

Reading a PRC

Performance Registration Certificate documents ownership and genetic merit of animals registered through the American Angus Association.

by *Shauna Rose Hermel, editor, & Tonya Amen & Chris Stallo, American Angus Association*

One of the cornerstones for recordkeeping in a registered-Angus herd is the Performance Registration Certificate, or PRC. This document summarizes some of the most pertinent information available on an animal — including details of ownership, pedigree, performance, genetic conditions and genetic merit — as well as performance information on the animal's parents and progeny.

"The PRC is the owner's certificate of authenticity, if you will, that the animal is indeed registered through the American Angus Association," says Dan Moser, president of Angus Genetics Inc. (AGI), noting that there are a lot of black cattle that are undocumented and unknown.

For owners, it represents the fruit of their efforts in collecting weights and measures and submitting the data to Angus Herd Improvement Records (AHIR®) to be included in national cattle evaluation by the American Angus Association.

"While the most effective selection is based on EPDs (expected progeny differences), there is benefit to documenting the information that went into compiling the EPDs," says Moser, noting that the PRC contains more of that background information in the form of ratios, contemporary group size, etc. "Ultimately, EPDs and genomic equations depend on the data that go into the formulation, so documenting complete data reporting is important."

Commerce of any type ultimately depends on documentation of a product in terms of its value, source and origin.

"That's what the PRC is for an Angus bull," says Moser, explaining the document describes the animal's relation to its ancestors and documents its own performance, that of its ancestors, and ultimately, its progeny.

"The information here is the biggest driver of the value of the animal," Moser says. "There are phenotypic things that are not reflected here, but we're in a highly data-driven economy and the relative value of

animals compared to others is in large part documented here."

For the buyer, it provides an unbiased source of information coming straight from the Association, says Moser. "There's no marketing influence here; this is the real deal."

At first glance the PRC may seem a bit complicated; however, closer examination with a little study provides some valuable information. Let's go through the document section by section.

1 Header section

The top portion of the PRC deals with pertinent information such as name, registration number, sex, tattoo, breeder and first owner. The breeder is the Association member who owned the dam at the time the animal was conceived. The first owner is the person who was the dam's owner of record when the calf was born.

2 Parentage/genomic information

This area provides information about what parentage and/or genomic tests have been performed on the animal. If parentage has been verified, the paper will specify whether by blood type; microsatellite markers; or, the most recent technology, single-nucleotide polymorphisms (SNP).

DNA evaluations included in the American Angus Association National Cattle Evaluation (NCE) to provide genomic-enhanced expected progeny differences (GE-EPDs) have evolved over time. If an animal has been DNA-tested, the paper will indicate which test was performed — the original Igenity test (IG1); the Igenity 384 test (IG384); the high-density test offered by Zoetis, formerly Pfizer (PF50); or the high-density test offered by GeneSeek (GGPHD).

3 Genetic conditions

If an animal is a potential carrier of a genetic condition or if it has been tested to determine its status for a particular condition, that information will be conveyed immediately below the animal's registration number at the top of the PRC.

The American Angus Association currently recognizes the following genetic conditions:

AM Arthrogryposis multiplex

CA Contractural arachnodactyly
DD Developmental duplication
M1 nt821 mutation for double muscling
NH Neuropathic hydrocephalus
D2 PRKG2 gene mutation for dwarfism
DM Double muscling
DW Dwarfism
RD Red gene
WT Wild-type color gene
HG Horn gene
HI Heterochromia irides
OS Osteopetrosis
SN Syndactyly

The following single letter descriptors appearing after a genetic condition code have the following meaning:

- ▶ P refers to a "potential" carrier based on an ancestor known to carry that specific mutation.
- ▶ F refers to an animal tested for one or more genetic conditions and determined to be "free" of that specific mutation.
- ▶ C refers to an animal tested for one or more genetic conditions and determined to be a "carrier" of that specific mutation.
- ▶ A refers to an animal tested for one or more genetic conditions and determined to be homozygous for (i.e., possesses two copies of) that specific mutation. It may or may not exhibit the phenotype associated with that genetic condition.

The following letter designations describe cases in which there is more than one genetic condition present:

XF — Free of more than one genetic condition

XC — Carrier of more than one genetic condition

XA — Affected by more than one genetic condition

RTF — Recessive-trait free (produced 35 or more calves from daughters without an observed genetic defect)

The genetic-condition codes and descriptors reflect the available, reported genetic-condition status of the animal at the time the PRC was printed. The Association does not warrant or guarantee that any



Fig. 1a: Working example of front side of a PRC

American Angus Association

REGISTRY NUMBER
AAA #10226429
[AMF-CAF-DDF-MIF-NHF]
For more info see reverse side.



Parentage: Blood type, Microsatellite, SNP
Genomic: IGI, IG384, PF50

SEX: Bull
TATTOO LEFT EAR: 14 | RIGHT EAR: 14
BIRTH DATE: 3/05/1982

1 Certifies That
SCOTCH CAP
BREEDER: A-258572 Hoff, Douglas H Spearfish SD
FIRST OWNER: A-258572 Hoff, Douglas H Spearfish SD

L B I G	Production EPD								Maternal EPD						Carcass EPD				SValues				
	CED	BW	WW	YW	RADG	YH	SC	Doc	HP	CEM	Milk	MW	MH	SEN	CW	Marb	RE	Fat	C	U	\$F	\$QG	\$W
	+3	+5.4	+32	+62	+1.8	+1.0	-0.7	+6	+8.5	+6	+10	+60	+9	+11.34	+23	+56	+40	+0.27	111	164	+9.11	+28.65	-1.22
	.91	.98	.97	.96	.54	.95	.94	.70	.50	.92	.96	.91	.91	.88	.89	.88	.88	475	233	+32.17	+3.52	+67.74	
	-7	+2.0	+21	+40	+2.2	+1.0	+2.5	+5	+7.9	+3	+5	+54	+1.0	+18.90	+1	+0.6	-27	+0.48	55	17	-8.65	+8.07	-4.04
	.95	.98	.97	.96	.44	.95	.92	.50	.24	.93	.96	.91	.92	.83	.85	.83	.82	132	21	+3.55	-4.52	+10.38	
D B M	+7	+1.9	+28	+55	+1.2	+3	-.32	+0	+8.9	-3	+10	+11	-1	+25.94	+21	+34	+41	+0.19			+3.45	+20.71	+18.74
	.50	.66	.60	.58	.18	.44	.50	.24	.11	.47	.60	.42	.40	.40	.42	.42	.39			+25.65	+4.94	+59.35	

4

5 Print Date 10/08/2013

L B I G	PRODUCTION								MATERNAL				ULTRASOUND											
	HERDS	IND. OR	HERDS	CONT	HERDS	CONT	HERDS	CONT	HERDS	PROG.	HERDS	PROG.	HERDS	PROG.	HERDS	CONT								
		1		163		163		71																
				121		112		126																
	249	1476	1561	55	1086	30	332	235	1177	4473	2214	23888	96	96	96	96	96	96	96	96	96	96	96	96
	577	1.2	13724	102	14764	101	9674	101	2075	100	1014	99	4473	1.2	5874	99	237	105	236	101	240	104	240	100
	704	1039	1210	72	747	30	235	61	921	5025	2066	32083	11	11	11	11	11	11	11	11	11	11	11	11
	4886	1.3	15494	100	17381	101	9617	102	2039	101	333	99	5025	1.2	7299	100	21	99	21	93	21	109	21	97
D B M	1	2	2	154	3	73			1	7	6	48												
	1	1.0	7	112	7	110	8	113			7	1.0	12	101										

6

7

SIRE
P S POWER PLAY
EARLY SUNSET EMULOUS 60E
EARLY SUNSET PRIDE 88
MENTEITH OF GRAHAM 37
P S MENTEITH BLANCHE 205
P S BLANCHE 415
BAND 234 OF IDEAL 3163
BAND 105 OF S C 579
JET OF S C
HOFF BAND 07 OF S C 509
C R R EMULOUS 26 17
EMULOUS E OF S C 4
LASSY S C

DAM
BIFFLES EMULOUS 775
AAA 6274681 (RDC)
AAA #8890783
AAA 10099786
AAA #8329603
AAA 8511577
AAA 7074946
AAA #8505294
AAA 9019342
AAA #8622984
AAA #9538351
AAA #7682162
AAA 8645304
AAA 5450822

Pathfinder

8 NAME AND LOCATION OF RECORDED OWNER: Hoff, Douglas H Spearfish SD
MEMBER CODE: A-258572
SALE DATE: 03/05/1982
TRF. NO.: 2

9 Processed Date 10/8/2013 File B00001 1
For more information consult the Breeder's Reference Guide.



American Angus Association
3201 Frederick Avenue
Saint Joseph, Missouri 64506-2997
Bryce F. Schumann
Chief Executive Officer 9300



Fig. 1b: Working example of back side of a PRC

PERFORMANCE REGISTRATION CERTIFICATE

TRANSFER

I (we) hereby authorize transfer of Registration on the records of the Association to:

10 Seller's Authorized Personal Signature: _____ (Member Code) _____

SALE DATE: _____ If the seller is retaining an interest in the animal, check this box:

Member Code	Name	Address	City, State/Province, Zip Code
(buyer 1)	_____	_____	_____
(buyer 2)	_____	_____	_____
(buyer 3)	_____	_____	_____

If the animal is an open female (not bred) check this box

If the animal is a female, serviced prior to Date of Sale, List Date of Service or exposed period as follows:

Service Bull Reg number	Natural or Artificial	Service Date or Pasture Begin Date	Pasture End Date
Service 1 _____	If artificial check box: <input type="checkbox"/>	_____	_____
Service 2 _____	If artificial check box: <input type="checkbox"/>	_____	_____
Service 3 _____	If artificial check box: <input type="checkbox"/>	_____	_____
Service 4 _____	If artificial check box: <input type="checkbox"/>	_____	_____
Service 5 _____	If artificial check box: <input type="checkbox"/>	_____	_____
Service 6 _____	If artificial check box: <input type="checkbox"/>	_____	_____

If the animal is female and sold with A.I. Breeding Privilege to seller's bull, certify by checking box, Sold with A.I. Breeding Privilege.

I certify that the above service conforms with the ownership provision of section 500 of the Rules governing artificial insemination, if applicable, as follows:

immediate relative full time employee SIGNATURE OF OWNER OF RECORD OF SERVICE BULL IF NOT SELLER OF FEMALE _____ MEMBER CODE _____

11 **Genetic Defect or Genetic Factor Codes**

All animals that have been reported and verified prior to the print date on this 3-generation certificate as carriers of recessive genetic defects or genetic factors are coded with the following codes. These codes represent a reporting of information on file when this 3-generation certificate was issued and do not indicate that any animal, coded or not, is free of genetic defects or genetic factors.

C = Carrier F = tested and non-carrier			
AM	Arthrogryposis Multiplex	AMC – tested carrier of AM	M1 nt821 Mutation for Double Muscling
		AMF – tested free of AM	M1C – tested carrier of M1
CA	CA Contractural Arachnodactyly	CAC – tested carrier of CA	M1F – tested free of M1
		CAF – tested free of CA	NH Neuropathic Hydrocephalus
D2	PRKG2 Gene Mutation for Dwarfism	D2C – tested carrier of D2	NHC – tested carrier of NH
		D2F – tested free of D2	NHF – tested free of NH
DM	Double Muscling	DMC – tested carrier of DM	OS Osteopetrosis
		DMF – tested free of DM	OSC – tested carrier of OS
DW	Dwarfism	DWC – tested carrier of DW	OSF – tested free of OS
		DWF – tested free of DW	RD Red Gene
HG	Horn Gene	HGC – tested carrier of HG	RDC – tested carrier of RD
		HGF – tested free of HG	RDF – tested free of RD
HI	Heterochromia Irides	HIC – tested carrier of HI	SN Syndactyly
		HIF – tested free of HI	SNC – tested carrier of SN
			SNF – tested free of SN
			WT Wild Type Color Gene
			WTC – tested carrier of WT
			WTF – tested free of WT
			RT Recessive Trait
			RTF – Recessive Trait Free
			Produced 35 or more calves from daughters without a genetic defect.
			XC Carrier of more than 1 defect
			XF Free of more than 1 defect

For more information, consult the Breeder's Reference Guide or go to www.angus.org

animal is free of all genetic conditions, whether coded or not coded.

Avoidance of mating carrier animals with the same genetic condition is an essential component of managing the incidence of genetic conditions, as is the strategic use of DNA testing.

④ EPD section

This section of the PRC documents the expected progeny differences and dollar value indexes for the animal, its sire and its dam as established through NCE. To review, let's use the descriptions published in the *Sire Evaluation Report* as to what some of these terms and acronyms mean.

EPD is the prediction of how future progeny of each animal are expected to perform relative to the progeny of other animals listed in the database. EPDs are expressed in units of measure for the trait, plus or minus.

Interim EPDs may appear for young animals when their performance has yet to be incorporated into NCE procedures. This EPD will be preceded by an "I" and may or may not include the animal's own performance record for a particular trait, depending on its availability, appropriate contemporary grouping, or data edits needed for NCE.

EPDs are enhanced by genomic results generated by GeneSeek and Zoetis.

Accuracy (ACC) is the reliability that can be placed on the EPD. An accuracy of close to 1.0 indicates higher reliability. Accuracy is affected by the number of progeny, ancestral records included in the analysis, and genomic test results.

\$Values are multi-trait selection indexes, expressed in dollars per head, to assist beef producers by adding simplicity to genetic selection decisions. The \$Value is an estimate of how future progeny of each sire are expected to perform, on average, compared to progeny of other sires in the database if the sires were randomly mated to cows and if calves were exposed to the same environment.

EPDs offered by the American Angus Association for production traits include:

Calving Ease Direct (CED) is expressed as a difference in percentage of unassisted births, with a higher value indicating greater calving ease in first-calf heifers. It predicts the average difference in ease with which a sire's calves will be born when he is bred to first-calf heifers.

Birth Weight EPD (BW), expressed in pounds, is a predictor of a sire's ability

to transmit birth weight to his progeny compared to that of other sires.

Weaning Weight EPD (WW), expressed in pounds, is a predictor of a sire's ability to transmit weaning growth to his progeny compared to that of other sires.

Yearling Weight EPD (YW), expressed in pounds, is a predictor of a sire's ability to transmit yearling growth to his progeny compared to that of other sires.

Residual Average Daily Gain (RADG), expressed in pounds per day, is a predictor of a sire's genetic ability for postweaning gain in future progeny compared to that of other sires, given a constant amount of feed consumed.

Yearling Height EPD (YH) is a predictor of a sire's ability to transmit yearling height, expressed in inches, compared to that of other sires.

Scrotal Circumference EPD (SC), expressed in centimeters, is a predictor of the difference in transmitting ability for scrotal size compared to that of other sires.

Docility (Doc) is expressed as a difference in yearling cattle temperament, with a higher value indicating more favorable docility. It predicts the average difference of progeny from a sire in comparison with another sire's calves. In herds where temperament problems are not an issue, this expected difference would not be realized.

EPDs and \$Values offered by the American Angus Association for maternal traits include:

Heifer Pregnancy (HP) is a selection tool to increase the probability or chance of a sire's daughters becoming pregnant as first-calf heifers during a normal breeding season. A higher EPD is more favorable, and the EPD is reported in percentage units.

Calving Ease Maternal (CEM) is expressed as a difference in percentage of unassisted births with a higher value indicating greater calving ease in first-calf daughters. It predicts the average ease with which a sire's daughters will calve as first-calf heifers when compared to daughters of other sires.

Maternal Milk EPD (Milk) is a predictor of a sire's genetic merit for milk and mothering ability as expressed in his daughters compared to daughters of other sires. In other words, it is that part of a calf's weaning weight attributed to milk and mothering ability.

Mature Weight EPD (MW), expressed in pounds, is a predictor of the difference in mature weight of daughters of a sire compared to the daughters of other sires.

Mature Height EPD (MH), expressed in inches, is a predictor of the difference in mature height of a sire's daughters compared to daughters of other sires.

Cow Energy Value (\$EN), expressed in dollar savings per cow per year, assesses differences in cow energy requirements as an expected dollar savings difference in daughters of sires. A larger value is more favorable when comparing two animals (more dollars saved on feed energy expenses). Components for computing the cow \$EN savings difference include lactation energy requirements and energy costs associated with differences in mature cow size.

EPDs offered by the American Angus Association for carcass traits include:

Carcass Weight EPD (CW), expressed in pounds is a predictor of the differences in hot carcass weight of a sire's progeny compared to progeny of other sires.

Marbling EPD (Marb), expressed as a fraction of the difference in USDA marbling score, is a predictor of the difference in marbling score of a sire's progeny compared to progeny of other sires.

Ribeye Area EPD (RE), expressed in square inches, is a predictor of the difference in ribeye area of a sire's progeny compared to progeny of other sires.

Fat Thickness EPD (Fat), expressed in inches, is a predictor of the differences in external fat thickness at the 12th rib (as measured between the 12th and 13th ribs) of a sire's progeny compared to progeny of other sires.

Group/progeny (C Grp/ Pg and U Grp/ Pg) reflect the number of contemporary groups and the number of carcass and ultrasound progeny included in the analysis.

\$Value indexes are multi-trait selection indexes, expressed in dollars per head, to assist beef producers by adding simplicity to genetic selection decisions. The \$Value is an estimate of how future progeny of each sire are expected to perform, on average, compared to progeny of other sires in the database if the sires were randomly mated to cows and if calves were exposed to the same environment.

\$Value indexes offered by the American Angus Association include:

Weaned Calf Value (\$W) is the expected average difference in future progeny performance for preweaning merit. \$W includes both revenue and cost adjustments

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associated with differences in birth weight, weaning direct growth, maternal milk and mature cow size.

Feedlot Value (\$F) is the expected average difference in future progeny performance for postweaning merit compared to progeny of other sires.

Grid Value (\$G) is the expected average difference in future progeny performance for carcass grid merit compared to progeny of other sires.

Quality Grade (\$QG) represents the quality-grade segment of the economic advantage found in \$G. \$QG is intended for the specialized user wanting to place more emphasis on improving quality grade. The carcass marbling (Marb) EPD contributes to \$QG.

Yield Grade (\$YG) represents the yield-grade segment of the economic advantage found in \$G. \$YG is intended for the specialized user wanting to place more emphasis on red-meat yield. It provides a multi-trait approach to encompass ribeye, fat thickness and weight into an economic value for red meat yield.

Beef Value (\$B) is the expected average difference in future progeny performance for postweaning and carcass value compared to progeny of other sires.

More details about \$Values can be found at www.angus.org/Nce/ValueIndexes.aspx.

5 Print date

Just below the EPD/\$Value block is a “print date.” This is the date of the most recent NCE from which the EPDs were calculated at the time the paper was printed.

6 Production Numbers

Above the pedigree is a table that contains performance data on the individual and its sire and dam.

Ind — The first line is the individual information on the animal. For example, this bull was calved unassisted (calving-ease score of 1). He had a birth weight ratio of 121 (21% heavier than the average of the 163 calves in his group). His weaning ratio was 112 (compared to the same group of 163 calves). His yearling ratio was 126; however, only 71 of the 163 calves in his weaning group were kept to yearling age in his management group.

Prog — The production and ultrasound sections of the second line reflect the performance of the individual’s progeny. In the calving-ease columns, only records from first-calf heifers are used. The maternal section deals with daughters of

the individual and their respective records.

Sire — The production and maternal sections of the third line reflect records of the sire’s progeny.

Dam — The production and maternal sections of the last line reflect records of the dam’s progeny.

7 Pedigree section

This section reveals the animal’s three-generation pedigree. Symbols are used with a registration number to indicate specific information about an animal. Embryo transfer (ET) animals will show a plus sign (+) before the registration number. A % symbol indicates an ET calf derived from a split embryo, while an @ symbol indicates an ET clone. A cell clone is indicated by a caret (^). A pound sign (#) before the registration number indicates the animal is a Pathfinder Sire or a Pathfinder Dam. Annual listings of Pathfinders and the related requirements can be found at www.angus.org/Performance/PathfinderInfo.aspx.

8 Owner/service sire section

This section lists the name of the recorded owner, their member number and the date of sale. If the animal is owned by multiple owners, that will be noted along with the number of owners. If the PRC is for a cow and the cow has been bred (or the cow is sold open) the information will print in this section of the PRC. The service dates and the registration number and name of the service bull are listed in this section. The number of times this animal has been transferred is also printed in this section. See Fig.2 below.

9 Bottom section

At the bottom of the PRC, the date represents the date the listed ownership was processed in the Association database. It is accompanied by the file number of the office transaction recording the ownership and the barcode of the animal’s registration number.

10 Transfer section

This section provides space to transfer the animal to a buyer. Fill out this section

completely and mail the completed form to the American Angus Association with proper payment to complete the transfer.

The first line is for the seller’s signature (or an authorized agent’s signature) and member code authorizing the transfer of ownership on AAA’s records. The sale date reflects the date the change in ownership occurred followed by a check box indicating whether or not the seller is retaining an interest in the animal.

The next section allows for the transfer of ownership to up to three buyers. Association rules allow up to three owners, and the PRC does not reflect percentage ownership.

Breeding records (service) must be reported on all females over 365 days of age or the female is recorded as not bred (open). Use the checkbox to indicate the female is open.

This section allows up to six service records to be reported on a transfer of ownership. The services may be AI service date(s) or natural exposure date(s) to bull(s).

If a female is sold with an AI Breeding Privilege to one of the seller’s bulls, the check box needs to be checked.

When a female is serviced by natural service to a bull not owned by the seller of the female, this bull permit (allowing registration of the resulting calf), should be signed by the owner of the service sire.

11 Genetic code section

This block lists genetic conditions and descriptors that, when applicable, will be at the end of the registration number of the animal (and under the registration number in section 3) and each animal in the pedigree.

For more information about registering and transferring Angus cattle, visit the “Management” tab of the Association’s website, www.angus.org.



Editor’s Note: *The core explanations of the PRC were compiled in committee and is available on the Association’s website, www.angus.org. Both on the committee, Tonya Amen is genetic services director and Chris Stallo is vice president of operations for the American Angus Association.*

Fig. 2: Illustrated example of owner/service sire section

SERVICE DATE		BULL NO.	SERVICE BULL NAME	TRF. NO.
05/21/2012	Need AI Cert.	AAA -----	XXX XXX XXXXX XXX	2
06/28/2012	-10/25/2012	AAA -----	XXX XXX XXXXX XXX	
06/28/2012	-10/25/2012	AAA -----	XXX XXX XXXXX XXX	
06/28/2012	-10/25/2012	AAA -----	XXX XXX XXXXX XXX	
06/28/2012	-10/25/2012	AAA -----	XXX XXX XXXXX XXX	
06/28/2012	-10/25/2012	AAA -----	XXX XXX XXXXX XXX	
06/28/2012	-10/25/2012	AAA -----	XXX XXX XXXXX XXX	