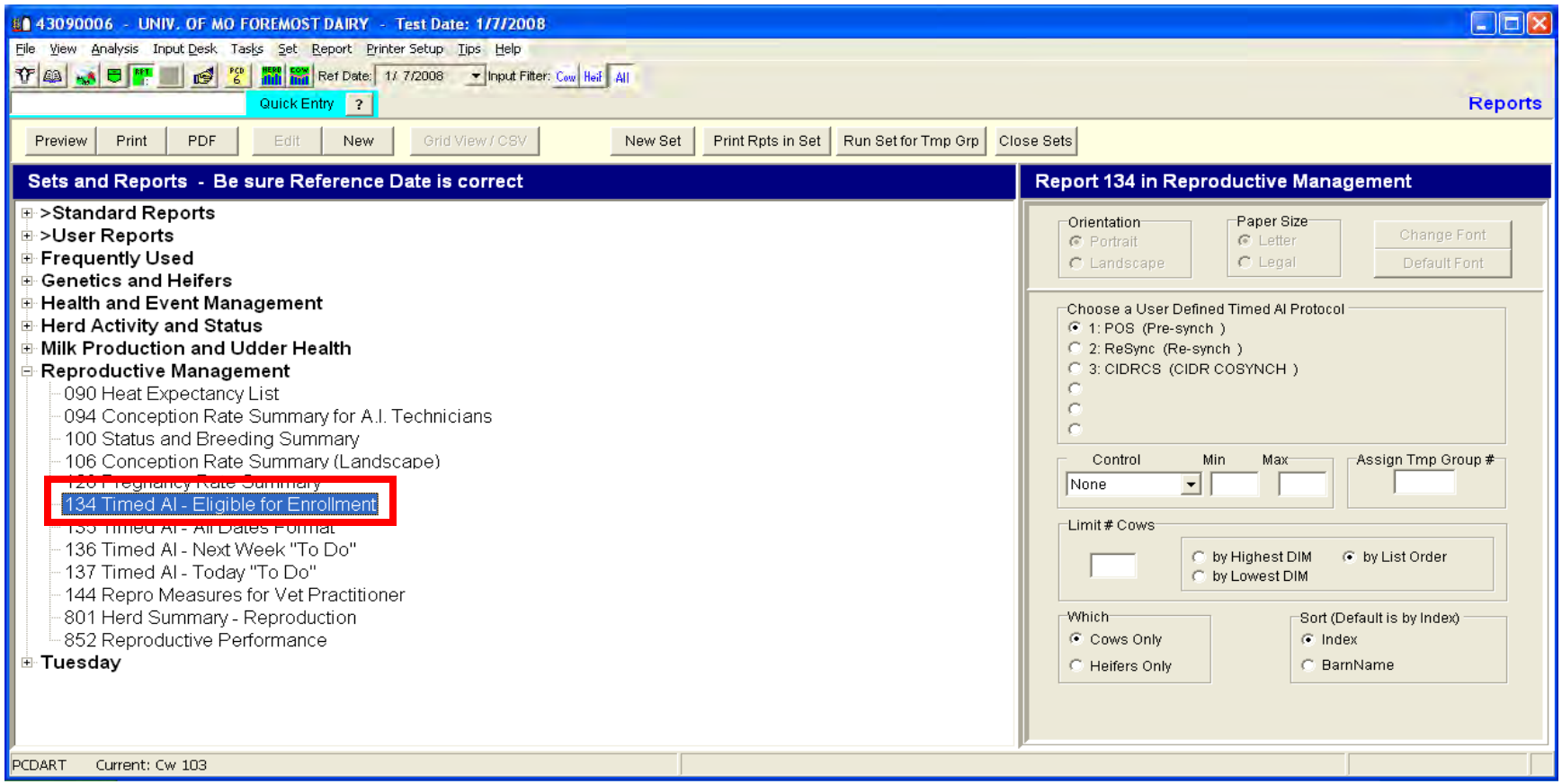
Click on "RPT"


43090006 - UNIV. OF MO FOREMOST DAIRY - Test Date: 1/7/2008
File View Analysis Input Desk Tasks Print Tips Help
Ref Date: 1/ 7/2008
Input Filter: Cow Heif All
Quick Entry ?
Overview
PCDART
Test Day Statistics
Action Lists
Run Set "Overview"
Heat in 7 | Due in 7 | Dry in 7
NextExpHeat | AniType | BarnName | Grp | DIM | TmsBrd
Jan 07 C 656 2 144 2
Jan 07 C 2039 1 476 12
Jan 07 H 2203 0 0 1
Jan 07 H 2244 0 0 1
Jan 08 H 2199 0 0 1
Jan 09 H J-002 0 0 6
Jan 09 H 2179 0 0 3
Jan 09 H 2217 0 0 1
Jan 09 H 2220 0 0 1
Jan 09 H 2229 0 0 1
Jan 09 H 2232 0 0 1
Jan 09 H 2242 0 0 1
Jan 09 H 2245 0 0 1
Jan 10 C 2118 1 362 8
Jan 10 H G-378 0 0 1
Jan 10 H 2249 0 0 1
Jan 10 H 2253 0 0 1
Jan 11 C 654 2 285 3
Jan 11 C 887 3 259 3
Jan 11 C 966 4 83 1
Jan 11 C 983 4 83 1
Jan 11 C 2099 1 306 5
Jan 11 C 2131 1 123 2
Jan 11 C 2982 4 82 1
Herd Statistics Today:
Cows
Total: 201
In Milk: 170
Dry: 31
Open: 56
Bred: 65
Pregnant: 80
Heat in 7 days: 10
Due in 7 days: 5
Dry in 7 days: 2
Heifers
Total: 255
Bred: 45
Pregnant: 73
Heat in 7 days: 18
Due in 7 days: 0
Bulls 3
PCDART Current: Cw 103

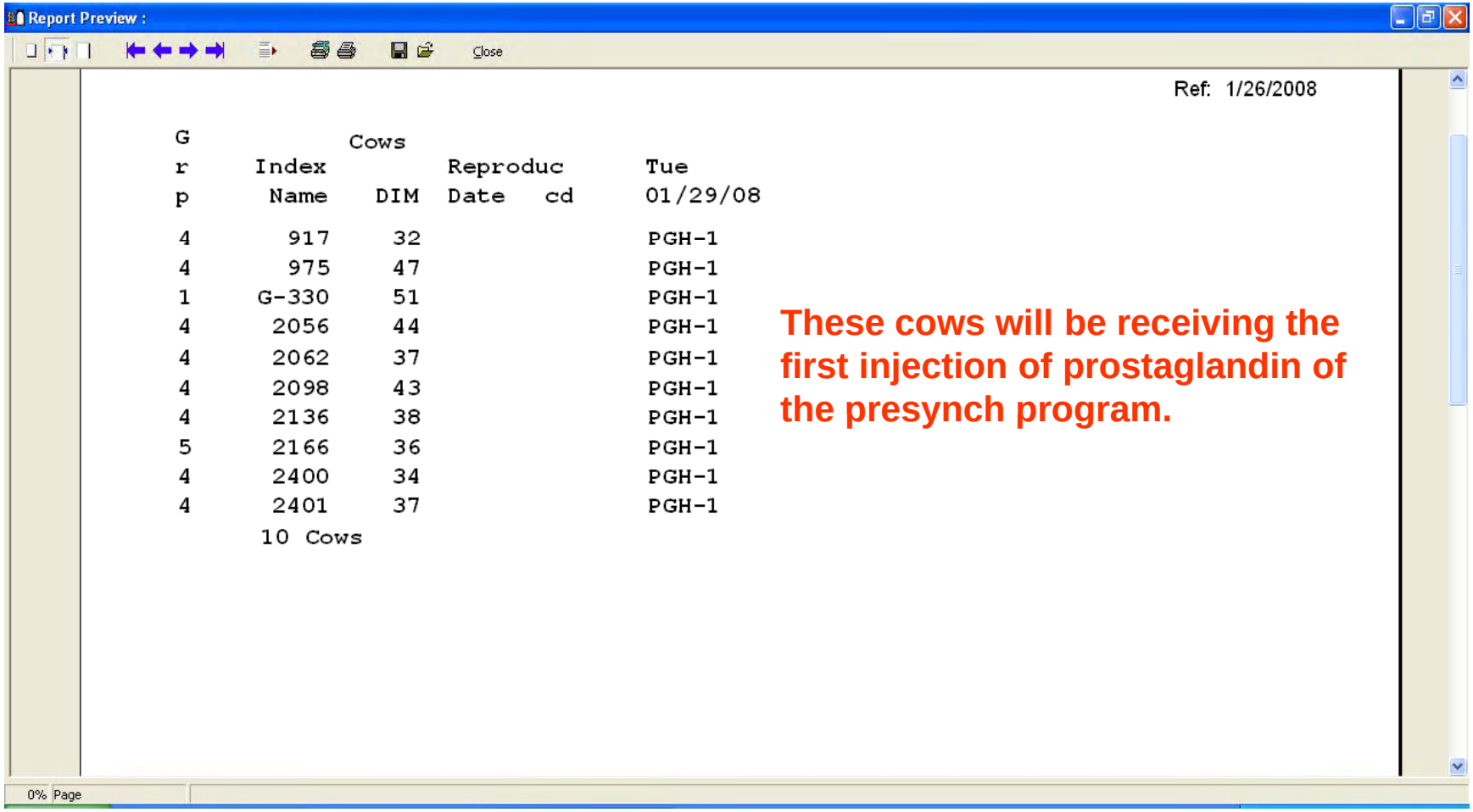
Click on Reproductive Management



Choose **report 134** (Timed AI—Eligible for enrollment) and be sure to mark the **POS (Pre-synch)** selection

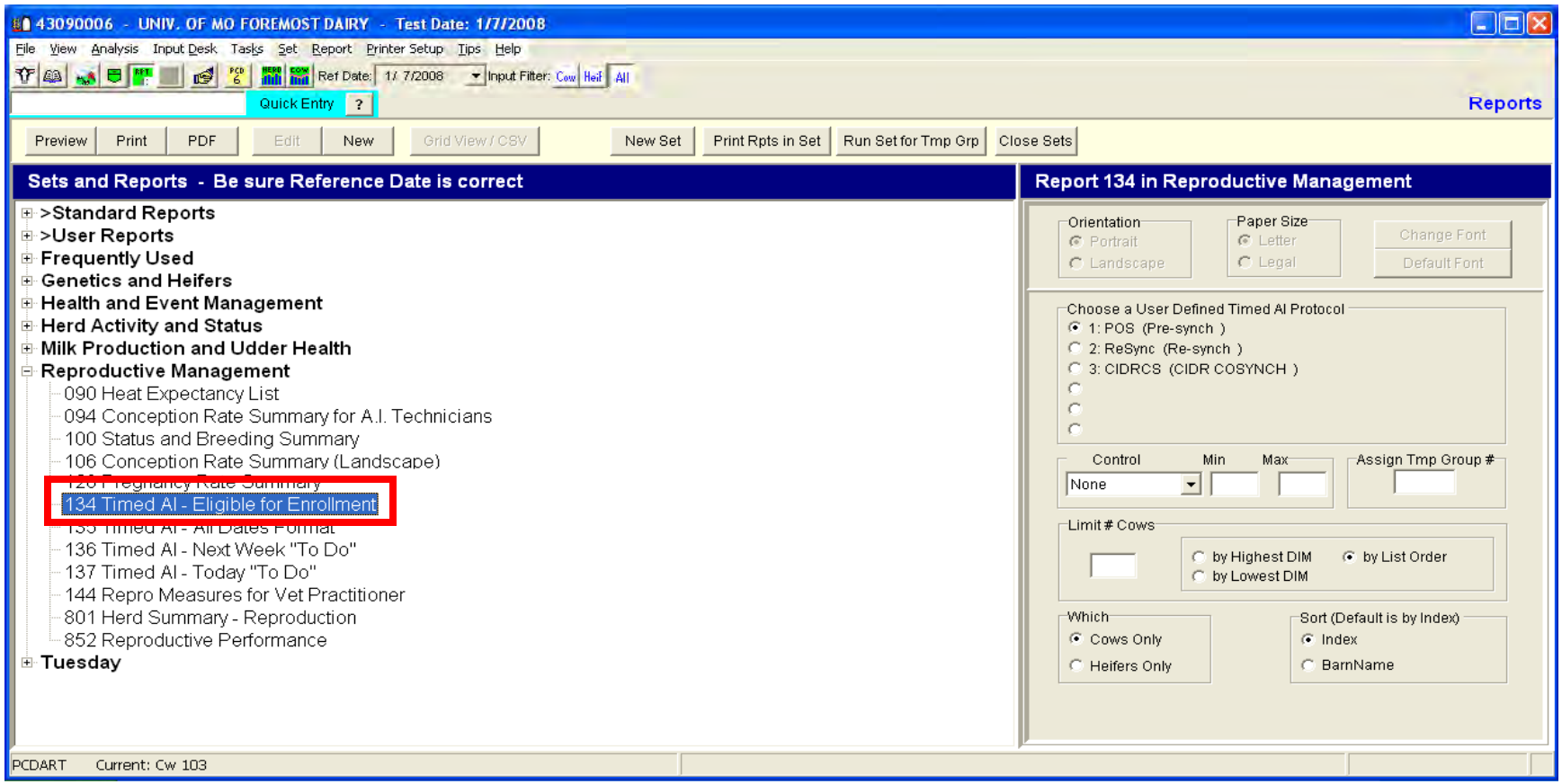


The Report will look somewhat like that below **(return to previous window in PC Dart)**

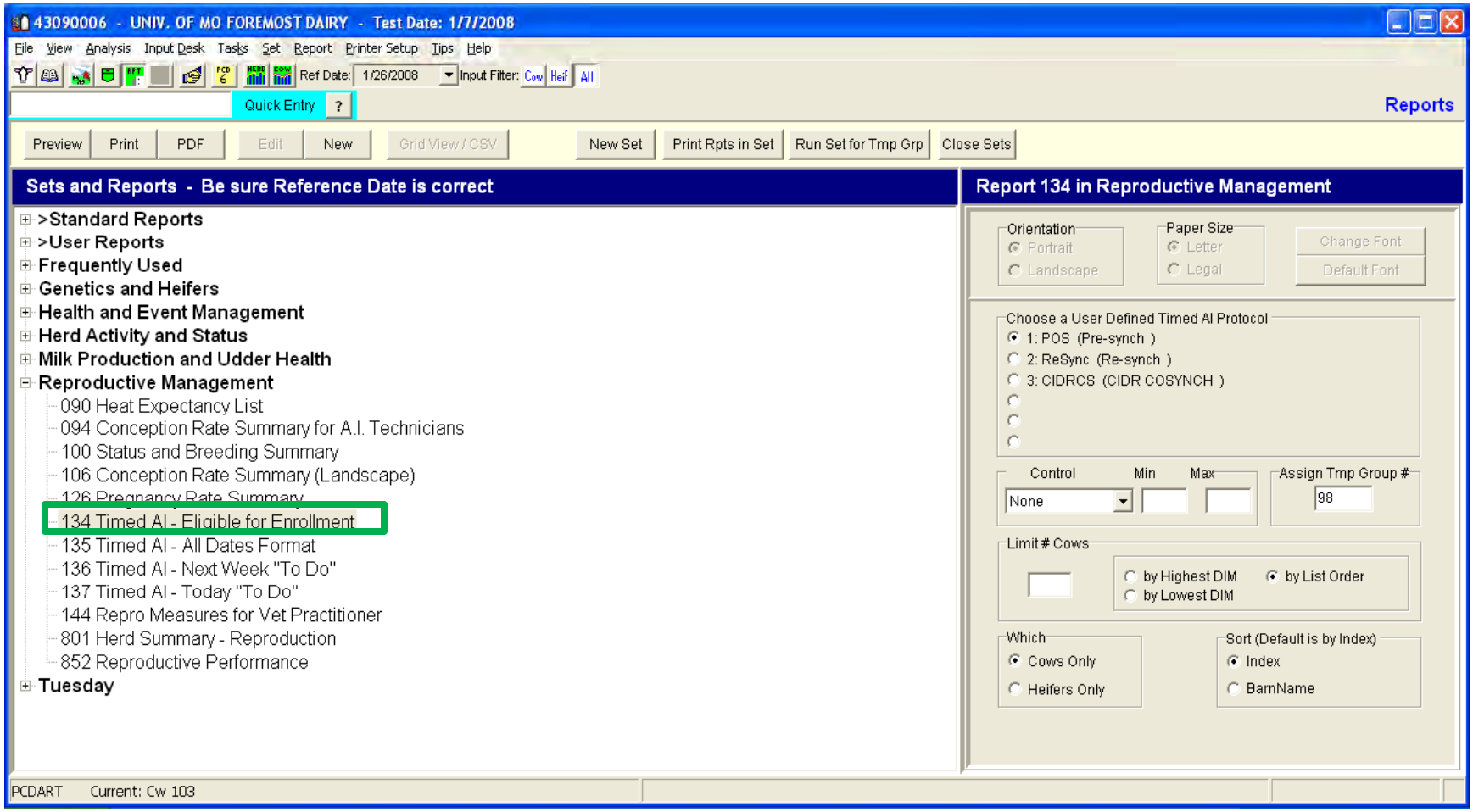


These cows will be receiving the first injection of prostaglandin of the presynch program.

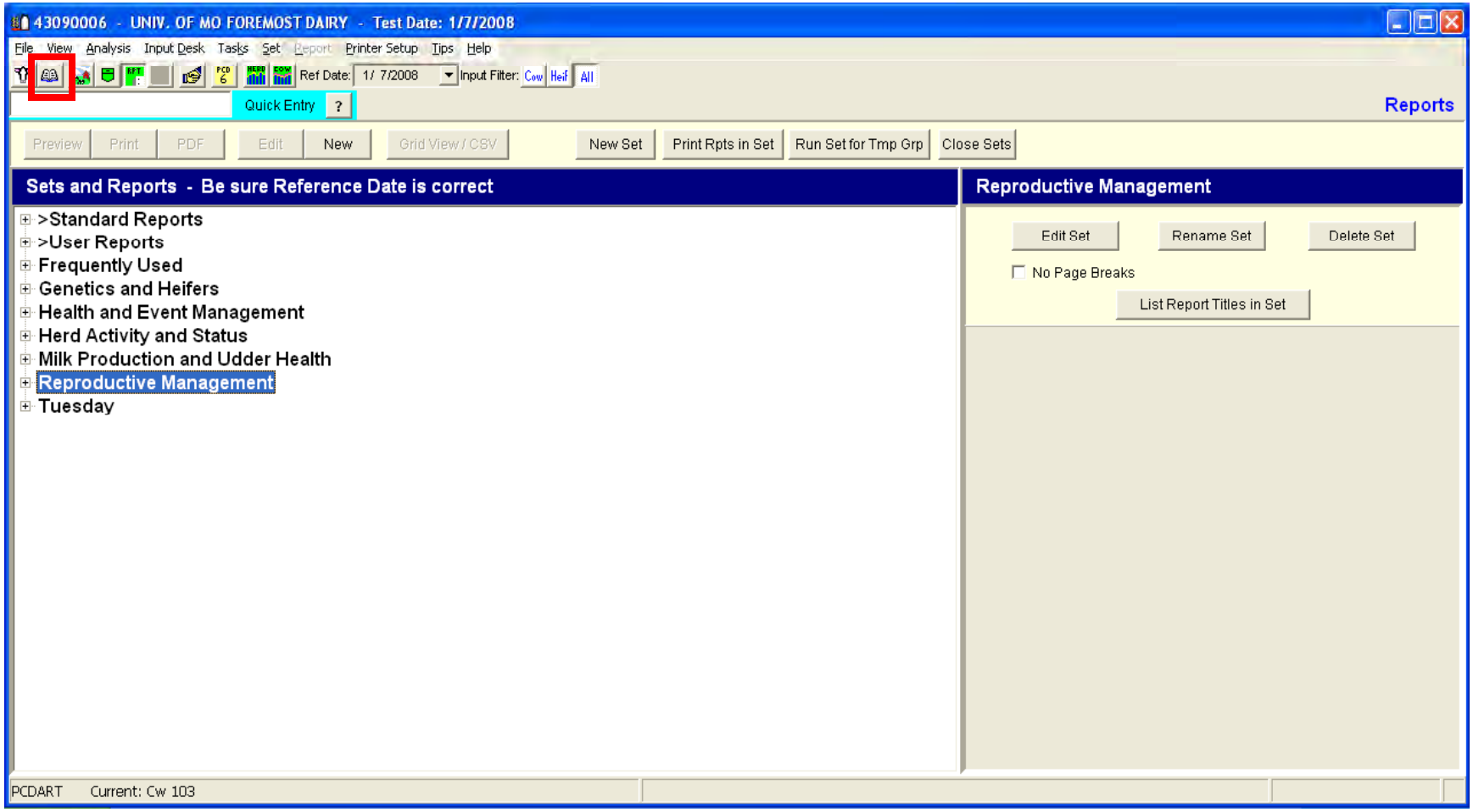
Choose **report 134** (Timed AI—Eligible for enrollment) and be sure to mark the **POS (Pre-synch)** selection



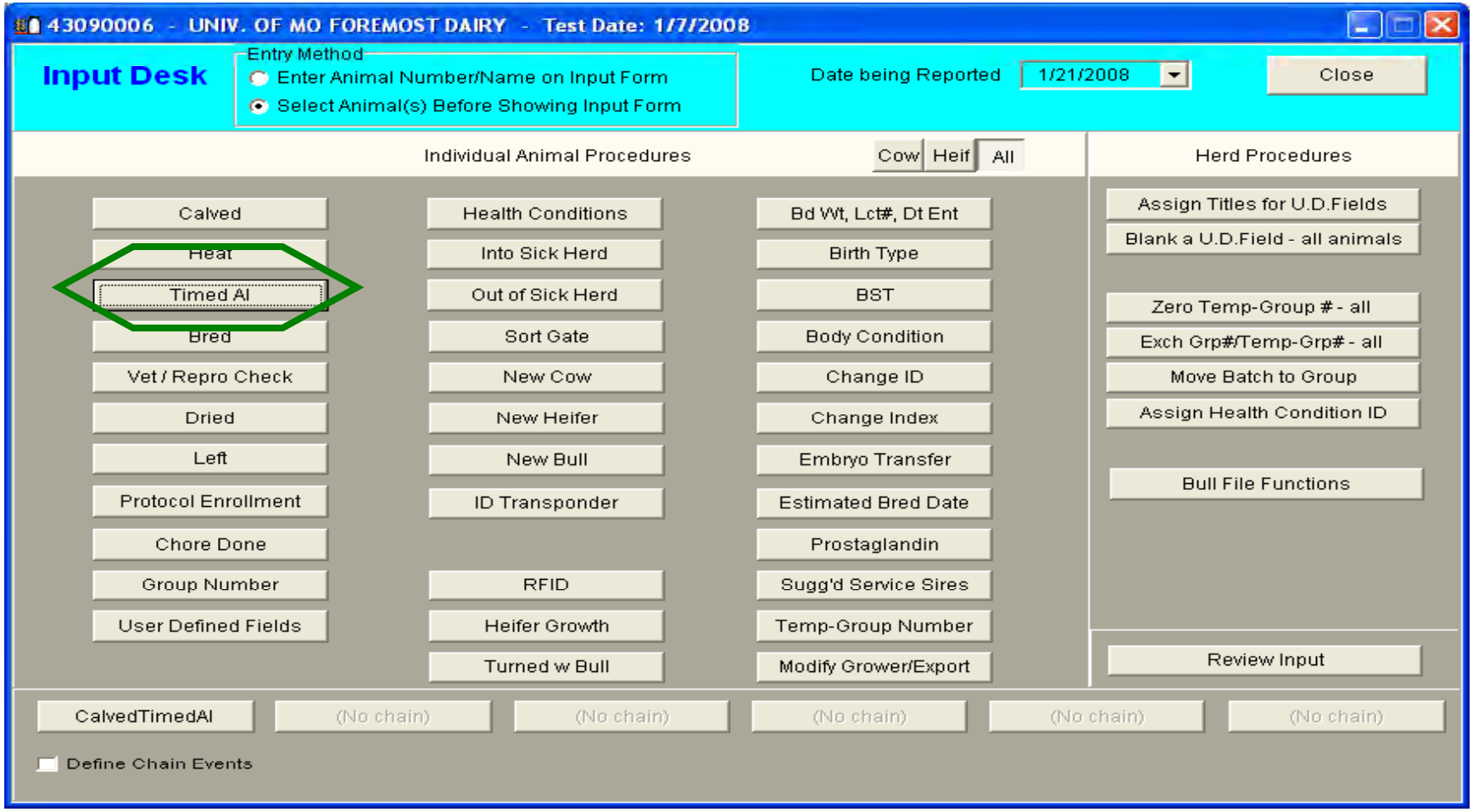
Select a “Assign Tmp Group #”
(98 for example) and then choose report **“134.”** This will generate a report so PC Dart know which cows are in temp group 98.



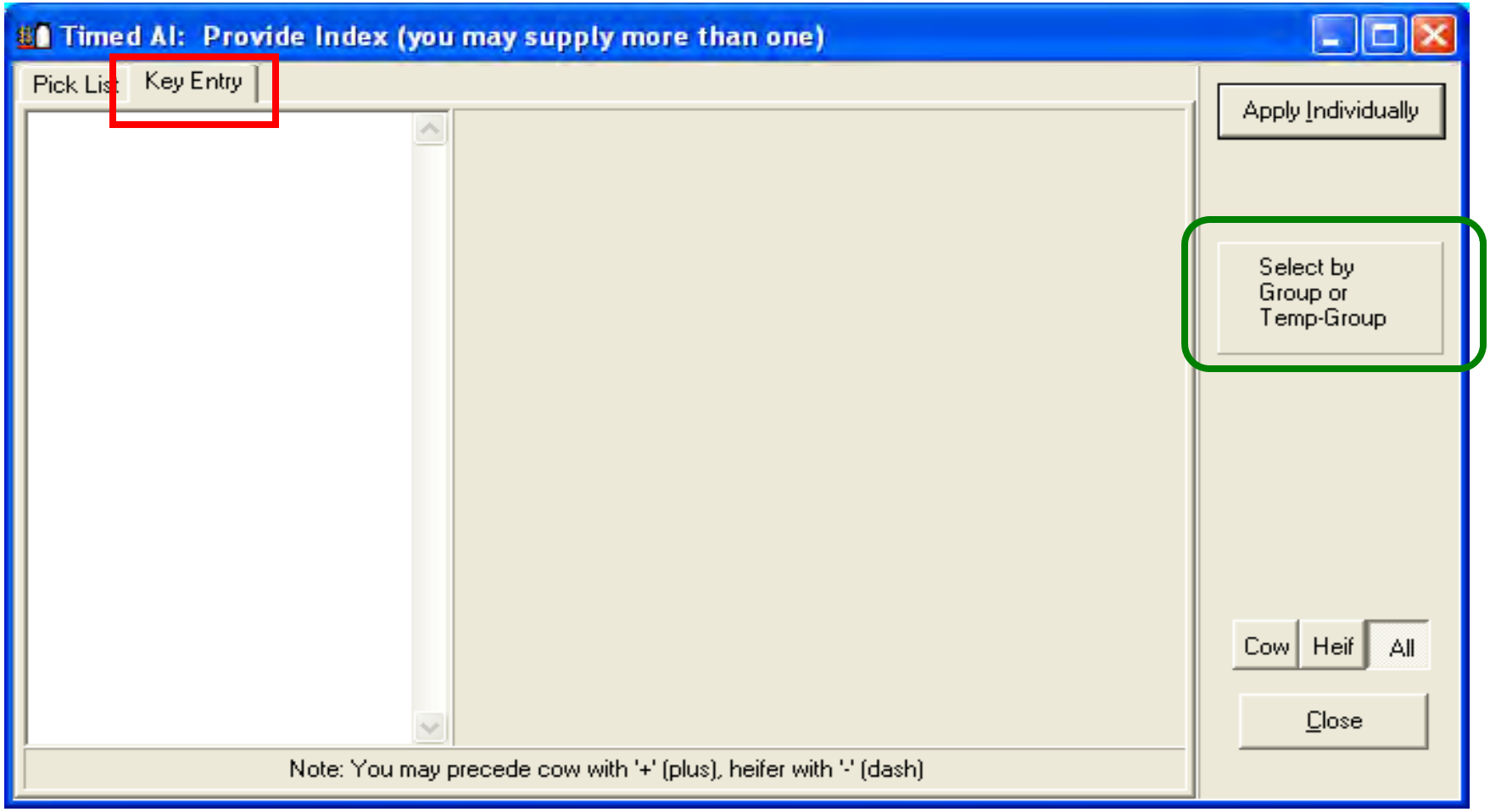
Choose the Input Desk



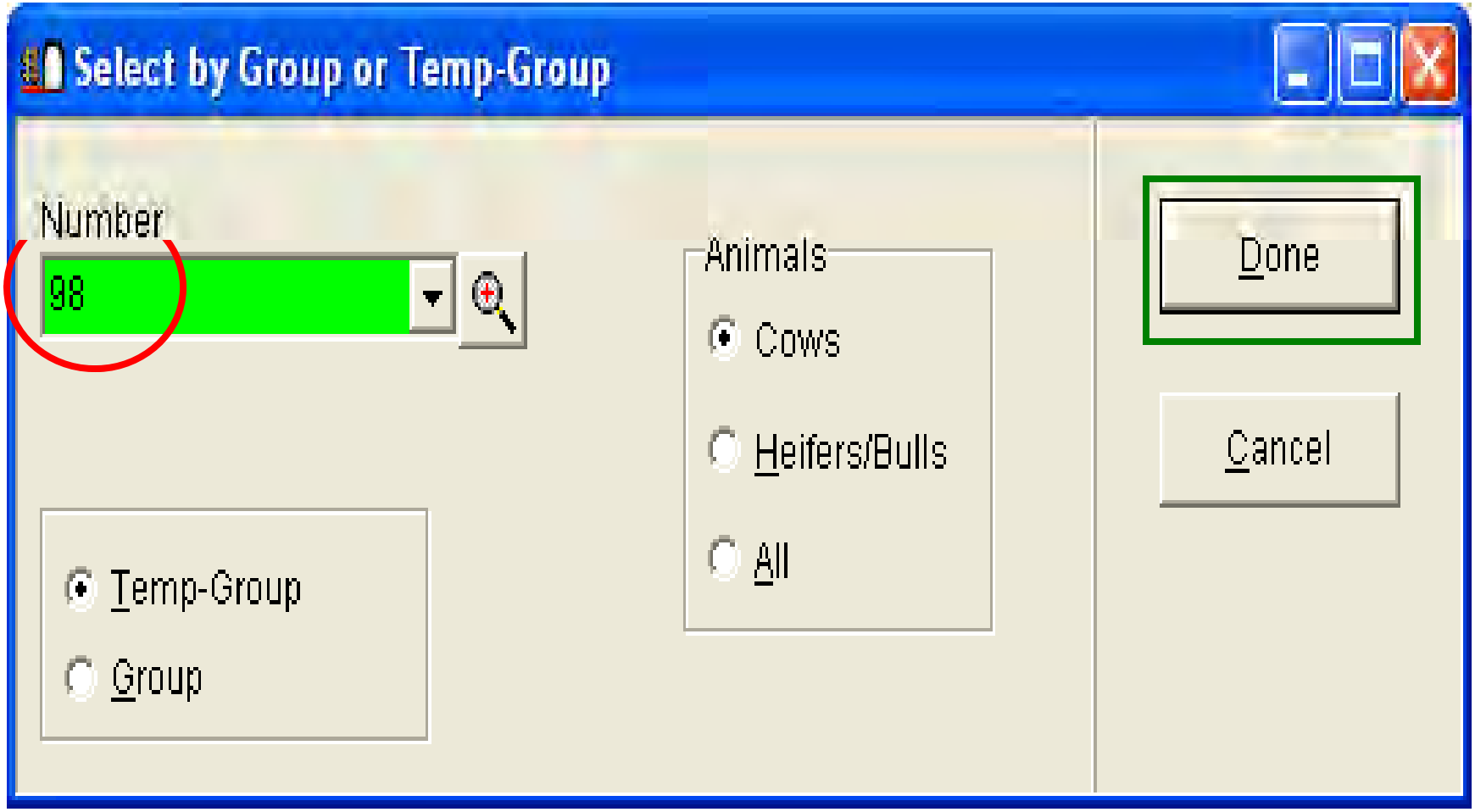
Use the "Select Animal(s) Before Showing Input Form" and then the "Timed AI"



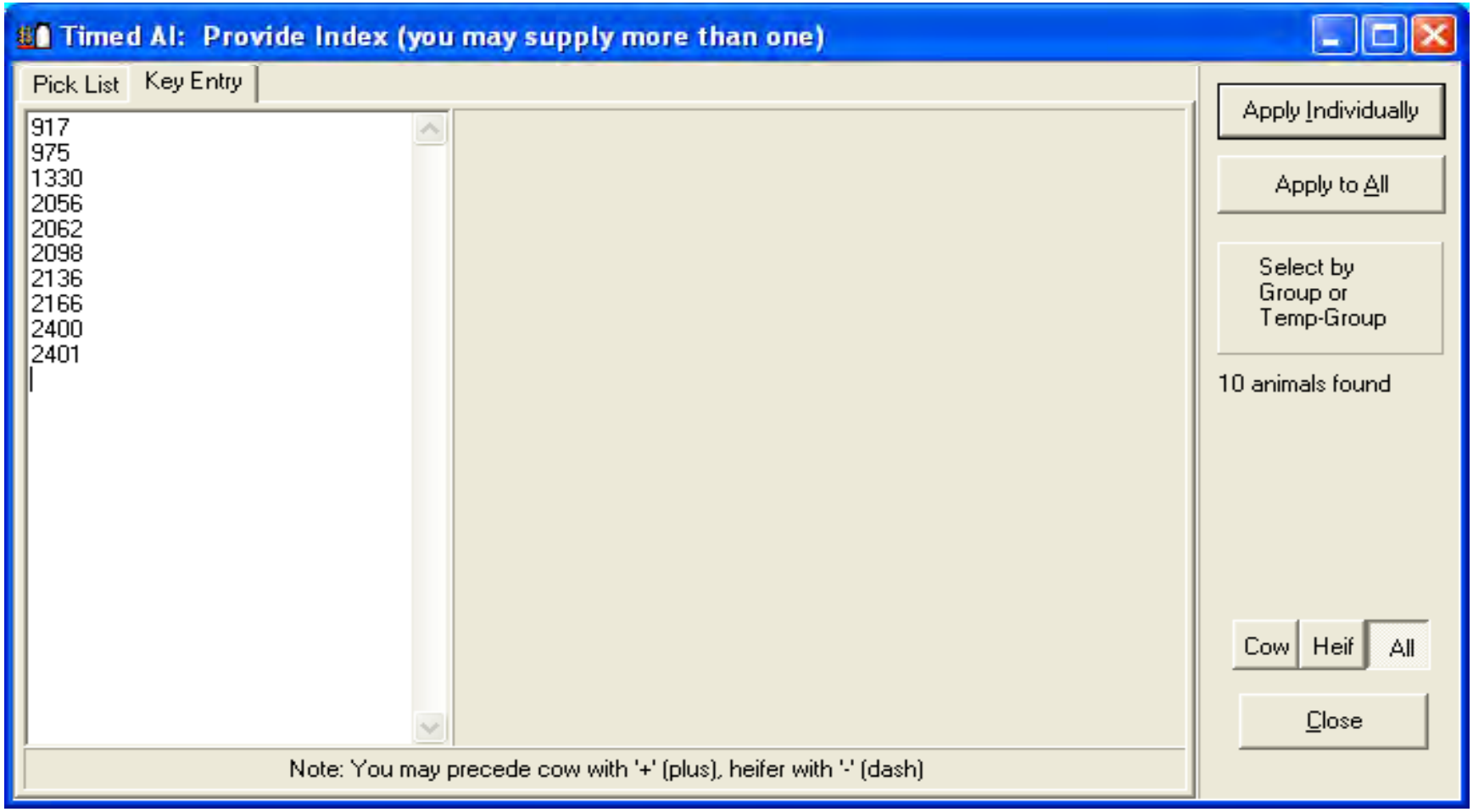
Choose the "Key Entry" Option and "Select by Group or Temp-Group"



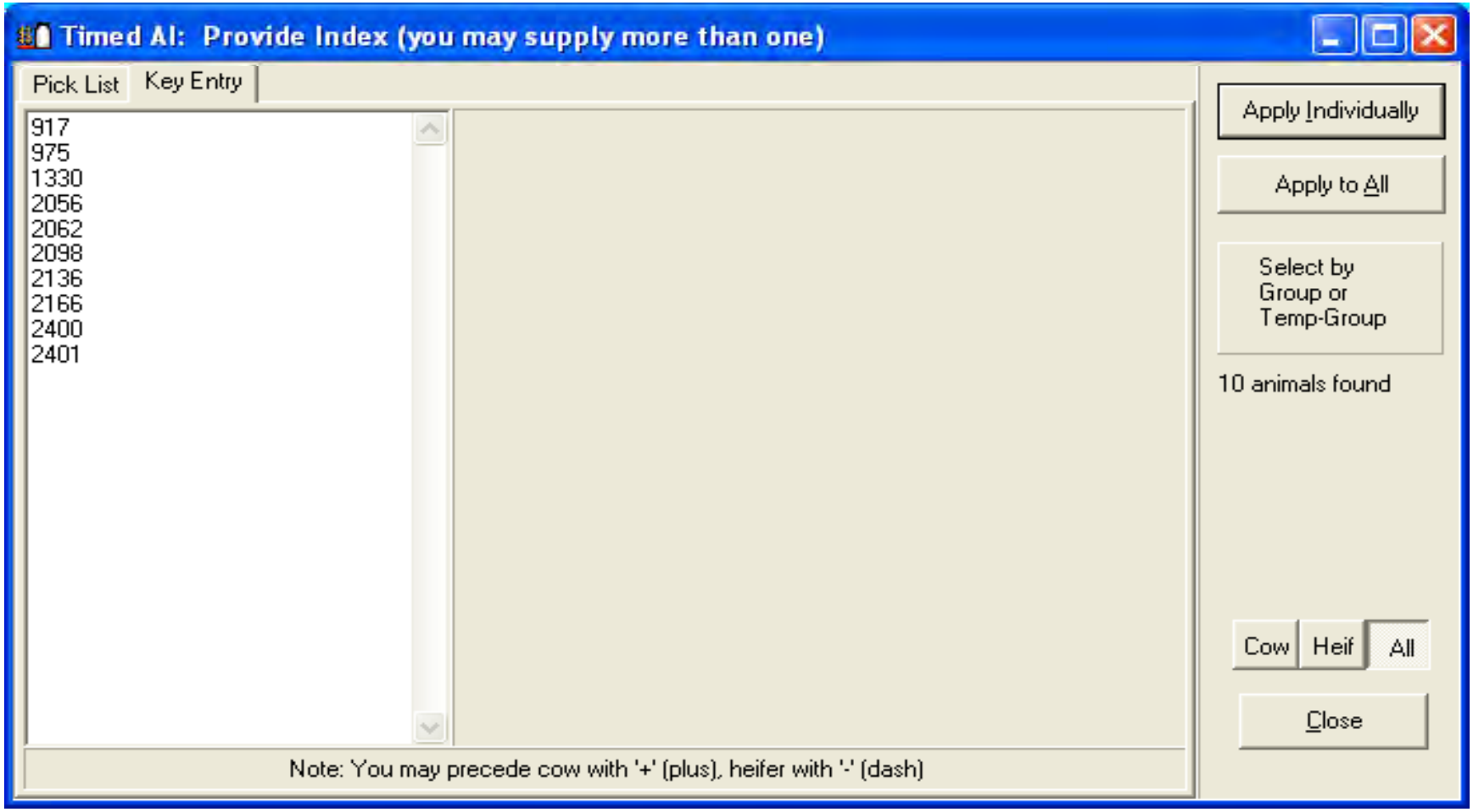
Enter your Tmp Group # (**98**) and then **Done**



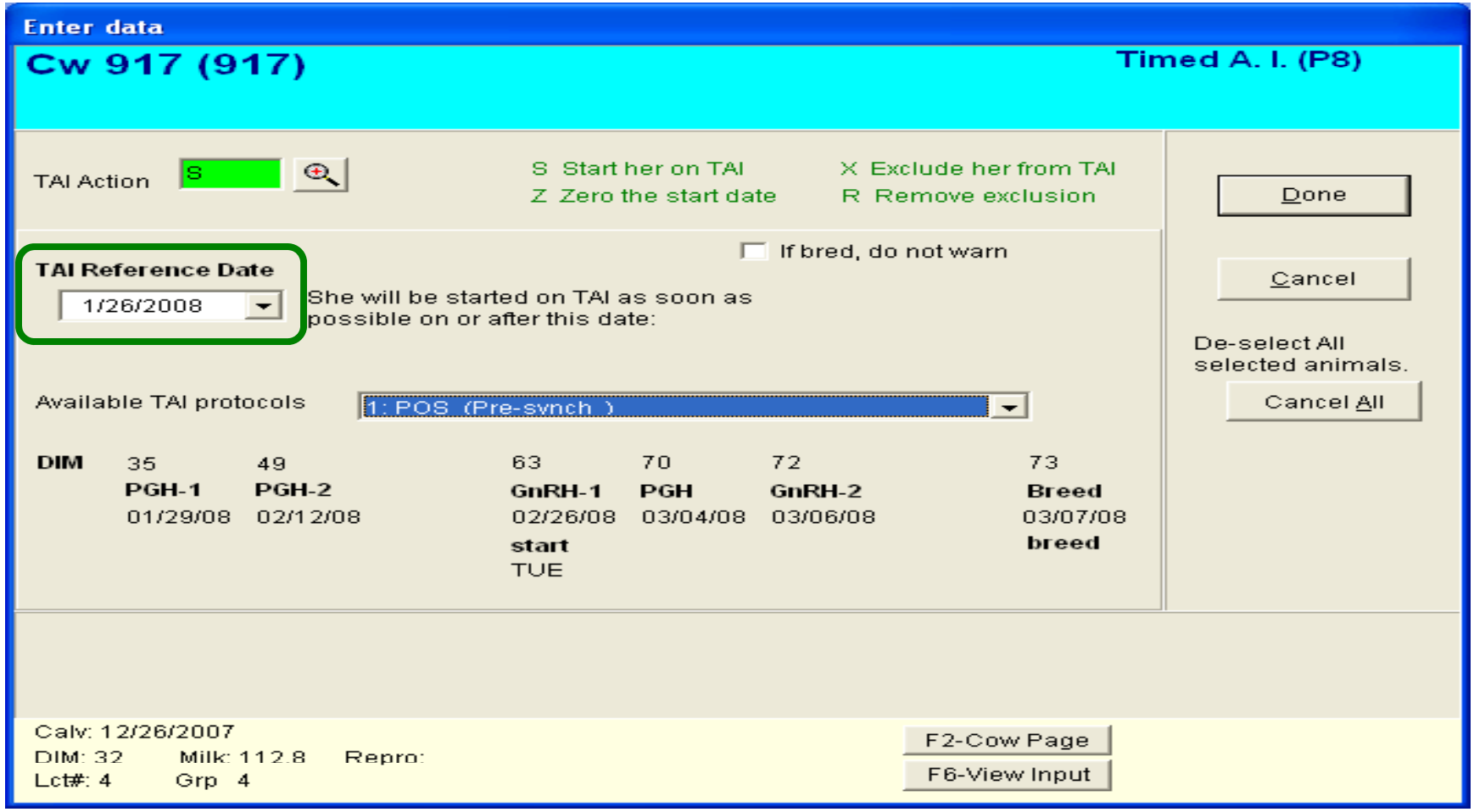
The selection will be similar to the screen below



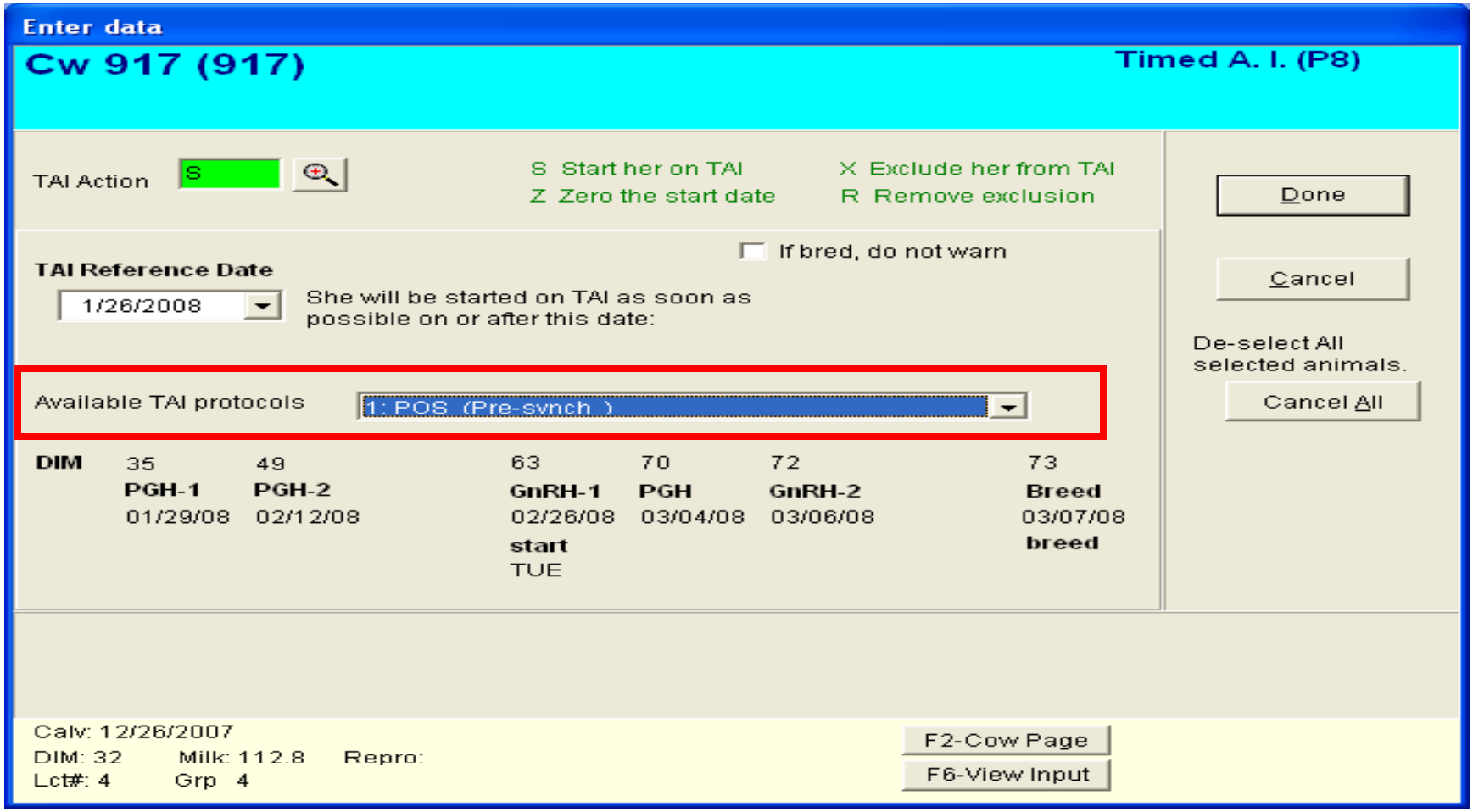
Now you want to “Apply to all”



Choose "S Start her on TAI"
Choose the "TAI Reference Date"



Choose from the "Available TAI protocols" and then "Done"

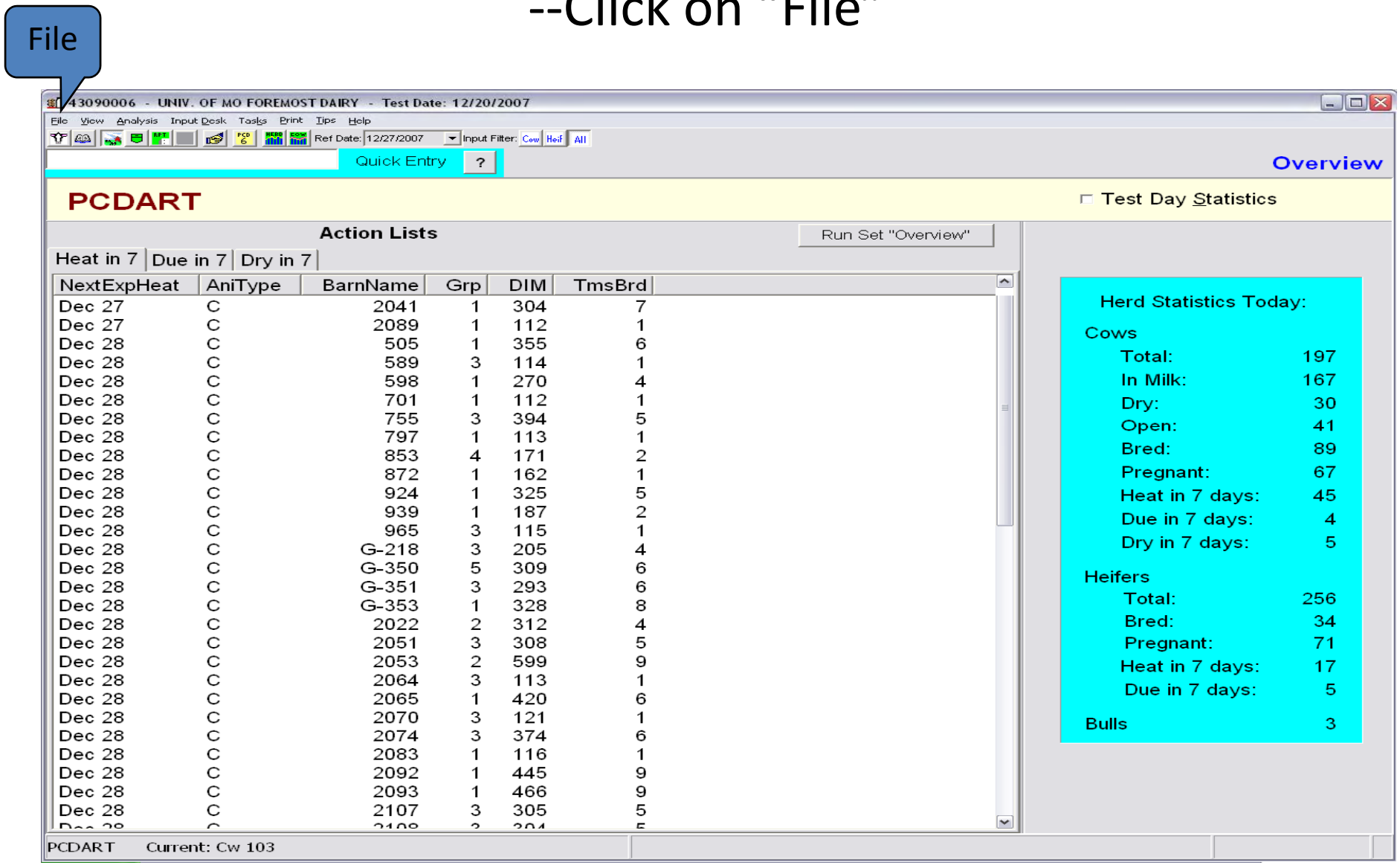


PC Dart will then apply the protocol to all the cows in temp group 98

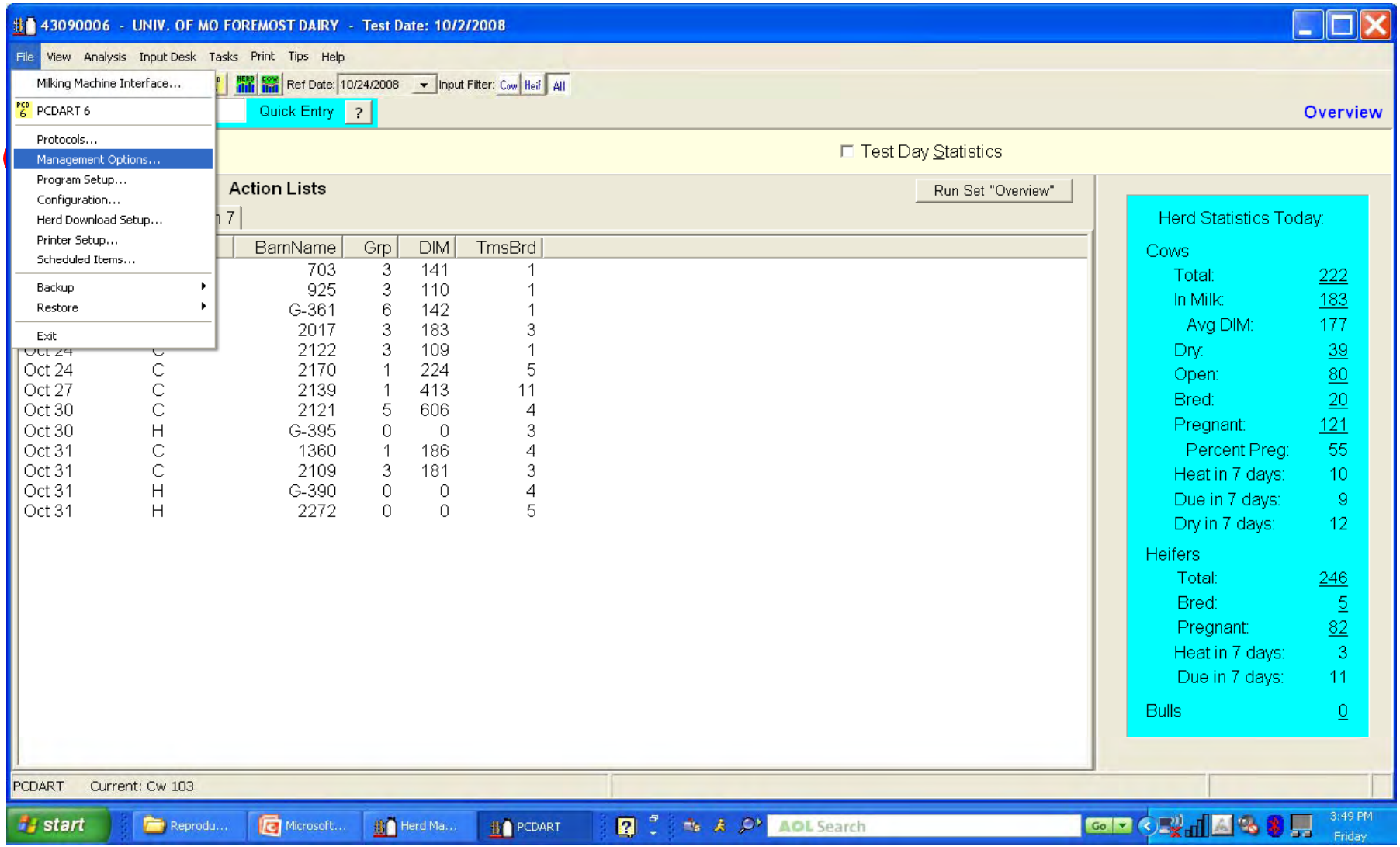
Chapter 4
Creating a Resynch Program in PC Dart

Resynch

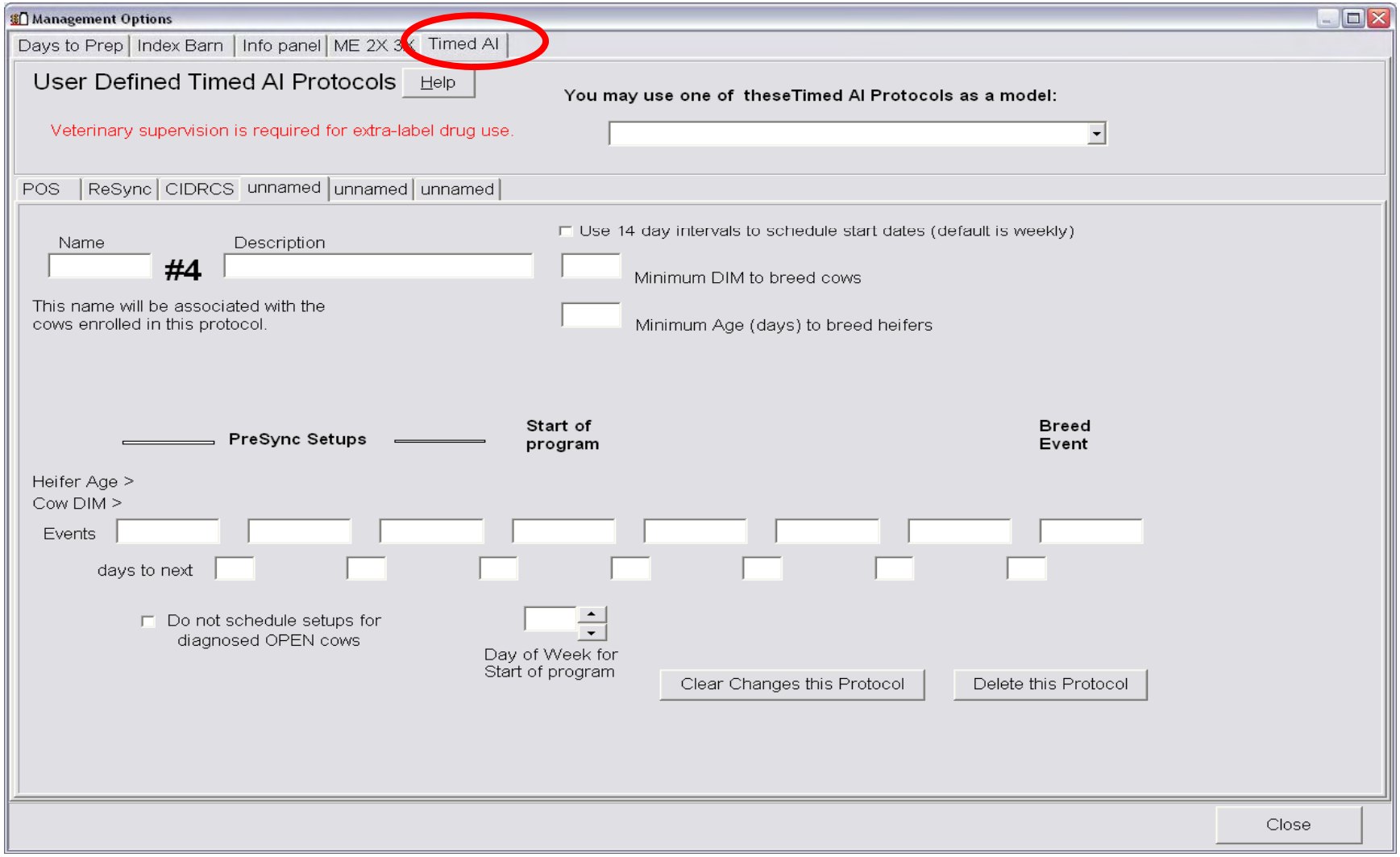
--Click on “File”



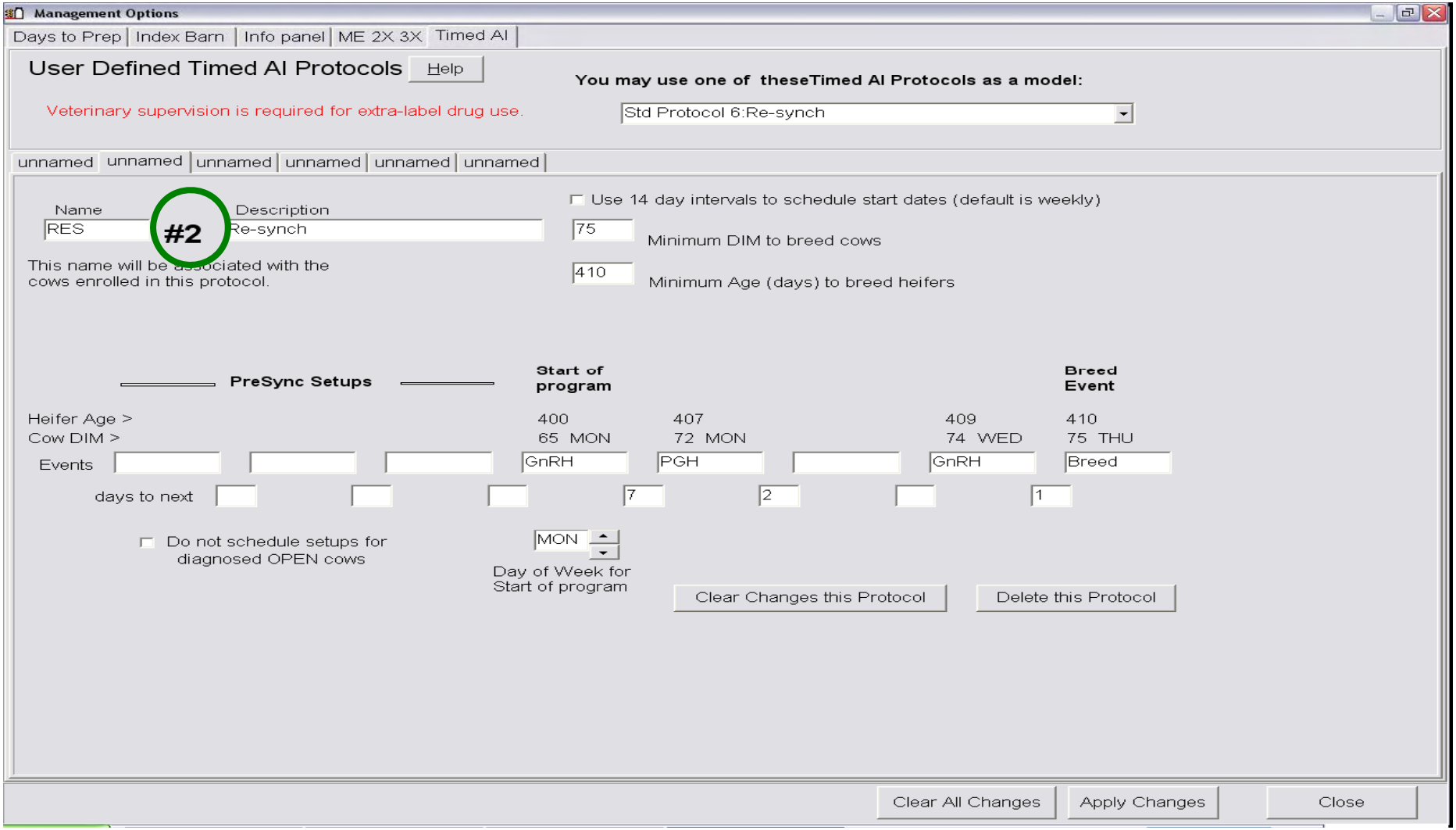
Choose “Management Options”



--Select “Timed AI”

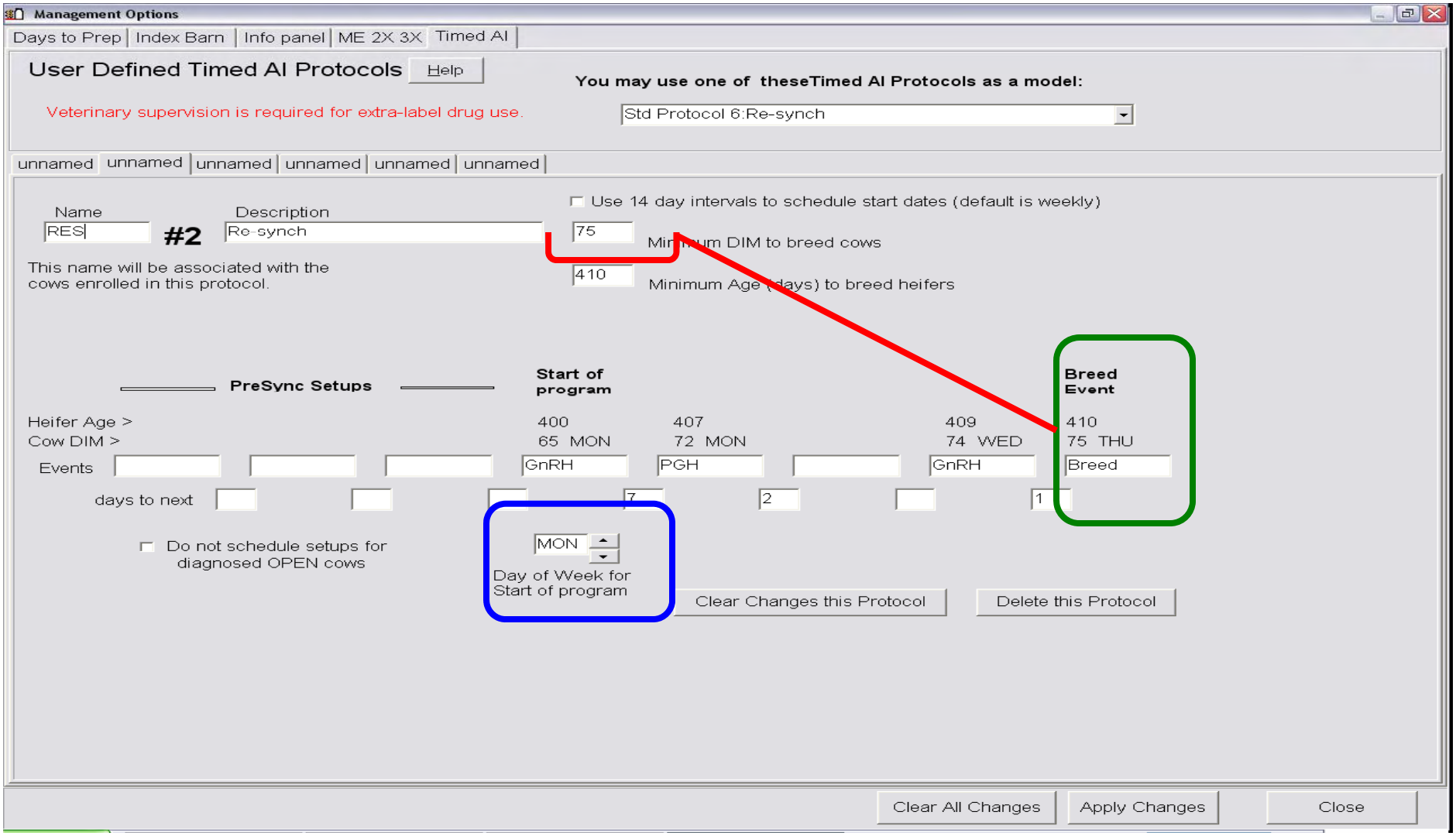


--Name Protocol from drop down menu (note name of protocol) and at #2

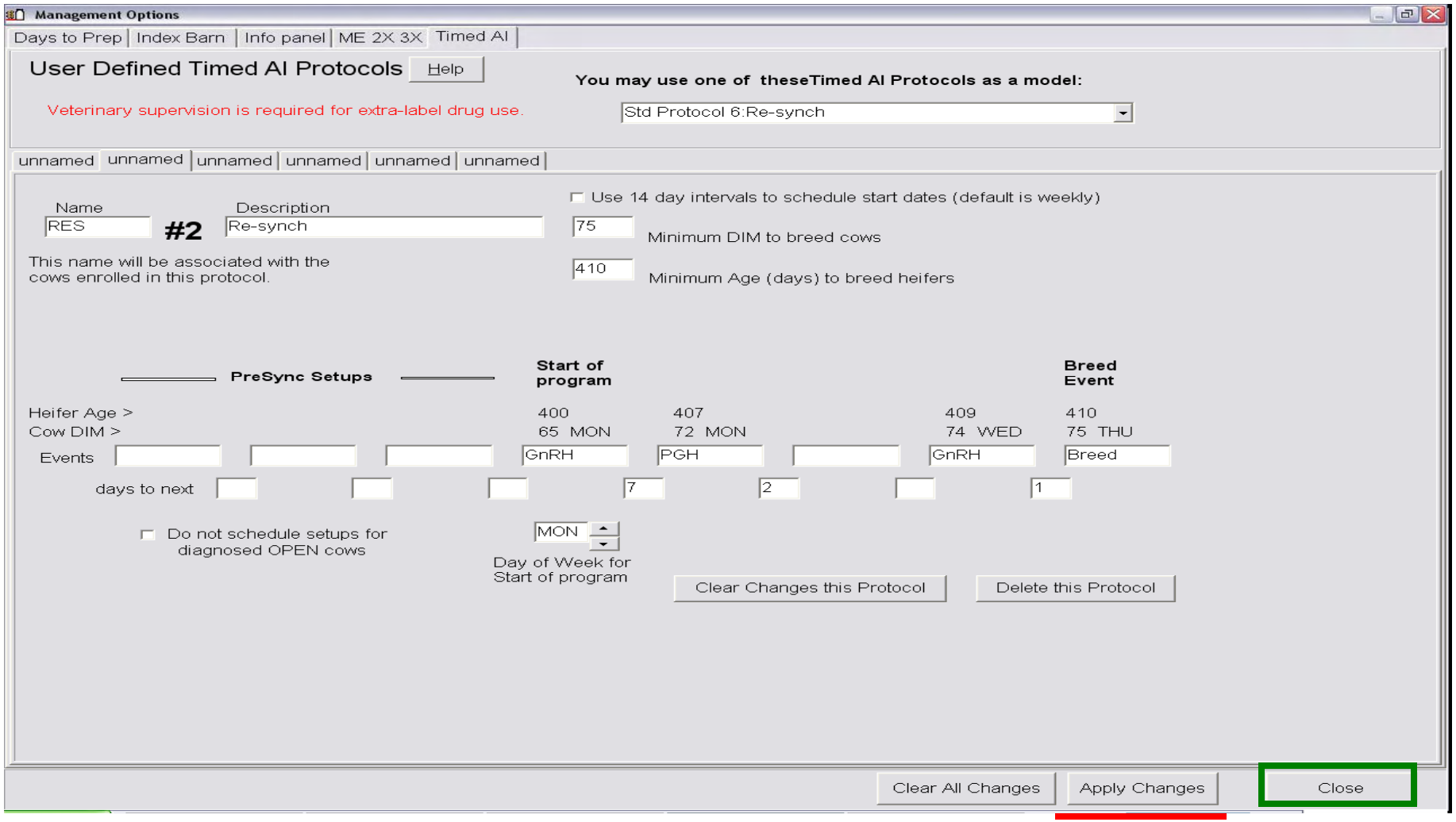


--Select "Minimum DIM to breed cows" (for breed event)

--Select "Day of week for start of program"



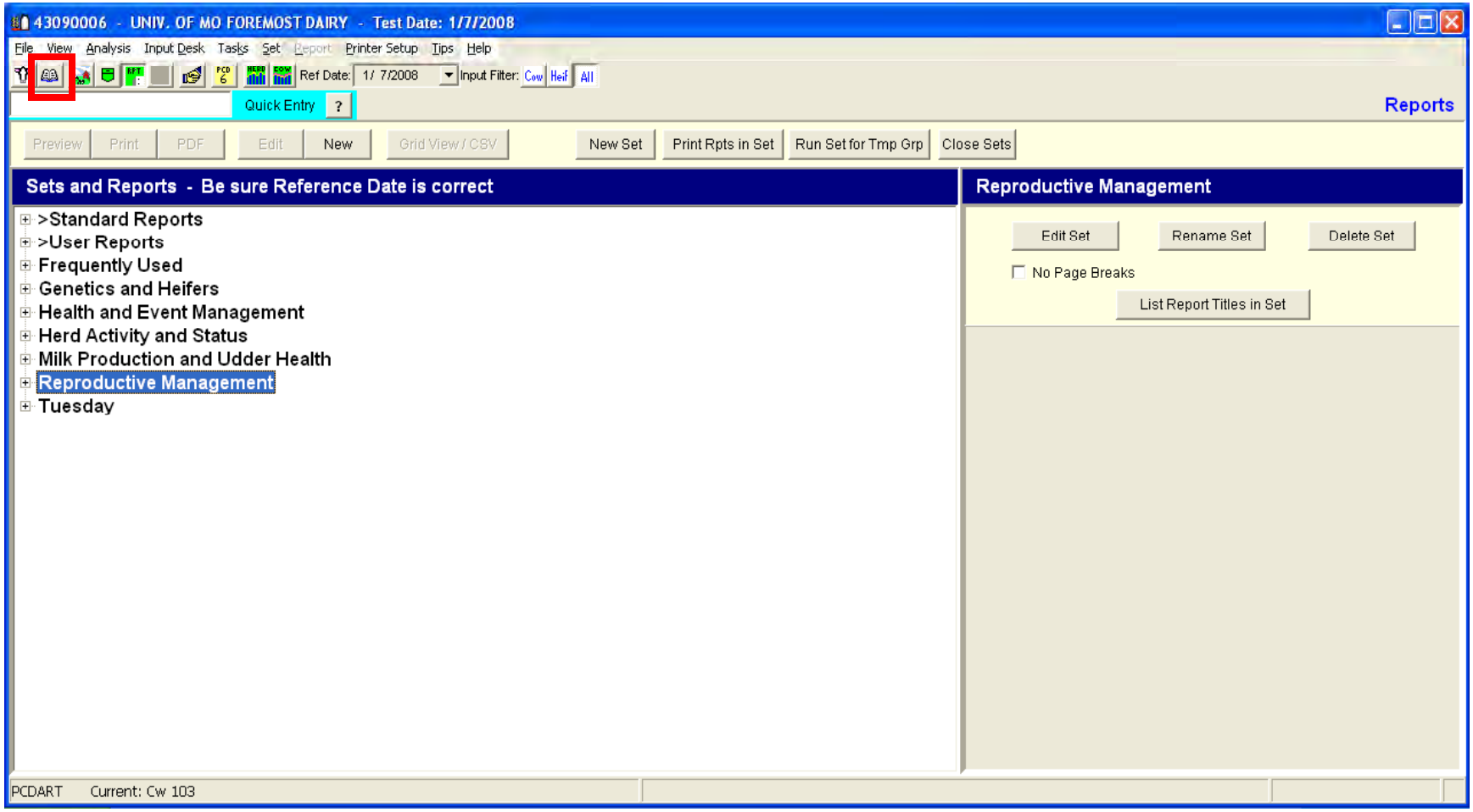
--Apply changes
--Close



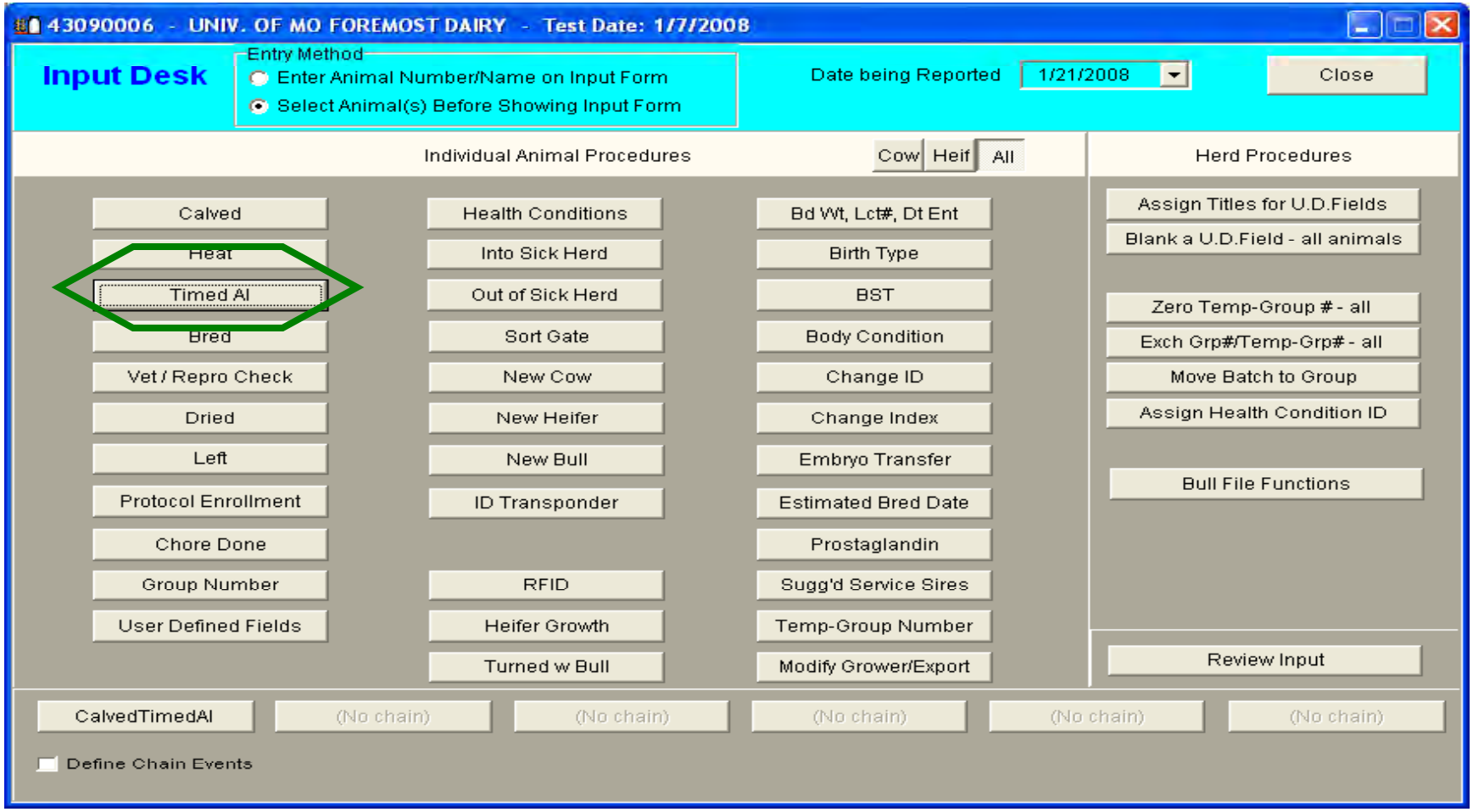
Now you will be able to enroll open cows back into the program!

- How do you enroll open cows?

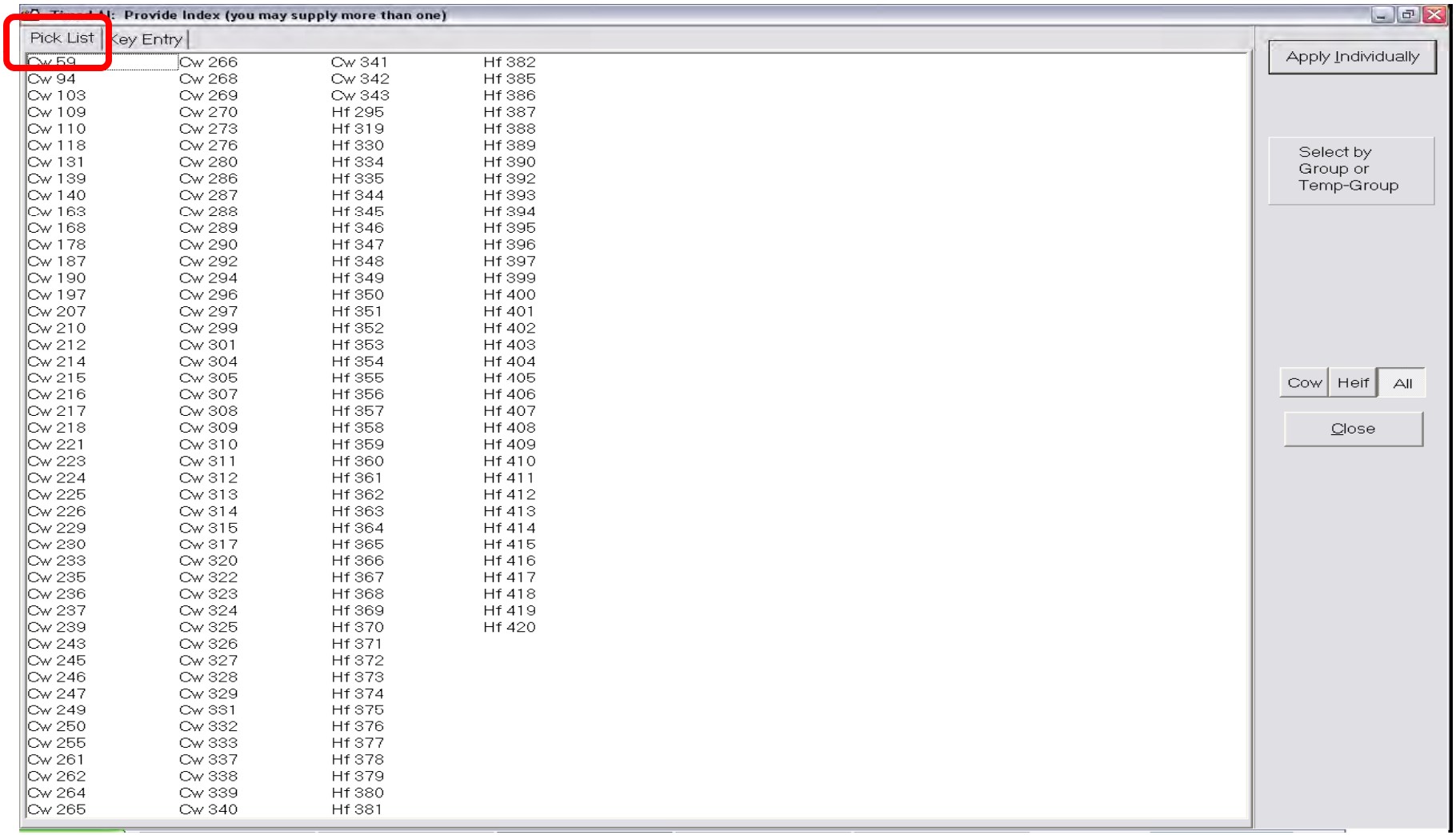
Choose the Input Desk



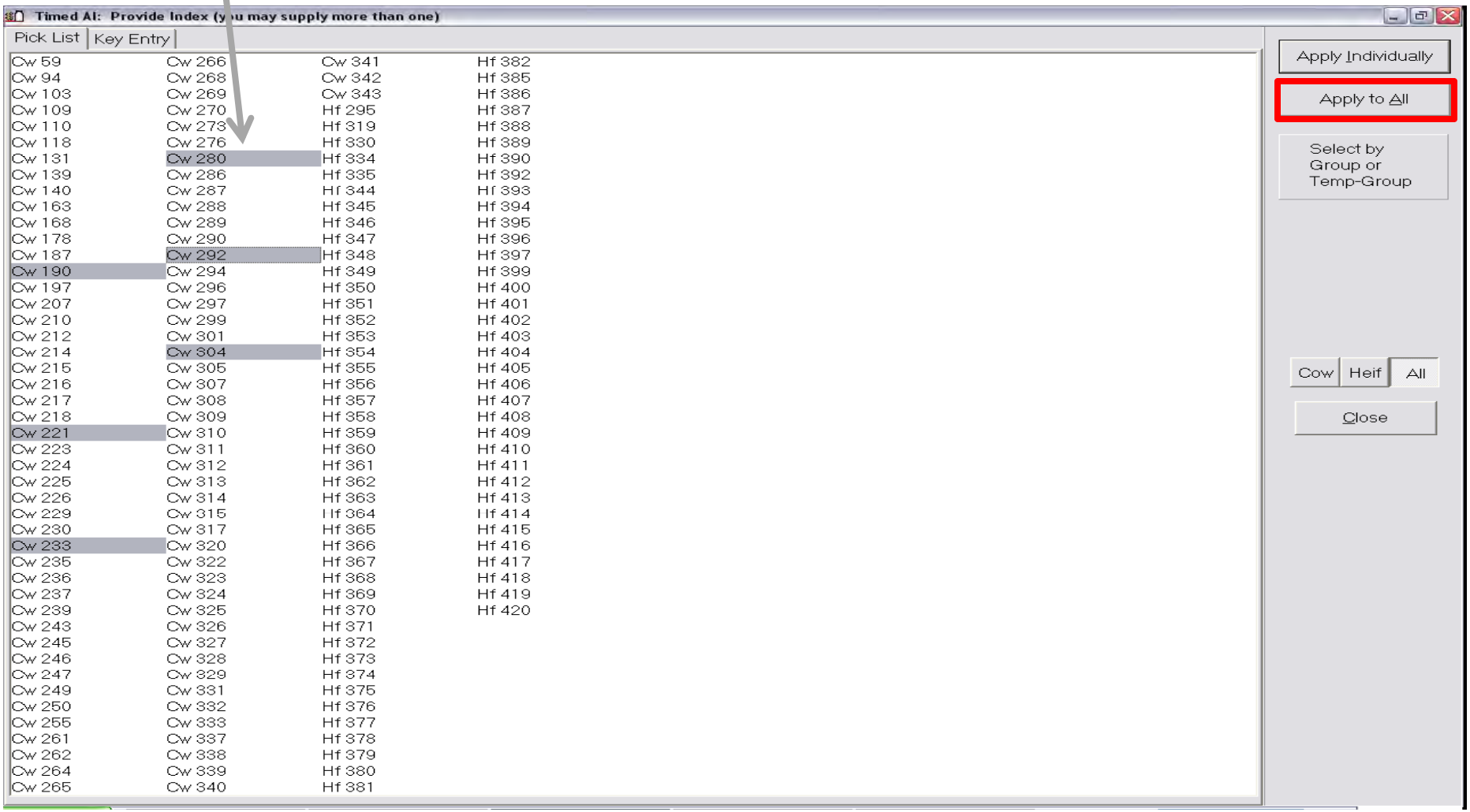
Use the "Select Animal(s) Before Showing Input Form" and then the "Timed AI"



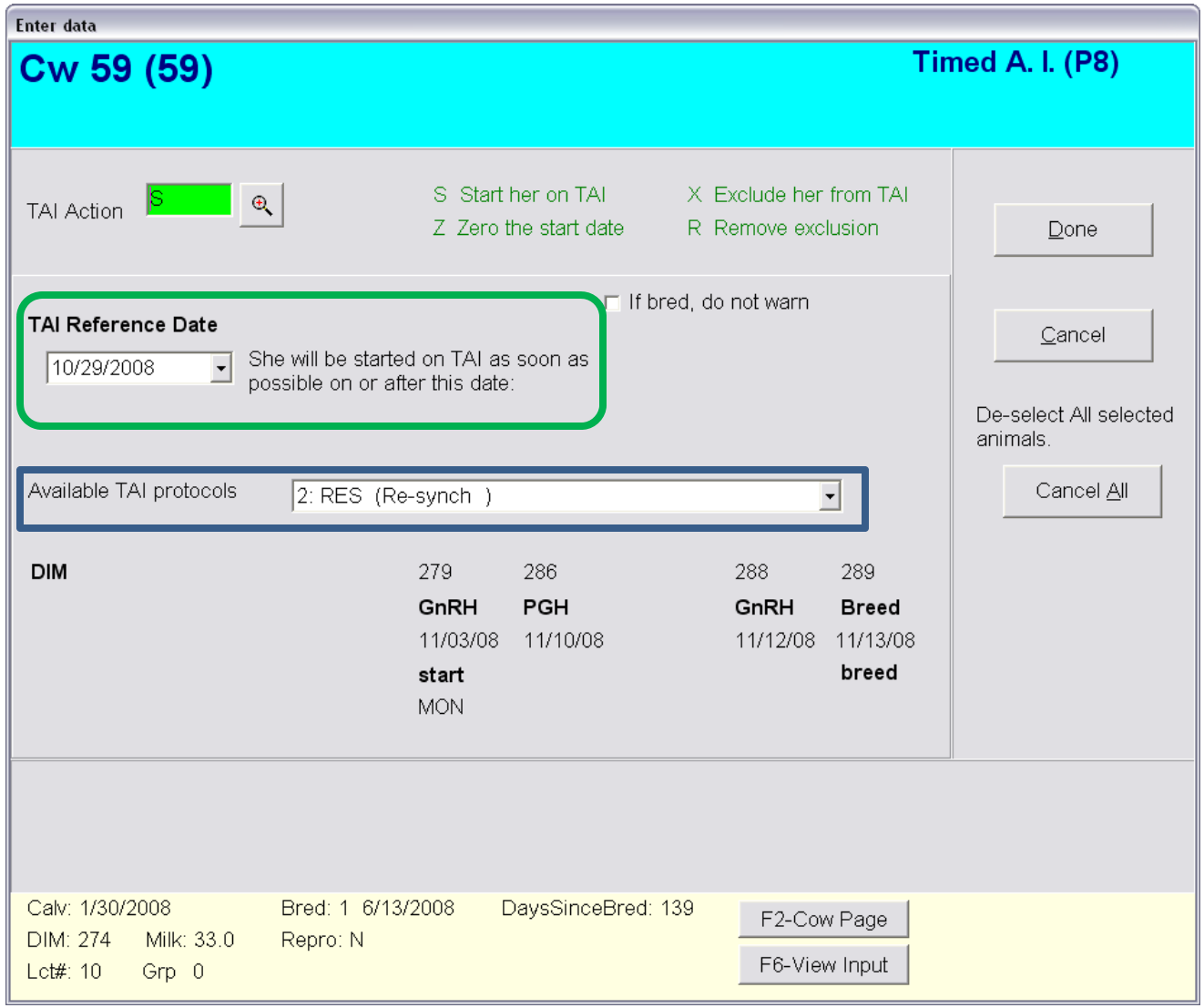
Choose the "Pick List" Option



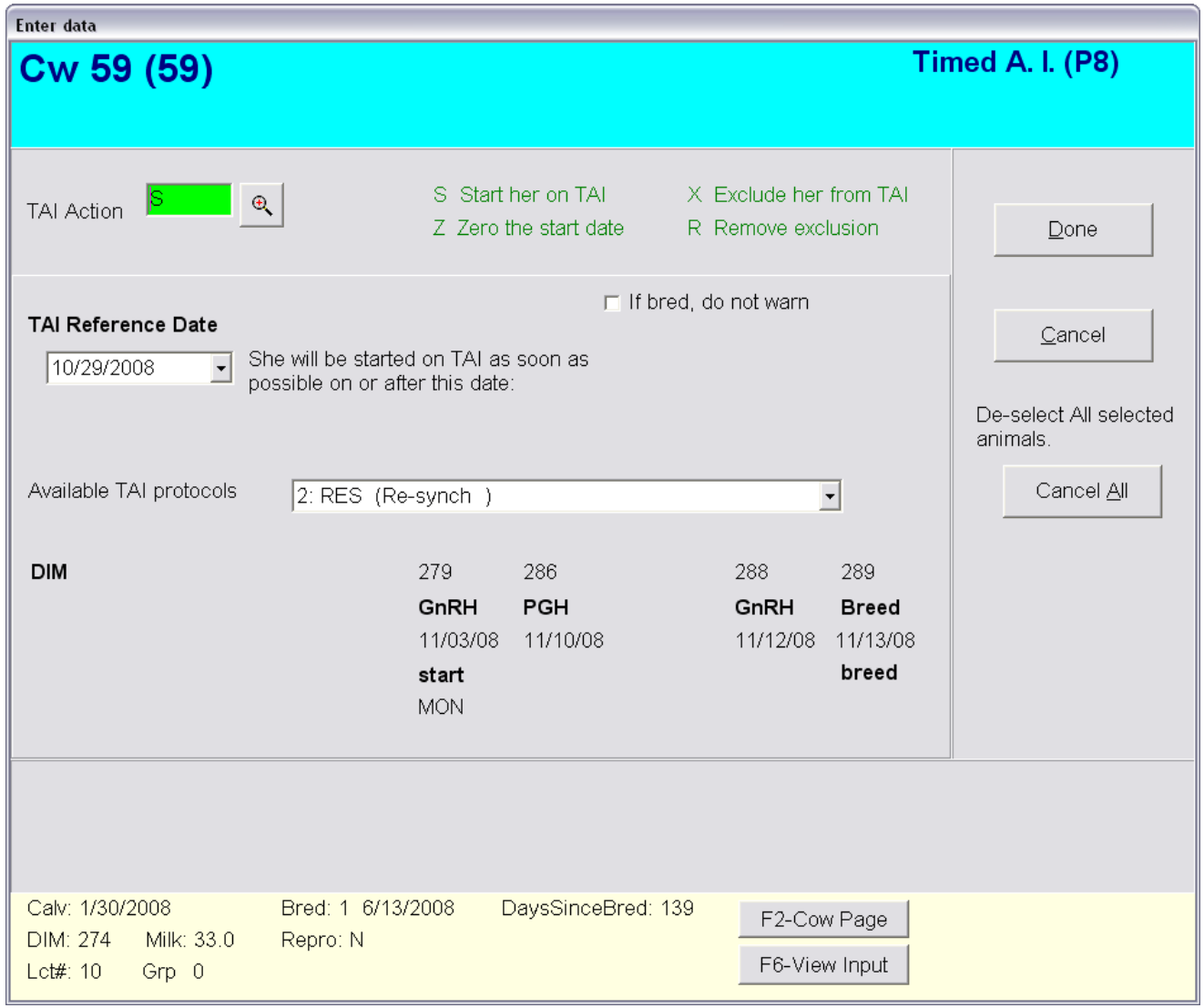
Click all the open cows that need to be re-enrolled and then choose "Apply to All"



Choose "S" for Start her on TAI and the **date** you want to start followed by the **TAI Protocol**

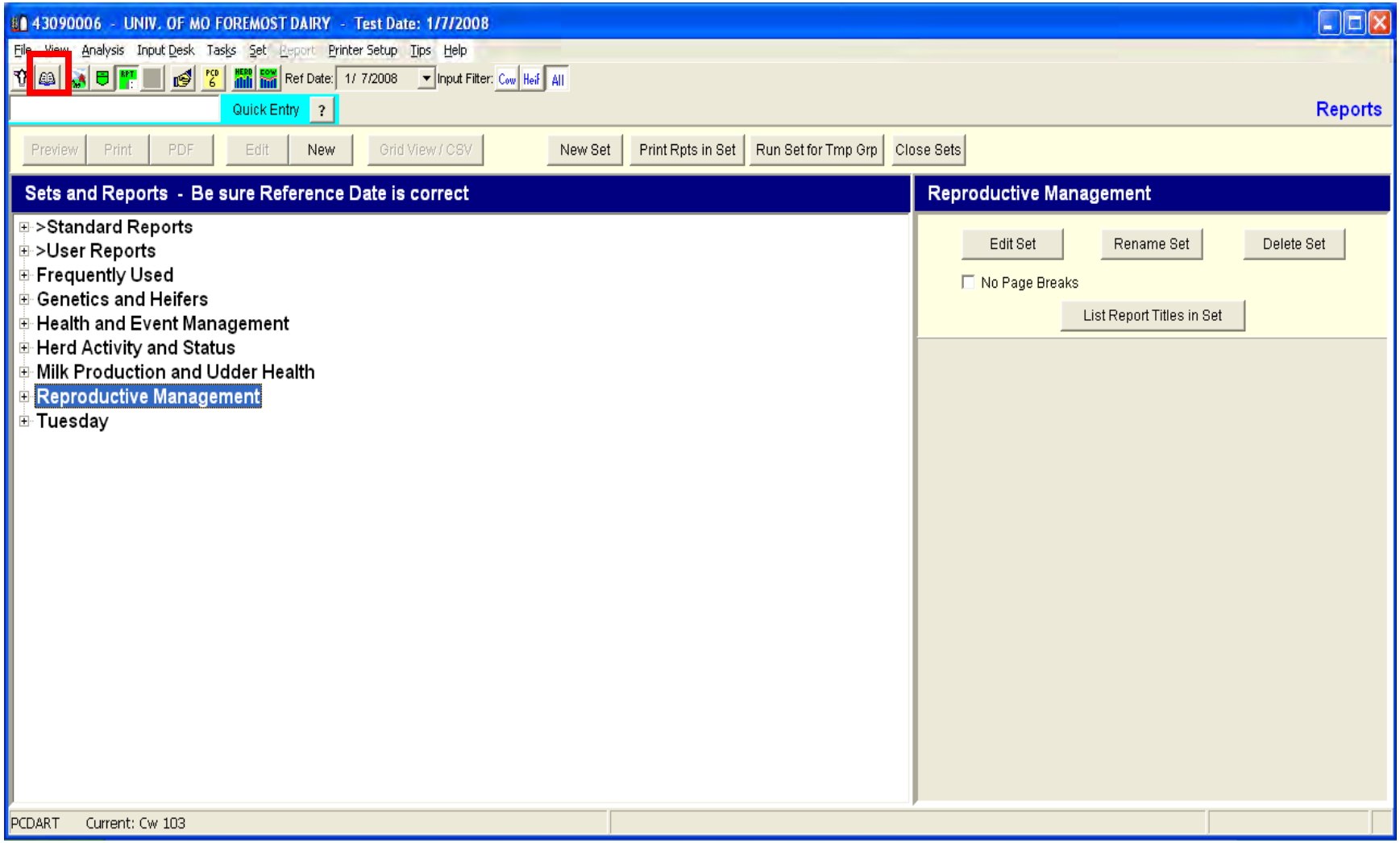


Choose "Done" and PC Dart will apply the resynch to all the chosen cows

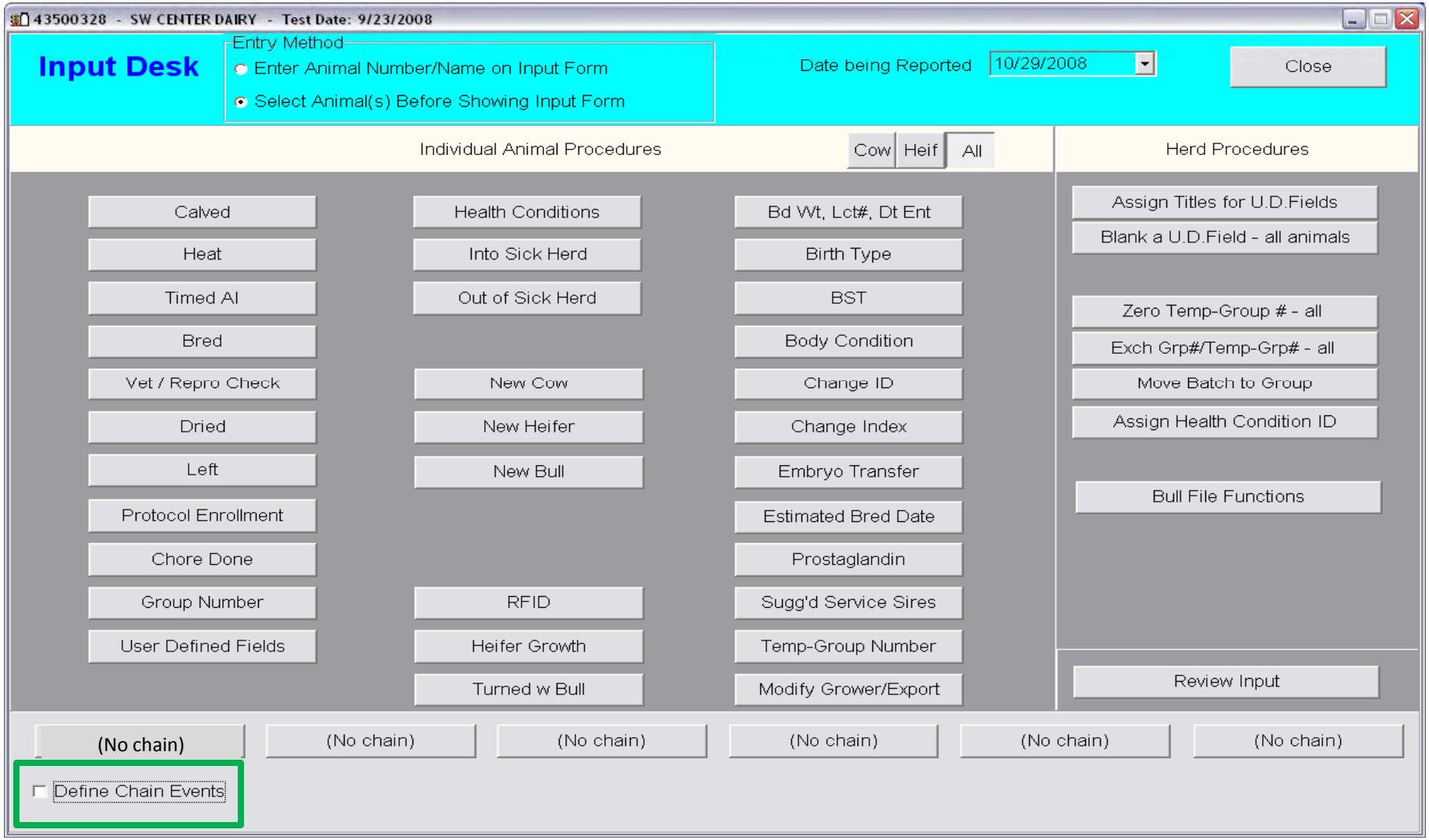


Chapter 5
Enrolling Cows into a Synchronization Program at Calving

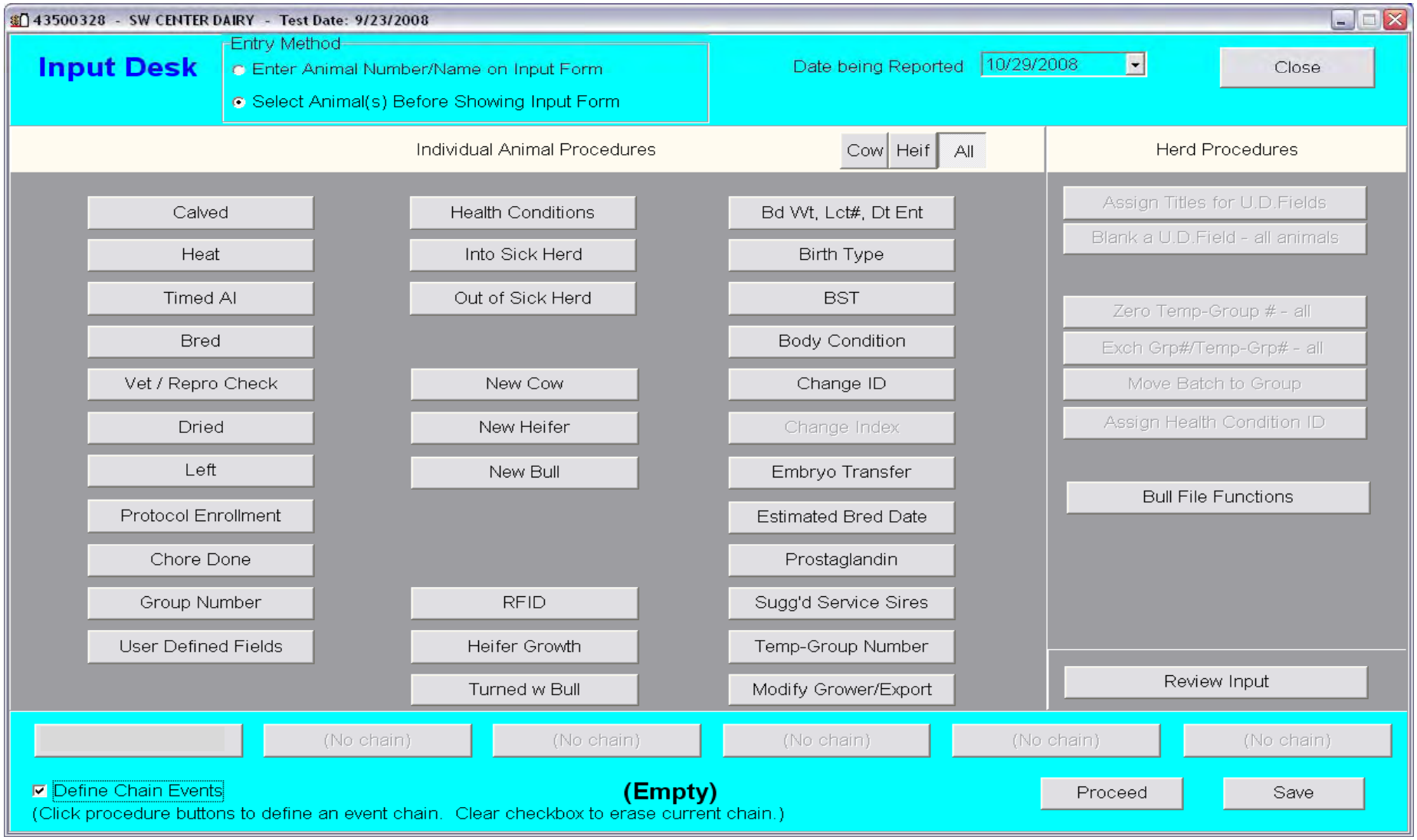
Choose the Input Desk



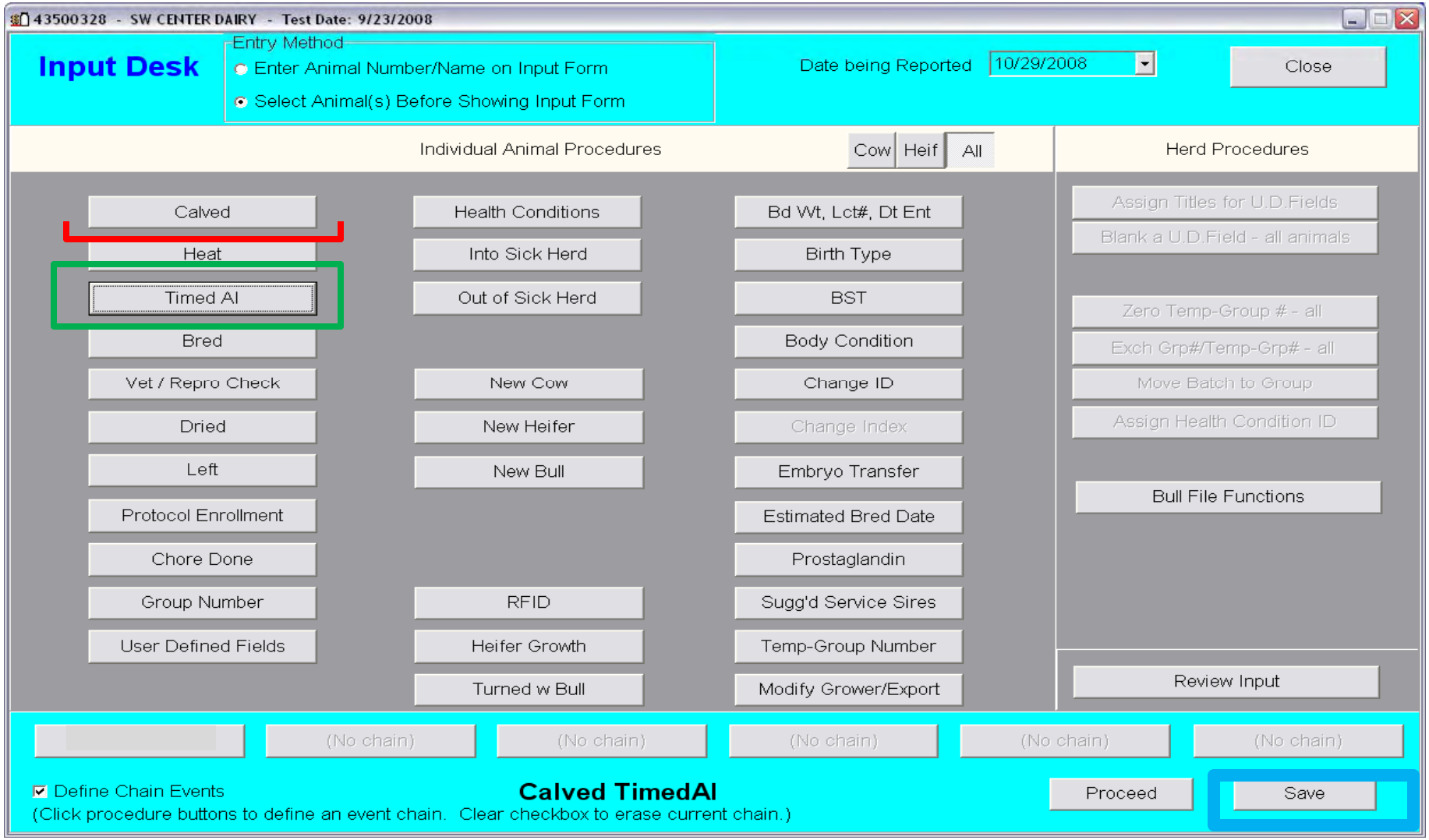
Choose “Select Animal(s) Before Showing Input Form¨ and then check ¨Define Chain Events¨



The screen will have changed and be similar to below

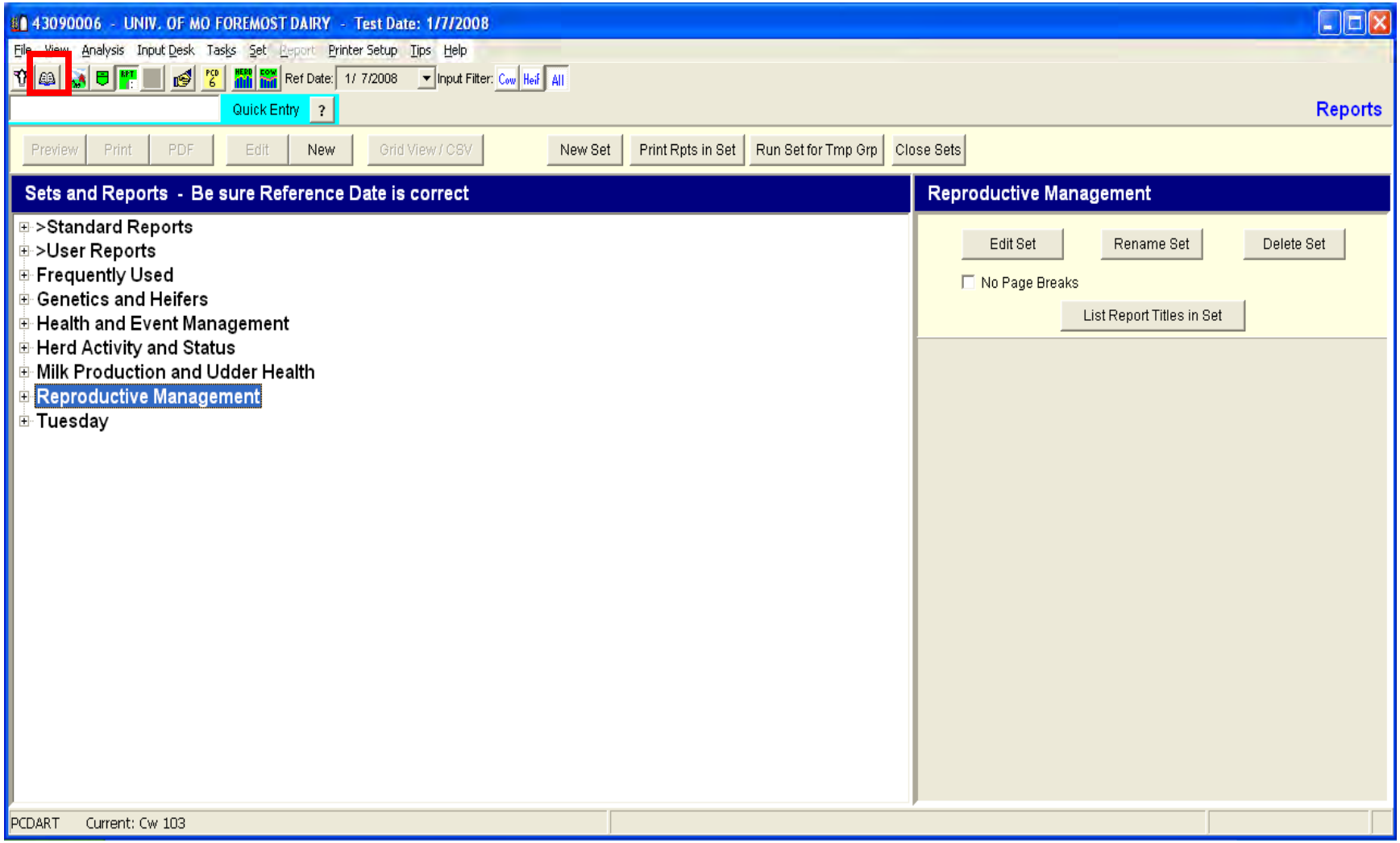


Choose "Calved" and then "Timed AI" followed by "Save"

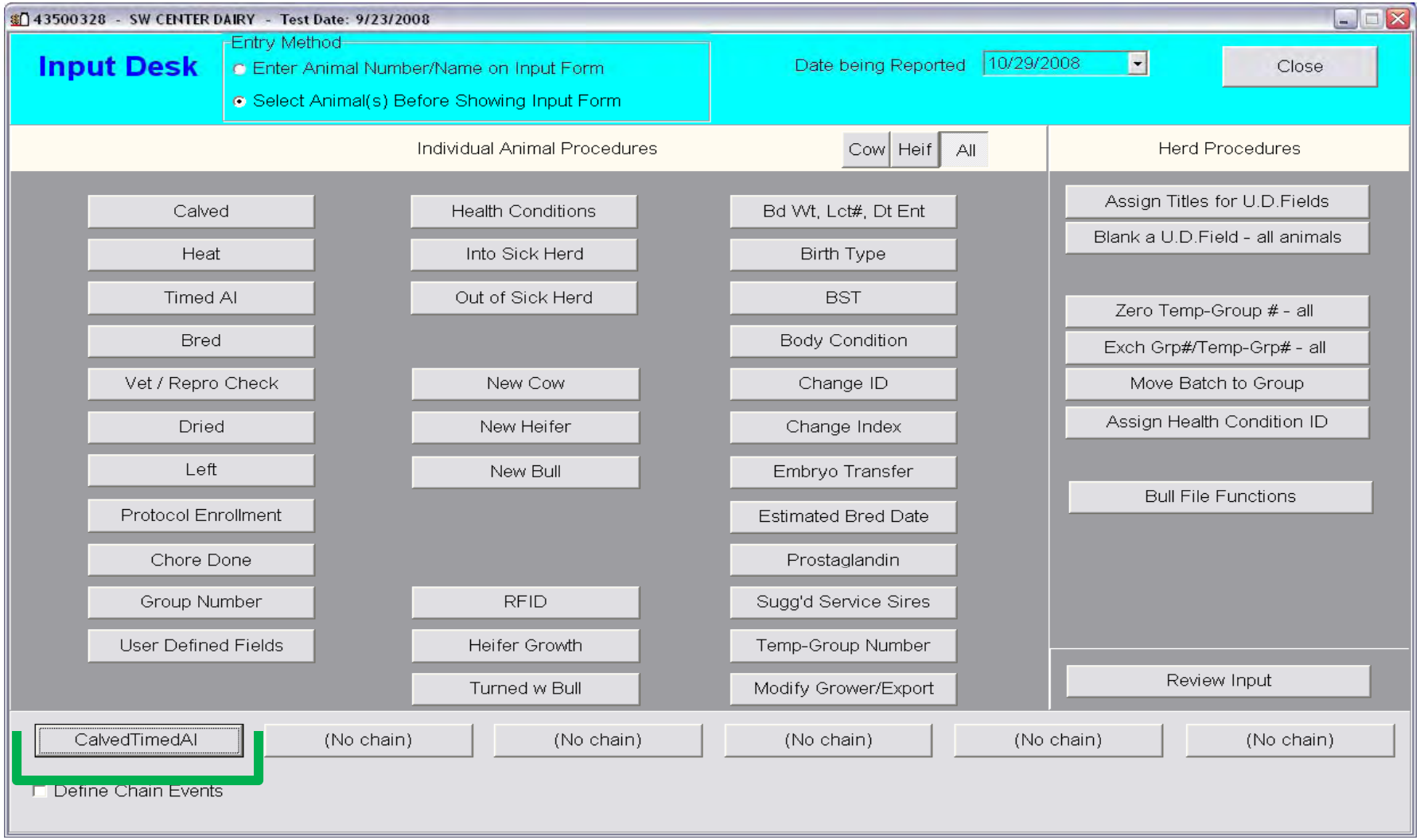


Steps to take when a cow calves

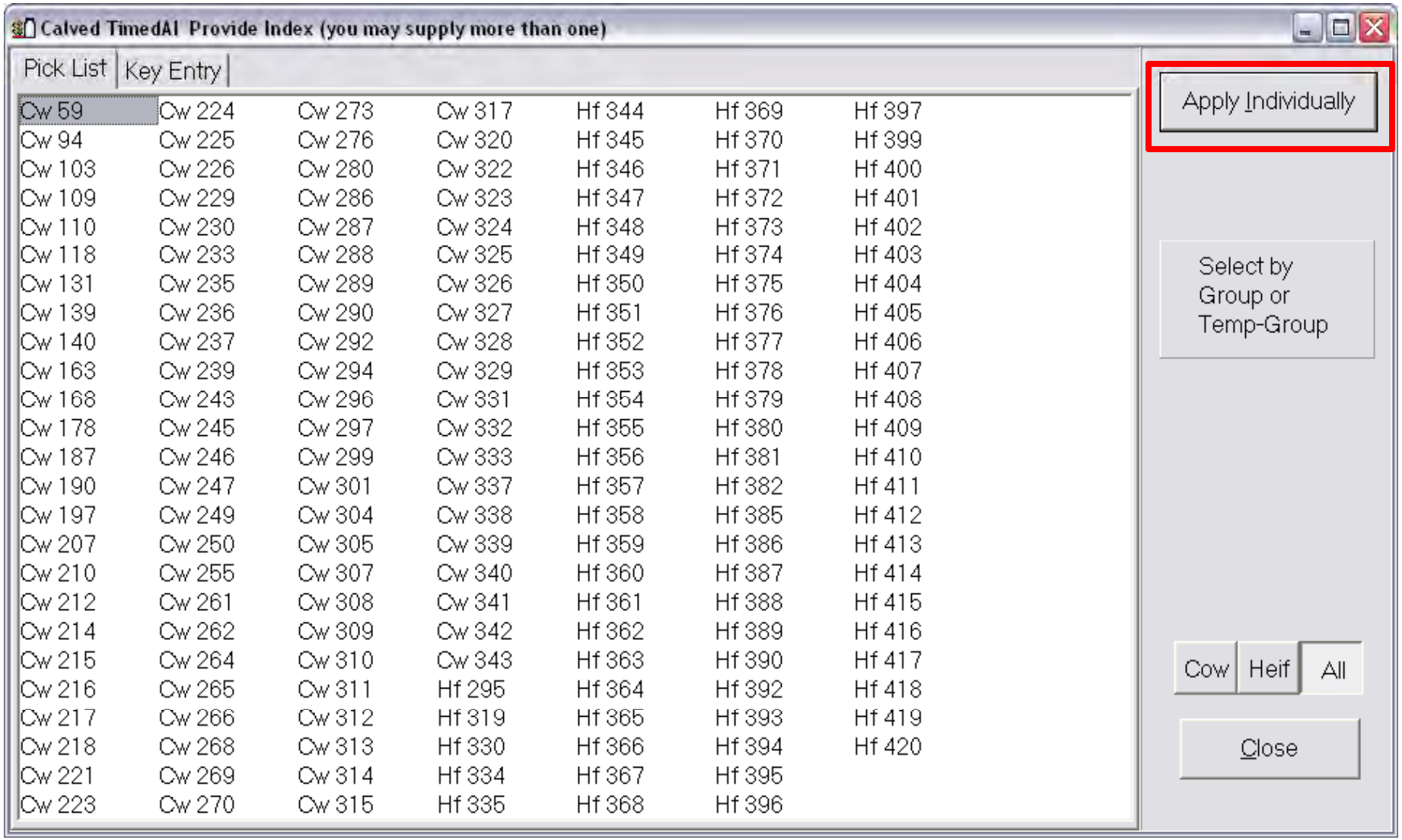
Choose the Input Desk



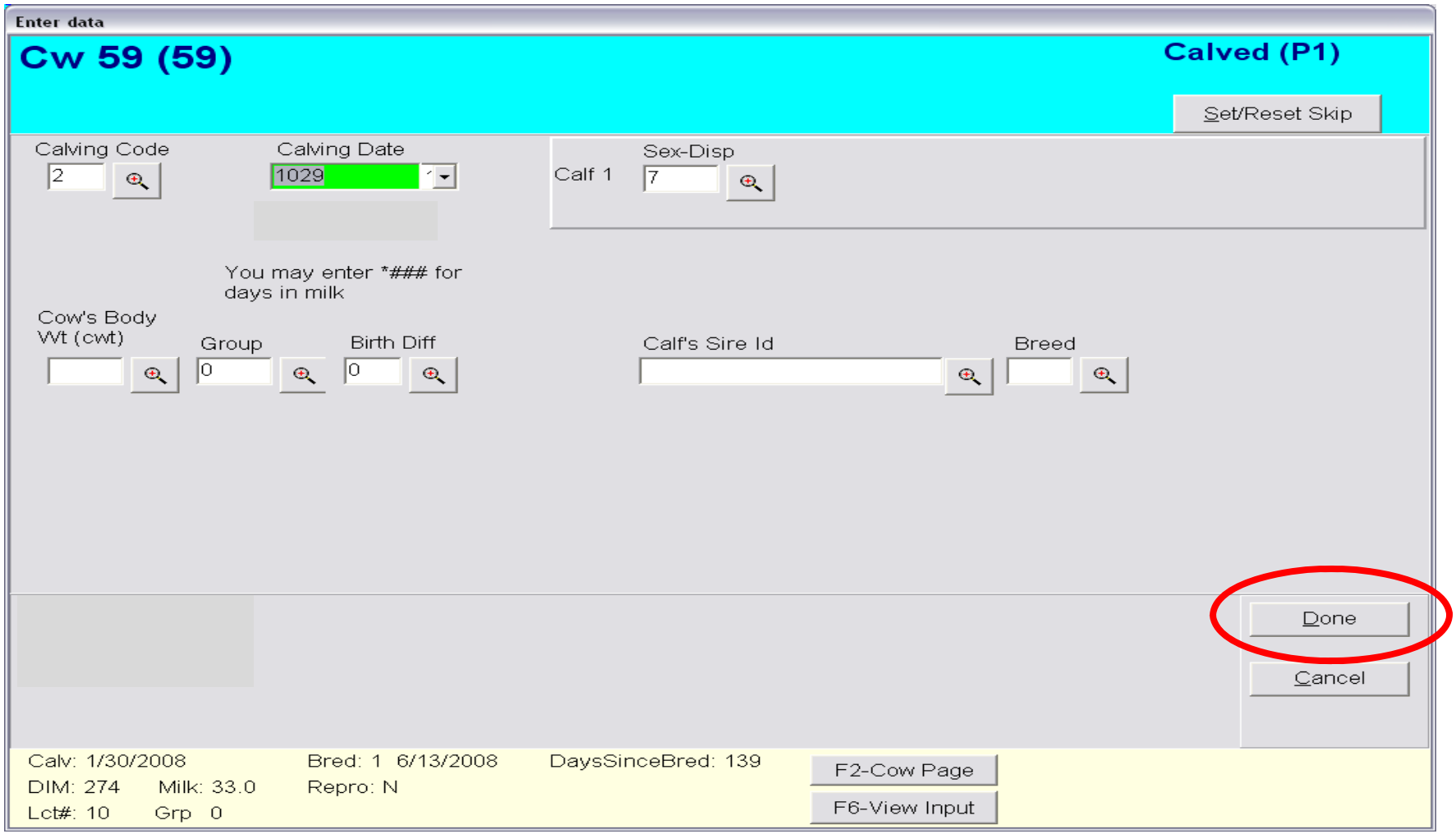
Choose “Select Animal(s) Before Showing Input Form¨ and then ¨CalvedTimed AI¨



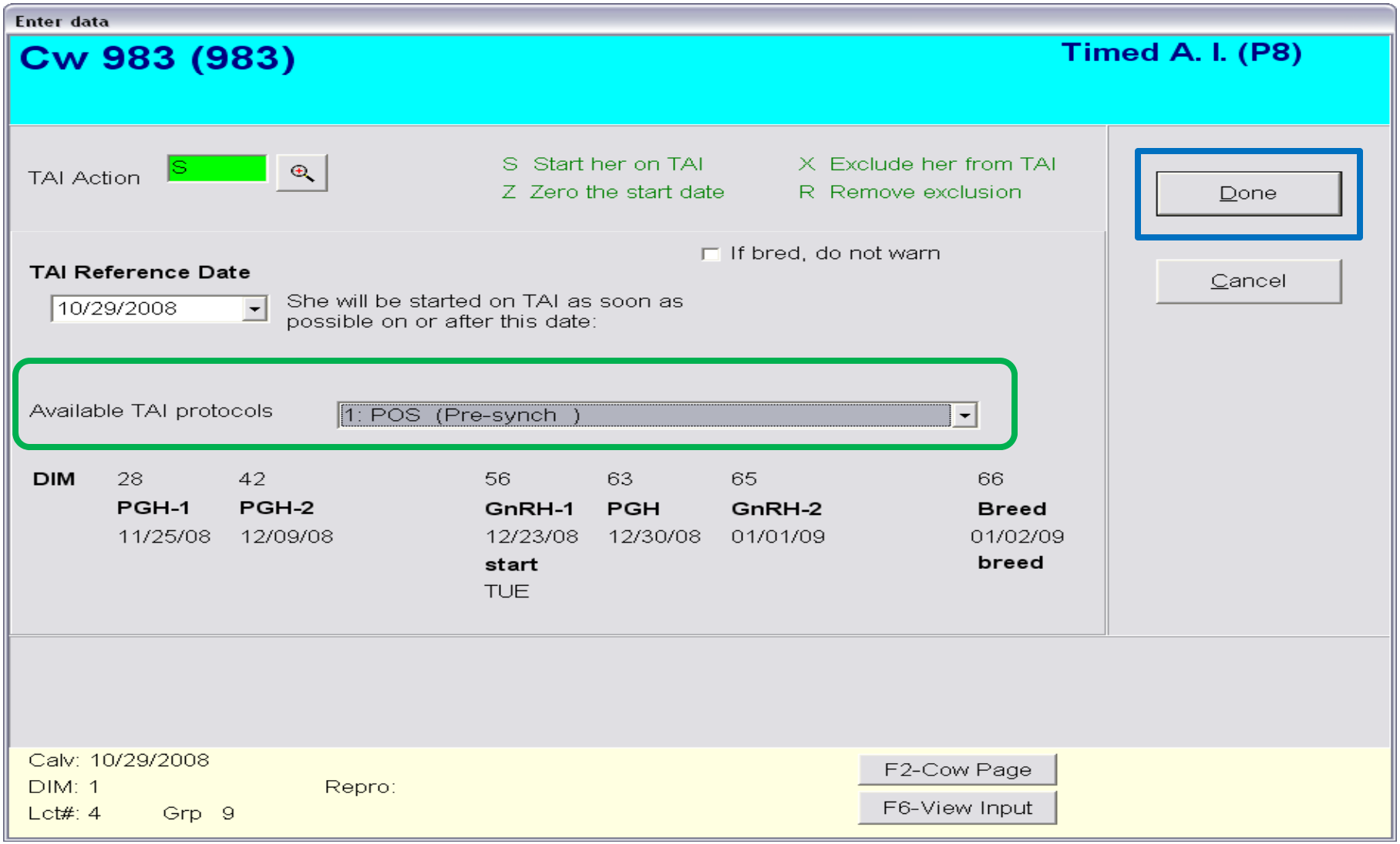
Choose your "cow(s)" and "Apply Individually"



Select the appropriate information in regard to date, calf, etc and then ¨Done¨



Choose "S" to start on Timed AI, then select the **TAI protocol**, and finally you are ¨**Done**¨

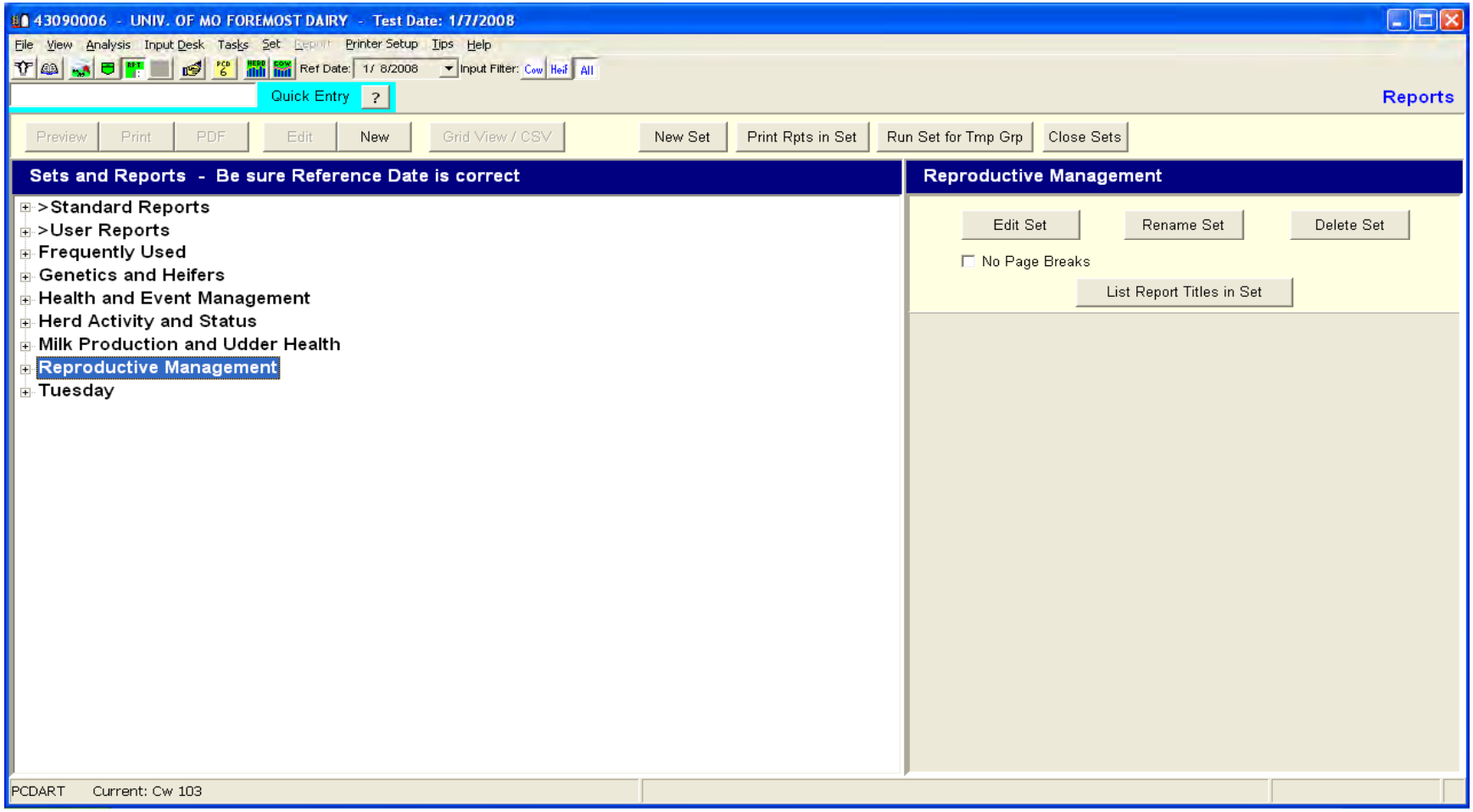


The cow will now be in the presynch/ovsynch program!

Chapter 6
Using PC Dart Reproductive Synch Programs on a Weekly Basis

How do you apply it every week?

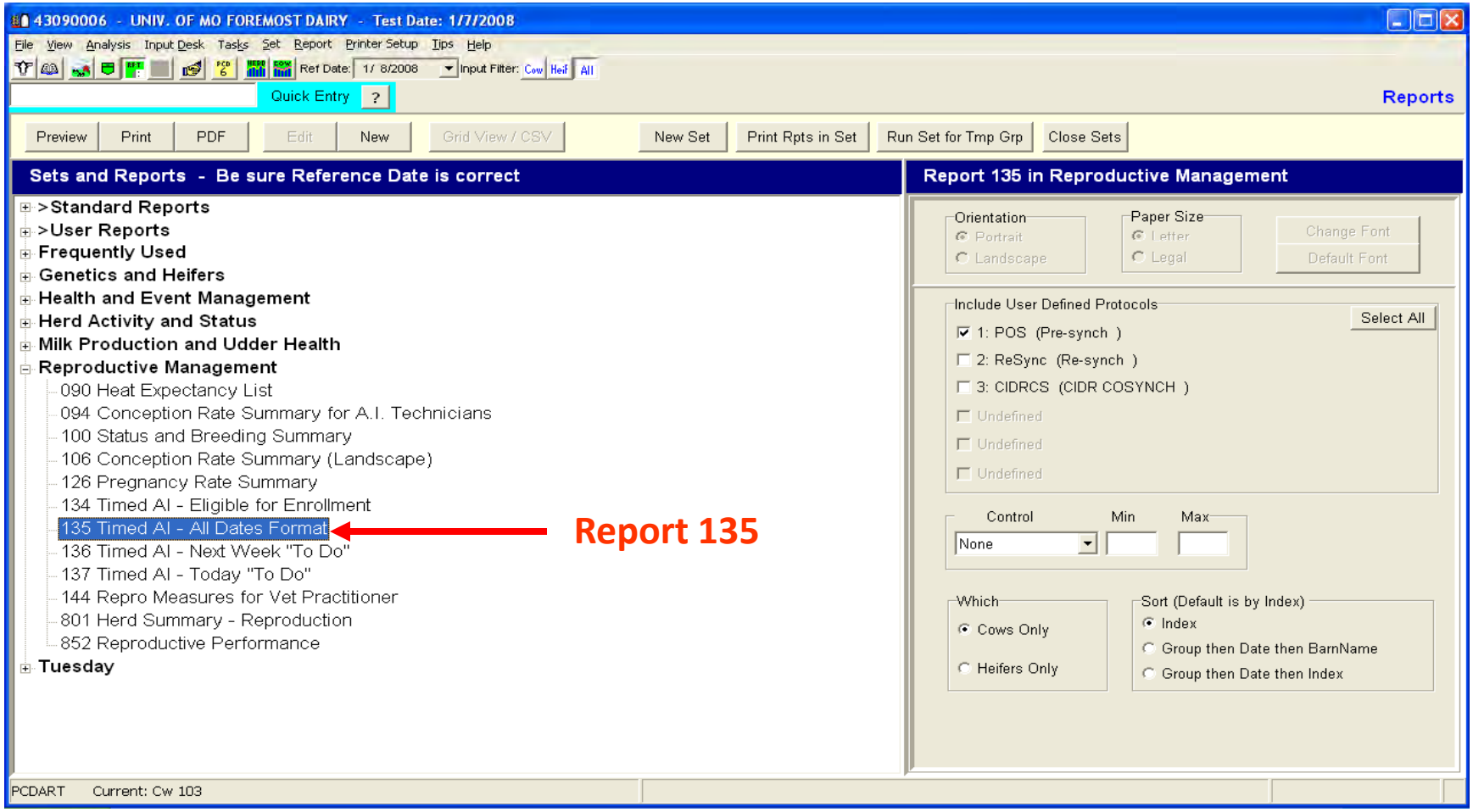
Choose “Reproductive Management”



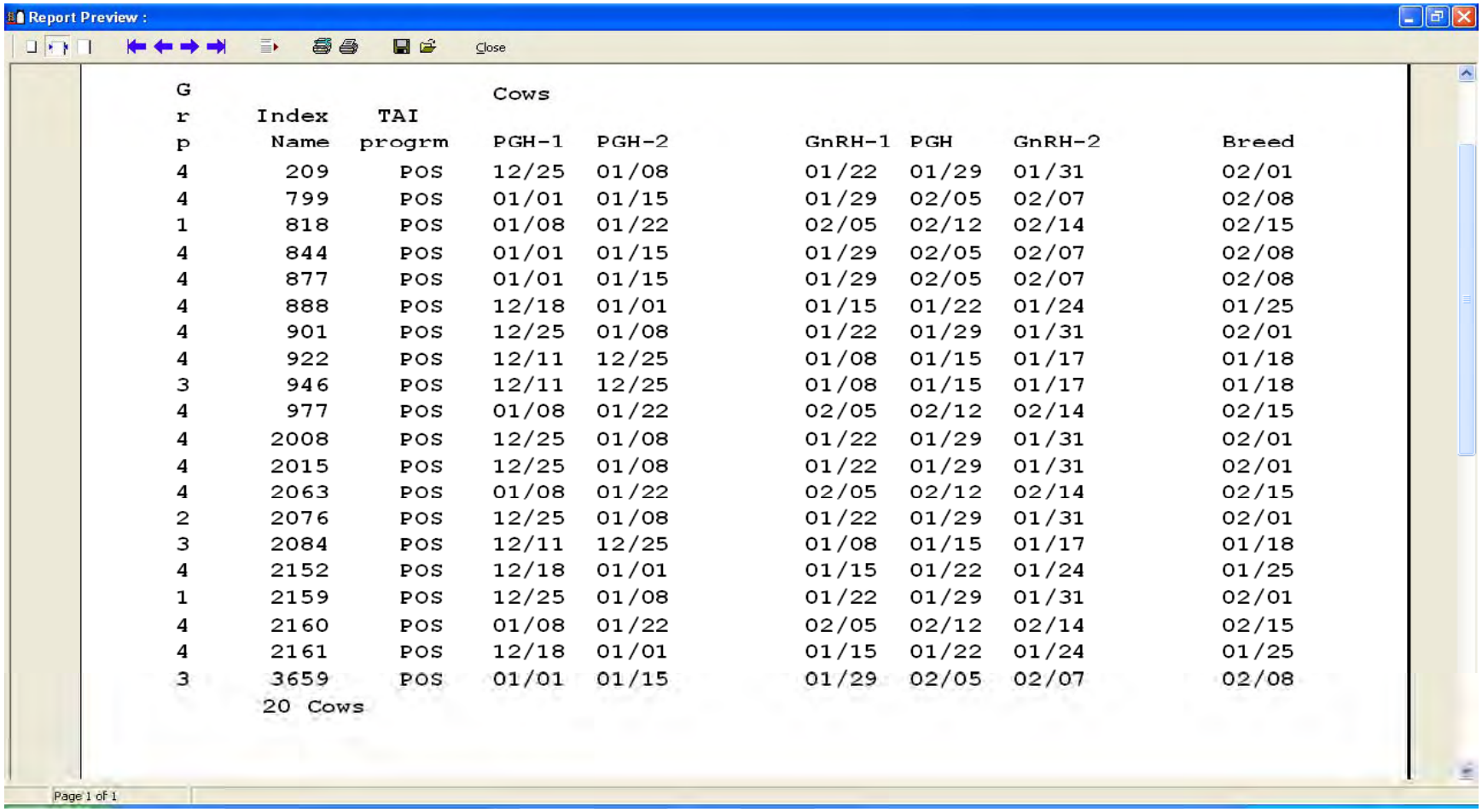
Big Picture

- To obtain a list of all the cows ENROLLED in the program and when they should receive the proper injection, select “report 135.”
- This gives you an overview of what to expect
- See next slide

Click on "Include User Defined Protocol (POS) and possibly Resync"



Output of report 135 Time AI (All Dates)


Report Preview :

Close

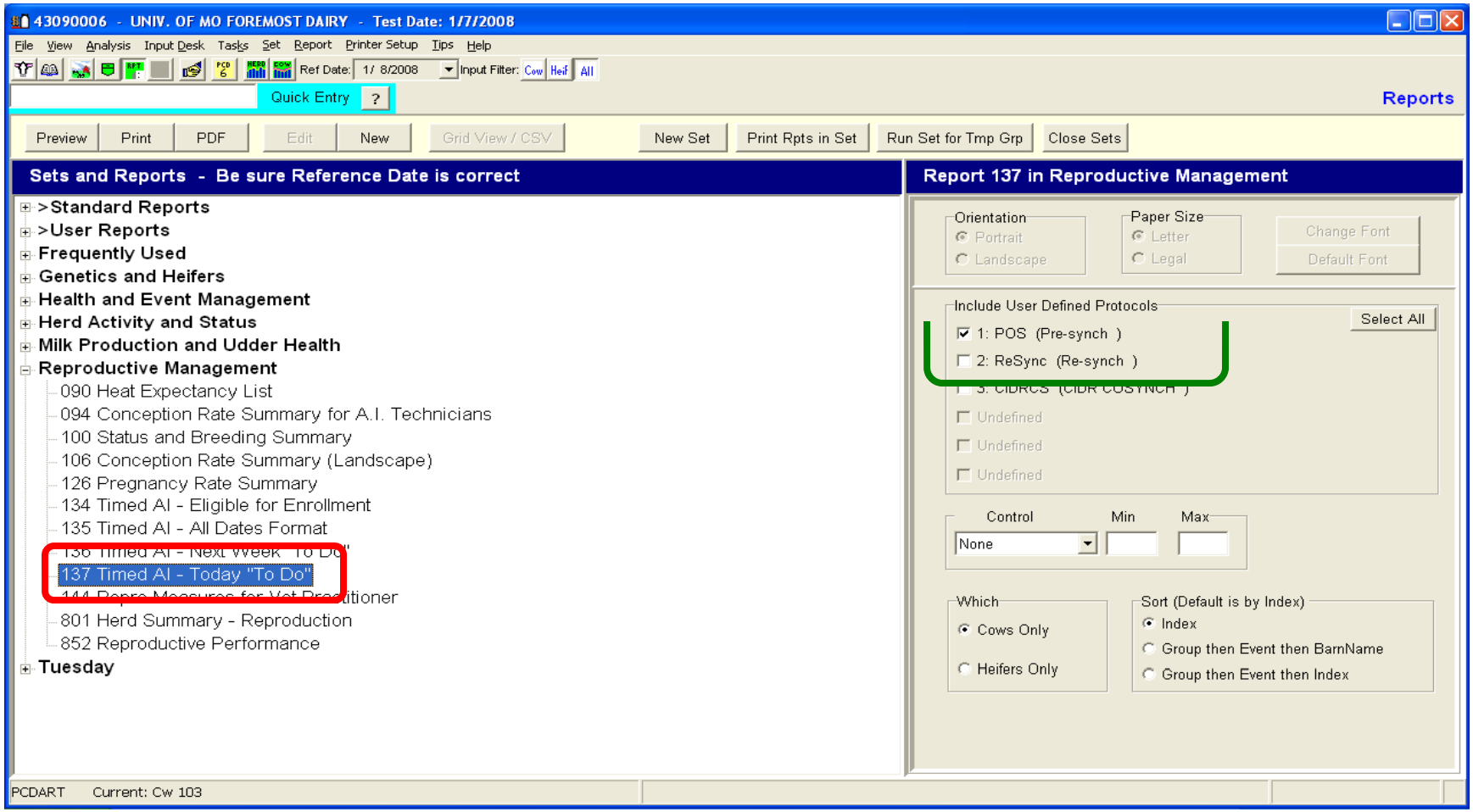
Grp	Index Name	TAI progrm	Cows PGH-1	PGH-2	GnRH-1	PGH	GnRH-2	Breed
4	209	POS	12/25	01/08	01/22	01/29	01/31	02/01
4	799	POS	01/01	01/15	01/29	02/05	02/07	02/08
1	818	POS	01/08	01/22	02/05	02/12	02/14	02/15
4	844	POS	01/01	01/15	01/29	02/05	02/07	02/08
4	877	POS	01/01	01/15	01/29	02/05	02/07	02/08
4	888	POS	12/18	01/01	01/15	01/22	01/24	01/25
4	901	POS	12/25	01/08	01/22	01/29	01/31	02/01
4	922	POS	12/11	12/25	01/08	01/15	01/17	01/18
3	946	POS	12/11	12/25	01/08	01/15	01/17	01/18
4	977	POS	01/08	01/22	02/05	02/12	02/14	02/15
4	2008	POS	12/25	01/08	01/22	01/29	01/31	02/01
4	2015	POS	12/25	01/08	01/22	01/29	01/31	02/01
4	2063	POS	01/08	01/22	02/05	02/12	02/14	02/15
2	2076	POS	12/25	01/08	01/22	01/29	01/31	02/01
3	2084	POS	12/11	12/25	01/08	01/15	01/17	01/18
4	2152	POS	12/18	01/01	01/15	01/22	01/24	01/25
1	2159	POS	12/25	01/08	01/22	01/29	01/31	02/01
4	2160	POS	01/08	01/22	02/05	02/12	02/14	02/15
4	2161	POS	12/18	01/01	01/15	01/22	01/24	01/25
3	3659	POS	01/01	01/15	01/29	02/05	02/07	02/08

20 Cows

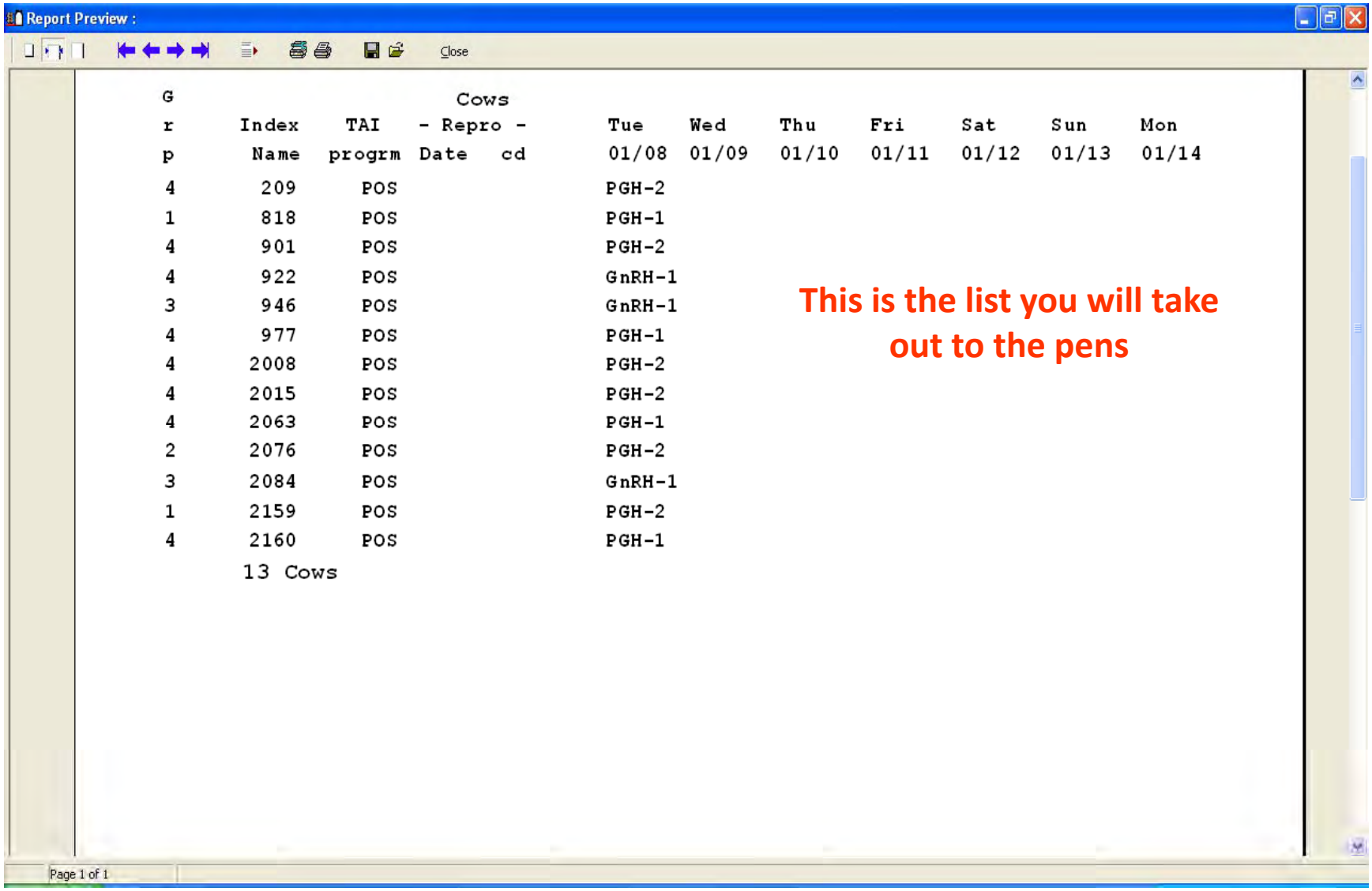
Page 1 of 1

Injection Day!

Choose report 137 (be sure to check the synch program, could be both POS and ReSync)



Output of Report 137

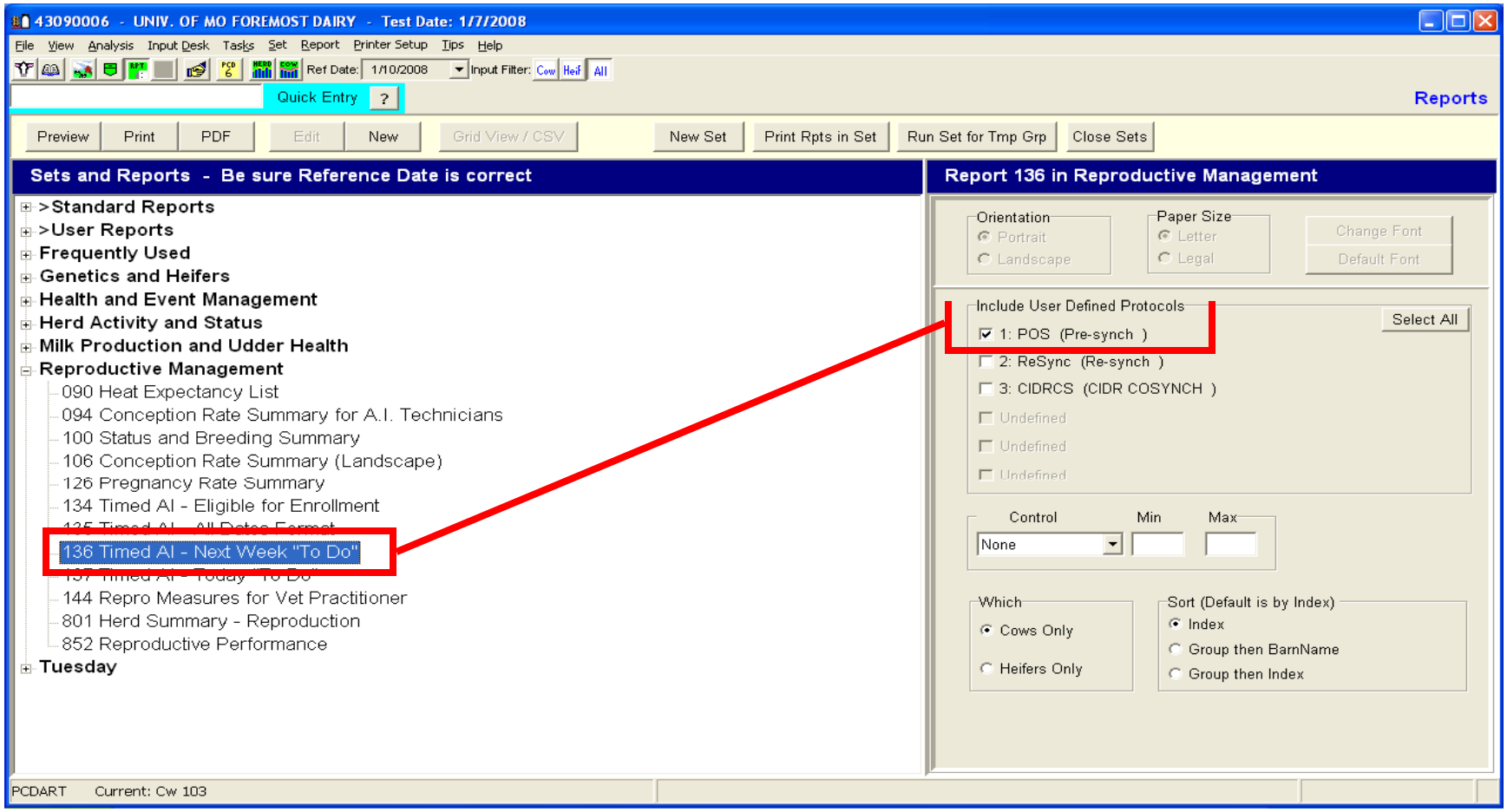


Grp	Index Name	TAI progrm	Cows - Repro - Date	cd	Tue 01/08	Wed 01/09	Thu 01/10	Fri 01/11	Sat 01/12	Sun 01/13	Mon 01/14
4	209	POS			PGH-2						
1	818	POS			PGH-1						
4	901	POS			PGH-2						
4	922	POS			GnRH-1						
3	946	POS			GnRH-1						
4	977	POS			PGH-1						
4	2008	POS			PGH-2						
4	2015	POS			PGH-2						
4	2063	POS			PGH-1						
2	2076	POS			PGH-2						
3	2084	POS			GnRH-1						
1	2159	POS			PGH-2						
4	2160	POS			PGH-1						

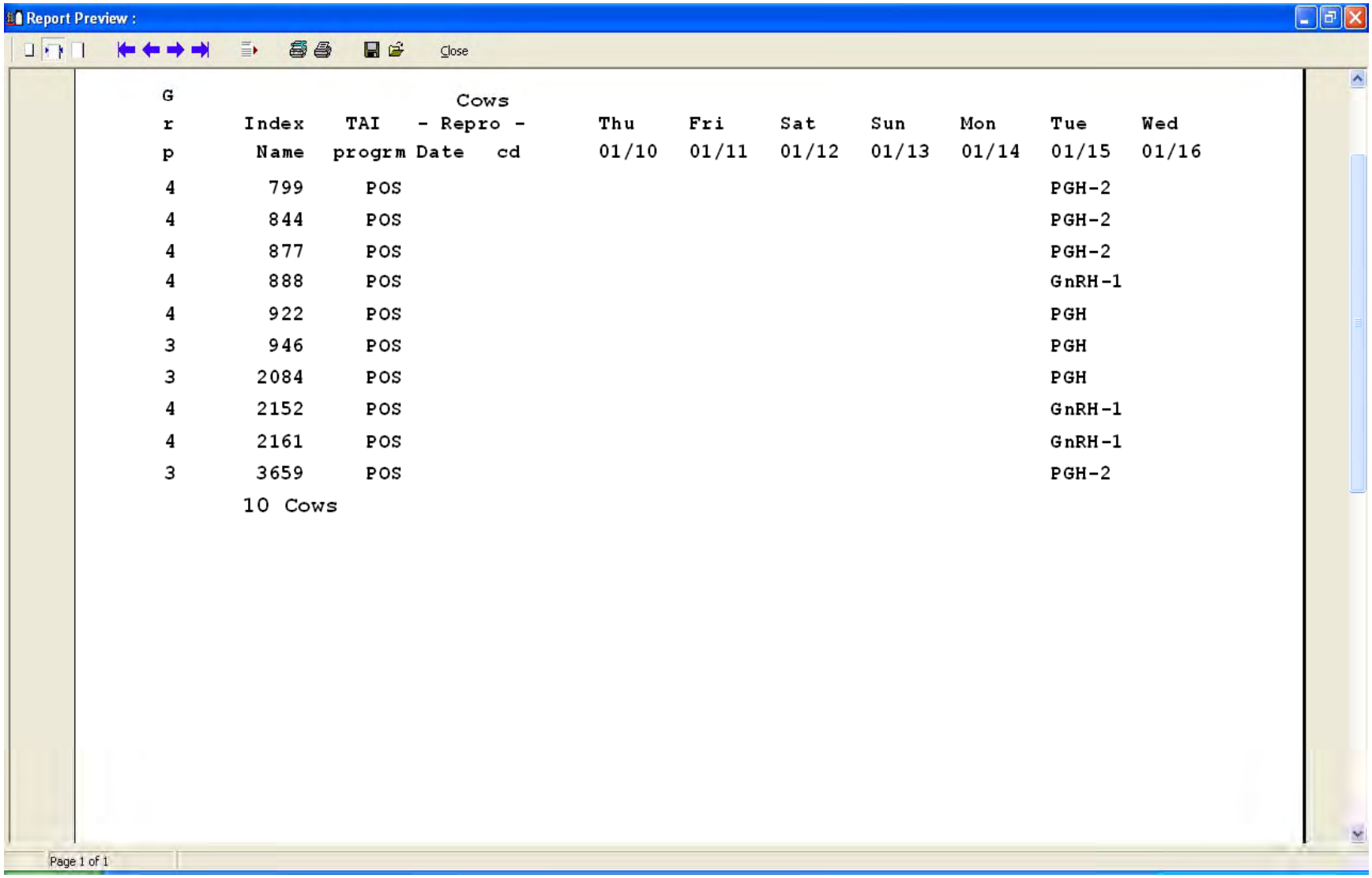
13 Cows

This is the list you will take out to the pens

To see which cows will be on the synchronization list next week Choose Report 136



Output of Report 136



Grp	Index Name	TAI progrm	Cows - Repro - Date	cd	Thu 01/10	Fri 01/11	Sat 01/12	Sun 01/13	Mon 01/14	Tue 01/15	Wed 01/16
4	799	POS								PGH-2	
4	844	POS								PGH-2	
4	877	POS								PGH-2	
4	888	POS								GnRH-1	
4	922	POS								PGH	
3	946	POS								PGH	
3	2084	POS								PGH	
4	2152	POS								GnRH-1	
4	2161	POS								GnRH-1	
3	3659	POS								PGH-2	

10 Cows

Chapter 7
Estrus Synchronization Programs

Ovsynch 56	**Monday**	(7 days)	**Monday**	(2 days)	**Wednesday**		**Thursday**
	GnRH		**PGF2**		**GnRH**		**Breed**
	AM		**AM**		**4:00 PM**		**AM**

Cosynch 72	**Monday**	(7 days)	**Monday**	(3 days)	**Thursday**
	GnRH		**PGF2**		**Breed**
	AM		**AM**		**GnRH**

SelectSynch	**Monday**	(7 days)	**Monday**	**Heat detect and Breed**			
	GnRH		**PGF2**				
	AM		**AM**				

Presynch + Ovsynch	**Monday**	(14 days)	**Monday**	(14 days)	**Monday**	(7 days)	**Monday**	(2 days)	**Wednesday**		**Thursday**
	PGF2		**PGF2**		**GnRH**		**PGF2**		**GnRH**		**Breed**
	AM		**AM**		**AM**		**AM**		**4 PM**		**AM**

Presynch + Cosynch	**Monday**	(14 days)	**Monday**	(14 days)	**Monday**	(7 days)	**Monday**	(3 days)	**Thursday**	
	PGF2		**PGF2**		**GnRH**		**PGF2**		**Breed**	
	AM		**AM**		**AM**		**AM**		**AM**	

G6G Ovsynch	**Monday**	(2 days)	**Wed**	(6 days)	**Monday**	(7 days)	**Monday**	(3 days)	**Thursday**
	PGF2		**GnRH**		**GnRH**		**PGF2**		**Breed**
	AM		**AM**		**AM**		**AM**		**AM**

CIDRsynch	**Monday**	(7 days)	**Monday**	(2 days)	**Wednesday**		**Thursday**
	CIDR		**CIDR**		**GnRH**		**Breed**
	IN		**Out**		**4:00 PM**		**AM**
	GnRH		**PGF2**				
	AM		**AM**				

CIDR Cosynch	**Monday**	(7 days)	**Monday**	(66 hours)	**Thursday**		
	CIDR		**CIDR**		**Breed**		
	IN		**Out 2PM**		**8:00 AM**		
	GnRH		**PGF2**		**Give GnRH at**		
	AM		**2 PM**		**Breeding**		

Definitions

Calving interval ---The time between when the cow delivers a calf until the next calf is born

Conception rate ---The percentage of the number of cows that conceive divided by the number bred at the time of pregnancy check

Days open---The time from when a cow calves until when she conceives

Days to first service--- The time from when a cow calves until the first time she is bred

Estrus synchronization--- A program to group the heats in animals

First service conception rate--- The percentage of cows that conceive at the time of their first breeding

Heat Detection Rate--- Number of cows bred divided by the number of cows eligible to get bred over a 21 day period

Pregnancy Rate--- Number of cows that became pregnant divided by the number of cows eligible to get pregnant over a 21 day period

Voluntary waiting period--- A specified time after a cow calves that no breeding takes place or the time when you will start breeding your cows